I. Introduction

Indigenous Latin Americans have been relegated to an inferior status in ever since their home countries were colonized by Europeans. Years after independence and the end of de jure discrimination, indigenous people still struggle to gain social and economic equality. Bolivia, where seventy-five percent of the population is of indigenous origin, has the lowest per capita GDP of any country in South America and the second most unequal dispersion of wealth on the continent[1] (World Bank, 2004). It is readily apparent that indigenous Bolivians overall make lower wages than white Bolivians, but the causes of this income disparity are not quite as obvious. Specifically, is the wage gap mostly attributable to differences in human capital endowments? Or do indigenous Bolivians earn less than white Bolivians with the same level of human capital, location, and sector of employment, leading to the conclusion that there is discrimination present in the labor market? If the indigenous-white wage gap is primarily due to discrimination, policies targeted at reducing the disparity would be different than if the gap were primarily due to disparities in human capital and therefore could be rectified by equalizing the levels of human capital between the groups.

Researchers have studied this issue in the United States[2] and have more recently begun to attempt to discern the causes of the white-indigenous gap in Latin America[3], drawing different conclusions about the proportion of the gap attributable to discrimination, sometimes within the same market. Two previous studies have focused on Bolivia. Kelley (1988) found that in a rural population in 1966, the entire white-indigenous gap was due to personal characteristics and family background rather than discrimination. Psacharopolous

[1] Brazil has the most unequal distribution of wealth in South America. As in Bolivia, there are also significant racial differences in wealth.
[2] For example, Gwartey and Long (1978), Sandefur and Scott (1983), or Chiswick (1988)
[3] For example, Silva (1992) or Patrinos (1998)

and Patrinos (1993) used 1989 data from urban centers and found that 72% of the wage gap was due to explained characteristics, while 28% could be attributed to discrimination. The 1990's in Bolivia was a time of significant economic change, such as privatization and trade liberalization. Many indigenous Bolivians argued that these reforms hurt them disproportionately during street protests against President Gonzalo Sánchez de Lozada in 2003. I use data from a 2002 household survey which encompasses both urban and rural households in order to determine a more recent assessment of the causes of the racial income disparity in Bolivia.

Two econometric techniques are used to estimate the extent and causes of the racial wage disparity. First, I make use of the Oaxaca decomposition (1974), which decomposes the earnings differential into an explained component due to differences in average levels of income-generating characteristics and an unexplained component due to differences in returns to those characteristics. This technique is useful because it not only specifies the magnitude of the overall explained and unexplained components of the wage disparity but also illustrates the contribution of specific human capital factors to the explained and unexplained components of the wage gap. My results indicate that 31% of the wage gap can be explained by differences in personal characteristics between the two groups, while 69% of the differential is due to differences in returns to these factors. This is a higher level of discrimination than in previous studies. A possible explanation for this difference is that the indigenous sample in my analysis included ethnically indigenous respondents raised speaking Spanish, who were better educated and earned more than indigenous respondents whose first language was an indigenous language. Because these indigenous respondents had similar levels of human capital to white Bolivians but still made lower wages, it is likely that

including them in my survey increased the overall level of discrimination faced by indigenous people. The unexplained component of the wage gap is primarily due to lower returns to experience and schooling accruing to the indigenous group, while the explained component is primarily due to the fact that indigenous people disproportionately tend to live in parts of the country with overall lower wages.

Second, I use the methodology described by DiNardo, Fortin, and Lemieux, (DFL hereafter), (1996) to estimate nonparametrically the counterfactual distribution of the wages of the indigenous group that one would observe if they had the same levels of a chosen set of covariates as the white group. This method has the advantage of illustrating differences not only in the mean levels of the distribution but in the whole distribution, so that I could verify that the gap in average wages extends to all parts of the wage distribution. The results of this procedure also indicate that the wage gap would almost completely disappear at all wage levels if the indigenous people were remunerated for their human capital on the same schedule as the whites.

Section II explains relevant previous research about the causes of racial wage disparity, particularly studies about Bolivia. Section III describes the data. Section IV explains in more detail the Oaxaca decomposition and DFL procedure. Section V analyzes the earnings functions, while Section VI explores the findings of the decomposition analyses. Section VII highlights some key differences in the Aymara and Quechua Indians' labor market experience. In section VIII, I offer some concluding remarks.

II. Review of Previous Research

Economists have focused for many years on earnings differentials and labor market discrimination. While there is a huge literature on the subject, I will concentrate on studies done in Latin America, and particularly in Bolivia. The idea of decomposing wage disparity originated in the study of male/female and black/white disparities in the United States. In a classic article, Oaxaca (1973) studied urban labor markets and formed earnings functions of males, females, blacks, and whites based on a large set of control variables such as education, experience, health, characteristics of immediate family, size of metropolitan area of residence, occupation, and region. He defined discrimination as the residual left after adjusting the wage disparity for differences in personal characteristics between groups. He explained that including too few of these personal characteristics in the earnings function would bias the estimation of discrimination by treating the two groups as closer substitutes in the provision of labor than they actually are. Even so, he attributed most of both the black-white earnings gap (94%) and male-female gap (78%) to discrimination.

Attempts to explain the indigenous-nonindigenous earnings gap in the U. S. have had mixed findings about the portion of wage disparity that is attributable to discrimination versus the potential for education and other human capital improvements to close the wage gap. Using data from the 1960's and 1970's, Gwartey and Long found little change in indigenous/white earnings differentials, despite increasing levels of education among the indigenous population (1978). They attributed 40% of the earnings gap to discrimination. Chiswick also found that indigenous Americans with low levels of education tend to receive low returns to education, evidence against the theory of decreasing marginal returns to education (1988).

Sandefur and Scott found that indigenous populations in the United States received greater returns to education than whites (1983). They argued that indigenous people overall had lower levels of human capital due to previous discrimination but extrapolated that if indigenous people had the same level of human capital as whites in the current labor market, they would have equal earnings. They attributed the lack of current labor market discrimination against the indigenous population to their more frequent intermarriage, general social interaction, and acculturation to the rest of American society. Kuo found similar results in Northern Canada and also argued that little of the indigenous/white earnings gap was due to discrimination (1976).

A few studies have focused specifically on determining the causes of the racial wage disparity in Latin American countries. The incidence of wage discrimination against indigenous populations in Latin America varies widely (Patrinos, 1998a). In Brazil, for example, much of the wage disparity between ethnic groups cannot be attributed to measurable difference in human capital. The magnitude of this discrimination is growing (Silva, 1992), an alarming finding that contradicts neoclassical economic theories which predict that discrimination will decrease over time. In Mexico and Peru, Patrinos attributed approximately half of the indigenous-white wage gap was to discrimination, while the other half was due to differences in human capital (1998a). The opposite end of the spectrum is Paraguay, where the magnitude of the earnings gap is the lowest among Latin American countries and can be attributed almost totally to differences in human capital (Patrinos 1998b).

In Bolivia, Kelley (1988) analyzed “the cost of being Indian” with a 1966 household survey of 1000 households in rural Bolivia. He pointed out that it is especially important to

study the indigenous-white gap in Latin America, which is much larger than often-studied black-white gaps in the United States. He decomposed the earnings differential between indigenous and nonindigenous Bolivians into differences in level of education, demographics, and other personal characteristics versus economic returns to these factors. He found that all of the earnings differences could be explained by individual characteristics such as family background, education, and occupation, which he considered to comprise the respondent's class.

Kelley acknowledged, however, that previously there had been considerable ethnic discrimination in Bolivia, which meant that there were few indigenous families as prosperous as white families; this would explain the large income gap. He attributed the disappearance of ethnic discrimination to the 1952 Nationalist Revolution, which eliminated forced labor and mandated other reforms that significantly improved the status and opportunities of Bolivia's indigenous population. Explaining that the nationalist movement had taken power from a land-owning aristocracy and placed it in the hands of a strong central government, he concluded that after the revolution it was much harder for local elites to exploit indigenous peasants.

Psacharopolous and Patrinos repeated Kelley's analysis using 1989 data collected from a household survey of urban centers in Bolivia (1993). They found that 72% of the indigenous-nonindigenous earnings gap could be attributed to differences in factor endowments, while 28% was unexplained. The unexplained component was comprised mainly of lower returns to education and age accruing to indigenous workers. Psacharopolous and Patrinos suggest that their results found a nontrivial unexplained component because they were unable to control for differences in wages due to family

background characteristics, as Kelley did. Another potential explanation is that discrimination gradually reappeared during the more conservative 1980's after the radically egalitarian post-Revolution period. Indeed, Kelley (1988) warned that if the government lost its egalitarian ideals and renewed its previous prejudice toward indigenous populations, the gap could reappear.

Becker's (1971) and other traditional theories of labor markets predict that discrimination against ethnic minorities will decrease over time as the minority group assimilates into the dominant culture and increases its average level of human capital, both of which will help it earn wages at a level closer to that of the majority group. Discrimination would also decline because profit-maximizing companies realize that they could hire more productive workers and thus increase their profits by hiring the productive workers that they had previously overlooked due to their ethnicity. In equilibrium, workers would be paid according to their marginal product of labor; investments in human capital that raised their productivity would also increase wages. This theory requires the assumption of fully rational actors and exogenously determined preferences, implying that working in a low-wage job does not affect a worker's tastes, abilities, or behavior.

However, other labor economists have argued against the neoclassical assumptions that predict market-clearing wages, arguing that an impediment to wage equalization is a system of segmented markets in which workers are segregated into a low-wage market, low-productivity market and a high-wage, high-productivity market (Dickens and Lang, 1988). The high-wage market tends to reward investments in human capital such as increased schooling and experience, while wages in the low-productivity group remain more stagnant. The shortage of high-paying jobs is created by wages kept above market level because of

union negotiations, distorted public sector salaries, and efficiency wages paid by multinational corporations.

Practical and cultural barriers, such as a lack of knowledge of other opportunities and difficulty obtaining money to invest in a job switch, prevent capable low-wage workers from transferring into the high-wage market. Dickens and Lang explain that many economists also allege that the act of serving in a low-paying job affects workers' beliefs, making them less likely to seek entry into the high-wage market because they begin to believe that they are only capable of serving in the low-wage market. On the surface, Bolivia exhibits evidence that indigenous workers are concentrated in disproportionately low-paying jobs; for instance, some types of commerce (such as street stands in the black market) are undertaken almost exclusively by indigenous workers, while the employees in the more formal, typically higher-paying commerce sector are usually white. The work does not seem to be more difficult in the higher-wage commerce sector, suggesting that skill differences cannot explain why indigenous workers do not seek those jobs.

Another factor allowing wage discrimination to persist is the public sector, which lacks a profit-maximizing incentive and thus may not allow productive indigenous workers to truly be remunerated based on their productivity (World Bank, 1996). Other theories attempting to explain persisting racial wage disparity suggest that indigenous groups earn lower salaries because they do not put as high an importance upon monetary wealth or success in a job. Rather, they are described as "target workers" who work only as long as is necessary to fund a specific purchase or amount of time outside of the labor market (Sandefur and Scott, 1983). These sporadic stints in the work force are associated with a

lower level of productivity, even compared to workers who have similar levels of human capital.

Labor market shocks that differentially harm minority groups could also counteract market forces pushing toward wage equalization across groups, leading to persisting wage disparities in the time period after the shock. For instance, the data used in Psacharopolous and Patrinos' 1989 study was collected during the incipiency of the 1989 Stabilization and Structural Adjustment program undertaken by the government, with the support of the IMF, in order to correct for an overly expansionary fiscal policy during the 1980's and mitigate the effects of the collapse of the international market for minerals. Horton (1994) found that the hyperinflation of the 1980's decreased income inequality but that inequality began to increase again in the early 1990's after the Structural Adjustment program was started. Horton explained that the program had a significant effect on the labor market, with particularly adverse effects seen among marginalized workers. Horton's theory is supported by the fact that there were more indigenous Bolivians in poverty in 1993 than in 1989 (World Bank, 1996).

It is difficult to determine how many of these effects were captured as the 1989 survey data were collected. The possibility that the Structural Adjustment program differentially harmed indigenous workers and increased labor market discrimination needs to be examined. The survey data I use were collected in 2002, after a time of numerous other economic reforms and during the rule of a president, Gonzalo Sánchez de Lozada, whose trade liberalization and privatization policies were particularly unpopular among Bolivia's indigenous population.

III. Data

In November and December of 2002, the Bolivian *Instituto Nacional de Estadística* (National Institute of Statistics), with financial and structural support from the Inter-American Development Bank's *MECOVI* (Improvement of Surveys and the Measurement of Living Conditions in Latin America) Initiative, conducted a survey of households throughout Bolivia, collecting data on 24,933 individuals in total. Among other information, this survey provides records of education, earnings, demographics, sector of employment, and ethnic group. The fact that the survey explicitly asked "Es indigena?" ("Are you indigenous?") represents a substantial improvement over previous household studies for researchers interested in race, who previously had to use the language(s) reported to be spoken as a proxy for the respondent's ethnic group. While it is accepted that there is a high correlation between speaking an indigenous language and ethnic indigenous origin (Latin American and Caribbean Demographic Center [CELADE], 1992), there is an increasing number of Bolivians who are ethnically indigenous but do not speak an indigenous language. Prior researchers addressed the issue by explaining that ethnically indigenous people who do not report speaking an indigenous language generally have better Spanish ability and are more assimilated into society than those who do report speaking an indigenous language, which they believe would decrease or eliminate wage discrimination based on ethnicity (Patrinos, 1998b). Still, it is at least possible that some labor market discrimination could be due to a worker's ethnic appearance, regardless of his or her language skills.

The ethnic breakdown of the Bolivians included in the study is reported in Table 1. The two largest indigenous ethnic groups are Quechua and Aymara Indians. Because their different origins continue to shape their current situations in the Bolivian labor market today,

TABLE 1
Ethnicity of survey respondents

	Salary data			*Working-age adults (15 < age < 65)*	
	No.	Pct.	Pct. Working for wage	No.	Pct of total
Quechua	833	24.6%	18.2%	4,580	30.6%
Aymara	482	14.2%	17.8%	2,714	18.1%
Guarani	64	1.9%	43.8%	146	1.0%
Chiquitano	41	1.2%	29.5%	139	0.9%
Mojeño	54	1.6%	22.0%	245	1.6%
Other	44	1.3%	22.3%	197	1.3%
Nonindigenous	1,867	55.2%	26.8%	6,954	46.4%
TOTAL	3,385	100%	22.6%	14,975	100%

their histories are briefly detailed here. The Aymara Indians have inhabited the *altiplano* (high plain) around the Andes Mountains of Bolivia, near the modern La Paz and Oruro departments, since around 600 BCE (Library of Congress, 2004). They Aymara lived in fortified hilltop towns and were known for their ability to withstand the cold, harsh conditions of the *altiplano*; they lived in collective units which typically distributed land equally among members. They also developed irrigation and preserving techniques to maximize the food supply produced by the region's poor soils. Today, the majority of Aymaras continue to inhabit the altiplano region, primarily in the department of La Paz. The more affluent Aymaras there live in the city of La Paz, but most reside in the satellite community of El Alto, an almost entirely Aymara city approximately the same size as La Paz, and commute into La Paz for work.

The Quechua Indians are descendents of Incan invaders who conquered the Aymaras in the early 1400's after invading from their power base in southern Peru. The Incans treated the newly conquered territory primarily as a source of mineral wealth to help maintain their

larger empire and enslaved Aymaras and other native Bolivians to extract the wealth. The Aymara settlements resisted most of the Incan cultural influence, however, and the area most heavily settled by the Incans was in the valleys between the altiplano and the Amazon lowland, rather than the mountain strongholds of the Aymaras. Though there is some shared vocabulary between the Aymara and Quechua languages due to their historic interactions, the general structure of the two languages is not similar and they are not mutually understandable. Today, most Quechua Indians continue to live in these areas, primarily the department of Cochabamba, but also in Chuqusaca, Potosí, Oruro, and Santa Cruz.

There were three other indigenous groups, primarily inhabiting the Amazon lowlands, encompassing more than 100 survey respondents – Guaraní, Mojeño, and Chiquitano – along with numerous smaller groups specified by individual respondents. Even though the indigenous groups overall have similarities in lifestyle, poverty, and experiences in the labor market, they have different histories, locations, languages, and socio-cultural legacies. It is important to examine the possibility that certain ethnic groups face different levels or types of labor market discrimination as a result of these differences. In my analysis I compare nonindigenous Bolivians to both indigenous Bolivians (a category incorporating any Bolivians who self-identified as a member of any indigenous group) and to the Quechua and Aymara groups specifically.

All of the examinations of earnings were conducted on the 3385 respondents who replied with a specific number to the question "Cuanto es su salario liquido?" (How much is your take-home salary?). Because of the importance of the informal sector in the Bolivian economy, it is not surprising that relatively few respondents specified a salary: only 34% of those who answered affirmatively to the question "En la semana pasada trabajó?" (Did you

work last week?) reported a salary. In a study of the size of the informal sector across 110 countries, Schneider (2002) found that Bolivia had the largest of all countries examined, 67.1%, a figure which corresponds almost perfectly with the percent of respondents who did not report an official salary. Table 1 also includes the ethnic breakdown of the individuals for whom salary data were available. The indigenous respondents are more likely to work in the informal sector because they comprise a smaller percentage of the respondents who reported a salary. Since my analysis is conducted only among workers in the formal sector, the discrimination I measure does not measure racial disparities in workers' opportunities to gain access to formal sector jobs.

Table 2 reports the sample means of selected survey questions for indigenous, white, Aymara, and Quechua populations, as well as for all individuals reporting salaries. The indigenous respondents, as predicted, have a lower average hourly wage (5.79 Bolivianos/hour), than do white Bolivians (7.27 Bs/hour). There is also a difference in the average hourly wage of Aymaras (5.31 Bs/hour) and Quechua (5.86 Bs/hour) although a t-test for the difference in means cannot reject the hypothesis that they are equal (P = .2205). The indigenous respondents were on average older, more likely to be married, and more likely to live in rural settings. There was no significant difference between the indigenous and white groups with respect to gender or membership in a union.

The indigenous respondents overall had fewer years of schooling, though the disparity (9.24 years for indigenous respondents, compared to 10.02 for white Bolivians) was not as high as in previous studies. Figure 1 presents the cumulative frequency of highest year of schooling completed for white and indigenous Bolivians. It is especially striking that the

TABLE 2

Sample means for individuals with salary data

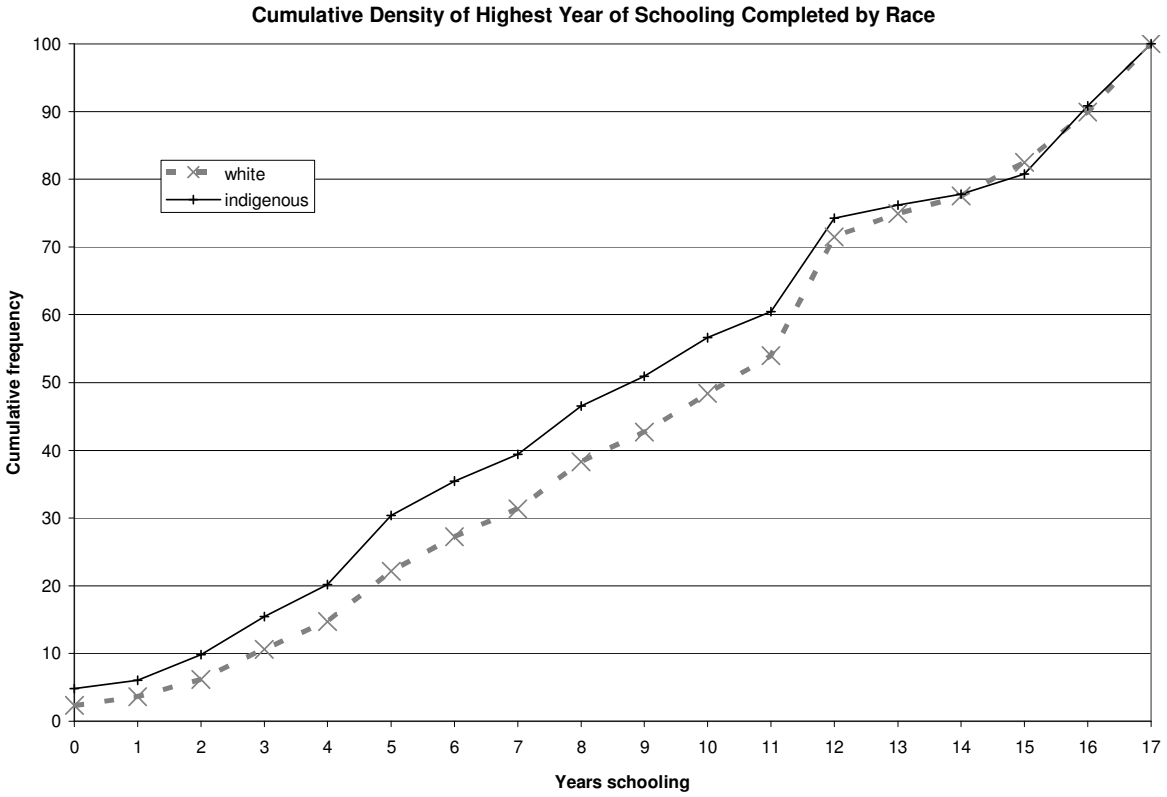
	Pooled	Indig	White	Quechua	Aymara
Hourly Wage (Bs)	6.58	5.79	7.27	5.86	5.31
	(14.17)	(8.507)	(17.439)	(8.538)	(6.619)
Age	33.41	34.27	32.71	33.14	35.00
	(12.409)	(12.363)	(12.405)	(11.958)	(11.881)
Schooling	9.67	9.24	10.02	9.17	9.55
	(4.92)	(5.105)	(4.732)	(5.389)	(4.650)
Male	0.663	0.665	0.662	0.615	0.743
	(0.473)	(0.472)	(0.473)	(0.487)	(0.438)
Union	0.210	0.217	0.205	0.235	0.222
	(0.408)	(0.412)	(0.404)	(0.424)	(0.416)
Married	0.447	0.495	0.408	0.481	0.577
	(0.497)	(0.500)	(0.492)	(0.500)	(0.495)
Urban	0.787	0.752	0.815	0.729	0.828
	(0.410)	(0.432)	(0.388)	(0.445)	(0.378)
Direccion	0.040	0.033	0.046	0.024	0.041
	(0.196)	(0.179)	(0.209)	(0.153)	(0.200)
Profesional	0.126	0.140	0.115	0.158	0.127
	(0.332)	(0.347)	(0.319)	(0.365)	(0.333)
Oficina	0.101	0.040	0.074	0.074	0.093
	(0.301)	(0.286)	(0.313)	(0.263)	(0.291)
Tecnico	0.059	0.090	0.110	0.049	0.025
	(0.235)	(0.195)	(0.263)	(0.216)	(0.156)
Comercio	0.108	0.097	0.117	0.096	0.108
	(0.311)	(0.296)	(0.322)	(0.295)	(0.311)
Agricultura	0.033	0.030	0.035	0.026	0.015
	(0.178)	(0.171)	(0.183)	(0.160)	(0.120)

	Pooled	Indig	White	Quechua	Aymara
Minera	0.214	0.254	0.181	0.236	0.315
	(0.410)	(0.436)	(0.385)	(0.425)	(0.465)
Operador	0.091	0.089	0.093	0.083	0.108
	(0.288)	(0.285)	(0.290)	(0.276)	(0.311)
Chuqusaca	0.070	0.076	0.066	0.126	0.006
	(0.256)	(0.265)	(0.248)	(0.332)	(0.079)
La Paz	0.186	0.248	0.135	0.031	0.720
	(0.389)	(0.432)	(0.342)	(0.174)	(0.450)
Cochabamba	0.155	0.258	0.071	0.423	0.068
	(0.362)	(0.437)	(0.257)	(0.494)	(0.253)
Oruro	0.070	0.111	0.036	0.126	0.120
	(0.255)	(0.314)	(0.187)	(0.332)	(0.326)
Potosi	0.062	0.086	0.042	0.145	0.021
	(0.241)	(0.281)	(0.200)	(0.353)	(0.143)
Tarija	0.094	0.035	0.142	0.031	0.015
	(0.292)	(0.184)	(0.350)	(0.174)	(0.120)
Santa Cruz	0.243	0.131	0.334	0.107	0.037
	(0.429)	(0.338)	(0.472)	(0.309)	(0.190)
Beni	0.091	0.053	0.123	0.008	0.008
	(0.288)	(0.224)	(0.328)	(0.091)	(0.091)
Pando	0.030	0.003	0.051	0.002	0.004
	(0.169)	(0.057)	(0.220)	(0.049)	(0.064)

Standard errors reported in parentheses below the sample means

indigenous Bolivians in the sample are attaining college degrees at approximately the same rate as white Bolivians, reflected in the near coincident cumulative frequencies from 12 years of schooling on. In Psacharopoulos and Patrinos' 1989 data of urban Bolivians, the indigenous respondents had on average only 7.41 years of schooling, while the whites

FIGURE 1



surveyed had 10.13 years. This difference is even more noticeable when compared to only the urban indigenous respondents in the survey I use, who had a higher level of schooling (9.75 years), as one might expect, than the overall indigenous population. The marked increase in the indigenous Bolivians' level of schooling in my survey likely reflects both increased access to schooling and also the fact that my indigenous group included ethnically indigenous Bolivians raised speaking Spanish, who would not have shown up as indigenous in previous studies that used childhood language as a proxy for ethnicity.

The survey also asked the respondents' *grupo ocupacional* (occupational category). The surveyor categorized the responses into eight categories. For each, the name I used in the table, the percentage of salaried workers who report working in the field, and my translation of the Spanish detailed in the surveyors' manual are listed:

direccion	4.0 %	management, in business or the public sector
profesional	12.6 %	professionals, scientists, intellectuals
oficina	10.1 %	office employees
tecnico	5.9 %	technicians and support professionals
comercio	10.8 %	providers and sellers of commercial goods
agricultura	3.3 %	agriculture, cattle-ranching, fishing
minera	21.4 %	extractive industry, construction
operador	9.1 %	operators of machinery and facilities maintenance

Seventy seven percent of responses fell into one of these categories; the other 23% were considered to be *trabajadores no calificados* (nonclassified professions) by the surveyor. Table 2 also specifies the percent of salaried workers from each race working in each profession. White respondents reporting a salary were more likely to work in management, commerce, or as technicians or office support professionals; indigenous respondents who work for salary were more likely to work in mining or as professionals. There was no appreciable racial difference in the number of salaried agriculture workers and machinery operators. It is important to remember that the distribution of professions among those who report a salary is very different from the distribution in all respondents. For example, 34% of indigenous Bolivians fifteen years and older report working in agriculture, while only 3% of indigenous Bolivians who report a salary work in agriculture. Still, this study will provide an analysis of the determinants of earnings among workers who do report a salary.

The distribution of survey respondents across departments (also included in Table 2) reflects the historical settlement patterns of Aymara, Quechua and other indigenous groups and the colonization patterns of Spaniards. Indigenous people were more likely to live in La Paz and Oruro (primarily Aymaras), and Potosí and Cochabamba (primarily Quechuas). Indigenous (mostly Quechuas) and whites were equally likely to live in Chuqusaca. Whites were more likely to live in Tarija, Santa Cruz, Beni, and Pando, continuing the pattern of

lower pre-Columbian population densities in those areas. The indigenous respondents who did live there were from smaller groups such as Guaraní, Chiquitano, or Mojeño.

IV. Estimation Strategy

I first estimate the magnitude and causes of the indigenous/white income gap using an Oaxaca decomposition (1973). This requires first the estimation of separate earnings functions for the indigenous and white groups. Each earnings function is estimated by regressing the logarithm of hourly wage on an individual's years of education, and dummy variables for gender, urban, union, and marital status. Both age and age squared terms were included because a scatter plot of an individual's earnings versus age suggested a concave shape, with a peak around forty-five years. The possibility that individuals working in different sectors could earn different salaries, even after individual characteristics were controlled for, was examined by including a series of seven dummy variables that categorized the individuals' occupations. Finally, I also included dummies for seven of Bolivia's eight departments; the omitted department is La Paz. An ordinary least squares procedure is used.

By comparing the coefficients on the explanatory variables in these two expressions, I can decompose the earnings gap into an "explained" component due to differences in the workers' characteristics and an "unexplained" component due to discrimination or unmeasured factors. The earnings functions can be summarized by the expressions:

$$\ln(AHE)_I = \beta_I * X_I + u_I$$

$$\ln(AHE)_W = \beta_W * X_W + u_W$$

where X_W is a vector of explanatory variables for white Bolivians, X_I is a vector of the same variables for indigenous Bolivians, and β_W and β_I are the coefficients on each explanatory variable for white and indigenous Bolivians, respectively. The terms u_I and u_W reflect both unobserved or immeasurable personal characteristics and measurement error. After taking the mean of each variable, the equations have the form:

$$\overline{\ln(AHE)_I} = \beta_I * \overline{X_I}$$

$$\overline{\ln(AHE)_W} = \beta_W * \overline{X_W}$$

Following Oaxaca's procedure, the equations are then subtracted in order to write an expression for the average wage differential as a function of personal characteristics and slope coefficients of the white and indigenous groups:

$$\overline{\ln(AHE)_W} - \overline{\ln(AHE)_I} = \beta_W * \overline{X_W} - \beta_I * \overline{X_I}$$

The term $\beta_W * \overline{X_I}$ can be added and subtracted to the equation, preserving the equality:

$$\overline{\ln(AHE)_W} - \overline{\ln(AHE)_I} = \beta_W * \overline{X_W} - \beta_I * \overline{X_I} + \beta_W * \overline{X_I} - \beta_W * \overline{X_I}$$

The terms can be regrouped to write the wage differential as a function of the difference in the mean values of each explanatory variable (the explained component) and the difference in the slope coefficients on each explanatory variable, which can be thought of as discrimination because a difference in slopes mean that the two groups are receiving different returns to the same income-generating characteristics.

$$\overline{\ln(AHE)_W} - \overline{\ln(AHE)_I} = \beta_W (\overline{X_W} - \overline{X_I}) + \overline{X_I}(\beta_W - \beta_I)$$

The relative size of the unexplained and explained terms can be interpreted as the percentage of the wage differential that can be attributed to discrimination or unexplained characteristics, versus the percentage due to difference in mean population characteristics. It

must be noted that the percentage of the gap attributed to discrimination does not take into account the effects of previous discrimination in the ability of individuals to obtain personal income-generating characteristics.

The second procedure, described by DFL (1996), first uses a kernel function to smooth and estimate the wage distribution of white and indigenous Bolivians. Then, as in the Oaxaca decomposition, an attempt is made to estimate a counterfactual condition: how much would an indigenous Bolivian earn if he kept his original endowment of a certain factor but received the same returns to that factor as a white Bolivian?

We begin with the marginal distribution of income-generating covariates (represented by x) for the indigenous group, $\int f(x \mid ind = 1)dx$, where *Ind* is a dummy variable which equals one for indigenous and zero for whites. By multiplying that expression by the conditional wage distribution for whites given the same covariates, we have:

$$\int f(y \mid x, ind = 0) * f(x \mid ind = 1)dx$$

the counterfactual wage distribution for indigenous workers that would result if we assumed that their wage distribution given their income-generating covariates is the same as for whites. Appendix 1 uses rules of conditional probability and some algebra to prove that the above expression is equal to the following:

$$= f(y \mid ind = 0) * e[w(x) \mid y, ind = 0]$$

Where we define the reweighting function to be $w(x) = \dfrac{P(ind = 1 \mid x) * P(ind = 0)}{P(ind = 0 \mid x) * P(ind = 1)}$.

Now we can approximate our original expression of interest simply by estimating $f(y \mid ind = 0)$ nonparametrically and estimating $P(ind = 1 \mid x)$ and $P(ind = 0 \mid x)$ with a

logit regression. The resulting approximation of $\int f(y \mid x, ind = 0) * f(x \mid ind = 1) dx$, when compared to the kernel-smoothed wage distributions for indigenous and white workers, will suggest how the distribution of the wage of indigenous workers would change if they received the same returns to human capital as whites. If the counterfactual graph is close to the indigenous distribution, the procedure suggests that much of the wage disparity is due to differences in the attained level of human capital. If the income gap, however, is due to differences in returns to human capital, the counterfactual graph would be much closer to the white distribution, suggesting that indigenous workers would have earnings similar to whites' if they received the same rewards to income-generating personal features as whites.

The use of a kernel functions allows the distributions (white, indigenous, and counterfactual) to be seen without the distortion created by using a histogram, which has a discrete number of categories, to represent data from a continuous wage distribution. (For an intuitive treatment, see Deaton, 1997.) The central idea of kernel smoothing is that the density is estimated at each point in the wage distribution by "counting" the points in a neighborhood (called the bandwidth) of each value of x assigning to each data point a positive weight which decreases with the distance from x. The kernel I use is a biweight kernel:

$$K(.) = \frac{15}{16} * (1 - z^2)^2$$

The kernel function over the chosen bandwidth, applied to each point in the distribution, then gives a continuous approximation of the density of the wage variable.

V. Earnings Function Results

Table 3 summarizes earnings functions for the pooled sample, as well as the indigenous, white, Quechua and Aymara groups. All groups exhibited a positive coefficient on the linear age term and a negative coefficient on the age-squared term, demonstrating that an additional year of age increases a worker's salary until a certain age, after which an additional year of life actually decreases salary. Because the dependent variable is in natural logarithm form, the slope coefficients on explanatory variables can be interpreted as the percent change in wage from a one-unit change in the particular variable. Therefore, the regression equations imply that for white workers, an additional year of age increased earnings by 5.09%, while an additional unit of age squared decreased earnings by .0521%. Indigenous workers received an average wage increase of 4.80% for an additional year of life, while an additional unit of age squared decreased earnings by .0506%. This pattern is reflected graphically in the age-earnings profile in figure 2, which graphs the average salary for 10-year cohorts of workers by age and depicts a flatter increasing slope for the indigenous group before the late 40's and less steeply decreasing slope afterwards.

The indigenous group also received lower returns to schooling than the white group. An additional year of schooling, ceteris paribus, increases wage by 5.01% for white Bolivians and only 3.23% for indigenous Bolivians. It is sometimes suggested that because the indigenous population in Latin American overall receives lower quality schooling than the white population, the lower returns to education that accrue to them are due more to the lower amount of learning in their schools than discrimination once they enter the labor market (Chiswick, 1988). Chiswick also suggests that indigenous Bolivians may disproportionately have trouble converting the learning they receive in schooling into human capital because of their home situations. For instance, the indigenous children in his study

TABLE 3

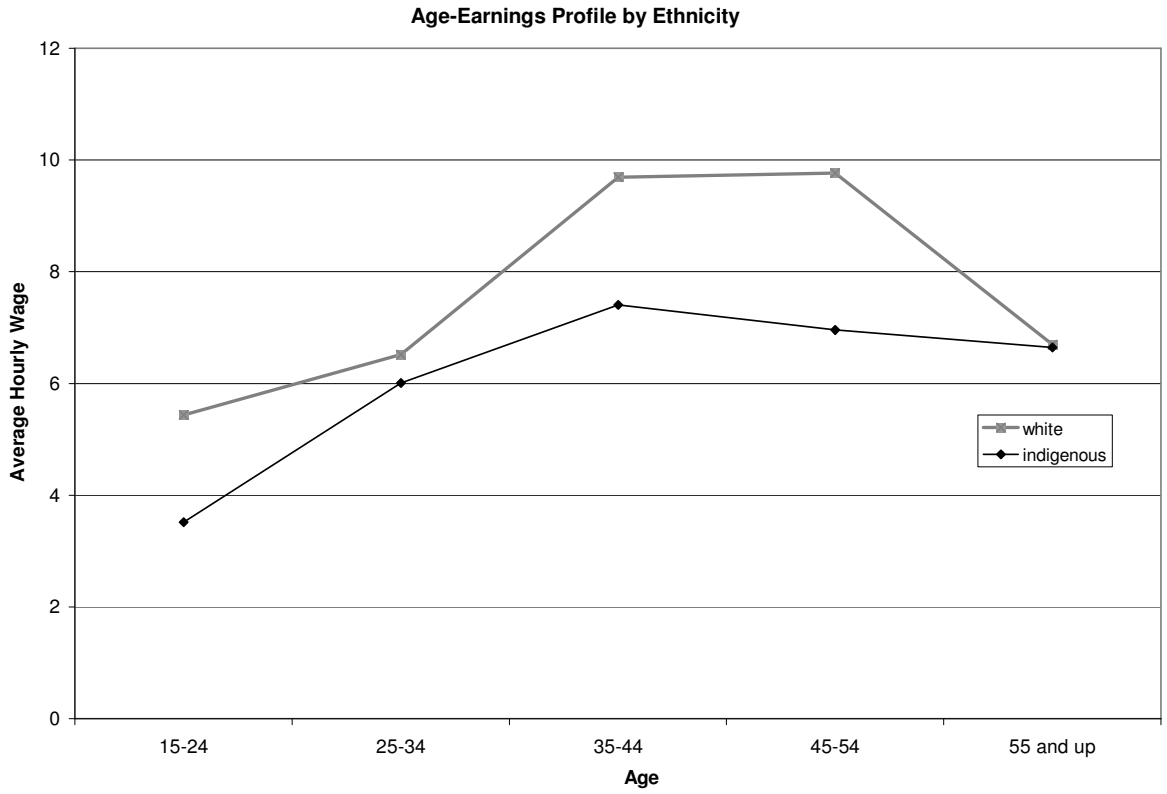
Earnings Functions By Ethnicity

	Pooled		Indig.		White		Quechua		Aymara	
Age	0.0509	**	0.0480	**	0.0547	**	0.0523	**	0.0494	**
	(0.006)		(0.009)		(0.008)		(0.012)		(0.019)	
Age2	-0.0005	**	-0.0005	**	-0.0006	**	-0.0006	**	-0.0005	
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Schooling	0.0429	**	0.0323	**	0.0501	**	0.0261	**	0.0381	**
	(0.004)		(0.006)		(0.006)		(0.008)		(0.013)	
Male	0.2963	**	0.3139	**	0.2857	**	0.3255	**	0.3416	**
	(0.033)		(0.049)		(0.044)		(0.063)		(0.102)	
Union	0.1343	**	0.1137		0.1442	**	0.1113		0.0145	
	(0.039)		(0.058)		(0.053)		(0.076)		(0.115)	
Married	0.0900	**	0.0939		0.0893	*	0.1012		0.0543	
	(0.033)		(0.049)		(0.044)		(0.066)		(0.096)	
Urban	0.0506		0.0391		0.0224		-0.0883		0.2116	
	(0.036)		(0.050)		(0.053)		(0.065)		(0.111)	
Direccion	0.7799	**	0.6129	**	0.8762	**	0.9722	**	0.2117	
	(0.083)		(0.131)		(0.107)		(0.199)		(0.233)	
Profesional	0.8224	**	0.8564	**	0.8122	**	0.9826	**	0.8050	**
	(0.067)		(0.099)		(0.090)		(0.126)		(0.205)	
Oficina	0.5326	**	0.5566	**	0.5233	**	0.6823	**	0.4061	*
	(0.059)		(0.092)		(0.077)		(0.127)		(0.179)	
Tecnico	0.3502	**	0.2843	*	0.3631	**	0.1741		0.4693	
	(0.069)		(0.120)		(0.085)		(0.147)		(0.276)	
Comercio	-0.1029	*	-0.1804	*	-0.0435		-0.2017		-0.0588	
	(0.052)		(0.081)		(0.068)		(0.106)		(0.158)	
Agricultura	0.0308		-0.0927		0.1271		-0.0797		-0.0538	
	(0.083)		(0.127)		(0.109)		(0.176)		(0.344)	

	Pooled		Indig.		White		Quechua		Aymara	
Minera	0.1489	**	0.0867		0.2335	**	0.1072		0.0196	
	(0.044)		(0.063)		(0.061)		(0.082)		(0.127)	
Operador	0.0709		0.1212		0.0348		0.0716		0.1869	
	(0.057)		(0.087)		(0.076)		(0.115)		(0.168)	
Chuqusaca	-0.0376		0.0742		-0.2260	*	0.0500		0.1700	
	(0.062)		(0.087)		(0.088)		(0.172)		(0.501)	
Cochabamba	0.1662	**	0.2334	**	0.0868		0.2572		0.1745	
	(0.048)		(0.059)		(0.086)		(0.160)		(0.159)	
Oruro	-0.0442		0.0466		-0.1540		0.1135		0.0737	
	(0.061)		(0.076)		(0.109)		(0.172)		(0.128)	
Potosi	-0.0836		-0.0170		-0.2007		0.0159		-0.1998	
	(0.064)		(0.082)		(0.105)		(0.169)		(0.282)	
Tarija	0.1797	**	0.3370	**	0.0145		0.1711		0.0902	
	(0.055)		(0.118)		(0.071)		(0.217)		(0.331)	
Santa Cruz	0.2413	**	0.2615		0.1196	*	0.2919		0.2717	
	(0.043)		(0.072)		(0.061)		(0.177)		(0.209)	
Beni	0.1862	**	0.2567	*	0.0524		0.2699		0.2089	
	(0.056)		(0.100)		(0.074)		(0.335)		(0.441)	
Pando	0.4560	**	0.5650		0.2890	**	0.9301		0.5189	
	(0.088)		(0.363)		(0.102)		(0.575)		(0.613)	
Constant	-0.7562	**	-0.6523	**	-0.7610	**	-0.5706	*	-0.9077	*
	(0.113)		(0.169)		(0.154)		(0.269)		(0.370)	
N	3385		1518		1867		833		482	
R-squared	0.3623		0.3441		0.3836		0.3970		0.2748	
Adj. R-squared	0.3579		0.3340		0.3759		0.3799		0.2383	

Notes: * = significant at 5% level ** = significant at 1% level
Standard errors are included in parentheses below the coefficients

FIGURE 2



were raised on average with more siblings, by parents with a lower level of schooling themselves and mothers who were more likely to work outside the home; he found all of these characteristics to be negatively correlated with school achievement.

While it is not possible to fully control for these possibilities with the data I have, the fact that education data were collected both numerically (years of schooling completed) and categorically (highest degree obtained) provides an opportunity to partially investigate this theory. While all types and qualities of primary and secondary education are categorized together, there are separate categories for public and private education. Since Bolivia has relatively few universities and it is generally agreed that all public colleges are roughly of the same quality (and all private colleges are of very similar quality to each other) it is likely that

differences in returns to each type of degree reflect differential treatment of indigenous and white workers as opposed to differences in quality of education. Table 4 shows just the coefficients on public and private university degrees for the earnings functions when education is used as a categorical variable. The lower coefficients for indigenous workers in each category (though the coefficient on private education in the indigenous workers' equation is only significant at the 10% level, due to the relative infrequency at which indigenous students attend private universities) support the theory that indigenous workers do not receive the same returns to education as white workers, even when they attend very similar schools.

TABLE 4

Coefficients on types of university education from earnings function with education as a categorical variable

	Indig.		White	
public university	0.1852	*	0.1938	**
	(0.085)		(0.074)	
private university	0.3119		0.4208	**
	(0.176)		(0.113)	

For both groups, the coefficients on *direccion, professional, oficina,* and *tecnico* were positive and significant, meaning that they raised salary relative to the unincluded category, "other." *Comercio* was positive and significant for indigenous workers, while *minera* was positive and significant for whites. It is important to remember, however, that these categories give the sector in which the respondent works, but not the nature of their work within that sector. For instance, agricultural workers who report an official salary probably work as supervisors rather than field laborers, who would likely be paid informally, although the surveyor would have needed to make a choice as to whether to categorize an agricultural manager as *agricultura* or *direccion*. Ideally, there would have been separate categories for profession and work sector, but they were grouped together as one question. However, since

most of these coefficients are significant I believed that it was important to include controls for profession, even if the categorization was not perfect.

For the indigenous group, the locations of Cochabamba, Tarija, and Beni were positive and significant. They were also of substantial economic significance as well, representing wage increases of 23.34%, 33.70%, and 25.67% respectively over the omitted category, La Paz. For whites, the coefficient of Chuqusaca was negative and significant, while the coefficients for Santa Cruz and Pando were positive and significant. The lack of overlap in significant coefficients between the groups is an interesting result that suggests that many locations have characteristics that improve (or harm) the work situations of workers from certain ethnicities but not others.

VI. Decomposition Results

Table 5 gives the results of the Oaxaca decomposition of the earnings differential between the white and indigenous groups. The first two columns present the "unexplained" component of the distribution, calculated for each factor by multiplying the difference in β_I and β_W by the indigenous mean, as derived in the explanation of the Oaxaca decomposition in the methods section. For ease of comparison, each quantity is also presented as a percentage of the overall differential in log wage. Quantities that are positive mean that the indigenous population receives a lower return overall to that factor than the white population, which then contributes positively to the overall wage differential. Negative quantities mean that the indigenous population received greater returns to that factor than the white population. It is mathematically and economically possible that entries due to certain characteristics (such as the unexplained components due to age or education in my analysis)

TABLE 5

Differential in Log Wage between indigenous and white workers

1.429	minus	1.274	=	0.155

Oaxaca Decomposition:
Unexplained and Explained by Factor

	UNEXPLAINED	AS PCT	EXPLAINED	AS PCT
Age	0.2294	147.92%	-0.0855	-55.13%
Age2	-0.0631	-40.65%	0.0573	36.98%
Schooling	0.1643	105.91%	0.0390	25.13%
Male	-0.0188	-12.10%	-0.0008	-0.49%
Union	0.0066	4.27%	-0.0017	-1.08%
Married	-0.0023	-1.48%	-0.0078	-5.05%
Urban	-0.0125	-8.09%	0.0014	0.92%
TOTAL	**0.3036**	**195.77%**	**0.0020**	**1.27%**
Direccion	0.0087	5.59%	0.0110	7.11%
Profesional	-0.0062	-4.00%	-0.0204	-13.17%
Oficina	0.0031	2.01%	0.0127	8.18%
Tecnico	-0.0030	-1.93%	0.0106	6.82%
Comercio	0.0133	8.55%	-0.0009	-0.57%
Agricultura	0.0067	4.29%	0.0006	0.37%
Minera	0.0373	24.07%	-0.0172	-11.11%
Operador	-0.0077	-4.95%	0.0001	0.08%
TOTAL	**0.0522**	**33.63%**	**-0.0036**	**-2.29%**
Chuqusaca	-0.0227	-14.67%	0.0022	1.44%
Cochabamba	-0.0377	-24.34%	-0.0162	-10.43%
Oruro	-0.0222	-14.31%	0.0114	7.37%
Potosi	-0.0159	-10.22%	0.0089	5.76%
Tarija	-0.0113	-7.26%	0.0016	1.00%
Santa Cruz	-0.0186	-11.99%	0.0242	15.62%
Beni	-0.0108	-6.94%	0.0037	2.36%
Pando	-0.0009	-0.59%	0.0138	8.87%
TOTAL	**-0.1401**	**-90.31%**	**0.0496**	**31.99%**
CONSTANT	**-0.1087**	**-70.08%**		
OVERALL	**21.57%**	**69.00%**	**0.0480**	**30.97%**

can be larger than 100%. In this case, such entries are counteracted by negative entries due to other characteristics, so that the sum of the explained and unexplained components due to each characteristic in the analysis still sums to 100%. The next two columns present the "explained" component of the distribution, calculated by multiplying the difference in sample means by the white coefficient. The lower returns to education and labor market experience that accrue to the indigenous population discussed in the previous section make up most of the unexplained earnings differential between white and indigenous workers. The lower linear returns to increasing age constitute 147.92% of the differential, while lower returns to schooling constitute 105.91%. The fact that indigenous workers' salaries decline more slowly as they grow older (the age squared coefficient on indigenous workers' salary is less negative than white workers') represents a negative contribution of 40.65%. In total, the age and schooling unexplained portion constitute 213.47% of the wage gap. Indigenous workers received slightly higher returns to male gender and urban location than whites, representing -12.10% and -8.09% of the gap, respectively.

Indigenous workers received smaller positive returns to the *direccion, tecnico*, and *minera* professions; negative returns to *agricultura* in contrast to the positive returns enjoyed by whites; and larger negative returns to *comercio*. Each of these categories then contributes in a positive direction to the overall earnings gap. Indigenous people did receive slightly higher returns to *oficina, professional*, and *operador* categories, but overall the professions contributed 33.63% of the income gap positively towards the unexplained portion.

Because the indigenous respondents were on average older than the whites and wages increased with the linear age term for both groups, the explained component due to linear age term represented -55.13% of the overall income gap, while the age squared term represented

a positive contribution of 36.98%. Because the indigenous respondents had less education, the explained part of the schooling variable constituted 25.13% of the gap. Overall, the total positive and negative explained components of the gap due to demographic, schooling, and professional characteristics were of roughly equal magnitudes, implying that these characteristics as a whole explain little of the income gap. Therefore, the primary source of the overall explained component is that indigenous respondents disproportionately lived in departments that had lower average earnings; overall, the explained component due to location constituted 31.99% of the earnings gap. Specifically, they were less likely to live in the relatively prosperous lowland departments of Santa Cruz and Pando.

By summing the contribution of each factor to both the explained and unexplained component, I found that that 31% of the overall wage differential is due to differences in human capital, while 69% is due to differences in returns to that human capital. Because the unexplained component includes both differences in unmeasured income-generating characteristics and unmeasurable differences in returns to all characteristics, it can be thought of as an upper bound on discrimination. Still, this is a substantial quantity, and it is difficult to believe that there is not at least some discrimination in the labor market. The amount of discrimination I found is considerably higher than in Kelley's or Psacharopolous and Patrinos' studies; later I will suggest some reasons for this difference.

Figure 3 shows the kernel-smoothed probability density function for the white group and indigenous group. Figure 4 depicts the cumulative density functions for indigenous, whites, and the counterfactual cdf that would result if indigenous received the same returns to income-generating covariates as whites. We can see that the indigenous cdf is shifted to the left of the white cdf at all levels of hourly wage, confirming that the disparity in the average

wage extends to all wage levels. The counterfactual cdf is a near perfect overlap of the white cdf, suggesting that the wage gap would be greatly reduced or eliminated if indigenous workers received the same returns to their human capital as whites.

Figure 5 shows graphs of the disparity in wage and the difference between the indigenous cdf and the counterfactual. With a smaller scale on the y-axis, it is easier to see than in figure 3 that the counterfactual cdf does approximately equal the white cdf at all points, suggesting that equal returns to human capital would close very much of the wage gap for indigenous Bolivians of all wage levels. Both the greatest wage disparity and the greatest discrepancy of returns to human capital accrue to indigenous Bolivians at approximately the

FIGURE 3

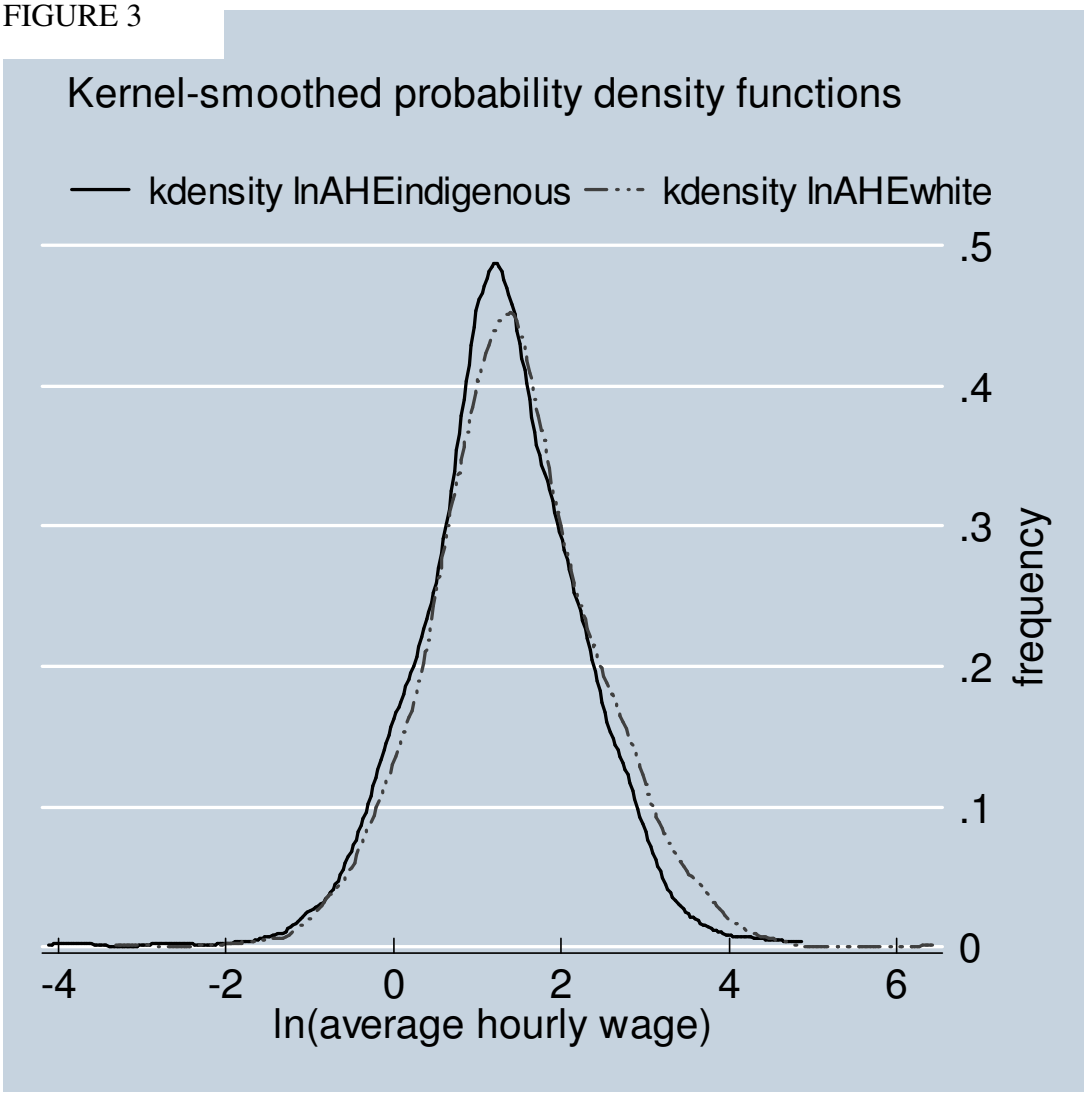


Figure 4: Counterfactual, White, and Indigenous CDF's

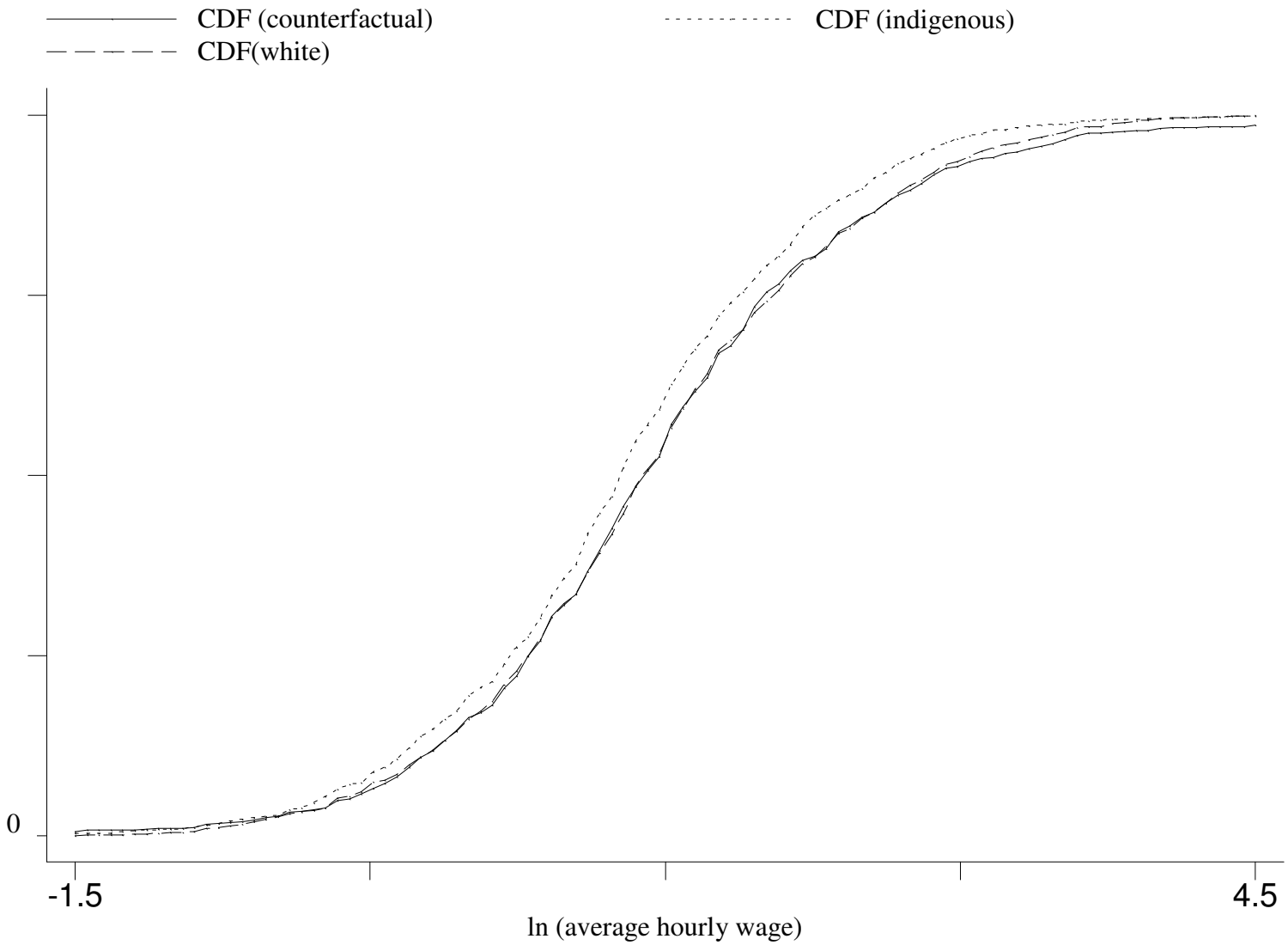
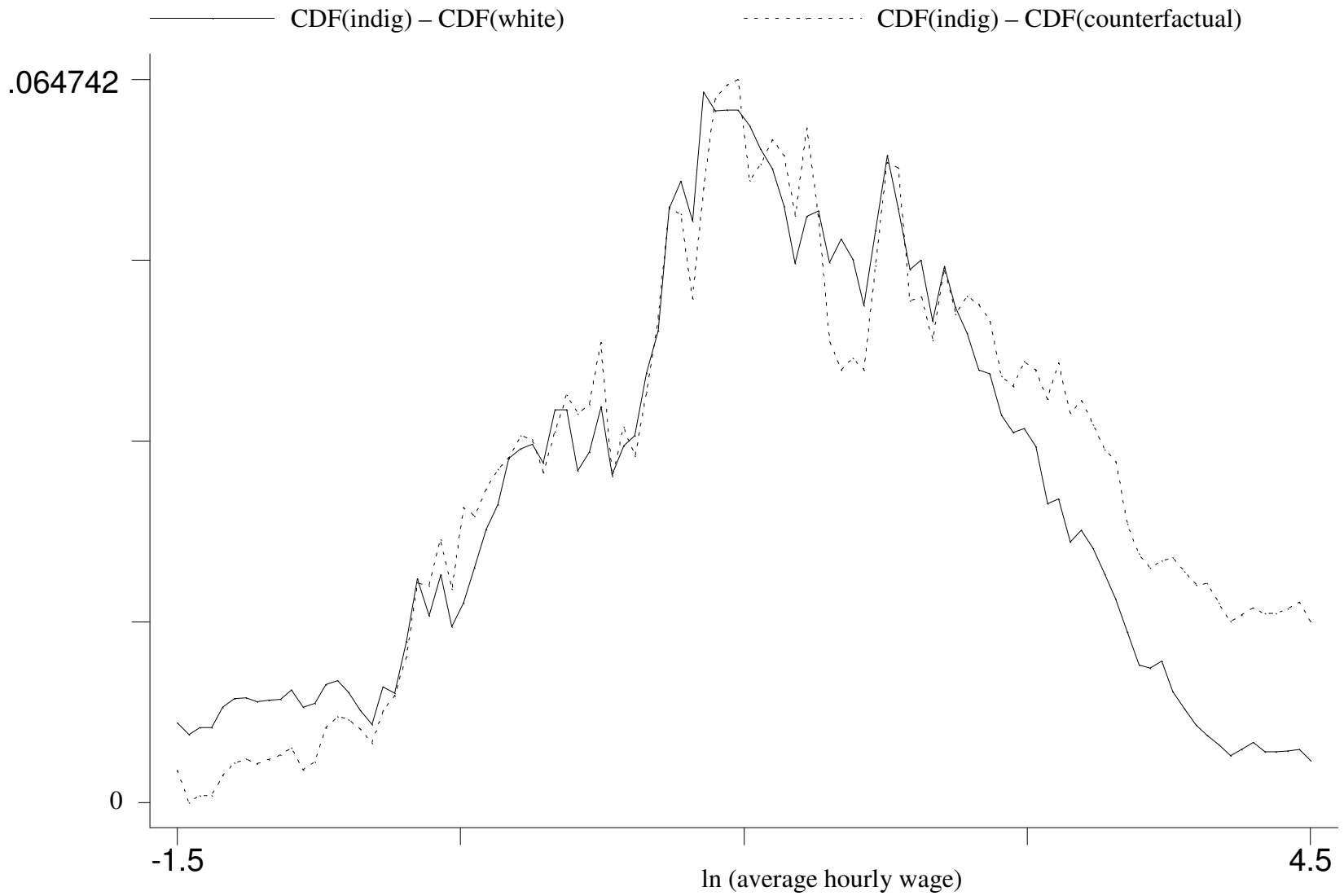


Figure 5: Differences between indigenous and white/counterfactual CDF's



median wage level. In other words, very poor and very wealthy indigenous Bolivians receive similar returns to their human capital and earn similar wages, while it is among the middle wage earners that the greatest disparity is seen between races.

VII. Quechua/Aymara Differences

I suggested earlier that it is not safe to assume that all indigenous Bolivians are treated the same way in the labor market. Indeed, the earnings functions calculated for the Aymara and Quechua groups separately confirm that there are substantial differences in how each group is treated in the labor market. As seen in the regressions reported in table 3, the Aymara group receives greater returns to schooling, while the Quechuas receive greater returns to increasing age. The Quechuas receive statistically significant and very large returns to work in *direccion*, *professional*, and *oficina* careers, while among the Aymara these coefficients are lower and the *direccion* coefficient is not significant.

Table 6 repeats the Oaxaca decomposition for the Aymara and Quechua groups. (Disparity is still calculated relative to whites, not to each other.) The differences in coefficients in the regression equation, as well as variation in the mean population characteristics for each group, translate into differences in the sources of the wage disparity for each group. For Aymara, wages rise more slowly with increasing age than Quechuas, but also drop more slowly than Quechuas or whites after the age of peak earnings, as evidenced by the negative contribution to the total wage disparity that the age squared term plays for Aymaras. Though Aymaras still receive lower returns to education than whites (the source of 43.53% of the wage difference), the lower returns to education for the Quechuas is 101.1% of their overall wage disparity.

TABLE 6

Oaxaca Decompositions of the Quechua-white and Aymara-white earnings gaps

Quechua - white gap (in log wage)	0.153
Aymara - white gap (in log wage)	0.203

	Unexplained		**Explained**	
	Quechua	Aymara	Quechua	Aymara
age	52.36%	91.74%	-15.51%	-61.72%
age2	45.78%	-59.87%	6.35%	38.74%
educ	144.13%	56.38%	27.81%	11.51%
male	-16.05%	-20.51%	8.86%	-11.38%
union	5.08%	14.22%	-2.85%	-1.20%
married	-3.77%	9.97%	-4.32%	-7.46%
urban	52.83%	-77.36%	1.27%	-0.14%
TOTAL	**280.37%**	**14.58%**	**21.62%**	**-31.64%**
direccion	-1.51%	13.61%	12.35%	1.75%
profesional	-17.69%	0.45%	-23.04%	-4.57%
oficina	-7.76%	5.40%	12.12%	4.25%
tecnico	6.10%	-1.30%	6.00%	8.88%
comercio	9.95%	0.82%	-0.61%	-0.20%
agricultura	3.58%	1.30%	0.70%	1.27%
minera	19.55%	33.29%	-8.56%	-15.54%
operador	-2.00%	-8.10%	0.22%	-0.26%
TOTAL	**10.22%**	**45.46%**	**-0.81%**	**-4.43%**
Chuqusaca	-22.79%	-1.22%	8.91%	-6.66%
Cochabamba	-47.16%	-2.96%	-19.98%	0.12%
Oruro	-22.09%	-13.52%	9.04%	6.38%
Potosi	-20.61%	-0.01%	13.60%	-2.08%
Tarija	-3.20%	-0.54%	1.05%	0.91%
Santa Cruz	-12.06%	-2.80%	17.77%	17.50%
Beni	-1.20%	-0.64%	3.92%	2.96%
Pando	-1.01%	-0.47%	9.18%	6.67%
TOTAL	**-130.11%**	**-22.17%**	**43.49%**	**25.79%**
Constant	**-124.77%**	**72.42%**		
OVERALL	**35.71%**	**110.28%**	**64.30%**	**-10.28%**

The Aymaras receive positive returns of greater magnitude than whites to living in an urban area, while the Quechuas actually receive negative returns. This is likely due to the fact that Aymaras living outside of La Paz city or its satellite, El Alto, live in harsh terrain on the *altiplano*, which, despite their historic successes at improving its productivity, is still very difficult land to farm or otherwise profit from. By contrast, Quechuas living outside the cities of Sucre or Cochabamba tend to live in more favorable conditions for farming and other economic activity.[4]

One of the most significant differences between Quechuas and Aymaras is the difference in contribution of the constant term of the equation to the total disparity. For Quechuas, it is very large and negative, meaning that the y-intercept of wages for Quechuas is substantially higher than for whites. In the Aymaras, however, this term is positive, meaning that their wages start out lower than those of whites. Though there are many unmeasured factors that could affect wages differentially in Aymaras and Quechuas, it is also possible that Aymaras face more discrimination than Quechuas. There are clear visual differences between Aymaras and Quechuas, so that employers and the general public can discern immediately not just that a worker is indigenous but also the group to which the worker belongs. In interviews I conducted with white Bolivians, they frequently stereotype Aymaras as "cold and unfriendly" and Quechuas as "cheerful."[5] During the most recent political turmoil, many white Bolivians also believed that Aymaras played a larger role than Quechuas in instigating violent protests, leading some whites to deem all Aymaras as

[4] This area is also the center of Bolivia's coca farming, which is illegal and therefore its workers' earnings would be excluded from officially reported salaries. However, due to the profitability of the illegal drug trade, these workers also tend to be better off than Aymara farmers in the *altiplano*.

[5] These ideas can be traced in part back to European scholars' turn-of-the-century theories about the determinants of personality in Indians. For instance, Alcides Arguedes suggested in his 1910 book *Pueblo Enfermo* (Sick People) that Aymaras have a cold personality because they inhabit a cold land, while Quechuas are more friendly because they live in a warm land.

troublemakers. These factors could lead both to a lack of opportunities for Aymaras to obtain higher-paying jobs and to lower wages earned even if they do obtain better jobs.

VIII. Relation to Previous Studies and Conclusion

My analyses suggest that there is a significant amount of discrimination in the Bolivian labor market. Although some of the 69% of the indigenous-white wage gap that is unexplained could be due to unmeasured characteristics that vary differentially across indigenous and whites, I used a substantial set of control variables in order to explain as much of the variation in wage as possible, and it therefore seems unlikely that there could remain enough income-generating factors that are different in whites and Bolivians to explain the entire 69%. It is also striking that indigenous Bolivians receive lower returns to the variables that are measured, most significantly to schooling and age. It is important to attempt to understand more specifically the characteristics of the labor market that are preventing indigenous Bolivians from being rewarded for their level of human capital. Some of the disparity may also result from differences in the qualities of the human capital accumulated, such as lower quality schools attended by indigenous students. My results suggest that it is not sufficient for the government or other agents attempting to help indigenous Bolivians merely to increase their overall level of schooling; it is also important to improve the quality of schooling that they do receive.

A natural question that arises in light of these results is why I have found a greater level of discrimination than in previous studies of the income gap in Bolivia. While there is empirical precedent elsewhere in Latin America for growing inequality and income discrimination (for instance, Silva in Brazil, 1992) and it is possible that the trade-

liberalization and free-market policies during the 1990's differentially harmed indigenous Bolivians and led to increased labor market discrimination, it is also likely that the sample on which I based my conclusion is different from those of previous researchers. For instance, the indigenous respondents in my survey had on average almost two more years of schooling than those in Psacharopolous and Patrinos' 1989 sample; it is unlikely that a completely comparable group of Bolivians thirteen years later would have increased their schooling by such a substantial magnitude. I know little about the procedure by which the *Instituto Nacional* chose households for this survey, so it is possible that the system they used selected households that were overall better off than those in previous studies.

An additional difference between my investigation and previous studies was that the indigenous group in my study was selected based on self-identification as part of an indigenous group rather than as having learned an indigenous language as a first language. Because those surveyed were also asked their childhood language, I have the opportunity to

TABLE 7

Childhood language versus ethnicity, for those with salary data

childhood language	ethnicity							
	Quechua	Aymara	Guarani	Chiquit.	Mojeno	Other	Nonindig.	**TOTAL**
Quechua	430	7	0	0	1	0	96	**534**
Aymara	5	283	0	0	0	0	55	**343**
Castellano	395	191	48	40	51	28	1,683	**2,436**
Guarani	3	1	16	1	0	0	14	**35**
Other native	0	0	0	0	2	15	0	**17**
Foreign	0	0	0	0	0	1	17	**18**
Does not speak	0	0	0	0	0	0	2	**2**
TOTAL	**833**	**482**	**64**	**41**	**54**	**44**	**1,867**	**3,385**

note: "Castellano" is a South American term for the Spanish language

investigate the correlation between the ethnicity and the childhood language of those surveyed. Table 7 presents these results. Though there is a clear pattern between childhood language and ethnicity, it is not a one-to-one correlation. For example, almost half of those who self-identified as Quechua grew up speaking Spanish rather than Quechua. Because these respondents grew up in disproportionately affluent household which emphasized upper mobility in society, they had more education and higher wages than Quechua Indians who grew up speaking Quechua. This difference is substantial: for instance, Quechuas raised speaking Spanish earned on average 7.48 Bs/hour, while those raised speaking Quechua earned on average 4.40 Bs/hour ($P < .0001$)[6]. Including their members in my analysis as Quechuas, rather than with the white group, raised the average education and wages of the indigenous group considerably.

However, despite these disparities in the samples, the conclusion remains that there was discrimination found toward the more affluent indigenous group that was analyzed. Wage gaps due to discrimination need to be addressed in a very different way than wage gaps due to differences in human capital, which typical provoke suggestions such as building schools in rural villages and providing job training for indigenous workers. Since I have found that there is likely discrimination among at least a certain subset of the population; further study is needed to examine the exact nature of the discrimination and suggest methods for increasing opportunities for indigenous Bolivians. Since differential returns to education and labor market experience were the main source of the unexplained component of the wage gap, future studies could also attempt to determine the specific reasons why the

[6] When I recalculated the earnings function for the indigenous group including a dummy variable, IndSpan, that equaled one for indigenous respondents raised speaking Spanish, the coefficient on IndSpan was .1276 ($P = .0100$). In other words, even after the personal characteristics included in the earnings functions were controlled for, indigenous Bolivians raised in Spanish-speaking households earn on average 12.8% more than those raised in households speaking indigenous languages.

indigenous group has difficulty converting their education and experience into human capital that is rewarded with higher wages. This is especially true among the Aymaras in the survey, who faced an overall larger income gap, of which a larger portion was attributed to discrimination. Any attempt on the part of the Bolivian government or other agents to reduce discrimination should specifically seek to reduce the discrimination faced by Aymaras.

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Appendix 1

We begin with the counterfactual distribution we are seeking to estimate:

$$\int f(y \mid x, ind = 0) * f(x \mid ind = 1) dx$$

the marginal distribution of income-generating covariates (represented by x) for the indigenous group multiplied by the conditional wage distribution for whites given the same covariates.

We then use Bayes' rule to derive:

$$= \int f(y \mid x, ind = 0) * \frac{f(x, ind = 1)}{P(ind = 1)} dx$$

$$= \int f(y \mid x, ind = 0) * \frac{f(x) * P(ind = 1 \mid x)}{P(ind = 1)} dx$$

We can multiply and divide the expression by *P(indigenous = 0)*, *P(indigenous = 0 | x)* and *f(y | indigenous = 0)*. The *f(y | indigenous = 0)* can be removed from the integral because it is not a function of x. The resulting expression is:

$$= f(y \mid ind = 0) * \int \frac{P(ind = 1 \mid x) * P(ind = 0)}{P(ind = 0 \mid x) * P(ind = 1)} * \frac{f(y \mid x, ind = 0) * P(ind = 0 \mid x) * f(x)}{f(y \mid ind = 0) * P(ind = 0)} dx$$

Again using Bayes' rule:

$$= f(y \mid ind = 1) * \int \frac{P(ind = 1 \mid x) * P(ind = 0)}{P(ind = 0 \mid x) * P(ind = 1)} * f(x \mid y, ind = 0) dx$$

We then define a reweighting function $w(x) = \frac{P(ind = 1 \mid x) * P(ind = 0)}{P(ind = 0 \mid x) * P(ind = 1)}$, making our transformation:

$$= f(y \mid ind = 0) * e[w(x) \mid y, ind = 0]$$