FIRM-SPECIFIC EVIDENCE ON RACIAL WAGE DIFFERENTIALS AND WORKFORCE SEGREGATION IN HAWAII'S SUGAR INDUSTRY

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Cliometricians have written a substantial amount about racial and ethnic wage differentials, particularly about blacks in the South and European immigrants in the United States in 1909. Most studies are based on aggregated data, like that compiled in the U.S. Immigration Commission Reports (1911). Several authors have recently studied wage differentials using disaggregated firm-specific data which have the advantage of restricting wage comparisons to workers who have their wages set by the same decisionmaker (i.e., employer). Using data from Virginia for 1900 and 1909, Higgs (1977) shows that in most cases blacks and whites were paid the same wage for the same job by the same employers. Wright's (1986) examination of firm-specific data from Virginia for 1907 yields similar findings and suggests that workforce segregation, often based on industry-specific job experience, was a major cause of black-white wage differentials. Malkiel and Malkiel (1973), using data from 1966-1971, find similar patterns for women employed by a single corporation; their results may not be comparable with results from earlier periods, as employer behavior has been constrained by federal laws prohibiting some types of discrimination in employment with respect to race and sex.

Since these studies constitute a small (but consistent) sample, it is unclear how common these patterns are. We examine firm-specific data from 38 sugar plantations in Hawaii during 1900-01 to shed additional light on the magnitude and source of ethnic and racial wage differentials. Further, we extend the inquiry to another important question. Are job-specific wage differentials present in settings where there may be discrimination against multiple ethnic groups? Fujii and Mak (1985) use 1975 data on individuals in Hawaii to examine wage differentials in a labor market with multiple ethnic groups. While they find that

occupational segregation explains most ethnic wage differentials, their study does not use job-specific or firm-specific data. Our use of job-specific, firm-specific data drawn from a single industry (sugar) employing many ethnic groups allows us to examine the magnitude of wage differentials in a more precise manner.

The data analyzed are drawn from the Report of the Commissioner of Labor on Hawaii: 1901 to the U.S. Senate, published in 1902 (pp. 139-87). The Report takes employment data compiled for aggregative census purposes and presents them such that the characteristics of individual workers at particular firms can be identified. Our sample covers 31,556 male adult workers at 38 sugar plantations operating in Hawaii during the winter of 1900 and 1901;[1] approximately 90 percent of all sugar plantation workers in Hawaii are included in the sample. A substantial portion of the entire Hawaiian labor force is covered by the sample because the sugar industry fueled the Hawaiian Islands' prosperity in 1900, employing between 40 and 44 percent of the 90,172 person workforce (Commis. of Labor, 1902, p. 79).

After briefly discussing the characteristics of the Hawaiian sugar labor market, the aggregate mean wages paid to various ethnic groups on Hawaiian sugar plantations are presented. We then try to answer the following questions: To what extent were the wage differences caused by paying different wages for the same job or concentration in low-wage jobs? Was the labor market heavily segregated by race? Were the ethnic groups paid different wages for the same jobs within the same firms? Finally, we discuss the source of the segregation of ethnic groups across jobs and the wage differentials within the same jobs.

I. BACKGROUND ON THE HAWAIIAN SUGAR LABOR MARKET

The sugar industry hired a variety of ethnic groups in part because its growth, beginning in the 1850s, coincided with a continual decline in the Native Hawaiian population. Estimates of the Native Hawaiian population at the time of Western contact in 1778 vary from 200,000 to 400,000 (Schmitt, 1977, p. 7); by 1900, there were only 29,787 Hawaiians and 7,848 Part-Hawaiians (U.S. Commissioner of Labor, 1902, p. 29). The increasing labor demands of the sugar industry during the latter half of the 1800s prompted the Hawaiian government to allow sugar planters to bring in contract laborers bound to serve at fixed wages for definite periods of time. During the 1870s and 1880s, Chinese workers were brought by the planters to Hawaii. The planters were disappointed by the Chinese workers, as they usually left their plantation jobs at the end of their contracts. Of the roughly 14,000 Chinese who entered Hawaii between 1878 and 1882, only 5,037 were still working on sugar plantations in 1882 (Glick, 1980, p. 19). In response to this turnover problem and to a rising tide of anti-Chinese feeling among the populace, the planters and the government stopped bringing in Chinese workers in 1886. Beginning in 1885 the slack was taken up by a massive inflow of Japanese workers. From 1885 to 1900, approximately 80,705 Japanese immigrants arrived in Hawaii (Moriyama, 1985, Tables 8 and 10). By 1900, 40 percent of the total population of Hawaii (154,000) were Japanese, 17 percent were Chinese, 24 percent were Hawaiian or part-Hawaiian, and approximately 19 percent were Caucasian (Commissioner of Labor, 1902, p. 32).

A major institutional change altered the Hawaiian sugar labor market just prior to the winter of 1900-01, the period we analyze. In the late 1800s most of the workers on Hawaiian sugar plantations had been brought

to the Islands as penal contract laborers. The workers typically signed contracts that bound them to one plantation for three years.[2] At the end of the contracts, most workers returned to their home country. Those that stayed in Hawaii either left the sugar industry or were paid significantly higher wages if they continued working on the sugar plantation. Despite the large numbers returning home and constant streams of new contract laborers, the percentage of contract laborers in Hawaii's sugar fields had been declining. By 1897 less than 55 percent of the 23,000 field hands in Hawaii were under bound contracts. The remainder were day men who were free to move from plantation to plantation (U.S. Department of Labor, 1903, p. 696).[3] When Hawaii's annexation to the United States became official on June 14, 1900, all penal contracts made after August 12, 1898 were declared null and void and terminated. This move substantially increased the mobility of the previously bound workers.[4] The U.S. Commissioner of Labor (1902, p. 17) found that the increase in mobility led to advances of the wage for field hands from $12.50 per month of 26 working days prior to annexation to $15, $17, $18, $20, and up to $26 in some cases. In addition, annexation gave all but the Chinese workers the additional outlet of immigrating to the U.S. mainland. Many of the Japanese left Hawaii for the U.S. mainland until a 1907 Executive Order and the subsequent Gentlemen's Agreement of 1908 reduced such movements.[5]

Once the workers were unbound from their penal contracts, there were few other obstacles to mobility across plantations. The sugar plantations all appear to have been involved in a single labor market. Although plantations were scattered over 5 major islands, the cost of water transport to another island was very low. Recruiters from plantations on

the outlying islands regularly visited Honolulu in search of laborers. Moreover, over 70 percent of the immigrant workers were unmarried and therefore faced low moving costs.

In 1900, 52 sugar plantations were in operation. Their close ties with 5 large firms (known as the Big Five) that provided financial and marketing services and the existence of an industry trade association, the Hawaii Sugar Planters' Association (HSPA), meant that collusion between the planters was certainly a possibility. Beechert (1985, p. 133) reports that the planters tried to restrict mobility by maintaining a system of passbooks for the workers, but generally the passbooks were quickly ignored when the need for workers arose. In August of 1901 (after the data used in this paper was collected) the HSPA tried to establish a complicated maximum schedule of wages. But it appears that these arrangements broke down in the face of competition for labor among planters, as "more enterprising" plantations sent representatives to solicit workers from other plantations (Beechert, pp. 135-6).

Plantation workers also had the option of leaving the sugar plantations for employment elsewhere in Hawaii. However, the Japanese and Chinese faced some governmental restrictions on opportunities elsewhere in Hawaii. Government officials in 1902 attempted to prevent them from entering the fishing industry by imposing a tax on fish caught by aliens. The Superintendent of Public Works in Hawaii in 1902 specified that Asiatics could not be hired on public road crews. Sections of the "Act to Provide a Government for the Territory of Hawaii," provided that government land could not be acquired or held by or for the benefit of any alien. Naturalization was possible only after five years of residence (Moriyama, 1985, p. 145). In spite of these restrictions, Japanese and

Chinese workers found numerous opportunities to participate in the urban economy. By 1905, approximately 50 percent of workers in personal and domestic service, trade, transportation, and manufacturing were either Japanese or Chinese. (U.S. Dept. of Labor, 1905).

II. AVERAGE WAGES BY ETHNIC GROUP

The U.S. Commissioner of Labor reported the daily and monthly wages paid in cash to workers from various ethnic groups on the sugar plantations in 1900-01. The cash wages were generally supplemented with in-kind benefits. Nearly all employees on sugar plantations had free houses and fuel, and as a rule, all employees earning less than $40 per month received free medical attendance.[6]

From the Commissioner of Labor sample, we calculated two measures of the average cash wage of adult male workers: an hourly wage and a monthly wage. We calculated hourly wages for all workers for whom the number of hours worked per week was reported.[7] Unfortunately, hours per week were not reported for roughly 30 percent of the workforce. Since the monthly wage does not take into account hours worked, it is not as good a measure as the hourly wage. However, use of the monthly wage allows us to include in the sample managers, bookkeepers, physicians, and other professionals who generally worked variable hours, and to include 8,665 contract workers in the cane fields. The contract workers were not the bound workers of the pre-1900 era. Contract field hands agreed to cultivate a certain quantity of land for a specified price per ton of sugarcane. They were typically advanced living expenses and then received the remainder of their earnings at the end of the harvest. Contract cane cutters and cane loaders were typically paid by the amount of cane they cut or loaded and

were paid monthly. (U.S. Commissioner of Labor, 1902, pp. 18-9; U.S. Department of Labor, 1903, pp. 735-56). The hourly and monthly wage measures are closely correlated where both are reported. The correlation between the mean hourly wage and the mean monthly wage for each job is 0.94. The correlation of hourly wage and monthly wage by individual observation is 0.97.[8]

Table 1 shows the average wage, the standard deviation of the wage, the minimum wage, and the maximum wage paid to the seven major ethnic groups we considered. The only ethnic grouping in the table that combines multiple groups is Europeans, which combines the countries of origin listed in the notes to Table 1. The table clearly shows substantial differences in the average wages. Americans and Europeans were at the top of the wage distribution with nonCaucasians below. The Part Hawaiian's wages were closest to the Americans and Europeans. The Portuguese[9] and Hawaiians head the lower part of the distribution, while the Chinese and Japanese are at the bottom. The standard deviations of the wages also reflect substantial differences in the dispersion of wages around the means. Generally, the dispersion around the means was lowest for the Chinese and Japanese and highest for the Americans and Europeans.

The remainder of the paper analyzes the sources of the differences in overall mean wages in Table 1. One of the problems that arises from examining more than two ethnic groups is determining a reference wage to serve as a standard of comparison. Two candidates for the reference wage are (1) the mean wage for each job paid to all workers or (2) the mean wage paid to Americans and Europeans (excluding the Portuguese, who were considered a distinct ethnic group in Hawaii). Throughout the remainder of the text we specify the Amer-European wage as the reference wage.[10]

MEAN WAGES FOR ADULT MALE WORKERS ON 38 SUGAR PLANTATIONS IN HAWAII BY ETHNIC GROUP, 1900

Ethnic Group	# of Workers	Hourly Wage in Cents Mean	S.D.	Max	Min	# of Workers	Monthly Wage in Dollars Mean	S.D.	Max	Min
American	214	36.3	16.3	81.4	8.2	326	108.5	48.4	300.0	26.0
European[1]	454	24.4	16.2	81.4	4.7	629	81.9	53.0	250.0	12.0
Part-Hawaiian	84	20.7	10.6	47.9	6.4	94	59.9	31.0	150.0	18.0
Portuguese	1,576	10.3	4.7	50.0	4.7	1,622	27.8	12.8	130.4	12.0
Hawaiian	578	10.3	4.5	39.0	3.6	617	27.8	12.7	104.3	12.5
Chinese	2,460	7.5	1.9	27.5	5.4	4,270	22.1	5.1	71.7	15.6
Japanese	17,139	7.3	1.6	35.0	3.9	23,998	21.1	5.1	91.2	11.0
American & European	668	28.2	17.1	81.4	4.7	955	91.0	53.0	300.0	12.0
Total	22,505	8.3		81.4	3.6	31,556	23.9		300.0	11.0

Notes. Several additional groups were left out due to their small numbers (number and mean hourly wage in parentheses). These include: white Hawaiians (5, 36.5), other islanders (Guam, Jamaica, Filipino, Fijian) (4, 13.5), and blacks and Puerto Ricans (86, 6.7). The difference in the number of workers used for the hourly means and the monthly means reflects the large number of workers for whom hours per week were not reported. Typically, field hands, cane cutters, cane loaders and cane strippers either were paid by the month or worked as contract laborers. A daily average wage was reported for contract workers but there were no hours reported. Many of the bosses, paid monthly, also worked variable hours, so their wages were not included.

[1] Includes German, Scotch, English, Irish, Swedish, Greek, Belgian, Canadian, Polish, Swiss, Norwegian, Austrian, Spanish, French, Danish, Welsh, New Zealander, Boer, Dutch, Russian, Bohemian, Italian, Hungarian.

Use of the Amer-European wage allows more succinct discussion of ethnic wage differences and eliminates problems arising from comparing the wages of a group like the Japanese with a mean wage for all workers when most of the workers are Japanese.

III. LOWER WAGES FOR THE SAME JOB VS. CONCENTRATION IN LOW-WAGE JOBS

Traditionally, studies of wage differentials focus on two major sources of disparity. Differences between the Amer-European wage and nonCaucasion wages might arise because nonCaucasions were paid lower wages than Amer-Europeans for the same jobs. Or they might stem from occupational segregation where the Japanese, Chinese, Hawaiians and others were concentrated into low-wage jobs. We can examine the relative importance of the two causes by decomposing the differences in the mean wages reported in Table 1 into a wage component and a distribution component. The wage component signifies the difference in the mean wage that results from differences in wages paid within occupations. It is calculated by giving both ethnic groups the same job distribution but within jobs paying each ethnic group its own wage. The distribution component is the difference in the mean wage caused by job segregation and is calculated by leaving each ethnic group with its own job distribution but paying members of both ethnic groups the same wage for the same job.

Table 2 shows the difference between the American-European wage and wage of the ethnic group listed (from Table 1) and decompositions of the difference under two sets of assumptions. In columns 2 and 3, the wage component gives both Amer-Europeans and the ethnic group listed the Amer-European job distribution; the distribution component is the remainder of the difference. In columns 4 and 5, the wage component gives

INTO DIFFERENCES IN MEAN WAGES FOR EACH JOB AND
DIFFERENCES IN THE DISTRIBUTION OF WORKERS ACROSS JOBS

Ethnic Group	Wage Diff. (1)	Based on Job Distribution of Americans[1] Wage (2)	Americans[1] Distrib. (3)	Other Group[2] Wage (4)	Other Group[2] Distrib. (5)	Avg. of Components Wage (2)(4)	Avg. of Components Distrib. (3)(5)
			Monthly Wages				
Part-Hawaiian	31.1	15.7	15.3	13.5	17.6	14.6	16.5
Portuguese	63.1	33.1	30.0	10.7	52.4	21.9	41.2
Hawaiian	63.1	32.8	30.3	13.0	50.1	22.9	40.2
Chinese	68.8	39.6	29.2	10.4	58.4	25.0	43.8
Japanese	69.9	47.3	22.6	12.1	57.8	29.7	40.2
			Hourly Wages				
Part-Hawaiian	7.5	4.5	3.0	4.1	3.4	4.3	3.2
Portuguese	17.9	10.6	7.3	3.7	14.2	7.1	10.8
Hawaiian	17.9	10.1	7.8	4.6	13.4	7.3	10.6
Chinese	20.7	13.1	7.6	2.9	17.8	8.0	12.7
Japanese	20.9	15.5	5.4	3.9	16.9	9.8	11.1

Notes. In jobs which contained no members of the ethnic group in question, we constructed a wage for that ethnic group. Since there were no Japanese bookkeepers, we calculated their wage rate by multiplying the Amer-European mean wage of bookkeepers by 0.5692, which is the average ratio of the mean Japanese wage to the mean Amer-European wage in jobs with both groups.

[1]Let W_{aj} be the mean wage for Amer-Europeans in job j; W_{ej} the mean wage for the other ethnic group in job j. Let P_{aj} and P_{ej} be the percentage of workers in job j for the Amer-Europeans and the other ethnic group. Then the decomposition based on the American job distribution is the following. The wage-difference component is the sum over j of $P_{aj}(W_{aj} - W_{ej})$, i.e., it is the difference in wages if both groups were given the Amer-European job distribution but paid their respective wages. The distribution-difference component is the sum over j of $(P_{aj}-P_{ej})W_{ej}$, i.e., the difference in wages when both groups are paid the other ethnic groups wage but keep their own job distributions.

[2]Using the other ethnic group's job distribution, the wage decomposes into the wage-difference component, the sum over j of $P_{ej}(W_{aj} - W_{ej})$, i.e., the difference in wages when both groups have the other ethnic groups distribution but are paid their respective mean wages for the job. The distribution-difference component is the sum over j of $(P_{aj}-P_{ej})W_{aj}$, i.e., the difference in distributions across jobs while paying both groups the

both groups the listed ethnic group's job distribution, and the distribution component is the remainder of the difference.

The different assumptions paint quite different pictures of the impact of low pay within the same job relative to concentration in low-paying jobs. When the Amer-European job distribution is held constant, the predominant cause of differences in the overall mean wage for Amer-Europeans and the groups listed is low pay within the same job. In contrast, when the decompositions are based on the other ethnic group's job distribution, concentration in low-paying jobs is the primary cause of differences in the overall mean wage. To get a single number for the decompositions, we might try averaging the wage decompositions in columns 2 and 4 and averaging the distribution decompositions in columns 3 and 5. The averages, listed in columns 6 and 7, suggest that concentration in low-paying jobs was a more important cause of overall wage differences than lower pay in the same jobs when comparing Amer-Europeans with all groups but the Part-Hawaiians. However, the range of the wage and distribution components under alternative assumptions is so large, that such a conclusion is at best tentative.

IV. WAGE DIFFERENCES WITHIN JOBS AT THE FIRM LEVEL

One question often left unanswered by students of ethnic wage differentials is: are workers from various ethnic groups treated differently when they do the same jobs within the same firms? This is an important question, because the employer is often assumed to be the source of discrimination. Higgs' 1977 study of black and white earnings in Virginia in the early 1900s is one of the few that have sought to answer this question. Although Higgs found that the average wage of whites

in Virginia was greater than the average wage of blacks, blacks and whites in the same firm received the same wages for the same job 70 percent of the time in unskilled positions and 36 percent of the time in skilled positions. This evidence suggests that the primary source of the Virginia black-white wage differential was workforce segregation, not pure wage discrimination by employers. The segregation may have been caused by discriminatory employers, but given the geographic dispersion of the firms he examined, Higgs argued that geographic dispersion of the races may have accounted for these differentials.

Our Hawaiian sample differs from the sample examined by Higgs. The sugar plantations were involved in a single labor market and were not as geographically dispersed as the firms in Higgs' sample. In addition, there are multiple ethnic groups to consider, each with a different relative position in society. Given these differences, do we see the same patterns observed by Higgs?

There was relatively little segregation across plantations, as nearly all the plantations hired workers from all ethnic groups. There may have been little need to exclude particular groups, because the plantations were large enough that they might internally separate ethnic groups that disliked each other by giving them different jobs or different workplaces. Although statistical tests show that the distribution of ethnic groups among plantations was not purely random, several facts about the distribution also suggest that plantations were not greatly segregated:[11] (1) the Japanese made up 76.1 percent of the male workers in the sugar plantation sample of all 38 plantations. On all but 4 plantations the Japanese composed over 50 percent of the workforce; on no plantation were they less than 37 percent of the workforce. (2) Chinese

made up 13.5 percent of male workers in the entire sample. On only 4 plantations were they more than 30 percent of the workforce; on only 1 were there no Chinese at all. (3) Portuguese were 5.1 percent of male workers in the entire sample. On only 5 plantations were they more than 10 percent of the workforce; on only 1 were there no Portuguese. (4) Americans were only 1 percent of the entire sample, but only 5 plantations were without Americans. (5) Europeans were only 2 percent of the entire sample but were on every plantation. (6) Hawaiians were only 2 percent of the entire sample, but were on every plantation but 1. On only 9 of the 38 plantations were they more than 5 percent of the workforce.

Following Higgs, we examine the differences between the Amer-European wage and the wages paid other ethnic groups for the same job within the same firm in two ways. First, for each firm-job combination we calculated the average wage paid Europeans and Americans. Firm-job combinations with no Europeans and Americans were omitted from the sample because direct comparison of other ethnic groups with Europeans and Americans was impossible. We then created Table 3 by calculating the number of workers in each ethnic group paid less than, greater than, or equal to the Amer-European average wage in their job within their firm. Second, for each worker we calculated the percentage difference between his wage and the average wage paid Americans and Europeans at his job in his firm. We then calculated the mean and standard deviation of these percentage differences for each ethnic group.

The information in Table 3 presents several facts of interest. First, the information reemphasizes the point that employers often hired Americans and Europeans for jobs different from the ones performed by the remaining ethnic groups. Only about 20 percent of the Japanese in the

PERCENTAGE OF WORKERS PAID LESS THAN, EQUAL TO, OR GREATER THAN THE MEAN WAGE FOR AMERICANS AND EUROPEANS IN THE SAME JOB IN THE SAME FIRM

Ethnic Group	Less Than	Equal	Greater Than	Total Number of Workers	Avg. Percent Difference From Mean[1]
			Based on Hourly Wage		
Americans and Europeans	19.6	48.2	32.2	668	0.0% (10.9)
Part-Hawaiian	78.0	9.8	12.2	41	-19.7 (29.4)
Portuguese	43.9	19.9	36.2	608	-8.9 (27.3)
Hawaiian	46.8	40.3	12.9	124	-14.1 (32.3)
Chinese	43.0	56.3	0.7	414	-13.8 (23.7)
Japanese	88.3	9.9	1.8	3,823	-21.1 (20.2)
			Based on Monthly Wage		
Americans and Europeans	17.1	62.5	20.4	955	0.0% (11.9)
Part-Hawaiian	78.3	8.7	13.0	46	-19.1 (29.4)
Portuguese	43.8	36.8	19.4	623	-9.3 (28.1)
Hawaiian	48.4	39.1	12.5	124	-15.3 (32.5)
Chinese	46.1	46.3	7.6	503	-6.9 (32.8)
Japanese	82.2	8.1	9.8	4,711	-14.4 (28.7)

Notes. Within firms jobs where Americans or Europeans were not employed were removed from the sample.

[1]For each worker we calculated the percentage difference between the worker's wage and the mean wage paid Americans and Europeans in that job within that firm. The reported figure is the mean of those percentage differences. The figure in parentheses is the standard deviation of those percentage differences.

sample were employed with Americans and Europeans in the same job in the same firm. The percentage for the Chinese was 11 percent, for Hawaiians 20 percent, and 38 percent for the Portuguese. Second, the average percent differences from the Amer-European mean show that on average the nonCaucasians were paid less than Americans and Europeans for the same job in the same firm. The average percent difference ranged from -6.9 percent for the Chinese monthly wages to -21.1 percent for Japanese hourly wages. Third, there was substantial diversity in the relative wages paid to individuals within the various ethnic groups. Despite lower averages for nonCaucasions than for Americans and Europeans, many members of these ethnic groups were paid the same or more than Americans and Europeans within the same job and firm. More than 50 percent of the Portuguese, Hawaiians, and Chinese were paid the same or more than the Amer-European mean wage within the same job and firm. The Japanese and Part-Hawaiians fared much worse. Less than 18 percent of the Japanese and less than 23 percent of the Part-Hawaiians were paid the same or more than Americans and Europeans within the same job and firm.

V. SOURCES OF SEGREGATION AND INTRAFIRM WAGE DIFFERENTIALS

The analysis has documented that the wage differentials exhibited by various ethnic groups can be attributed both to segregation by job and to lower wages paid for working at the same job. We consider the source of each contribution to the differential in turn.

A. INTRAFIRM WAGE DIFFERENTIALS FOR THE SAME JOB

The presence of ethnic differences in wages within firms for the same jobs commonly leads to two conflicting interpretations. The differences

could be a sign of direct discrimination by the employer against nonCaucasian workers or, alternatively, they could result from differences in the productivity of members of ethnic groups. The two interpretations are not mutually exclusive, as both discrimination and productivity differences may play a role in determining wage differentials. Unfortunately, direct evidence on productivity of individual workers is unavailable, so we cannot determine the relative importance of discrimination and productivity differences. We can, however, still examine the data to determine whether the pattern of wage differentials is consistent or inconsistent with various maintained hypotheses.

Let us begin with the maintained hypothesis that all workers within the same job and firm were equally productive. Therefore, all ethnic wage differences within the same job and the same firm were caused entirely by discrimination. The results in Table 3 suggest an interesting puzzle for this hypothesis. In each ethnic group a significant percentage of workers was treated as well or better than the typical Amer-European worker. Using the monthly wage comparisons in Table 3, about 22 percent of part-Hawaiians, 56 percent of the Portuguese, 52 percent of the Hawaiians, 55 percent of the Chinese, and 18 percent of the Japanese received the same or better wages than the average Europeans and Americans in the same job in the same firm. If discrimination were the primary cause of wage differences, then it was not uniformly applied to each member of each ethnic group.

Indirect evidence from the plantation wage sample is consistent with an alternative hypothesis that productivity differences were a cause of wage differences. Within ethnic groups wage differences for the same job were often present within the same firm. For the five major ethnic groups

on the 38 plantations, there were 1,637 job-firm-race combinations. (For example, if there were Japanese cane cutters on all 38 plantations, it would count as 38 job-firm-race combinations). In 26 percent of those combinations the firm paid more than one wage for the same job to members of the same race, suggesting that there may have been productivity differences among these members.

Another comparison from the plantation sample consistent with the productivity hypothesis is that ethnic wage differentials were narrower for unskilled than for skilled jobs. Since unskilled jobs require little training, the range of productivity within unskilled jobs is likely to be smaller than in semiskilled or skilled jobs. Therefore, if productivity differences are a major cause of ethnic wage differentials, the ethnic wage differences within jobs within firms will be smaller for samples containing only unskilled jobs than for samples with both skilled and unskilled jobs.

The comparisons examine only unskilled jobs. As predicted by the productivity hypothesis, ethnic wage differences within a job category at a single firm are smaller for unskilled jobs than for all jobs. When all are examined (Table 3), the average percent difference from the Amer-European mean wage ranged between -6.9 and -21.1 percent for the remaining ethnic groups. For unskilled jobs (Table 4), the average percent difference from the Amer-European mean wage was smaller in absolute value and positive for the Portuguese and Hawaiians, and ranged between -3.4 and 3.1 percent for the Chinese. The Japanese average percent difference was still negative in Table 4 but 7 percentage points smaller than in Table 3. In every ethnic group the percentage of workers paid the same or higher than the Amer-European wage was higher for the

PERCENTAGE OF WORKERS PAID LESS THAN, EQUAL TO, OR GREATER THAN THE MEAN WAGE FOR AMERICANS AND EUROPEANS IN THE SAME JOB IN THE SAME FIRM FOR UNSKILLED JOBS[2]

Ethnic Group	Less Than	Equal	Greater Than	Total Number of Workers	Avg. Percent Difference From Mean[1]
			Based on Hourly Wage		
Americans and Europeans	1.4	97.3	1.4	74	0.0% (0.9)
Portuguese	23.6	56.6	19.9	297	1.5 (7.9)
Hawaiian	5.9	84.3	9.8	51	5.3 (24.5)
Chinese	28.1	71.9	0.0	317	-3.4 (5.5)
Japanese	87.7	11.5	0.8	3,040	-14.6 (9.1)
			Based on Monthly Wage		
Americans and Europeans	1.4	97.3	1.4	74	0.0% (0.9)
Portuguese	22.8	54.7	22.5	307	2.06 (8.3)
Hawaiian	5.9	84.3	9.9	51	5.3 (24.5)
Chinese	35.2	56.2	8.6	406	3.1 (25.2)
Japanese	80.3	9.0	10.8	3,898	-7.5 (23.2)

Notes. Within firms jobs where Americans or Europeans were not employed were removed from the sample.

[1]For each worker we calculated the percentage difference between the worker's wage and the mean wage paid Americans and Europeans in that job within that firm. The reported figure is the mean of those percentage differences. The figure in parentheses is the standard deviation of those percentage differences.

[2]Included as unskilled laborers were cane cutters, field hands, mill laborers, cane loaders, cane strippers, general laborers, railroad laborers, land clearers, cane hoers, ditchmen, ditch diggers, laborers for steamplows, mill construction, saw mills, pumps, and steam tugs.

unskilled jobs than for all jobs.[12]

The Japanese wage differential changes by a smaller percentage than the other ethnic differentials when we compare unskilled jobs instead of all jobs. This may imply greater discrimination within jobs by employers against the Japanese than against other ethnic groups. However, the small changes could also be due to the higher percentage of Japanese in unskilled jobs. The unskilled Japanese in Table 4 compose 79 to 83 percent of the Japanese workers in Table 3, the Chinese unskilled 76 to 80 percent, the Hawaiian unskilled 41 percent, and the Portuguese unskilled 41 percent.

That productivity differences caused differences in wages within and across ethnic groups does not imply that discrimination played no role in ethnic wage determination. It is possible that the ethnic groups had about the same average productivity in each job with a distribution of productivities around the average. If so, discrimination was the cause of the lower average wages for ethnic groups within jobs within firms. However, evidence from sources aside from the plantation sample suggests that the average productivity across ethnic groups varied.

Many nonCaucasian workers, particularly the Japanese and Chinese, were at a disadvantage because they lacked basic communication skills, literacy and ability to speak English. These skills were important even for workers in low-skilled positions. In obtaining information about job opportunities in the labor market, literate workers who could speak the dominant language had a decided advantage. Employers were more likely to pay a premium for English-speaking workers, because their costs of training, instructing, and supervising such workers were lower. In addition, literacy might have partially enhanced productivity, even in

unskilled labor, because literate workers had previously accumulated more experience in learning how to learn.

Table 5 provides data on the percentage of each ethnic group that was illiterate (could not write any language) or could not speak English. That the Japanese have the highest totals in both categories is consistent with the hypothesis that their relative standing in Tables 1, 3 and 4 is in part determined by relative illiteracy and inability to speak English. Given that 86 percent of the Japanese could not speak English and that 40 percent could not write any language, the lower pay received by 82 percent of Japanese workers on a given job (compared to Amer-European workers) may have been partly based on productivity differences.[13] The surprising degree of illiteracy among Caucasians (Americans, Europeans, and Portuguese) may also help to explain why large numbers of workers from other ethnic groups earned more than Amer-Europeans employed at the same job within the same firm.

Job experience is another factor that often determines the wage rate in a particular job. While it is unclear how important experience was for unskilled jobs on a sugar plantation, some crude measures of experience suggest that workers with less experience received lower pay. Some of the Japanese penal contracts and later contracts for Puerto Rican workers had monthly wage scales that rose after one or two years.[14] Throughout the nineteenth century on Hawaiian sugar plantations, there was substantial turnover among every ethnic group, especially under the penal contract system that expired in June of 1900. At the end of their contracts most workers, especially the Japanese, left the sugar plantations to return home, migrate to the mainland United States, or obtain jobs elsewhere in Hawaii. Those who stayed were paid higher wages than under the contract

LITERACY AND KNOWLEDGE OF ENGLISH LANGUAGE
AMONG MALES IN ETHNIC GROUPS IN HAWAII: 1900-01

Percentage of Ethnic Group	Percent of Illiterates Over 10 Years of Age	Percent Unable to Speak English, Over 10 Years Old
Hawaiians	6.02	43.10
Part-Hawaiians	1.90	5.20
Caucasians	22.87	14.20
Chinese	37.68	69.91
Japanese	40.26	85.71

Source: U.S. Commissioner of Labor, 1902, pp. 127-8. Literacy is defined as being unable to write in any language.

or moved up into the job hierarchy (Beechert, 1985, p. 89). In the winter of 1900-01, those who had immigrated within the last three years were likely to have received lower wages and be at the bottom of the job hierarchy.

B. JOB SEGREGATION BY ETHNIC GROUP

Part of the wage differential stems from concentration of particular ethnic groups in low-wage jobs. The data compiled in Table 5 on literacy and ability to speak english indicate that other factors aside from discrimination may have denied people the opportunity to advance in the job hierarchy. The high-wage jobs dominated by Americans and Europeans were often supervisory positions, physicians, bookkeepers, clerical positions, and skilled trades like blacksmiths. The skills for such positions may not have been obtainable through on-the-job training at the plantation. Instead, the inability of Japanese and Chinese to obtain these jobs may have been largely determined before they arrived in Hawaii. After coming to Hawaii, the Japanese and Chinese faced substantial barriers to obtaining such skills. They still had to overcome literacy and language barriers and attending school was costly. Many workers had been bound to three-year penal contracts prior to the Department of Labor survey and had little time for acquiring new skills. Few workers had the necessary capital available to finance skill acquisition. Fujii and Mak (p. 571) argue that skills will be acquired by later generations when the necessary capital has been accumulated to finance education. Deficiencies in the capital market precluded investment until sufficient savings had been attained. Further, given the intentions of most Japanese to return home at the end of their three-year

contract, investment in skills specific to the sugar plantation that would allow them to move up in the plantation job hierarchy would not be undertaken.

To the extent that on-the-job training was important for advancement in the job hierarchy, the Japanese were concentrated in low-paying jobs because a higher percentage of Japanese than of other groups were recent immigrants. Table 6 exhibits time-series data on employment in Hawaii sugar plantations which show that the growth in Japanese employment was larger than that for any other major ethnic group.[15] Between 1898 and 1901 the number of Japanese workers rose by 64 percent. The 17 percent increase in Portuguese employment on the sugar plantations is the only other increase recorded for an ethnic group during this period. The number of Hawaiians and combined Americans and Europeans stayed almost constant. Meanwhile, there was a dramatic drop in the number of Chinese from 7,200 to 4,976. Given similar turnover rates among ethnic groups, the employment data imply that the Japanese had the highest proportion of newly migrated workers, an implication supported by immigration statistics. In 1899, sugar planters, anticipating that federal legislation restricting Asian migration to the U.S. would be extended to Hawaii, brought 26,103 Japanese contract laborers to Hawaii. During 1900 and the first half of 1901, only 600 Japanese arrived in the Islands, while 4,709 departed.[16] Meanwhile, the flow of Chinese workers slowed to a trickle in 1899 and 1900, as annexation to the United States placed Hawaii under the jurisdiction of various federal Chinese exclusion acts.

Although it is difficult to characterize accurately the work experience of the remaining workers from other ethnic groups, it appears that a large proportion of the Japanese workers had less than 2 years of

NUMBER AND ETHNIC GROUP OF ALL LABORERS ON
HAWAIIAN SUGAR PLANTATIONS, 1896-1901

ETHNIC GROUP	1896	1897	1898	1899	1901
Japanese	12,893	12,068	16,786	25,654	27,537
Hawaiian	1,615	1,497	1,482	1,326	1,470
Portuguese	2,268	2,218	2,064	2,153	2,417
Chinese	6,289	8,114	7,200	5,969	4,976
European	458	542	791	539	991[a]
American	142	133	188	267	-
TOTAL[b]	23,780	24,653	28,579	35,987	39,587

Source: Wray Taylor, Report of the Secretary of the Board of Immigration, 1896, 1897, 1898, 1899. The 1901 data are from the Hawaiian Annual for 1902. The statistics for the years 1896-98 are for workers on the plantations as of December 31. The 1899 statistics are as of October 31.

[a] The European figure for 1901 includes American workers who were not separately reported.

[b] The total also includes South Sea Islanders, Puerto Ricans, and Negroes. The number of South Sea Islanders declined from 115 in 1896 to 46 in 1901. There were no Puerto Ricans and Negroes until 1901 when there were 2,095 and 55, respectively.

experience at the time of the survey (winter 1900/1901). Their lack of experience relative to that of other ethnic groups surely contributed to the findings in Table 3 that so many Japanese were paid less than the Amer-European wage for the same job by the same firm and that they were generally relegated to the jobs requiring little experience.

VI. CONCLUSIONS

This snapshot of Hawaii's sugar plantations in the winter of 1900-01 finds a labor market operating soon after a major institutional change: the termination of penal contracts in June of 1900. This markedly increased the short-run mobility of laborers. The interaction of ethnic prejudices with the labor market was made more complex by the presence of several definite ethnic groups.[17] We found substantial differences in the average wage received by members of different ethnic groups. Americans and Europeans were at the top of average wage rankings, while the Chinese and Japanese were at the bottom. While a substantial portion of the wage differences was caused by concentration of nonCaucasians in low-wage jobs, Americans and Europeans were also often paid higher wages than nonCaucasians for the same job.

In contrast to Higgs' (1977) findings for blacks and whites in Virginia, the average wages of nonCaucasian groups within jobs at individual firms were lower than the wages of Americans and Europeans. Without individual-specific evidence on productivity, we cannot rule out discrimination as a cause of the concentration of some ethnic groups in low-paying jobs and the lower average wages paid nonCaucasians for the same work in the same firm. However, there is ample evidence that productivity differences were a major cause of wage differentials. Wages

varied within ethnic groups for the same jobs, suggesting that productivity varied within ethnic groups. Further, most of the Chinese, Hawaiians, and Portuguese earned the same or more than the average Amer-European wage in the same job in the same firm. Ethnic wage differences were narrower in unskilled jobs than in all jobs, as would be expected with narrower ranges of productivity. Finally, there is evidence from outside our wage sample that suggests that the low-wage groups had lower productivity on average. The typical member of a low-wage groups was less likely to be literate, less likely to speak English, and (in the Japanese case) had less job experience.

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FOOTNOTES

[1]If women and child workers are included, the sample contains a total of 33,489 workers.

[2]The majority of immigrant workers arrived under contract to work for three years at a specified monthly wage. Each month usually consisted of 26 ten-hour workdays. Hawaiian law (Penal Code of 1850, sec. 1417) allowed contracts for up to five years. The first contract laborers, the Chinese, arrived in 1851 bound to five-year agreements to work on a specific plantation. The contract length became quickly standardized at three years during the influx of immigrants during the 1870s and 1880s. The 1886 Emigration Convention with the Japanese also specified three-year terms. Unlike contracts for indentured labor in the United States, contracts were specific to the individual employer, could not be exchanged, and terminated with the demise of the business. The contracts were regulated by Hawaii's Masters and Servants Law, which provided tough penalties for workers who either refused or deserted service. For more detailed information on the contracts and their enforcement, see U.S. Department of Labor, 1903, pp. 689-97; Beechert, 1985, pp. 40-57, 112-7.

[3]The percentage of contract workers differed among ethnic groups. In 1894 only 165 Chinese were under contracts compared to 2,444 day laborers (Char, 1975, p. 71).]

[4]The typical penal contract in 1898 called for the withholding of 15 percent of the wage until the contract was terminated and cancelled. The worker could obtain the 15 percent of the wage by presenting his cancelled contract to the Japanese Consul General. A large number of bound workers stopped work on June 14, 1900 and demanded the return of their cancelled

contracts. Many plantation owners returned the contracts but refused to cancel them (preventing collection of the withheld 15 percent from the emigration banks) in hopes of using the monetary incentive to keep the now unbound laborers on their plantation (Beechert, 1985, p. 120). Whether this strategy reduced the mobility of workers with cancelled contracts is uncertain. While the refusal to refund withheld monies may have prevented some workers from leaving their jobs, workers also became aware of the red tape involved in obtaining the money from the emigration banks. One Japanese writer observed that the red tape "was so great that many laborers never got [the withheld monies] at all." (Kihara (1935), p. 272, as quoted in Beechert, p. 120). If most workers accurately perceived the high cost of obtaining the withheld monies, mobility may not have been significantly impaired.

[5]Between January 1, 1902 and December 31, 1906, 33,844 Japanese left Hawaii for the U.S. mainland. After the Gentlemen's Agreement in 1908, only 1,106 Japanese moved from Hawaii to the mainland in 1909 (Moriyama, 1985, pp. 52, 133). Between 1905 and 1916, approximately 63,000 Japanese entered Hawaii, 28,068 departed for the West Coast, and 30,119 returned to Japan (Beechert, 1985, p. 132).

[6]U.S. Commissioner of Labor, 1902, pp. 96, 139-87. The Commissioner's Report also presents wages for individuals at 15 manufacturing establishments in Hawaii. Rather than try to assign values to free rent and fuel, we left the manufacturing establishments out of the sample. The focus on sugar plantations also enhanced the probability that job titles would have the same meaning across firms. Beechert (1985, p. 104) observes that some workers did not receive room and board. This will not be a problem for our within job within firm comparisons of cash wages

as long as firms did not vary in their provision of room and board within jobs.

[7]In the sample adult workers were paid either by the month or by the day. The hourly wage for workers paid by the day was calculated as: Daily Wage/(Hours per Week/Days per Week). The hourly wage for workers paid by the month was calculated as: Monthly Wage/(Hours per Week * 4.354), where 4.354 represents the average number of weeks in a month. For workers paid by the month, the monthly wage was just the monthly wage listed. The monthly wage for workers paid by the day was calculated as: Daily Wage * Days per Week *4.354.

[8]Wage comparisons of field hands with other workers may be complicated slightly because 11 plantations offered bonuses (to approximately 3,000 field hands) of between $1 and $2.60 for working over 22 to 26 days. However, the U.S. Commissioner of Labor (1902, p. 18) found that comparatively few workers earned the bonuses.

[9]Portuguese were not considered as Caucasians by the Hawaiians or the Caucasians. Fuchs (1961, p. 56) speculates that this may have been due to "their swarthy skin or perhaps because approximately three quarters of the Portuguese immigransts had been illiterate peasants." See the extensive discussion in Fuchs, pp. 53-59.

[10]The advantage of grouping Americans and Europeans is that comparisons with the wages of the remaining ethnic groups are allowed for a larger set of jobs. To the extent that Europeans were not perceived to be as desirable workers as Americans, the Amer-European mean wage distorts the reference wage by merging two heterogenous groups of workers. However, we found little difference between the wage rates paid to Europeans and Americans within jobs or within jobs within the same firm.

[11]A chi-square test on contingency tables of ethnic group by plantation rejects the hypothesis that the distribution of workers was random at the 99.99 percent level.

[12]See Taylor (1968) for an early discussion of racial wage differentials which uses firm-specific data. In his regression analysis Taylor finds that the race coefficient (black vs. white) is smaller for an unskilled job (janitor) than for a skilled job (material handler). Although the data is firm-specific, Taylor does not include a firm dummy variable in his regressions. He does, however, conclude that the large race coefficient for material handlers was due to the disproportionate representation of blacks in low-wage establishments.

[13]Apparently, the group of immigrants from Japan who came after annexation was much more literate than earlier groups. The Bureau of Immigration suggested that only 1.2 percent of the Japanese immigrants over 14 years old who entered Hawaii in 1902 were illiterate (U.S. Dept. of Labor, 1903, p. 785). Moriyama (1985, pp. 106-7) cites these figures when discussing the literacy of Japanese immigrants. After annexation, there also seems to have been a shift toward the Japanese establishing roots in Hawaii, as the percentage of Japanese immigrants that were female rose dramatically at this time.

[14]See the sample contract in Moriyama (1985, p. 182). Note that other contracts cited (pp. 173-87) did not have a rise in pay. Notices for attracting Puerto Ricans show that the planters offered a sliding scale based on experience. Offering $15 per month during the first year, $16 per month during the second year, and $17 per month during the third year. A month was 26 working days (U.S. Department of Labor, 1903, p. 704).

[15]Between 1894 and 1898, some 64,000 Japanese workers and 17,000 Chinese workers migrated to Hawaii (Char, 1975, pp. 308-11; Moriyama, 1985, Tables 10 and 15).

[16]Wakukawa, 1938, p. 128. The Tokyo government had prohibited immigration during this period due to the Hawaiian government's treatment of Japanese residents in an area of Honolulu alleged to be a reservoir of bubonic plague. On January 20, 1900 the section of Honolulu where many Chinese and Japanese lived was set afire and destroyed (Moriyama, 1985, p. 51).

[17]Lind (1980) states that "[r]ace, in the traditional Western sense of a large grouping of human beings distinguished from others by identifiable and biologically inherited physical traits, scarcely functioned at all among the great mass of Hawaii's people during most of the nineteenth century" (p. 24). Cultural differences "in language, food habits, dress, and moral values" (p. 23) were more likely to be the subject of animus than a person's race.