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Methodological Appendices to The Patterns of Job Expansions in the United States: a comparison of the 1960s and 1990s.

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METHODOLOGICAL APPENDICES TO

The Patterns of Job Expansions in the United States:
a comparison of the 1960s and 1990s
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APPENDIX A: DATA AND MEASURES

A.1. The Current Population Survey

We use the *Current Population Survey* (CPS), sponsored by the Bureau of the Census for the Bureau of Labor Statistics, for the entire 1963-2000 period. The CPS is the best available dataset for this analysis because it has the relevant variables, a substantial sample size, and annual data back to the 1960's. The CPS is the major source of labor force data in the U.S., used to calculate the federal unemployment rate, among other important statistical series. The CPS is conducted monthly on a sample of about 50,000-60,000 non-institutional households in the U.S. All 50 states and the District of Columbia are represented in each monthly sample. Each month a series of questions called the "basic labor force survey" are asked; these provide the basis for the calculation of the unemployment rate. Since 1979, every month a sub-sample of the respondents are asked a series of questions about earnings (details on these data are provided below). In addition, in some months, detailed data about special topics are collected, called "supplements", in that they supplement the basic labor force questions that make up the core of the CPS. The most important supplement is the "March annual demographic supplement", which collects a very extensive set of data about the demographic circumstances of the sample households, including annual earnings, which we use before 1979.

No useable CPS microdata is currently available before 1962. In addition, the CPS data files that are available for the early 1960's are lower quality than those used in later years in part because of the difficulties of data collection and storage in that period and in part because the CPS has been improved over the years. For example, employment level estimates in various years in the 1960s are appreciably different than those reported by other sources. The 1962 data is particularly problematic therefore we decided not to use that year. Later years become progressively better. We decided to begin the analysis in 1963 as a compromise between the quality of the data and our need to include as many years of the economic expansion as possible. This means that our analysis begins two years after the 1961 start date of the expansion. We did run the analysis using different years as our starting point, and the broad patterns of our conclusions were maintained. Despite the problems with the data, there are no other sources of employment data for the 1960's as comprehensive and appropriate for our purposes as the CPS.

The methodology we use requires the following data:

1. operational definition of a job in an occupation-by-industry matrix;

2. measure of the median wages of each job that contains at least one person in both of the end-point years of the time period of interest;
3. measurement of the important demographic characteristics of workers which are sources of variation in position in the employment structure, including age, sex, race and nativity.

We restrict the sample to full-time employees aged 18-64. While a few of the concepts used in this analysis are measured in exactly the same way in the CPS from the 1960s to 2000, most undergo some change in definition. The operationalization of each of these concepts is described below, including changes over time. Age and sex have a straightforward operationalization and there are no changes in the way they are measured in the CPS, so we will not discuss them.

A.2. Occupation and Industry Coding.

Until 1967, the CPS used a two-digit coding regime as the most disaggregated coding of occupation and industry. After 1967, the CPS used the Census 3-digit occupation and industry classifications. These classifications are redone after every Census. The CPS use of these regimes is as follows:

1967-1970	1960 classification
1971-1982	1970 classification
1982-1991	1980 classification
1991-2000	1990 classification

The classifications for industry change less than the codes for occupation. We code industries into 23 categories and these 23 categories can be created for each expansion, except for one category in the 1960s when the code for "utilities and sanitary service" cannot be separated from a general "utilities" code. Appendix Table 1 lists the 23 industries.

We also created two more aggregated categories. The first, "personal services", consists of 4 sectors from the full typology: private household service; repair services; entertainment and recreation services; and assorted personal services (which includes hotels; laundry; barber and beauty; and miscellaneous personal services). The second, the "high technology domain" consists of all jobs in high technology sectors plus all high technology-using occupations in non-high technology sectors. We use Chris Benner's (1998 and personal communication) classification of high technology industries, which includes the following Census 3-digit industries: drugs; ordnance; office and accounting machines; computers and related equipment; radio, TV, and communications equipment; electrical machinery, equipment, and supplies, not elsewhere classified; aircraft and parts; guided missiles, space vehicles, and parts; scientific and controlling instruments; medical, dental, and optical instruments and supplies; communications; radio and television broadcasting and cable; telephone communications; telegraph and miscellaneous communications services; professional and commercial equipment and supplies;

electrical goods; and computer and data processing services. We added to Benner's classification, all high technology occupationsregardless of the sector in which they were located, which includes the following Census 3-digit occupations: engineers; mathematical and computer scientists; natural scientists; health diagnosing occupations; health assessment and treating occupations; technicians and related support occupations; computer equipment operators; and communications equipment operators.

The occupation classifications do change significantly over the years. The 1960 and 1970 classifications are very similar to each other as are the classifications for 1980 and 1990. The biggest change is between the 1970 and 1980 classifications. Procedures for coding occupations changed for our analysis of each expansion as a result of the changes to the Census classification scheme.

1960's expansion. We used a revised version of the 2-digit 1963-1967 CPS occupation and industry coding scheme for the entire expansion. The original 2 digit coding is somewhat revised in order to use codes that can be created using the 3 digit coding scheme based on the 1960 Census categories that are in use in 1968-1970. The final coding scheme is 30 occupational categories. One further complication results from CPS use of a somewhat different coding scheme for the occupation of job held last week versus occupation of the longest job last year in 1963-1970. As we will explain in the next section, the job last week is used to calculate the counts of people in the job at the beginning and end of the period, whereas the job last year is used to calculate the median wages of jobs (because of the way the earnings data was gathered). Where possible, we recoded job held last year into the job held last week categories. In the few cases where this was not possible, the median wages for the job are calculated using only 1968-1970 data, based on the 3-digit 1960 Census occupational classification.

There are some discontinuities between the estimates of occupation and industry produced by the change in the coding scheme in 1968. For example, the estimate for retail trade appears to be somewhat inflated in the earlier period compared to the later period. In order to test for the effect of this and any other discontinuities between the 1963-1967 and 1968-1970 coding scheme, as well as for the higher aggregation of the 1963-1967 classification, we did the analysis for 1968-1970 only and the patterns remained similar, including the patterns for retail trade. The total number of possible jobs in this 1960s is 30 occupations times 22 industries, making possible 660 jobs. Appendix Table 2 lists the 30 occupations.

1970's expansion. We use a 2 digit coding based on the 1970 occupational classification system. We use the standard 45-category coding scheme for occupations, based on the CPS/Census 2-digit occupational classification. The total number of possible jobs is 45 occupations times 23 industries, making 1035 possible jobs. Appendix Table 3 lists the 45 occupations.

1980s and 1990s expansions. Since the 1980s and 1990s occupational classifications are very similar, we create the same coding scheme for the two expansions. We begin our analysis

of the 1980's expansion in 1983 instead of at the beginning of the expansion in 1982 since the CPS starts using the 1980 Census occupational classification in 1983 and the changes between the two schemes could lead to spurious results if comparisons are made using counts based on different classifications. In the 1980s and 1990s we use a 104 category occupational scheme, attempting to make the categories as homogenous in pay as possible without sacrificing too much aggregation. The total number of possible jobs is 104 occupations times 23 industries, making 2392 possible jobs. Appendix Table 4 lists the 104 occupations.

A.3. Median hourly wages of jobs

The way earnings data is collected in the CPS has changed over the years in several important ways that affect this analysis. Before 1979, data on earnings were not collected as a part of the basic labor force survey, but rather were collected only once per year in the "March annual demographic supplement" as a measure of annual earnings in the year previous to the survey. Starting in 1979, earnings data began to be collected once a month from a sub-set of the sample, called the "outgoing rotation groups". The CPS uses a rotating sample with a somewhat complicated structure. Sample members are surveyed for four consecutive months, and then they are *not* surveyed for four consecutive months, after which they are brought back into the survey and interviewed for a last series of four consecutive months. In any given month of the survey, the sample is composed of people at various stages of their rotation. The "outgoing rotation groups" are composed both of people ending their 4th month in the survey, "outgoing" into their 4 month hiatus, and of people in their last month of the survey, "outgoing" from the survey entirely. Roughly 1/4 of each month's basic CPS sample is in the outgoing rotation group. The ORG data is released as an annual file, which, containing roughly 1/4 of each month's sample, has a sample 3 times the size of a single month. An entire year's sample of outgoing rotation group interviews of workers is substantial, around 150,000 (including both full and part time workers). The sample for earnings data before 1979 is substantially smaller, containing only one month's sample, than that for 1979 and later.

In addition to the difference in sample size, there are differences in the procedures for collecting data on jobs and earnings in the March versus ORG files. In the ORG files, all relevant data including weekly or hourly earnings and usual hours worked is collected for the main job worked in the week before the interview. In the March data, annual earnings are collected for the longest job held in the previous year but there is no data on the earnings for the job held at the time of the interview. We use the earnings only of people who did not change jobs in the past year to calculate median wages for jobs. Industry and occupation of the job is collected for the main job worked in the week prior to the interview is collected, so that data is used to count the number of people in the job cells at the beginning and end of the period under analysis.

The calculation of hourly wage relies upon a measure of hours worked. This measure also changes between the March and ORG data. In the March supplement, the only measure of hours available before 1976 is a measure of *usual* hours worked per week at all jobs at the time of the interview. This measure has two drawbacks: it is a measure for all jobs worked, and it

applies to the respondent's current situation rather than to the situation last year, the reference for the earnings data. We restrict the calculation of hourly wage to people who worked in the same industry and occupation at the time of the interview as they did last year, attempting to select for people with the same job with the assumption that the hours worked per week for people working the same job will not be as likely to change as for people who change jobs. Starting in 1976 in the March files hours worked last year at the main job is collected. In the ORG files, the hourly wage is collected directly for workers paid hourly. For salaried workers, weekly earnings are collected, which we then divide by usual hours worked per week at main job to calculate an hourly wage. Starting in 1994, the CPS allowed respondents to indicate that their hours of work "varied". These cases are excluded from the calculation of hourly wage, however the cases are included in the counts of the number of people in each job when usual full- or part-time status could be determined, feasible for the majority of the respondents.[1]

We use the same hours variables discussed above to assign full-time/part-time status, with one exception. In the March demographic supplement, there is a CPS-created variable for usual full or part time status, which we use in selecting full-time workers to calculate the hourly wage. To identify full-time workers in calculating the number of people in the cells, we use the usual hours worked per week variables — in March, referring to all jobs, and in the ORG, referring to the main job.

In order to test for whether the differences in these methods affect our results, we did several experiments. We compared the results for weekly earnings to those for hourly wage in the 1960s since a weekly earnings variable required fewer restrictions because it does not require a measure of hours worked (except to identify full and part time workers). We also used the March annual demographic supplement and those methods in the 1980s and 1990s. In all cases, the patterns of our results were not substantially affected.

A. 4. Coding of Race and Ethnicity

From 1962-1988 the race variable has three codes: white, black and other. From 1989 on, the race variable is a little more detailed, including codes for American Indian and Asian. In 1996, the category "other race" is dropped. There is no item for Hispanic ethnicity until 1979. After 1979, we divide workers into 3 racial and ethnic categories: non-Hispanic White, Hispanic White, and all Black. Before 1979, we simply divide workers into the two categories Black and White. Workers of other races, including American Indian, Asian and "Other" are included in the analyses for all workers, but not in the analyses focused on specific racial and ethnic groups.

[1] Workers who answered that their hours varied and worked more than one job, whose hours at all jobs totaled more than 35 hours a week cannot be assigned full or part time status and are excluded from the analysis. Thanks to Robert McIntire of the Bureau of Labor Statistics for clarifying the status of the hours vary cases.

A.5. Changes in the CPS sampling and weighting procedures

There have been a couple of additional changes in the CPS that affect our analytic strategy and the comparability of our results. Changes in the CPS sampling and weighting procedures affect the estimates of employment levels and their comparability over time. There was also a major reorganization of the CPS in 1994 that could potentially affect our results.

Changes in the sampling and weighting procedures are periodically made to the CPS to ensure that it remains representative of the ever-changing population of the United States. For example, since the CPS weights are based in part on the Decennial Census description of the population, after every Census, the CPS weights are changed. These adjustments to the sample and weights of the CPS could introduce shifts in the numbers of people in jobs that do not reflect changes in employment levels, but rather improvements in the CPS measurement. Major changes over the time period of this study include 1) a series of changes made from 1971 to 1973, including a shift to Census 1970 population controls; 2) changes made in the mid-1980s both to shift to Census 1980 population controls and to improve the weights, which had its greatest impact on measures of the numbers of Hispanic workers; 3) substantial changes to the sample design and shift to Census 1990 population controls in 1994. The CPS has adjusted the 1990-1993 data to include the same population controls as the 1994 on data.[2] With the exception of the 1971-1973 changes, we tested the impact of these changes on our results by comparing analyses done before and after the change in sampling and weighting procedures and found that these changes do not threaten our conclusions. Since the 1971-1973 changes occur over the entire period of an economic expansion, we cannot test for their impact on our results for that expansion and we decided not to include an analysis of that expansion.

In 1994 very substantial changes were instituted in the design of the questionnaire and interviewing techniques in an overarching redesign of the CPS. We tested for the impact of this change in design and find that it does not substantially affect our results[3].

[2] See the Current Population Survey "Technical Paper 63RV: Design and Methodology" for more details on these changes and the current sampling and weighting procedures.

[3] See Mishel et al 1998 for a more detailed discussion of the 1994 design change and similar findings that this change does not have a large effect on measures of inequality.

APPENDIX B: ALTERNATIVE JOB QUALITY INDICES

We created three alternative job quality indices based on different aspects of job quality than median hourly earnings for the 1990s expansion in order to assess whether the pattern of job expansion we observe for earnings holds for other job attributes. We developed indices based on 1) the job Duncan SEI score; 2) job unemployment rate; and 3) job education. In each case, we followed the same procedure as for earnings where we calculate a single measure of job quality for each job, then rank jobs from the lowest quality to the highest quality, and finally split them into quintiles. For the Duncan SEI score, we use a Hauser and Warren-constructed SEI score for occupations (Hauser and Warren 1997) for the 1990s for both men and women. Since these scores are available only for occupations, in this analysis, all cells with the same occupation have the same job quality with no variation across industry. To calculate the job unemployment rate, we pool all the CPS data from both the 1990s recession and 1990s expansion and calculate an unemployment rate for each cell in our occupation-by-industry matrix. For job education, we follow Hauser and others (Hauser and Warren 1997) and calculated the percentage of people in each job in our occupation-by-industry matrix who completed at least one year of college.

Appendix figure B1 shows the analysis of the 1990s expansion using each of the three alternative job quality indices, together with the earnings index for comparison. There are, of course, differences across these alternative ways of indexing the job structure. However, a striking similarity is that each shows a trough in the middle. Further, both the SEI and education graphs also demonstrate versions of the asymmetrical polarized job growth that we observe in the earnings analysis. The unemployment rate analysis shows more growth at the bottom and less growth at the top than the others. This is likely in part because jobs with the highest unemployment rates are more cyclical than others, so that workers are let go during recessions and brought back in force during expansions. These results demonstrate that polarized job growth is not limited only to earnings, but also to other important features of jobs.

Appendix Table A1. Industry Codes for all Expansions

	Industry Name
1	Agriculture
2	Mining
3	Construction
4	Manufacturing, durable goods
5	Manufacturing, non-durable goods
6	Transportation
7	Communications
8	Utilities and sanitary services
9	Wholesale trade
10	Retail trade
11	Finance, insurance, and real estate (FIRE)
12	Private household services
13	Business services
14	Assorted personal services, except private household
15	Entertainment and recreation services
16	Hospital service
17	Other medical service
18	Educational services
19	Social services
20	Other professional services
21	Forestry and fisheries
22	Public administration
23	Automotive and repair services

Appendix Table A2. Occupation Codes for the 1960's Expansion

	Occupation Name
1	Engineers
2	Medical and other health workers
3	Teachers, except college
4	Other professional, technical and kindred
5	Farmers and farm managers
6	Managers, officials and proprietors except farm
7	Stenographers, typists, secretaries
8	Other clerical and kindred workers
9	Sales workers: retail trade
10	Sales workers: not retail trade
11	Carpenters
12	Construction, craftsmen, except carpenters
13	Foremen, not elsewhere classified
14	Machinists and job setter
15	Mechanics and repairmen: Automobiles
16	Mechanics and repairmen: Not automobiles
17	Metal craftsmen except machinists and mechanics
18	Other craftsmen and kindred workers
19	Drivers and deliverymen
20	Mine operatives and laborers
21	Operatives, manufacturing
22	Operatives, non-manufacturing
23	Private household workers
24	Protective service workers
25	Waiters, cooks and bartenders
26	Other service workers
27	Farm laborer and foremen:
28	Laborers: construction
29	Laborers: manufacturing
30	Laborers: other industries

Appendix Table A3. Occupation Codes for the 1970's Expansion

	Occupation Name
1	Administrators and officials, public administration
2	Other executive, administrators and managers
3	Management related occupations
4	Engineers
5	Mathematical and computer scientists
6	Natural scientists
7	Health diagnosing occupations
8	Health assessment and treating occupations
9	Teachers, college and university
10	Teachers , except college and university
11	Lawyers and judges
12	Other professional specialty occupations
13	Health technologists and technicians
14	Engineering and science technicians
15	Technicians, except health engineering , and science
16	Supervisors and proprietors, sales occupations
17	Sales representatives, finance , and business service
18	Sales representatives , commodities , except retail
19	Sales workers, retail and personal services
20	Sales related occupations
21	Supervisors-administrative support
22	Computer equipment operators
23	Secretaries, stenographers , and typists
24	Financial records, processing occupations
25	Mail and message distributing
26	Other administrative support, including clerical
27	Private household service occupations
28	Protective service occupations
29	Food service occupations
30	Health service occupations
31	Cleaning and building service occupations
32	Personal service occupations

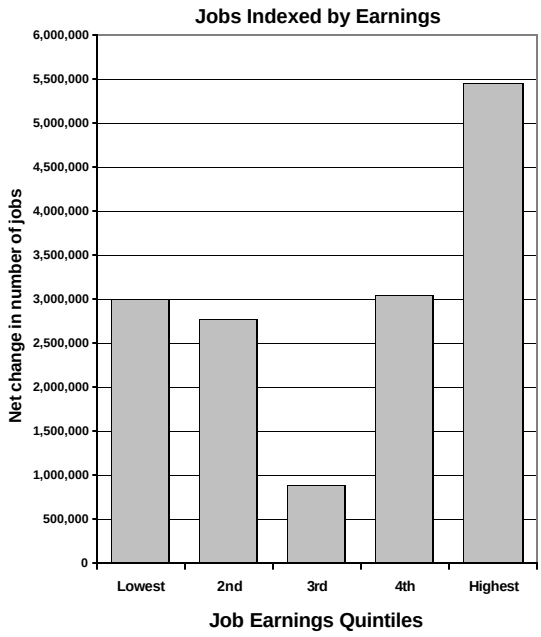
33	Mechanics and repairers
34	Construction Trades
35	Other precision production occupations
36	Machine operators and tenders, except precision
37	Fabricators, assemblers, inspectors, and samplers
38	Motor vehicle operators
39	Other transportation occupations and material moving
40	Construction laborer
41	Freight , stock and material handlers
42	Other handlers, equipment cleaners and laborers
43	Farm operators and managers
44	Farm workers and related occupations
45	Forestry and fishing occupations

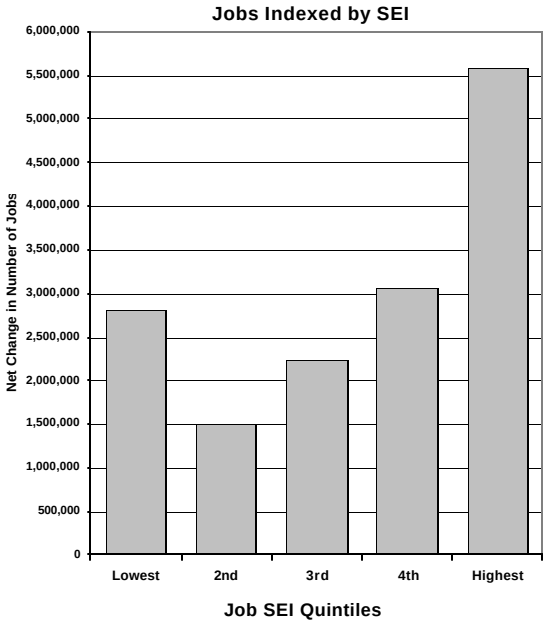
Appendix Table A4. Occupation Codes for the 1980's and 1990's Expansions

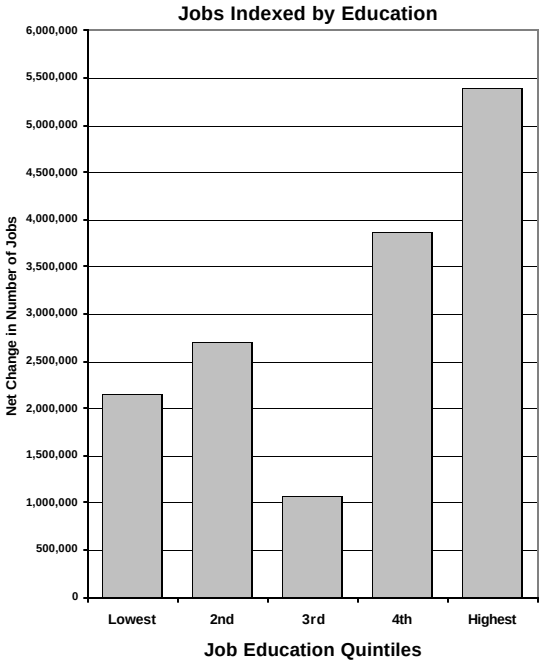
	Occupation Name
1	Public administration
2	Managers, food services
3	Managers, other services
4	Managers, health services
5	Managers, corporate miscellaneous
6	Financial managers
7	Managers, education
8	Managers, marketing and other specialty
9	Management related, lower tier
10	Management related, middle tier
11	Accountants, auditors, underwriters
12	Management related, upper tier
13	Engineers, lower tier
14	Engineers, upper tier
15	Math and computer scientists
16	Natural scientists
17	Physicians and other health diagnosing
18	Health treating, lower tier

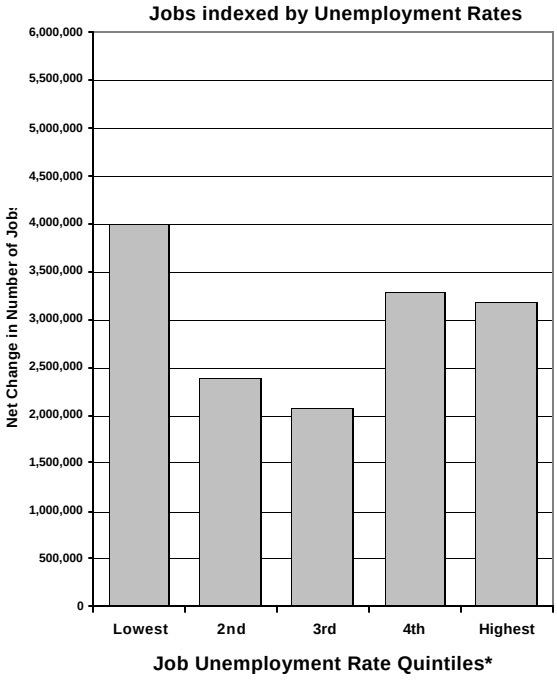
19 Registered nurses
20 Health treating, upper tier
21 College and university teachers
22 Kindergarten and pre-k teachers
23 Elementary school teachers
24 High school teachers
25 Lawyers and judges
26 Arts and recreation occupations
27 Religious occupations
28 Social workers
29 Other professional specialties
30 Health technicians, lower tier
31 Licensed practical nurses
32 Health technicians, upper tier
33 Engineering and scientific technicians lower tier
34 Engineering and scientific technicians upper tier
35 Other technicians, miscellaneous
36 Computer programmers and miscellaneous
37 Sales supervisors/ proprietors
38 Sales reps, finance and business
39 Securities and financial services sales
40 Sales reps, commodities
41 Cashiers
42 Retail sales: non-durables
43 Retail sales: durables and miscellaneous
44 Supervisors: administrative support
45 Computer operators
46 Secretaries, typists, stenographers
47 Financial records processors
48 Mail clerks
49 Postal workers
50 Lower tier clerks
51 Lower middle tier clerks
52 Upper middle tier clerks
53 Upper tier clerks
54 Top tier clerks
55 Private household services
56 Private security
57 Correctional officers
58 Police and fire, public service
59 Waiters, servers
60 Cooks
61 Health services (aides)
62 Maids

63 Janitors
64 Other cleaning occupations
65 Child care workers
66 Ushers, attendants, misc. lower tier personal services
67 Barbers and hairdressers
68 Upper tier personal services
69 Automobile mechanics and repairs
70 Other lower tier repair occupations
71 Middle tier repair occupations
72 Upper tier repair occupations
73 Lower tier construction
74 Carpenters
75 Middle tier construction
76 Plumbers & electricians
77 Upper tier construction
78 Lower tier precision production
79 Lower-middle tier precision production
80 Machinists and other middle tier precision production
81 Supervisors, production occupations
82 Upper tier precision production
83 Textile and garment workers
84 Lower tier operators
85 Misc. machine operators, middle tier
86 Upper tier machine operators
87 Lower tier assemblers
88 Assemblers
89 Inspectors, production
90 Welders
91 Taxis and miscellaneous motor vehicle
92 Bus and truck drivers
93 Industrial truck and tractor
94 Lower tier transportation
95 Upper tier transport operators
96 Construction laborer
97 Stock handler
98 Miscellaneous freight handlers
99 Other handlers, cleaners
100 Laborers and other misc.
101 Farm operators/ managers
102 Farm workers
103 Other agricultural workers
104 Fisherman and forestry



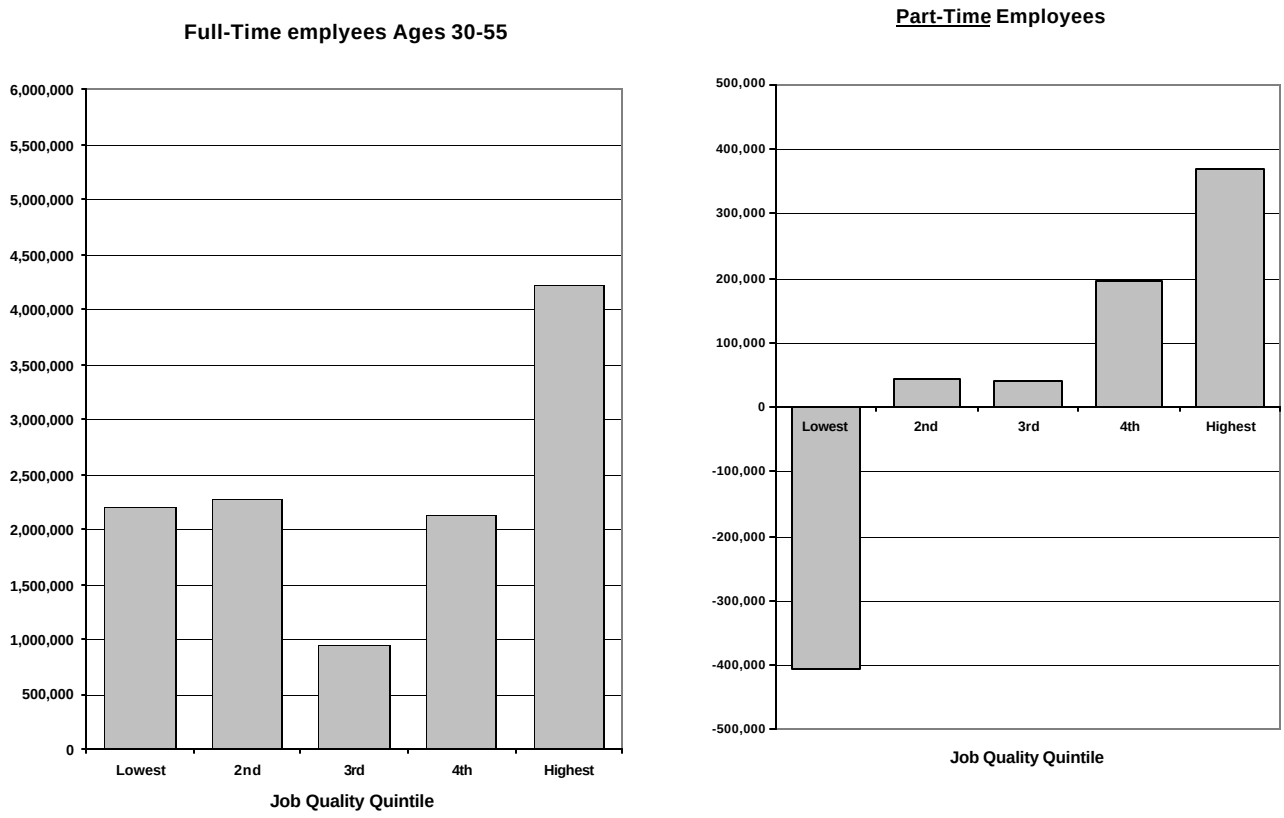






* The lowest quintile of jobs in the unemployment index have the highest rates of unemployment

Appendix Figure B1
Distribution of net job growth using Alternative measures of job quality, 1992-2000



Appendix Figure C1
Comparison of Job Growth of Full-Time jobs for all ages, full-time times for prime-age labor force, and Part-time jobs