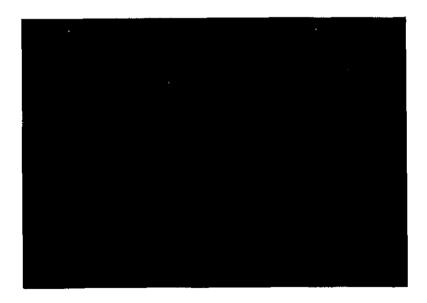# National Longitudinal Surveys

Discussion Paper

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NLS
Discussion
Papers

Participation in Low-Wage Labor
Markets by Young Men

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September 1992

Report: NLS 93-16

Participation in Low-Wage Labor
Markets by Young Men

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September 1992

Executive Summary

Some of the most controversial issues encountered in public debates over governmental intervention in labor markets involves questions concerning the circumstances underlying individuals participation in low-wage jobs. Competing views of the labor market suggest different policy prescriptions. Nowhere is this more evident than in the case of minimum-wage legislation. Those holding the view that some individuals become trapped in low-paying jobs and that the earnings from these jobs contribute significantly to household income advocate raising the minimum wage as an anti-poverty program. Alternatively, policymakers who view participation in low-wage markets as temporary positions offering individuals the opportunity to acquire the work experience and the additional skills needed to move on to higher-paying jobs frequently argue against minimum-wage legislation or for the inclusion of sub-minimum training wages in such legislation. These two divergent views of the role played by low-wage jobs in economic mobility are often at the root of many disputes over labor-market policy.

This report develops a comprehensive picture of the experiences of youths in the low-wage sector and the role that this experience plays in future employment and earnings prospects. This picture identifies where low-paying employment fits into the career paths of individuals in the initial stages of their life-cycle, and how these career

paths vary across race-ethnic groups and educational attainments for men. We carry out our empirical analysis using data from the National Longitudinal Survey Youth cohort (NLSY). Youths are, of course, an ideal demographic group for studying involvement in low-wage sectors because they are major participants, and they are in the formative years of their lifetime employment activities. The availability of the rich information on job experiences provided by the NLSY on a diverse group of individuals, in conjunction with long observation periods, offers the opportunity to assess both the short- and the long-term consequences of involvement in low-paying employment and to determine whether such employment appears to influence subsequent mobility.

To characterize involvement in low-wage employment, we formulate an empirical framework based on a sophisticated modification of a transition probability model that synthesizes the work experiences of individuals during the initial years of their work career. This framework describes the distribution of the lengths of the number of weeks that individuals spend in various activities and the paths that they follow to and from these activities. Though our primary interest is to characterize participation in low-wage labor markets, our empirical model describes a wide variety of labor-market activities including: employment in low-wage jobs, employment in high-wage jobs, simultaneous employment in low- and high-wage jobs, involvement in educational activities, and nonemployment. Our empirical work conducts separate analyses for 4 education groups (high-school dropouts, high-school graduates, individuals with some college education, and college graduates), and for 3 race-ethnic groups (Whites, Blacks, and Hispanics).

Further, we examine the implications of 2 distinct definitions of a low hourly wage rate: one given by the lowest quintile of the wage distribution for all workers in the monthly Current Population Survey; and a second equal to $1 above the federally legislated minimum wage.

Our resulting empirical model captures 6 aspects of participation in low-wage labor markets and of earnings mobility:

- The probability that a youth will enter low-paying employment over various portions of his early career.

- The likelihood of entering or returning to low-wage employment from alternative labor-market statuses.

- The lengths of spells spent in low-wage employment, as well as in employment in high-wage jobs, in nonemployment, in educational activities, and in combinations of these statuses.

- The likelihood that a low-paying employment spell will end with a participant moving to high-wage employment, educational activities, or nonemployment.

- Measures of the total time spent in low-wage employment--or in any other state--over an extended period of time, including the number of spells and the cumulative duration during a specified horizon.

- The way in which experiences vary among individuals possessing different characteristics and labor market histories.

To summarize the implications of this empirical model in a readily understandable manner, our analysis implements a simulation approach to portray labor-market mobility during the first 10 years after leaving formal schooling in a variety of scenarios.

The empirical findings of this study offer a valuable source of information for evaluating many of the assumptions maintained by policymakers in their deliberations

over labor-market policy. The report undertakes a synthesis of these results in an effort to answer the following questions:

- Among young men, who participates in low-wage sectors?

- How much does earnings from low-wage jobs contribute to income?

- Is employment less stable for workers in low-wage markets?

- Is participation in low-wage sectors temporary or persistent?

- Is low-wage employment a port-of-entry into high-paying jobs?

Disputes over the answers to these questions are often at the heart of many public debates over governmental interventions in the labor market.

Summary of Basic Findings

A synthesis of our findings provides the following answers to the above questions:

- ### Among Young Men, Who Participates in Low-Wage Sectors?

    All demographic groups have some experience. High-school dropouts and high-school graduates have a 75%-80% chance of holding a low-wage job at sometime during the first 10 years after leaving school. The participation rate of college graduates in the low-wage sector during their first 5 years after school is a surprisingly high 30%.

    High-school graduates experience the most time in low-wage jobs during the 10-year period after school, followed by high-school dropouts, with college-educated individuals having considerably less experience. The larger amount of low-wage employment for high-school graduates relative to dropouts reflects that a significant segment of the dropout population spends a considerable amount of time in nonemployment. High-school dropouts and graduates average 1-2 years of low-wage employment during the 10-year period. Approximately 50% of high-school dropouts start their

employment in low-wage jobs; this percentage steadily drops for higher levels of education, falling to well below 20% for college graduates.

Measurements designed to gauge the extent of low-wage employment depend critically on the time frame used to register participation, as well as on the age of individuals. Consider the population of high-school dropouts and high-school graduates. If involvement in low-wage labor markets refers to holding any low-paying job during a 2-year period when these individuals are in their late teens, then the participation rate in low-wage employment is as large as 59%. Alternatively, if low-wage experience means holding a low-paying job during any particular quarter when these individuals are in their late twenties, then the participation rate is as small as 11%.

Regardless of the age and education of young men, participation in low-wage jobs is twice as likely to occur over 2-year horizons than in any particular quarter making up this horizon. Irrespective of the time frame used to catalog participation, the likelihood of holding low-wage jobs declines with age (by as much as 50%), with the most significant decreases occurring at the earlier ages. As individuals age, education becomes a stronger factor determining the likelihood of holding a low-wage job.

Race-ethnic differences in low-wage participation are relatively minor at young ages, but they tend to widen at older ages especially at lower levels of education. Ignoring college graduates, Blacks tend to have the highest participation rates in the low-wage sector, with no systematic ordering between Whites and Hispanics. Race-ethnic differentials are inconsequential for college graduates.

● **How Much Does Earnings from Low-Wage Jobs Contribute to Income?**

The fraction made up by earnings from low-wage jobs falls as one considers longer horizons for accumulating income and broader sources of income. Earnings from low-wage jobs is a relatively high fraction of individuals' labor income earned during the quarter during which these jobs were held; it is a much smaller fraction of total family income received over 2 years. For high-school dropouts and high-school graduates, earnings from low-wage jobs average as much as 86% of total labor income during those quarters during which such jobs were held; this average drops to as little as 30% when calculating the contribution of these earnings to total

family income received over 2-year periods during which low-paying employment occurs. For college graduates, the analogous percentages are 71% and 15%.

For less-educated men who hold low-wage jobs, earnings from these jobs account on average for 65%-80% of total family income received in a quarter, and 40%-50% of family income received over 2-year periods when low-paying jobs are held. Considering individuals' labor income alone, the fraction of earnings coming from low-wage jobs for less-educated participants ranges between 69%-88% when considering the contribution of these earnings to quarterly labor income; and it ranges between 33%-61% when considering the contribution to total labor income received during 2-year periods when low-wage jobs are held.

The contributions of earnings from low-wage jobs to any measure of income over any period declines with age and with higher levels of education. The rate of decline associated with aging is much steeper for higher education levels. At the lower levels, the fraction of any measure of income made up by earnings from low-wage jobs is typically highest for Blacks, with Hispanics second, and with Whites having the lowest fractions. Race-ethnic differentials are insignificant for college graduates.

● **Is Employment Less Stable for Workers in Low-Wage Labor Markets?**

A central finding in this study concerns the role of work experience in future labor-market activities. The total amount of past employment is the main factor predicting the extent of future employment, irrespective of whether this past experience occurred recently or whether it occurred in low- or high-wage jobs. Within any education group, past employment is the primary factor governing the stability of individuals' future employment. The link between previous labor-market experience and future employment diminishes at higher education levels. A large component of the race-ethnic differentials observed in the amount of employment and the fraction of this employment spent in high-wage jobs reflects the influence of limited employment early in careers--i.e., time spent out-of-work, not time spent in low-wage jobs--that has a compounding effect on subsequent labor-market activities.

● **Is Participation in Low-Wage Sectors Temporary or Persistent?**

There is a great deal of mobility out of low-wage jobs. The evidence does not support the notion of a low-wage "trap". Young men spend relatively little time in low-paying employment in the first 10 years after school. Individuals typically experience very few entries into low-wage jobs during this period. Even for the lowest education groups, only 50% start low-paying jobs 2 times or more during the 10-year period; only 10% start such jobs more than 4 times. Further, the durations of spells in low-wage employment are surprisingly short. Typical spells last for less than 5 months for the high-school dropouts, and around 6 months for high-school graduates and beyond; 90% of all spells are completed well within 2 years. High-school dropouts and graduates average a modest 1-2 years of low-wage employment in total during the 10 years after school; the majority spend less than 1 year; and only 10% of this population spend more than 4 years in low-paying jobs.

About 50% of high-school dropouts or graduates entering low-paying employment find a high-wage job within 15 months; 90% find such employment within 3-5 years. While the typical members of race-ethnic groups wait similar amounts of time to enter high-paying employment, a component of Black high-school dropouts experience exceptionally long waits; 25% are not in high-paying employment before 3.5 years; and 10% are not in such employment even after 9 years. Most of this wait, however, does not reflect long periods spent in low-wage employment, instead it reflects much time spent out of work.

Mobility out of low-wage jobs does not vary systematically across education levels, except for college graduates who experience noticeably more rapid movement into high-wage jobs. Substantial differences exist in mobility out of low-wage employment across race-ethnic groups at lower levels of education, but these differentials steadily dissipate for the higher education groups and become inconsequential for college graduates.

If there is any notion of a "trap" in the labor market, it must incorporate time spent out-of-work along with low-paying employment. Time spent in the combined state of nonemployment and low-wage jobs provides a notion of a labor-market status more relevant than time spent in low-paying employment alone for judging the prospects of individuals in the subsequent stages of their working careers. The extent of participation in the combined status of low-wage jobs and out-of-work diminishes sharply for higher levels of education and for older workers.

Less-educated Blacks spend an exceptionally large amount of time in

this status, and the experiences for some poorly-educated White and Hispanic dropouts are not much better. More than 50% of Black high-school dropouts spend more than 6.5 years in low-paying jobs or out of work during the first 10 years after school; and 10% spend more than 9 years. About 50% of Hispanics spend about half of the 10-year period in low-wage employment or out of work; and 10% participate almost 9 years in these statuses. White dropouts fare better than Blacks and Hispanics, and yet 10% of Whites spend 7.5 years or more in low-wage jobs or out of work.

The large amount of time spent in this combined state of low-wage employment and nonemployment primarily reflects the influence of insufficient labor-market experience early in the career which predicts low future employment. When individuals acquire labor-market experience, even in low-wage jobs, their prospects for future employment are significantly enhanced.

* ### Is Low-Wage Employment a Port of Entry into High-Paying Jobs?

Increasing employment at any wage implies more time spent in high-wage jobs in the future. The evidence supports the familiar concept of life-cycle wage growth, which depicts participation in low-wage sectors as offering individuals the opportunity to acquire the work experience and additional skills needed to move on to higher-paying jobs in the future. The acquisition of work experience in low-paying jobs at earlier ages not only implies more employment in the future, but a greater amount of this future employment takes place in high-paying jobs.

The findings generally support the view that the majority of people entering high-paying employment will not experience low-wage jobs for quite some time, though a nontrivial fraction of the high-school dropouts and graduates become involved in low-wage employment in the not-too-distant future. From time of entry into a high-wage job, 25% of high-school dropouts are in low-paying jobs within about a year. On the other hand, over 25% avoid such jobs for over 8 years.

Once in a high-wage job, educational attainment is a significant factor in determining the length of time before participation occurs in low-wage employment. Whereas 75% of the college graduates who start high-wage jobs wait at least 5 years before entering low-wage employment, about 50% of high-school dropouts are back in low-wage jobs within 3.5

years. Race-ethnic groups have broadly similar experiences in entering low-paying employment after working at a high-wage job, regardless of the level of educational attainment.

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1. Introduction

Characterizing the circumstances underlying individuals' participation in low-wage labor markets invariably occupies the center stage of many public debates over labor-market policy. Two divergent views of economic mobility support contrary positions in the formulation of many public policies. One view, associated in the economics literature with institutional theories of the labor market (e.g., dual-labor markets), describes a world with minimal mobility where the likelihood that an individual moves far from a relative point in the wage or earnings distribution is small. According to this view, some individuals, especially minorities and women, become trapped in low-paying jobs in which there are few opportunities for advancement to high-earnings employment. A second view, associated with neoclassical theories of the labor market (e.g., human capital), presents a picture of wage and earnings mobility that portrays low-paying jobs as temporary positions. Assuming efficiency of markets, this picture depicts participation in low-wage markets as a way station offering individuals the opportunity to acquire the work experience and the additional skills needed to move on to higher paying jobs.

Public policy presumes the validity of both these views as the motivation for programs and legislation that intervene in labor markets. A frequent argument supporting minimum wage legislation, for example, is that employment in low-paying jobs is not temporary and that the earnings derived from such employment constitutes a substantial

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component of family income. Proponents of such legislation accept the institutional view of the labor market and argue in favor of increased minimum wages as an antipoverty program that raises the earnings of workers who are stuck at the bottom of the wage distribution. At the same time, those adopting a neoclassical view of the world with high economic mobility argue that the imposition of constraints on wages restrict the opportunity for new labor-force entrants to build skills to qualify them for future employment in higher paying jobs. The force of such arguments leads to the provision for a sub-minimum wage that defers the imposition of wage constraints for a period of time that allows for the training of workers.

Numerous debates over public policy involving labor markets hinge on the applicability of the two competing views of labor-market mobility. The desirability of publicly supported training programs is another prominent area in which the views clash. Proponents of the institutional view declare a need for government-sponsored training programs to compensate for a variety of structural failures that must be overcome to provide better employment opportunities for some individuals. These advocates view participation in low-wage markets as permanent without intervention that increases the educational attainments of individuals. To the extent that promoters of the efficient-markets view tend to support training policies at all, they advocate it as a device to allow individuals to gain entry into labor markets where they can progress beyond low-paying employment after the acquisition of work experience. A third prominent example involves public debate directed towards eradicating discrimination. Policy makers with

an institutional perception of economic mobility plead the case for preferential programs or other structural changes in labor markets to improve the prospects for disadvantaged groups to exit low-wage jobs. Policymakers with an efficient-markets perception of high earnings mobility merely advocate the requirement for open job opportunities for all groups.

Surprisingly little is known about the process by which workers enter and exit low-wage employment. A large body of research describes the persistence of poverty, but this notion of income variability is only peripherally linked to low-paying employment. This loose linkage in part reflects the fact that members of nonpoverty households work in low-wage jobs, and in other part arises from the inclusion of nonwage income in the determination of poverty. There is also a considerable body of research summarizing the time series properties of earnings at the individual or household level, but such studies invariably analyze either annual earnings measures or a person's wages observed at disperse points in time. Consequently, movements to and from low-wage markets are missed unless employment in these markets is long-term and represents the principal source of earnings. Further, knowledge of intertemporal correlation patterns alone is insufficient to determine the likelihood that an individual falls into any particular earnings category. Even after integrating the evidence available from the various bodies of research, there is far too little information to enable one to formulate anything approximating a complete characterization of the types of workers who participate in low-wage labor markets, the extent to which these workers remain in such markets, and the

reasons for exiting low-paying employment.

This paper develops a comprehensive picture of the experiences of youths in low-wage labor markets and the role that this experience plays in future employment and job prospects, using data from the National Longitudinal Survey Youth Cohort (NLSY). This picture identifies where low-paying employment fits into the career paths of individuals in the initial stages of their life cycle, and how these career paths vary across race-ethnic groups and education attainments for men. Youths are, of course, an ideal demographic group for carrying out a study of this sort because they are major participants in low-wage markets and they are in the formative years of their lifetime employment activities. The availability of the rich source of information on job experiences provided by the NLSY on a diverse group of individuals, in conjunction with long observation periods, offers the opportunity to assess both the short- and the long-term consequences of involvement in low-paying employment and to determine whether such employment appears to influence subsequent mobility.

To develop this picture of involvement in low-wage employment, we formulate an empirical framework that synthesizes the work experiences of individuals during the initial stage of their life-cycle, distinguishing among jobs according to whether they pay low or high wages. One cannot infer such a picture without devising a statistical model that is estimable using limited data on the activities of individuals, recognizing that the period of observation available for each person in the sample covers only subsets of those years in the life-cycle of concern in this analysis. To accomplish this task, we develop a

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sophisticated variant of a transition probability model (TPM), summarizing events using age, rather than calendar time, as the relevant time metric. This framework describes the distribution of the lengths of the number of weeks that individuals spend in various activities and the paths that they follow to and from these activities. Though our primary interest is to characterize participation in low-wage labor markets, we must consider a broader range of activities in our statistical model. In addition to being employed at various wages, youths spend considerable amounts of time either in educational pursuits (e.g., training) or in a nonemployment status. Consequently, our TPM describes youths' movements among five distinct activities: low-earnings employment, high-earnings employment, simultaneous participation in low-and high-earnings employment, training, and nonemployment. This requires the development of a "five-state" TPM that allows for multiple episodes in the various states. In defining the concept of a low-wage sector in this model, we consider 2 distinct thresholds for assigning hourly wage rates to the low sector: one given by the lowest quintile of the wage distribution for all workers in the monthly Current Population Survey; and a second equal to $1 above the federally legislated minimum wage.

Our statistical model provides a flexible alternative to a competing-risks model, with many features incorporated in our specifications not found in empirical applications elsewhere in the literature. Our formulation not only accounts for different forms of duration dependence, it also allows for a broad range of labor-market activities experienced prior to current episodes to influence present durations and the likelihoods of

future exits to other statuses. Further, our formulation permits duration dependence to vary in a way that depends on previous work history and on demographic characteristics.

To summarize the implications of this model in a readily understandable manner, our analysis implements a simulation approach to produce a picture of labor-market mobility during the first ten years after leaving formal schooling under a variety of scenarios. The findings from these simulations provide the basis for answering a wide assortment of questions concerning the dynamic patterns of participation in low-wage labor markets and the relationships linking this participation with subsequent mobility. In addition, the results allow_us to determine how these experiences differ across age and demographic groups. The summary statistics derived from the simulation analysis provide considerable information about youths' mobility across jobs offering different hourly compensation, as well as their movements to and from nonemployment and educational activities.

1.1 Overview of the Literature

There is no empirical research of which we are aware that resembles the analysis proposed here. Some longitudinal data sets covering a lengthy time horizon provide sufficient information to study the intertemporal movements in individuals' hourly or weekly wages observed at interview times which occur in one-year intervals, but even this limited source of information has not been investigated except at the most elementary level. Analysis of earnings mobility at time intervals shorter than a year over a long

period has not been possible because, until the availability of the NLSY, no data set has offered weekly, monthly or quarterly information on the wages earned by individuals.

The most widely cited studies of earnings stability compare the rankings of individuals' annual labor income observed several years apart to measure the degree of relative mobility. Schiller (1977), in the most prominent study, draws a sample from Social Security records of nearly 75,000 males who were 16 to 49 years of age and earned at least $1000 in 1957 and who had positive earnings in 1971. Dividing the sample into 20 earnings categories, Schiller measures the movements of individuals among the categories between 1957 and 1971. Controlling for the effects of age, the findings indicate that workers on average moved about four categories, which leads Schiller to conclude that individuals are highly mobile across relative positions in the earnings distribution. Results from several other studies applying similar techniques generally support Schiller's findings. Kohen, Parnes and Shea (1975) carry out a comparable analysis using data from the National Longitudinal Surveys commenced in 1966. Calculating movement in family income rather than in earnings between the years 1966 and 1969 for young men, this study finds differential mobility between Whites and Blacks. Taubman (1975) examines earnings mobility using data from the NBER-TH sample which contains information on middle-aged men who were military enlistees in World War II and classified above average in IQ. Comparing earnings in 1955 and 1969, this study like the others provides evidence that there is substantial mobility in earnings over long periods starting from most positions in the earnings distribution.

This body of research at best only hints at the story of participation in low-wage labor markets. Two major shortcomings lead to this situation. First, this research analyzes mobility only in terms of movements in annual measures of total labor or family income, and low annual earnings are not synonymous with employment in low-wage jobs. On the one hand, the annual earnings of an individual may be low due to few hours worked during the year rather than employment at a low wage rate. On the other hand, annual earnings may be high even if employment in a low-wage job occurs because hours of work are high, other jobs are also held, or the time of employment in a low-paying job is short. Second, studies making up this body of research consider mobility only between two points in time set several years apart. Consequently, any mobility occurring within the period bounded by these points is totally missed and absolutely nothing is known about participation in low-wage employment during this period.

There are a variety of other studies that examine the time-series correlation properties of annual earnings or of annual average-hourly earnings over a long successive sequence of years using panel data, which indirectly provide some evidence concerning the nature of earnings mobility. Examples of this line of research include the work of Lillard and Willis (1978), Lillard (1983), Chamberlain (1984), Bhargava and Sargan (1983) and MaCurdy (1982). While this work avoids the second shortcoming noted above in that it considers information over a continuous sequence of years, it does suffer from the first shortcoming. The use of annual measures of earnings leads to serious difficulties in drawing inferences about participation in low-wage markets. Even

abstracting from this problem, the empirical results from these studies are not well-suited for assessing the extent of earnings mobility because the primary findings describe only the autocorrelation structure associated with the variability in annual earnings. To measure mobility, a researcher also needs to know much more about the distributional properties of earnings and about the determination of initial conditions. Given these problems, this body of work provides very little information on the topic of mobility across employment categories paying different wage rates.

1.2 Outline of the Paper

Addressing the substantive issues motivating this research requires at a minimum an understanding of the routes followed by individuals into low-wage labor markets, the factors leading to continued participation in these markets and to return participation, and the routes of escape from these markets. Our empirical model captures these features succinctly, and its simulation provides both a complete characterization of the lengths of time that individuals typically spend in alternative activities during the early part of their lifetimes and of the likelihoods that they move among various activities in particular sequences.

Specifically, the subsequent analysis focuses on answering two fundamental sets of questions:

- How important are earnings received from low-wage employment? Do workers with low-paying jobs tend to hold more than one job simultaneously, or are they more likely to work part-time? Are low-wage earners likely to come from households where more than one member works or where there

are other sources of income? How does the composition of participants in low-wage labor markets vary by such demographic characteristics as age, race, and education level?

- How temporary is employment in low-wage jobs? How likely is it that an individual who works near the minimum wage sometime during a year will be doing so at various times in the future? Are low-wage jobs "traps" of the sort envisioned by institutional theories, or do these jobs serve as ports-of-entry into job ladders with stable and higher-paying employment in the future? What is the likelihood of moving from low-earnings employment to high-paying jobs, and vice versa? What is the general nature of wage and earnings mobility among the young? Are earnings and employment less stable for workers in low-wage labor markets? What is the role of life-cycle wage growth in economic mobility?

While simple summary statistics enable us to answer aspects of these questions, we require the empirical results from the multi-state duration framework to investigate most of the issues.

The remainder of this paper consists of six sections. Section 2, which follows next, outlines the data set used in our empirical analysis, integrating information on individuals' experiences in employment with low and high earnings, in nonemployment, and in training and schooling. As a first step in answering the above questions, Section 3 presents a variety of descriptive statistics designed to measure the extent of low-wage participation across education and race-ethnic groups, along with the degree to which earnings from low-paying jobs contribute to total individual and family income. Section 4 outlines the essential elements of our econometric framework for characterizing earnings mobility; and Section 5 introduces the parameterizations used in the estimation of our statistical model, along with a brief discussion of the empirical results. Section 6

analyzes the results from the simulation of our estimated TPM model to produce a comprehensive description of labor-market mobility during the initial years after departing from school. Finally, Section 7 summarizes the results and attempts to interpret what our findings have to say about the questions posed above.

2. Data Description

Characterizing the process of economic mobility in the labor market requires very detailed work histories for individuals, not only dating their episodes of employment, but also differentiating between periods of low-wage and high-wage employment. We use the information available in the NLSY on wages and hours of work for each job held during each week to construct a complete weekly time series of employment statuses, distinguishing between jobs that pay different hourly wage rates. In addition, we can identify periods of participation in other labor market activities, such as formal schooling, training and nonemployment, on a weekly basis. These weekly series capturing the labor-market activities of young men form the foundation of the subsequent empirical analysis by providing a mechanism to classify men into various economic statuses over time. This section outlines the formulation of our sample of young men used in the subsequent empirical analysis; Appendix A presents a detailed description of our data set.

2.1 Sample Selection Criteria

The NLSY is an incomparable data source for carrying out a study of economic mobility. It incorporates both a randomly designed, nationally-representative sample of 3,003 young men, and a supplemental sample of 2,576 Black, Hispanic, or economically

disadvantaged non-Hispanic, non-Black men, all of whom were ages 14 to 21 in 1978.

The youths themselves were interviewed annually beginning in 1979. Information about

the labor market experiences of these young men is drawn from the first ten rounds of the

NLSY covering the years 1978 to 1988.

The analysis in this paper utilizes a data set of 2,699 young men drawn from the

nationally representative sample of the NLSY and the supplemental samples of young

Black and Hispanic men.[4] Inclusion in our data set required a man to be interviewed in

every year of the first ten rounds of the NLSY and he must have "permanently" left

school sometime between January 1978 and the 1988 interview date. This schooling

condition is necessary to ensure that we capture a man's experiences from the time he

first enters the labor market.

The empirical analysis below differentiates among young men based on their level

of educational attainment at the time they "permanently" leave formal schooling.

Specifically, we categorize individuals into four educational groups:

11- : persons with 11 years of education or less (high-school dropouts);

12 : persons with 12 years of education (high-school graduates);

13-15: persons with 13 to 15 years of education (some college); and

16+ : persons with 16 years of education or more (college graduates).

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[4] We exclude the respondents from the economically disadvantaged non-Hispanic, non-Black supplemental sample because the original selection of this supplemental sample suffered from several shortcomings. See Appendix A for details.

In all of our empirical work, we conduct separate analyses for each of these educational groups.

The notion of permanently leaving school differs for high-school dropouts as compared to the other education categories. An individual from one of the three higher education groups is deemed to have permanently left school at the time he is last observed attending school during the sample time frame. For example, someone who graduated from high-school, worked for one year and then enrolled in college would not permanently enter the labor market until they stopped attending college. In contrast, a young man who drops out of high-school during the sample period and does not return to formal schooling within a year is considered to have permanently left school and entered the labor force at the time he dropped out of high-school.[5] If these individuals return to school and obtain a high-school diploma or a GED in the future, we classify them as participating in a training program while they are engaged in these educational pursuits.

2.2 Defining Economic Statuses

To describe a population's participation in labor markets paying different wage levels over time, we classify individuals as occupying any one of six exhaustive and mutually exclusive labor-market statuses in any week. When a person is attending formal schooling, we refer to them as occupying labor market status or state "s". Upon leaving

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[5] The year-long interruption in schooling for the high-school dropout is important because someone with an interruption shorter than a year is considered to have continuously attended school.

formal schooling, an individual occupies one of five statuses: employed in a low-wage labor market (status ℓ); employed in a high-wage job (status h); simultaneously employed in both a low- and a high-wage job (status b); involved in some type of training or educational activity (status e); and neither working nor participating in an educational activity (status n).

The distinction between low-wage and high-wage employment is a critical feature of our analysis. As the debate between the institutional and neoclassical schools of thought so markedly points out, there is not a well-defined demarcation line between these two sectors in the economy. Accordingly, we examine two distinct specifications of the wage threshold in the subsequent analysis: one based on the lowest quintile of the hourly wage distribution for all workers derived from the monthly Current Population Survey (CPS) samples (termed definition LQ); and a second based on an absolute differential of $1 above the federally legislated minimum wage (termed definition M). Comparing the results obtained for these two concepts of low wages enables us to assess the influence of different definitions on our findings.

Figure 1 graphs the values of the two thresholds defining low-wage employment over the sample period. The third line in the figure, termed the "lowest quintile trend", represents the fitted value from a regression of the lowest quintile on a second-order polynomial in time. This trend tracts the profile of the lowest quintile closely, and we use it as our threshold in the LQ definition of low wages to avoid erratic movements of the threshold; the raw lowest quintile not only jumps around, it remains constant at

common values of the hourly wage rate such as at $4.00 and $5.00. As is apparent in Figure 1, the M threshold exceeds the LQ threshold by about $.75 in the late 1970s, but it rises more slower than the LQ values resulting in about a $.75 shortfall in the early 1990s.

2.3 Descriptive Statistics

Table 2.1 presents some summary statistics of the labor market experiences for the sample of young men used in our empirical analysis. The table reports separate statistics for the four education categories and for both the LQ and M definitions of low-wage employment. To account for the nonrandom composition of our analysis sample from the NLSY (e.g., the incorporation of the supplementary samples), we use weighted estimation procedures to calculate these summary statistics.

Generally, the results in Table 2.1 reveal what one would suspect about the labor market experiences of individuals with different levels of educational attainment. Looking across the four educational groups, the amount of total employment and the fraction of employment spent in high-wage jobs increases with the level of education. Further, the incidence of low-wage employment and the amount of nonemployment decreases with increases in education.

There are, however, two statistics in this table that are quite surprising. First, the incidence of training is relatively constant across the four categories. It should be noted, however, that "training" encompasses many different activities, ranging from reentry into

school to training while employed. Training undertaken by college graduates is likely to be of a very different character from that by high-school dropouts. Second, there is a remarkably high participation rate in low-wage jobs for college graduates. Specifically, one out of every five young men with 16+ years of education experiences an episode of low-wage employment sometime after leaving school. Summary statistics in the later tables will shed further light on these issues.

2.4 Descriptions of Durations

Tables 2.2 presents summary statistics on the duration of spells spent in the five post-school labor-market activities (i.e., low-wage employment ℓ, high-wage employment h, both low-wage and high-wage b, training e, and nonemployment n). The tables designated Table 2.2-LQ use the lowest-quintile as the low-wage cutoff; and those marked Table 2.2-M utilize the minimum wage plus $1 as the threshold for classifying low-wage employment. Again, the tables present separate results for the four education groups and weighted procedures are used to calculate the measures.

The results in Tables 2.2 corroborate the expected relationships between education and the characteristics of spells. For example, employment spells are longer and episodes of nonemployment are shorter for the higher education groups. Furthermore, the length of training spells decreases with increases in the level of educational attainment. Finally, individuals from the higher education categories are less likely to experience low-wage employment; however, these low-wage spells are longer in length than the low-wage

spells of high-school dropouts.

2.5 Descriptions of Transitions

Tables 2.3 present the sample proportions reflecting the likelihood that individuals

follow particular paths when entering the five post-school labor-market activities. Table

2.3-LQ contains the weighted summary statistics for the lowest quintile interpretation of

low-wage employment and Table 2.3-M presents the analogous measures using the

minimum wage criterion to define a low-wage job. The rows, designated by the term

"origin status", refer to the labor-market state from which an individual has just left and

the column designation refers to the status an individual has just entered. Thus, within

each of the four education groups the columns must add up to one because these entrance

probabilities are conditioned upon entering a particular status.

The summary measures in Tables 2.3 help clarify some of the unexpected findings

in Table 2.1. First, with regard to the constant incidence of training across education

groups, the results in Tables 2.3 suggest that individuals with a higher level of education

are much more likely to enter training from an employment status as compared to their

less educated counterparts. Second, the last row in Table 2.3-LQ and Table 2.3-M

suggests that some of the unexpectedly high rate of participation in low-wage employment

by college graduates is the result of their taking a low-wage job immediately after leaving

school. Specifically, more than 27 to 33% of all low-wage spells for this education

group are the result of an individual moving from status s directly to status ℓ. Finally,

one other interesting feature of Tables 2.3 is the routes through which men simultaneously hold both low-wage and high-wage jobs. In particular, it is very rare for someone to move into status b from any status other than the other two employment statuses (i.e., status ℓ and status h).

Tables 2.4-LQ and 2.4-M present the weighted sample proportions measuring the likelihood that individuals with a given level of education follow particular paths when exiting from each of the six labor market activities; s, ℓ, h, b, e, and n. The designations LQ and M associated with these tables represent the lowest quintile and minimum wage definitions of low-wage respectively. In these tables, the origin status refers to the labor-market state which an individual has occupied and just left, and the designation status refers to the state in which an individual enters immediately upon exiting from the origin state. Each of the rows in this table must sum to one because these exit probabilities are conditioned on an individual leaving a particular status.

Casual examination of the statistics in Tables 2.4 reveals several interesting patterns in the exit probabilities. First, the relatively small amount of movement directly from low-wage employment to high-wage employment is somewhat surprising, especially in the higher education categories. For example, the highest probability of moving from a low-wage to a high-wage job occurs for an individual with some college using the LQ definition and still only 34% of all low-wage spells end with the man moving into a high-wage status. Second, as expected, there is more movement from low-wage employment directly to high-wage employment than movement from high-wage to low-wage across all

education categories. Third, it is uncommon for men to move from holding both a low-wage and a high-wage job to a status where they are not working at all. Fourth, individuals with more education are more likely to move from training to employment, specifically high-wage employment, than are individuals with less education. Finally, there is substantial movement from nonemployment to low-wage jobs and from low-wage employment to nonemployment. This suggests that it may be difficult to use low-paying jobs as a jumping stone to high-wage employment. The findings upcoming in Section 6 show this suggestion to be misleading.

3. Earnings from Low-Wage Employment

An understanding of the relative importance of low-wage jobs as a source of income to individuals and their households is needed to address the issues raised by the first set of questions in Section 1. Four factors are important determinants of the relative importance of low-wage employment: the extent of individuals' involvement in the low-wage sector; the degree to which individuals hold high-paying jobs at the same time they are employed in a low-wage job; the relative contribution to household income of earnings from low-wage employment; and the time horizon over which one measures the importance of low-wage employment.

A comprehensive analysis of these four factors not only includes a description of how these factors vary across demographic groups, but also involves an examination of the time paths followed by these measures. This analysis considers both of these dimensions. Specifically, to summarize the relationship between demographic characteristics and the importance of low-wage employment, it focuses on describing variation in these factors across age and racial groups within each of the four education categories. In addition, it explores the time paths of the four factors by incorporating time effects that are common across age and racial groups but differ across the educational categories.

3.1 Empirical Framework

Simple regression methods offer an attractive approach for providing summary statistics reflecting the part played by low-wage employment in determining economic mobility. These methods provide a way to decompose various measures of the relative importance of low-paying jobs into age effects and common time components. In particular, let the variable y_{it} denote the ratio of low-wage earnings to some measure of total income corresponding to the i-th individual in period t. Consider the regression equation

$$(3.1) \qquad y_{it} = \sum_{j=0}^{3} \beta_j \, age_{it}^{j} + \sum_{k=1}^{K} \gamma_k d_{kit} + \text{error} ,$$

where the variable "age_{it}" refers to the age of individual i in period t, the variables d_{kit} are year dummies, and βs and γs are parameters. This equation induces a third-order polynomial in age; evaluating the polynomial at a particular age gives the average of y corresponding to that age over the entire period. Imposing the identification condition $\Sigma_k \gamma_k = 0$ implies that the γ_k coefficient represents the common deviation experienced by all ages in period k.

The following analysis estimates a variety of regression models to investigate the four factors that determine the relative importance of low-wage employment. Specifically, we consider two types of dependent variables that capture various dimensions of low-wage employment and different time horizons to uncover the temporary or permanent nature of low-wage employment. The first type of dependent

variable only distinguishes whether an individual participates in the low-wage sector at all over a given time horizon and thus captures a very general notion of low-wage employment. More refined notions of low-wage employment are incorporated into the analysis by picking dependent variables that measure the fraction of an individual's income, or his family's income, that arises from employment in low-paying jobs. We consider four distinct time horizons to measure the periods 1...T in the subsequent analysis: (1) all quarters included in the calendar years 1978,...,1987, designated 3m periods (signifying 3 months); (2) all 6-month intervals during the calendar horizon, designated 6m periods; (3) all one-year intervals, denoted 1y periods; and (4) all two-year intervals, designated 2y periods.

We estimate distinct models for each of our four educational categories and within each category we often estimate separate models for the three race-ethnic groups. To examine the time paths of the various dependent variables we simplify the regression model by including only two time dummies in equation (3.1). One time dummy is equal to one if the period of observation begins in the years 1978 to 1983 and is zero otherwise. Similarly, the second time dummy is equal to one if the time interval associated with y_{it} begins in the years 1984 to 1987 and is zero otherwise. This first period is termed the late 70s and early 80s and we refer to the second period as the mid-80s.

3.2 Participation in Low-Wage Employment

Table 3.1-LQ and Table 3.1-M present the participation rates in low-wage labor markets respectively for the two definitions "LQ" and "M" of low-wage employment for each of the four education categories. The tables report weighted least squares estimates of equation (3.1), with y_{it} representing a dummy variable that takes the value of one if individual i receives any earnings from a low-paying job in period t and it takes on a value of zero otherwise. The upper entry in each cell is the fitted value for an individual in the age range specified in the heading of the column, and the three lower entries represent the fitted values from separate regressions for the three race-ethnic groups making up our sample--in the order White, Blacks and Hispanics. The left group of columns reports results for the late 70s and early 80s, and the right group presents averages for the mid-80s.

The results in Tables 3.1-LQ and 3.1-M provide the information necessary to answer the questions posed in Section 1 concerning participation in low-wage labor markets. The main findings implied by the two definitions of low-wage employment are very similar. The following discussion first tries to gain some understanding of the permanence of low-wage employment by comparing the predicted participation rates across different time horizons and age groupings. The discussion then turns to a comparison of participation rates for different ages, racial groups and education categories to uncover how the composition of participants varies across these demographic characteristics.

Within education categories and calendar periods a comparison of the predicted

rates in the lower left hand cell with the rates in the upper right hand cell suggests that participation in the low-wage sector is a temporary event for most young men. For example, in Table 3.1-M during the late 70s and early 80s, 75% of teenage high-school graduates hold a low-wage job when considering a 2-year horizon and yet only 11% of this group are employed in the low-wage sector by the time they are in their late 20s if we use a 3-month time horizon. While this example is the most extreme drop in the tables, there is a significant decline in every education category. This picture of short-term participation in the low-wage sector is reinforced by examining the patterns in participation rates across both different ages and time horizons. In particular, as individuals reach their late 20s they are about half as likely to hold a low-paying job as compared to when they were in their late teens; and while one would expect widening the time horizon to lead to greater participation, moving from a 3-month horizon to a 2-year time frame more than doubles the participation rate for most of the age-education categories.

The variation in participation rates across different demographic characteristics are generally consistent with the patterns displayed by the summary statistics presented in Tables 2.1; however, Tables 3.1 point out some interesting interactions among age, race and educational attainment. As noted in Section 2, rates of participation decline with increases in education and yet a surprisingly large fraction of college graduates hold a low-wage job when they are in their early 20s. A closer examination of the results in Tables 3.1 reveals widening educational differences as individuals age. In particular, for

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men in their late teens the participation rates for high-school dropouts are very similar to the rates for high-school graduates and the some college group; however, for older men the participation rate is higher for the dropouts compared to the other two categories. Focusing on the lower three entries in each cell suggests there is a substantial interaction among the demographic characteristics. At the younger ages there are only slight differences between the participation rates of Whites, Blacks and Hispanics in every educational category. These differences are magnified at the older ages especially for the lower education groups. For example, in Table 3.1-LQ compared to Whites a similar fraction of Black college graduates hold low-wage jobs in their late 20s, while at this same age the participation rate for Blacks in the other educational categories is roughly double the rate for Whites.

In summary, the significant findings revealed in this analysis are:

- Involvement in low-wage jobs tends to be a short-term phenomena and is more concentrated among young men. Consequently, measurements designed to gauge the extent of low-wage employment depend critically on the time frame used to register participation as well as on the age of individuals.

- For high-school dropouts and high-school graduates, participation rates in low-wage employment are large as 59% when registering participation as holding any low-wage job in a 2-year period in the late teens, and it is as small as 11% when participation refers to holding a low-paying job during an arbitrary quarter when individuals are in their late 20s.

- Regardless of the age and education of young men, participation in low-paying jobs is twice as likely to occur over a 2-year horizon than in any of the particular quarters making up this horizon.

- Irrespective of the time frame used to catalog participation, the

likelihood of holding low-wage jobs declines with age (by as much as 50%), with the most significant decreases occurring at the earlier ages.

- As individuals age, education becomes a stronger factor determining the likelihood of holding a low-wage job. While participation rates in low-wage employment steadily decline as individuals acquire educational attainments beyond high school, a surprisingly large fraction of college graduates hold low-wage jobs at the start of their working careers-- around 30% in the first 2 years after graduation.

- Race-ethnic differences in low-wage participation are relatively minor at young ages, but they tend to widen at older ages especially at lower levels of education. Ignoring college graduates, Blacks tend to have the highest participation rate, with no systematic ordering between Whites and Hispanics.

3.3 Relative Importance of Earnings from Low-Wage Jobs

Tables 3.2-LQ and 3.2-M present estimates of the relative contribution of earnings from low-wage employment to several sources of household income for the two definitions of low-wage. The tables report weighted least squares estimates of the fitted values implied by equation (3.1) with y_{it} constructed three ways. Calculating y as the ratio of an individual's earnings from low-wage employment over his total labor earnings in the period yields the results reported in the first group of rows listed for each education group. Calculating y as the ratio of an individual's earnings from low-paying jobs over total family nontransfer income in the period produces the estimates reported in the second group of rows listed for each education category. Finally, calculating y as the ratio of an individual's earnings from low-wage employment over total family income in the period yields a set of findings presented in the third group of rows. The upper entry

in each cell is the implied fitted value for a nationally representative sample of youths associated with the corresponding age-education category and period measure. The three lower entries present estimates of the percentages of income received from low-wage employment, with separate regressions run for the three race-ethnic groups; the first entry refers to White; the second to Black; and the third to Hispanics.

The results in Tables 3.2-LQ and 3.2-M portray very similar pictures suggesting that low-wage jobs are an important source of income for participants and their families. Further, for some types of individuals it is also a significant income source over long time horizons. Within a given education category-calendar period, a comparison of the upper left hand cell with the lower right hand cell provides a general overview, as well as a range of values, indicating the importance of earnings from low-wage jobs in determining the economic well-being of individuals and their families. As one would expect this diagonal comparison shows a decrease in the importance of low-wage earnings as the width of the time horizon window increases and as broader income measures are considered. For example, in Table 3.2-LQ for the mid-80s using a 3-month time horizon, 88% of a teenage high-school dropout's own labor income comes from employment in the low-wage sector while a dropout in his late 20s derives only 38% of total family income over a 2-year horizon from low-wage jobs. A similar comparison of these same income measures across demographic groups suggests that Black high-school dropouts obtain a significantly larger fraction of income from the low-wage sector over both short and extended periods of time. Specifically, over a 3-month horizon over 85%

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of a Black high-school dropout's own labor income is derived from low-paying jobs and more than half (56-69%) of his family income over a 2-year horizon results from his employment in low-wage jobs.

A closer examination of particular income measures provides a more through understanding of the importance of low-wage employment in determining the economic mobility of young men. In particular, examining the total individual labor income measure at different time horizons provides information on the extent to which individuals work in both low-wage and high-wage jobs. For example, using a 3-month time horizon the predicted fraction of own labor income resulting from low-wage employment is generally above 70% for all ages, races and education categories which indicates there is little "simultaneous" employment in both low-wage and high-wage jobs. In contrast, low-wage employment is much less important as the time frame widens to 2 years (e.g., only 25%-60% of own labor income is derived from low-wage employment) suggesting that most low-wage participants are also working in high-wage jobs over this period. Taken together with the results in Tables 3.1, these measures imply that low-wage employment is an important, but temporary, event for most people. There is an exception to this implication for Black and Hispanic men with less than 16 years of education because a significant number of men from this demographic group obtain a significant fraction of own labor income from low-wage employment over longer time horizons.

Comparing the estimation results for the individual labor income measure with the results from the two family income measures provides some insights into the part low-

paying jobs play in determining a family's economic circumstances. This comparison across different educational categories suggests that low-wage employment is relatively less important in determining the economic circumstances for the families of men with higher levels of education. For example, in Table 3.2-LQ using a 3-month horizon a typical high-school dropout in the mid-80s who is in his early 20s receives 85% of his own labor income versus 73% of total family income from low-wage employment while a comparable college graduate receives 71% of own labor income and only 54% of total family income from low-paying jobs. Similar comparisons indicate that earnings from low-wage jobs are relatively less important in determining a family's income as men age and longer time horizons are considered. Conducting the same exercise using the lower entries in each cell point out some significant differences in the relative importance of low-wage employment for Whites, Blacks, and Hispanics. In particular, the families of Black men with lower educational levels (i.e., categories 11-, 12 and 13-15) rely more on earnings from low-paying jobs relative to Whites. These racial differences are not as prominent for college graduates.

The principal conclusions drawn from this analysis on the relative importance of earnings from low-wage jobs are as follows:

- The fraction of income made up by earnings from low-wage jobs falls as one considers longer horizons to accumulate income and broader sources of income. Earnings from low-wage jobs is a relatively high fraction of individuals' total labor income earned during the quarter in which these jobs are held; it is a much smaller fraction of total family income received in the 2-year periods including these quarters.

- For high-school dropouts and high-school graduates, earnings from low-

wage jobs average as much 86% of total labor income during those quarters when such jobs are held; this average drops to as little as 30% when calculating the contribution of these earnings to total family income received over 2-year periods during which low-paying employment takes place. For college graduates, the analogous percentages are 71% and 15%.

- Considering individual's labor income alone, the fraction of earnings coming from low-wage jobs for low-educated participants ranges between 69% and 88% when considering the contribution of these earnings to quarterly labor income; and it ranges between 33% and 61% when considering the contribution to total labor income received over 2-year periods when low-wage employment occurs.

- For poorly educated men who hold low-wage jobs, earnings from these jobs on average account for 65%-80% of total family income received in a quarter, and 40%-50% of family income received over 2 years periods when low-paying jobs are held.

- The contribution of earnings from low-wage jobs to any measure of income over any period declines with age and with higher levels of education. The rate of decline associated with aging is much steeper for the upper education groups.

- At the lower education levels, the fraction of any measure of income made up by earnings from low-wage jobs is typically highest for Blacks, with Hispanics second, and with Whites having the lowest fractions. Race-ethnic differentials are insignificant for college graduates.

4. An Empirical Framework

Understanding the process underlying economic mobility for a population requires extensive information on the patterns of their work experiences from the time of initial entry into the labor force until a distant point in their working careers. If we had detailed longitudinal data on a sample of individuals covering the early portion of their lifetimes, say at least the first ten years after leaving school for each person, then there would be little need to introduce a statistical model to infer the findings developed later in this paper. Given such data, one could readily calculate a variety of statistics summarizing the total amount of time that persons occupy in different labor-market statuses over alternative horizons, along with the various routes followed by individuals to employment paying different wage levels. Unfortunately, such data are never available. Invariably, persons included in a data source are not observed over the same period (in either the life cycle or calendar time); they are typically observed for shorter periods—indeed, substantially shorter in many instances—than the long horizon of interest in this study; and some individuals enter the sample after they have left school, which implies that no detailed information is available on their work histories from the time that they depart school until when they become sample members. These complications severely limit the conclusions that can be drawn from simple summary measures, and they create significant difficulties in any empirical analysis of economic behavior in a dynamic context.

As a conceptual framework for dealing with these issues, the subsequent analysis introduces a generalized variant of a transition probability model (TPM), substantially expanded beyond that found in applications of Markov chains.[6] This model offers a flexible econometric framework for studying economic mobility and movements among labor markets paying different wage rates, as well as movements to and from educational and nonemployment activities. The perspective adopted in the model is to characterize youths' labor-market experiences using age--not calendar time--as the relevant time measure. Our aim is to describe the patterns of experiences that occur over alternative stages of individuals' lifetimes after they leave formal schooling. Interest not only focuses on the cumulative amount of time that persons spend in various activities, it also considers the sequences of these experiences.

The resulting empirical model characterizes six aspects of participation in low-wage labor markets and of earnings mobility in general:

- The probability that a youth will enter low-paying employment over various portions of his lifetime.

- The likelihood of entering or returning to low-wage employment from alternative labor-market statuses.

- The lengths of spells spent in low-wage employment, as well as in employment in high-wage jobs, in nonemployment, in educational activities, and in combinations of these statuses.

- The likelihood that a low-paying employment spell will end with a participant moving to high-wage employment, educational activities or nonemployment.

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[6] For further discussion of elementary variants of Markov chain models, see the textbooks by Bartholomew (1982) and Howard (1971).

- Measures of the total time spent in low-wage employment--or in any other state--over an extended period of time, including the number of spells and the cumulative duration during a specified horizon.

- The way in which experiences vary among individuals possessing different characteristics and labor market histories.

We formulate the TPM to characterize the process governing individuals' mobility on a weekly basis across the five economic statuses defined in Section 2, which include: status ℓ (employment in a low-wage labor market); status h (employment in a high-wage job); status b (simultaneous employment in both a low- and a high-wage job); status e (involvement in some type of training or educational activity); and status n (not working and not participating in educational pursuits). We consider both the LQ (lowest quintile of the hourly wage distribution) and the M ($1 above the minimum wage) definitions of low wages in assigning an individual to state ℓ in a given week, which means that we carry out separate empirical analyses for these two definitions.

The subsequent empirical framework incorporates three basic building blocks: initial probabilities, duration distributions, and entrance probabilities. The initial probabilities summarize the likelihood that individuals start their working career in alternative labor market activities at the time that they leave school. The duration distributions describe the length of spells or the number of weeks that individuals spend uninterrupted in a particular state. The entrance probabilities summarize the likelihood that individuals who terminate a spell enter alternative statuses (i.e., leave via alternative routes). Throughout the analysis we account for potential differences in individual characteristics and the possible effects of history variables on the various statistical

relationships. Our statistical model provides a flexible alternative to a competing-risks model, with many features incorporated in our specifications which are not found in empirical applications elsewhere in the literature.

4.1 Probabilities Determining Initial Labor-Market Status

The first element needed to characterize individuals' work experiences over their lifetimes is the specification of the labor-market status that persons enter immediately upon finishing formal schooling. In econometric terminology this component determines the initial conditions of the process describing labor market mobility. The statistical specification needed here is a type of entrance probability, for it reflects the likelihood that an individual enters each of the states ℓ, h, b, e, or n at the end of school. We specify these probabilities as

(4.1) $$Pr\ (s \to i) = Pr\ (s \to i \mid X) \quad i = \ell,\ h,\ b,\ e,\ n$$

for the probability that a person exits from school (state s) to state i as the first labor-market status at the end of school. Formally, the quantity $Pr\ (s \to i)$ represents the probability that an individual moves from state s to state i conditional on the covariates X. By incorporating demographic characteristics in X, one can allow for differences in the way in which various segments of the population start their working careers. In the subsequent analysis, X includes variables reflecting schooling attainment, age, and race.

4.2 Duration Distributions and Hazard Rates

The next element required to characterize labor-market experiences is a summary of the length of time that individuals spend in the various statuses upon entry. A duration distribution characterizes the likelihood that an individual experiences a given number of weeks of continuous residence in a particular labor market activity given admission into this status and some specification of history prior to the start of the spell.

According to our formulation, an individual may occupy any one of the five statuses (ℓ, h, b, e, or n) at any given time. Letting "i" designate an arbitrary status, a duration distribution takes the form

$$(4.2) \qquad f_i(\tau) = S_i(\tau-1) \, H_i(\tau) \quad ,$$

with

$$(4.3) \qquad H_i(t) = 1 - P_i(t, Z)$$

and

$$(4.4) \qquad S_i(\tau-1) = \prod_{t=1}^{\tau-1} P_i(t, Z) \quad .$$

In these expressions, the variable τ corresponds to the duration of a spell spent in labor-market status i, and Z accounts for factors other than duration that influence the lengths of these spells. The probability $P_i(t, Z)$ designates the likelihood that an individual remains in the current labor-market status after already having been in the state for t weeks, with the covariates Z summarizing the demographic characteristics and previous

work history at the start of current episode; $P_i(t,Z)$ conditions on the variables t and Z.

The function $f_i(\tau)$ specifies the likelihood that a spell in status i will last exactly τ weeks

for individuals falling into a category characterized by attributes Z at the beginning of the

spell. The hazard rate $H_i(t)$ determines the fraction of the population who, having been in

the labor-market status for t-1 weeks, will leave on the t-th week of their spell. Finally,

the quantity $S_i(\tau$-$1)$, the survivor function, depicts the probability that an individual will

experience an episode in status i that lasts at least τ-1 weeks.

The covariates Z include two distinct components in our analysis: the components

X accounting for demographic characteristics; and the variables H summarizing an

individual's particular work history experienced prior to the start of the current spell.

We consider a wide variety of summary measures in H, including: total employment

since leaving school; the amount of employment experienced in the year prior to the

initiation of the current spell; an indicator of whether the individual participated in any

training since leaving school; the amount of training completed since leaving school;

indicators of the low-wage participation in each of the two years preceding the current

spell; and indicators of the labor-market status from which the individual exited just prior

to entering his current position. Most covariates are interacted with t, the length of the

individual's spell in the current labor-market status.

4.3 Entrance Probabilities

The third element needed to characterize labor-market mobility summarizes the

likelihood that individuals enter the alternative labor-market statuses upon the termination of a spell. This component of the model determines how different work histories and demographic characteristics influence the prospects of following the various paths available to persons when exits occur from each status under a variety of circumstances.

Upon the conclusion of a spell in state k, define the probability that an individual enters state i as

$$(4.5) \qquad Pr(k \to i) \equiv Pr(k \to i \mid \tau, Z), \qquad i \neq k, i = \ell, h, b, e, n .$$

Formally, the quantity $Pr(k \to i)$ represents the probability that an individual moves from state k to labor-market activity i conditional on ending a spell of τ weeks in state k and on the covariates Z which describe circumstances at the start of the spell that just ended. Incorporating work history variables and demographic characteristics in Z allows one to model how the particular nature of each individual's lifetime work experiences influences the prospects for entering a new labor-market status and how these prospects differ across demographic groups.

4.4 Characterizing Employment Experiences

Estimated variants of the preceding statistical specifications provides all the information needed to describe events associated with time spent in low-paying jobs over any horizon, along with the pattern of transitions to and from such employment. Using this knowledge, one can infer a wide array of dimensions associated with low-wage experience, such as: the probability that a youth will enter low-paying employment over

various portions of his lifetime; the routes of entry into and exits from low-wage jobs; the number of entries into low-wage employment; the lengths of spells spent in low-wage jobs; and measures of the total time spent in low-wage employment.

The above elements serve as building blocks for several approaches for characterizing employment patterns. While not the most convenient approach, one can analytically calculate the likelihood of any particular employment sequence by forming the appropriate product of initial probabilities, duration distributions and entrance probabilities; such a procedure literally permits one to predict the likelihood that a member of a demographic group will experience any specific pattern of labor market experiences.

To illustrate this procedure, define $f_{ki}(\tau_{ki})$ and $S_{ki}(\tau_{ki}-1)$ as the duration distribution and the survivor function associated with the ith spell experienced by an individual in state k, where k = ℓ, h, b, e, and n, depending on whether the person occupies a low-wage job, a high-wage job, simultaneous employment in low-wage and high-wage jobs, training positions, or nonemployment. Each f_{ki} and S_{ki} has a form analogous to the corresponding expression listed in (4.2) and (4.4). Similarly, let $Pr(k_i \rightarrow m_j)$ denote the entrance probabilities, linking transition from the ith spell in state k to the jth spell in state m. Relation (4.5) characterizes the form for these probabilities. Multiplying the quantities f, S, and Pr in a way that describes an individual's experience provides the expression for the probability associated with the particular spell sequence corresponding to this experience.

For example, the likelihood that, over a period of T weeks after leaving school, a person starts a spell in low-wage employment lasting $\tau_{\ell 1}$ weeks, moves to nonemployment at that time, and spends the remaining $\tau_{n1} = T - \tau_{\ell i}$ weeks in nonemployment is given by

$$(4.6) \qquad Pr(s \to \ell_1) \, f_{\ell 1}(\tau_{\ell 1}) \, Pr(\ell_1 \to n_1) \, S_{n1}(\tau_{n1})$$

If, instead, this individual completes the spell in the nonemployment after τ_{n1} weeks prior to the end of the period, enters high wage employment for τ_{h1} weeks, and again enters nonemployment for the remaining τ_{n2} weeks which runs to the end of the period, then the implied probability is

$$(4.7) \qquad Pr(s \to \ell_1) \, f_{\ell 1}(\tau_{\ell 1}) \, Pr(\ell_1 \to n_1) \, f_{n1}(\tau_{n1}) \, Pr(n_1 \to h_1) \, f_{h1}(\tau_{h1}) \, Pr(h_1 \to n_2) \, S_{n2}(\tau_{n2}),$$

where $\tau_{n2} = T - \tau_{\ell 1} - \tau_{n1} - \tau_{h1}$.

The use of analytical methods for calculating summary statistics describing dynamic patterns of labor-market experiences is computationally burdensome. While inferring the likelihood of any particular sequence of experiences is relatively straightforward, it is exceedingly complex to calculate such statistics as the average amount of time that an individual can be expected to participate in a specific activity over fixed horizons.

Simulation methods, of the sort now commonly used in statistics and econometrics, offer a far simpler approach for computing summary statistics designed to characterize labor-market activities. The subsequent analysis utilizes such methods to summarize experiences of the four education groups considered in the previous discussion during horizons covered in the first 10 years of their working careers after leaving school.

5. Empirical Specifications and Estimation

Implementing the empirical framework outlined in Section 4 requires the estimation of three statistical quantities, considered most conveniently in the order: the probabilities $P_i(t,Z)$, which determine the length of spells in labor-market activities; the entrance probabilities $Pr\ (k \rightarrow i)$, which indicate the likelihood of entering alternative statuses at the end of spells: and the initial-status probabilities $Pr\ (s \rightarrow i)$, which designate the likelihood of starting a career in the various labor-market activities after leaving formal schooling. This section introduces the empirical specifications adopted in our empirical analysis for these quantities, along with the procedures implemented to estimate specifications. The discussion outlines estimation results only briefly; Appendix B describes the specifications and results in greater detail, and Section 6 fully characterizes the implications of the empirical findings.

5.1 Parameterization of Duration Distributions and Hazard Rates

Proposing specifications for f_i and H_i requires an appropriate functional form for $P_i(t,Z)$, representing the probability of remaining in state i for one more week beyond duration t given characteristics Z. Three aspects of this functional form are critical to these specifications. The first involves the nature of duration dependence applicable for the various types of work activities, which primarily determines how P varies with t.

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The second concerns the effect on P of an individual's previous work experiences, which are included in the covariates Z. The third relates to the possibility that central features of duration dependence change as the values of Z change. To account for such a possibility, we require a formulation for P that admits flexibility both in the functional form for duration dependence, and in the way in which this dependence varies for different values of the covariates Z.

Plotting hazard rates is a popular mode for presenting information about the character of duration dependence. Graphs of hazard rates in our data reveal that empirical specifications of the probabilities $P_i(t,Z)$ must admit nonmonotonic duration dependence and allow the form of this dependence to vary according to the attributes Z. Standard empirical specifications typically do not accommodate nonmonotonic duration dependence, nor do they allow for interaction between the form of duration dependence and covariates Z.

To allow for such flexibility, we specify the following logistic model for the probabilities $P_i(t,Z)$:

$$(5.1) \qquad P_i(Z,t) \;=\; \frac{1}{1+e^{Z_1\beta_i+g_i(t,Z_2,\alpha_i)}} \quad,$$

where Z_1 and Z_2 are vectors of variables made up of the covariates Z, β_i is a parameter vector, and the function $g_i(t, Z_2, \alpha_i)$ determines the duration properties associated with the time spent in labor market status i.

The covariates Z include demographic characteristics, X, and work-history variables, H, where all of these variables evaluated at the start of the current labor-market episode. The characteristics making up X include: an intercept, indicator variables for racial origin (Black and Hispanic); indicator variables for educational attainment (i.e., representing the groups 11-, 12, 13-15, and 16+); and the natural logarithm of the total number of weeks since the individual left formal schooling--which measures the person's age when this variable is fully interacted with indicators of educational levels, as is done in the subsequent analysis.

The work-history variables H include: the fraction of time spent employed during the 52-week period prior to the initiation of the current spell; an indicator variable signifying whether the individual was employed in a low-wage job for at least 1 week during the year preceding the current spell; an indicator variable signifying whether the individual was employed in a low-wage job for at least 1 week during the two years preceding the current spell; the total number of weeks spent in training programs since leaving school; the proportion spent employed of the total time since leaving school; the product of this proportion and the logarithm of the total number of weeks since the individual left school (i.e., an interaction between the fraction of total employment and the log of potential labor market experience); and a set of 6 indicator variables signifying the economic status occupied by the individual prior to entering the current status-- including indicators for school s and for the five labor-market statuses ℓ, h, b, e, and n.

In specification (5.1), the function $g_i(t, Z_2, \alpha_i)$ not only captures the properties of

duration dependence, but the presence of Z_2 in g_i also allows duration dependence to vary according to all the attributes included in Z_2. Spline models are an attractive approach for modelling duration effects, since they fit the data with a flexible and smooth function of duration. Implicit in conventional spline models, which fit polynomial functions to a series of intervals over duration, is a tradeoff between smoothness and goodness of fit. Fit can be improved by increasing the number of polynomial functions, but nondifferentiability at the boundaries requires a sacrifice in smoothness. Limiting the number of intervals or the order of the polynomial functions yields a smoother curve but diminishes the capabilities of detecting complicated forms of duration dependence.

In our approach, we specify $g_i(t, Z_2, \alpha_i)$ as the general function:

$$(5.2) \qquad g_i(t, Z_2, \alpha_i) = \sum_{j=1}^{J} \left[\Phi_{ij}(t) - \Phi_{i,j-1}(t) \right] \left[\alpha_{ij0} Z_2 + t\, \alpha_{ij1} \right]$$

The quantity $\Phi_{ij}(t)$ denotes the cumulative distribution function of a normal random variable possessing mean μ_{ij} and variance σ_{ij}^2, and the α_{ikj}'s in (5.2) represent parameter vectors.

The presence of Z_2 in g_i allows duration dependence to vary according to all the attributes included in Z_2. To describe the characteristics of g_i, suppose for the moment that Z_2 only consists of an intercept; so $\alpha_{ij0} Z_2 + t\, \alpha_{ij1} = \alpha_{ij0} + \alpha_{ij1} t$. The presence of the *cdf*'s in (5.2) permits us to incorporate spline features in g so that the linear polynomial $\alpha_{ij0} + \alpha_{ij1} t$ represents g over only a specified range of t. In particular, suppose we wish to set $g_i = \alpha_{i10} + \alpha_{i11} t$ for values of t between 0 and t^* and to set $g =$

$\alpha_{i20} + \alpha_{i2I} t$ for values of t between t^* and some upper bound $\bar{t}$. To create a specification of g that satisfies the property, assign $J = 2$ in (5.2); fix the three means determining the cdfs as $\mu_{io} = 0$, $\mu_{iI} = t^*$, $\mu_{i2} = \bar{t}$; and pick very small values for the three standard deviations σ_{io}, σ_{iI}, and σ_{i2}. These choices for the μ's and the σ's imply that the quantity $\Phi_{iI}(t)-\Phi_{io}(t)=1$ over the range $(0, t^*)$ and $=0$ elsewhere, and the quantity $\Phi_{i2}(t)-\Phi_{iI}(t)=1$ over the range $(t^*, \bar{t})$ and 0 elsewhere. Accordingly, g_i possesses the desired property. Further, $g_i(t, Z_2, \alpha_i)$ is differentiable in t. With the values of the μ_{ij} and the σ_{ij} set in advance of estimation, $g_i(t, Z_2, \alpha_i)$ is strictly linear in the parameters α and in known functions of t and X_2. One can control where each spline or polynomial begins and ends by adjusting the values of the μ's. One can also control how quickly each spline cuts in and out by adjusting the values of the σ's, with higher values providing for a more gradual and smoother transition from one polynomial to the next.

5.2 Estimation of Duration Distributions and Hazard Rates

We estimate parameters of the transition probabilities $P(t,Z)$ appearing in specifications (5.1) and (5.2) by implementing maximum likelihood methods of the sort found in duration analysis to estimate the distribution $f_i(\tau)$. The incorporation of the NLSY supplemental samples into our data set requires the use of weighted maximum likelihood techniques in the estimation of these probabilities. Our sample consists of observations on all spells initiated during our period of observation. We have complete information on the variables included among our work-history covariates H, so we

encounter no problems with left censoring. Our procedure accounts for right censoring when spells are interrupted. We estimate distinct models for each of our four educational categories, and our two low-wage definitions.

In estimation, we pick a specification of $g_i(t,Z_2,\alpha_i)$ by setting $J = 5$ in (5.2), with the μ's and σ's fixed according to the particular status analyzed. We selected the values for the μ's and σ's after extensive exploratory data analysis for each type of spell; the properties of the empirical hazard rates principally determine the formulation of the function $g_i(.)$. We allow the form of the duration dependence to vary with all covariates by including all the components of Z listed above in Z_2, with Z_1 eliminated from the specification. The empirical analysis estimates the α coefficients for each of the transition probabilities that determine the five duration distributions.

Following some general guidelines for choosing specifications, we adopted different parameterizations of the transition probabilities across the alternative labor-market statuses and education categories. (Appendix B presents the details of the final specifications for each spell type and education category.) Regarding the nature of duration dependence and the characteristics of the spline functions, the values of the μ's and σ's vary across spell types, but are held constant across education categories.[7] Conventional hypothesis tests indicate that significant interaction effects exist between

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[7] Extensive testing indicates that the null hypothesis of $\alpha_{ijl} = 0$ for combinations or individual values of i and j cannot be rejected at conventional significance levels; thus, the estimated transition probabilities used in the subsequent analysis impose this restriction on the parameters in equation (5.2). Furthermore, after testing, we restrict the $\alpha_{i50} = 0$ in estimation, except for the coefficient on the intercept term in Z_2; thus, the transition probability is constant and does not depend on individual characteristics beyond the last spline point.

duration and demographic characteristics and between duration and history variables over some range of weeks for all of the spell types and education categories; thus, we included the components of both X and H as part of the covariates included in Z_2.[8]

5.3 Parameterizations of Entrance Probabilities

The probabilities $Pr\ (k \rightarrow i)$, defined by (4.5), determine the likelihood that an individual enters labor-market activity i conditional on ending a spell of τ weeks in status k and on the covariates Z. The way in which the variables τ and Z influence the value of $Pr\ (k \rightarrow i)$ specifies how various circumstances related to previous work experiences and demographic characteristics affect the route by which individuals exit from labor-market status k. The probabilities $Pr\ (k \rightarrow i)$ are also likely to display history dependence.

To offer a flexible specification for entrance probabilities, we parameterize these quantities using a multinomial logit specification analogous to the formulation proposed in (5.1), which takes the form:

$$(5.3) \qquad Pr\ (k \rightarrow i) = \frac{e^{Z_1 \beta_{ki} + g_{ki}(\tau, Z_2, \alpha_{ki})}}{\sum_{j = \ell, h, b, e, n} e^{Z_1 \beta_{kj} + g_{kj}(\tau, Z_2, \alpha_{kj})}}, \qquad i \neq k, i = \ell, h, b, e, n \ ,$$

where Z_1 and Z_2 are vectors of variables made up of the covariates Z; β_{ki} is a parameter

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[8] To simplify the model, we restrict the coefficients on the variables in Z_2, other than the intercepts, in two ways: first, if none of the coefficients are individually significantly different from zero at conventional significance levels, and a joint hypothesis test indicates that we can accept the hypothesis that all of the parameters in a spline are equal to zero, then we impose these zero restrictions; and, second, we constrain the coefficients to be equal across spline points whenever a joint hypothesis test indicates this is a valid restriction.

vector; and the function $g_{ki}(\tau, Z_2, \alpha_{ki})$ determines how the likelihood of various entrances changes with the length of the spell that has just terminated.

The covariates Z include the same demographic characteristics and work history variables listed in Section 5.1, in addition to an indicator variable in H signifying whether any training took place before the current spell.

The form that we specify for the function $g_{ki}(\tau, Z_2, \alpha_{ki})$ in model (5.3) allows covariates to interact with the duration of the previous spell, thus controlling for history dependence. We parameterize $g_{ki}(.)$ similarly to the overlap-spline function $g_i(.)$ specified in (5.2); the quantities $\Phi_{ij}(\tau)$ in this formulation represent the cumulative normal distribution function, as before, and τ is the spell length of the previous spell. If $\sigma_{ij} = 0$ for all i and j, the model can be interpreted as interacting a series of dummy variables in duration with the covariates in Z_2, where the values of the μ_{ij} terms determine the range over which the dummy variables apply. In this specification, the Z_2 variables can have different effects as duration changes for the spell just ended. For example, the model could detect relatively high tendency for individuals who have short spells to enter a particular status. This phenomenon would be reflected in the α parameters. Our overlap-spline specification allows for the effect of the dummy variables to change gradually with time, according to the properties of the cumulative distribution functions, $\Phi_{ij}(\tau)$.

5.4 Estimation of Entrance Probabilities

The parameters of the entrance probabilities are estimated by weighted maximum likelihood techniques using the multinomial logit specification appearing in equation (5.3). As with the duration specifications, weighted procedures are required to account for the nonrepresentative sample design. Distinct specifications are estimated for each of the four educational categories and each of the five labor market statuses. Our estimation sample consists of all observations on completed spells.

We adopt a parameterization of the entrance probability in equation (5.3) that includes the history variables H in Z_1 and specifies $g_{ki}(\tau, Z_2, \alpha_{ki})$ as a function of the length of the current spell with Z_2 including indicator variables for race-ethnic groups. The covariates Z_1 incorporate nonlinear functions of the logarithm of the total number of weeks since the individual left school, the two dummy variables for previous low-wage employment, the six indicator variables for the preceding economic status, both the short-term and long-term measures of the fraction of time spent in employment, the total number of weeks spent in training programs and the indicator variable for any training since he left school--all measured at the time the individual started the labor market episode that he is just leaving.

The formulation of the function $g_{ki}()$ used in the estimation sets $J = 2$ and picks the μ's and σ's according to the specific status analyzed. Inclusion of race-ethnic dummies in Z_2 in $g_{ki}()$ means that the length of just completed spells in status k influence the likelihood of entering the alternative labor-market statuses differently for Whites, Blacks, and Hispanics. The empirical analysis estimates the β and α coefficients that

determine the four entrance probabilities for each of the five labor market statuses.

5.5 Parameterizations of Initial-Status Probabilities

The empirical formulation introduced above for the entrance probabilities is a natural candidate for specifying the $Pr(s \to i)$, for these probabilities also measure the likelihood of entrances into the various labor-market statuses at the start of an individual's work career upon the completion of school. The nature of these initial-status probabilities rules out the possibility that they depend on any work-history variables; and, thus, the specification of the probabilities in equation (5.4) depends exclusively upon the demographic characteristics X.

We parameterize these probabilities using a multinomial logit specification. Empirical formulations take the form:

$$(5.4) \qquad Pr(s \to i) = \frac{e^{X\beta_n}}{\sum_{j=\ell,h,b,e,n} e^{X\beta_n}}, \qquad i = \ell, h, b, e, n .$$

The covariates X include the demographic characteristics: age and race.

5.6 Estimation of Initial-Status Probabilities

We implement maximum likelihood techniques to estimate the parameters of specifications (5.4), using weighted procedures to account for sample design. In this step of the empirical analysis, there is a single observation for every young man making up

our sample because the selection criterion requires the individual to leave school during the observation period. To admit flexible specifications, we estimate different models for each of the four educational categories.

In the specification of the covariates, X in (5.4) includes: the race-ethnic dummies; and several terms designed to allow for a flexible formulation for the way in which age influences entrances into the alternative labor-market statuses. We construct these terms by incorporating components of a variant of the function $g(t, Z_2, \alpha)$ specified in (5.2) as elements of X, with the argument "t" defined as the age of the man (measured in months) when he exits from formal schooling. The parameterization of $g()$ used in the empirical analysis sets $J = 2$ in equation (5.4), with the μ's and σ's in the functions Φ_{ij} differing across the four educational groupings and with Z_2 containing nothing more than an intercept.