Job Mobility and Wage Dynamics

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Abstract

Using a dataset covering the population of Danish private-sector workers, I analyze the relationship between job changes and wage dynamics. I find that the number of past job changes is positively related to wages. This result is consistent with the idea that workers changing firms end up with better matches than workers who do not change firms. The main findings are verified using the U.S. NLSY panel data, implying that they can not be attributed to the peculiarities of the Danish labor market.

1 Introduction

Search, matching and switching costs are commonly used frameworks for investigating job transitions. In the most standard matching model, that of

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Becker (1973), almost any production function will give the result that more able workers should match with better jobs. In more dynamic extensions, a worker changes jobs when he receives an offer from a firm for which he is a better match and the higher wages exceed a switching cost. The decision to switch may be influenced by the stock of firm-specific human capital at a current employer. Firm-specific human capital is destroyed when a worker switches employers. Search and switching cost theories predict that workers with more specific human capital and better matches will be less likely to leave their employers.

The predictions of matching theories are ambiguous about the cross-sectional correlations between the number of jobs a worker of a given age has held and his match quality. One empirical possibility is that those workers who remain at their jobs for a long time do so in part because they have high matches, while those workers who switch firms do so because they have low matches and want to improve match quality through switching in order to catch up to those with initial high matches. A second possibility is that workers who voluntarily switch employers end up with match qualities that exceed those of workers who do not switch. Reasons for switching often to upgrade match quality include a plethora of opportunities, lower search, switching or hiring costs, and a general human capital gain from broad experience at multiple employers.

The empirical evidence in this paper supports the possibility that workers who voluntarily switch employers often have higher match qualities than those who do not switch. I regress wages on firm and industry tenure and approximations to the number of past voluntary job changes. The null hypothesis is that voluntary switching is motivated by a desire to improve poor matches. Under the null, the cross sectional regression of wage on the number of past jobs a worker has held should yield a 0 or negative coefficient, as the number of past jobs is not a proxy for match quality, or is negatively

correlated with match quality. I estimate a low coefficient on firm tenure and a high positive coefficient on the number of past job changes, which is not consistent with the null but consistent with the conclusion that workers who switch firms more often have better matches.

Since the number of past jobs a worker has held measures both voluntary switches and involuntary switches due to layoffs, I examine alternative measures that attempt to measure only voluntary switches, and indeed the more targeted voluntary switching measures are more correlated with wages. I also use the panel and universal coverage aspects of our data to show our results are not due to correlation of wages with time invariant worker and firm characteristics. Further, I use the panel aspect of the data to compute wage changes, and show that workers experiencing firm switches earn higher wage changes than other workers.

I am also concerned that our empirical finding that the number of past firm switches a worker has had is positively correlated with his current wage is an artifact of institutional details in Denmark. This is especially true because some rough empirical evidence in Mincer and Jovanovic (1981) suggests that the correlation is negative in the United States: workers who switch firms often are negatively sorted by worker ability. I use the American National Longitudinal Study of Youth, as prepared by Pavan (2005), to analyze whether current wages are positively or negatively correlated with past firm changes. For workers and a count of firm changes over the age of 25, I find a positive correlation for firm changes not corresponding to a year away from the labor market. This suggests that even in the United States most firm changes increase the match quality of a worker. Of course, switching firms causes a worker to lose firm-specific human capital. I include controls for firm tenure, and the coefficients on firm tenure vary in sign and magnitude with the sample and controls used.

In summary, this paper provides empirical evidence that workers who switched firms often in the past earn higher wages. This effect is of a greater order of magnitude than the correlation between firm wages and tenure. I argue that this finding is consistent with a story where voluntarily switching firms often leads to better matches than those held by workers who do not switch.

The empirical work in this paper uses as its base data a complete panel of all Danish citizens from 1980–2001. In the empirical work, I restrict attention to only employed workers in the private sector who have finished school. This massive dataset allows us to observe worker labor market histories after 1980 and to precisely measure firm sizes and growth levels. I can also include worker and firm fixed effects when appropriate, although most of our wage regressions use as outcomes only wages in 2001 to make computing standard errors simpler. As our paper is in part about worker turnover, we note that in Denmark about 30% of workers switch employers in a given year. Overall levels of worker tenure are similar to those in Australia, Canada and the United Kingdom.

Section 2 of this paper discusses matching and the implied biases in wage regressions. Section 3 discusses the detailed Danish panel data that we use. Section 4 also reviews the standard measures of job creation and job destruction, and presents evidence on the degree of within-industry reallocation in Denmark. Section 5 shows the cross-sectional correlation between wages and the number of firms a worker has been employed by, as well as between wage changes and firm switches over the same time interval. I verify that the most important results from Denmark also hold in US data. Finally, Section 6 concludes.

2 Assortative Matching and Wage Regressions

The basic model of the labor market I rely on this paper is simple. There are workers and firms. Each firm is decomposed into jobs, and workers match to jobs. The output of a match is a combination of the ability (time invariant ability plus accumulating human capital) of the worker and the level of responsibility of the job. Under most commonly used production functions, such as Cobb-Douglas, output is supermodular or complementary in the inputs: the cross-derivative of output with respect to worker input and job responsibility is positive. Under the famous result from matching theory of Becker (1973), in an labor market matching equilibrium more able workers will assortatively match with more responsible jobs[1].

Over careers, workers accumulate human capital and match to more responsible jobs. A worker can match to a more responsible job within his existing firm, or at a new firm. Moving to a new firm may entail search or paying switching or hiring cost. The heterogeneous nature of workers and jobs means it is often efficient to move a worker to a new job in another firm, even with the associated costs.

The matching model of the labor market presents estimation problems because complete measures of worker ability and job responsibility are not found in labor market data. I model wages as monotonic functions of match production. If production is Cobb-Douglas in inputs and compensation is some common percentage markdown of production, one specification for the wages of worker i and a job a at some employer d at time t is

$$\begin{aligned} \log W_{iadt} &= \beta_0 + \beta_{ft} firmtenure_{idt} + \beta_{it} industrytenure_{it} + \beta_e experience_{it} \\ &\quad + \beta_c firmchanges_{it} + \beta_s firmsize_{dt} + \vartheta_{adt} + \alpha_i + \varepsilon_{adit} \end{aligned} \tag{1}$$

[1] Shimer and Smith (2000) and Atakan (2004) extend Becker (1973)'s result to models with forward looking agents engaging in search.

where firm tenure is the number of years the worker has been at firm d, industry tenure is the number of years the worker has been employed by firms similar to d, experience is the number of years the worker has been in the labor market, the number of firm changes is the number of past times a worker has switched employers, ϑ_{adt} is the unmeasured responsibility or other characteristic of job a at firm d, α_i is an unmeasured characteristic reflecting time invariant worker ability, and ε_{adit} is a match or match-year specific unobserved component. The parameter β_{ft} is the causal effect of accumulating specific human capital on production and hence wages, β_{it} is the causal effect of industry (or career) specific capital on wages, β_e is the causal effect of totally general human capital, β_c is the causal effect of accumulating general human capital through broad experiences in different companies, and β_s is the causal effect of the unmeasured firm productivity, rent-sharing or efficiency wage process captured by a firm's past success as proxied for by its size.

Becker's two-sided matching theory predicts that workers assortively match to jobs: jobs with more responsibility will have more capable workers, in both observed and unobserved characteristics. The correlation of characteristics such as firm tenure with unobserved job and worker characteristics such as ϑ_{adt} and α_i causes least squares to produce biased estimates of the parameters β . The high-level nature of labor market data suggests that the contribution of unmeasured characteristics to production is likely to be large, and the logic of assortative matching then opens the possibility that the biases in estimation are large.

A dynamic extension of Becker's logic allows that the inputs of workers and firms into production change over time. Workers accumulate more human capital and firms experience success or failure in their product market activities. Thus, over time the optimal sorting of workers to jobs changes. Within a firm, workers may be promoted to higher-ranked positions. Across

firms, a firm may have an opening and it may be efficient to fill that opening with a worker from another firm, even if there are search, switching and hiring costs. Also across firms, it may be efficient to leave slots unfilled in less productive firms, meaning that more productive firms will become larger as it is efficient to match more workers with more productive firms.

The nature of across firm switches means that it is impossible to take positions in other firms while retaining firm-specific human capital. Thus, with multiple inputs in production, it is technologically impossible to perfectly assortative match in all inputs. Thus, it is an empirical issue about what inputs will drive equilibrium matching we see in the data, and hence the biases in least squares estimation of the wage regression.

Consider two extreme views about how workers move between firms. The first view is consistent with the costly search model of Jovanovic (1979b). There is no human capital gain to accumulating experience in multiple firms ($\beta_c = 0$), and costly investment in specific human capital only takes place for workers not planning on switching firms. Workers only decide to stay at a firm for several years once they find a good match and stop searching. For workers of a given age or experience level, this theory is likely to predict

$$cov\left(FirmTenure_{idt}, \vartheta_{adt}\right) > 0 \ \& \ cov\left(FirmChanges_{it}, \vartheta_{adt}\right) \leq 0$$

The logic for the latter prediction is that firm switches are made so workers with initial bad matches can catch up to the level of match quality of workers who initially found good matches. In this case, and ignoring more complex correlations between observable inputs, one might expect that the firm tenure coefficient is biased upwards (taking into account match quality in addition to specific human capital accumulation), and that the least squares estimate of β_c is negative instead of 0.

A second theoretical possibility is that some workers take better matches

at other firms as a substitute to acquiring specific human capital and being promoted within the firm. Workers may be willing to switch more than others because they have low search or switching costs, scarce skills meriting lots of offers, or just plain luck at securing offers. In this case,

$$cov\left(FirmTenure_{idt}, \vartheta_{adt}\right) \leq 0 \ \& \ cov\left(FirmChanges_{it}, \vartheta_{adt}\right) > 0$$

I expect least squares to produce a downward-biased estimate of the returns to tenure, and an upward biased (positive) estimate of the returns to switching firms, β_c.

In both cases, the causal human capital accumulation story and the bias from assortative matching reinforce each other. If specific human capital dominates resorting, $\beta_t >> 0$, then both the causal human capital effect and the matching response through optimal sorting will cause there to be a large estimated coefficient on firm tenure and a small or negative coefficient on job changes. If instead workers aggressively switch firms in response to attractive outside offers, the match quality bias will cause a high estimate of β_c, which is only reinforced if there is a true causal human capital benefit to acquiring a broad array of experiences in different firms. If workers aggressively seek to improve match quality by switching firms, we might expect a negative bias on the estimated returns to firm tenure.

The results of this paper sugggest that the second story appears to be closer to the truth: in wage regressions, the coefficient on changing jobs is high and the coefficient on the returns to tenure is low when both controls are included. I conclude that workers switching firms to increase match qualities dominates any selection effect where workers with high match qualities do not move.

3 Data and Measurement

3.1 Danish Matched Employer–Employee Data

To investigate the relationship between wages and workers' labor market histories, I need data on both individual workers and on the establishments and firms to which workers have been attached to over their career. I use the Danish Integrated Database for Labor Market Research (IDA), which is the universe of Danish citizens from 1980–2001. Auxiliary files provide information on individual jobs (a worker may have more than one job) and physical establishments.

Denmark is a fairly prosperous Northern European country of 5.4 million people. The commercial base is fairly diversified with fewer large companies than, say, Sweden. Denmark had a recession in the early 1990's and was in an expansion during the period we study. In 2001, the unemployment rate was fairly low at 4.2%.

Workers in Denmark are mobile by European standards. The data show 30% of workers in the private sector leave their employers in a given year. According to the OECD, the mean firm tenure in Denmark is similar to mean tenure in Australia, Canada and the United Kingdom, and slightly higher than mean tenure in the United States.

I consider private sector workers. As some workers can hold multiple jobs at the same time, we consider only a worker's primary job, although we do consider part time work if that is a worker's primary job. The primary job is defined as the job for which a worker has worked more than 50% of his working time over a given year I also constrain the sample to include only workers aged 25 to 44. Workers younger than 25 are often in school or working in jobs that are not part of their final careers. The restriction

to workers younger than 45 arises from data limitations. The data cover the period 1980–2001, so workers younger than 45 in 2001 were younger than 24 in 1980, meaning at most they had just started their careers. For workers older then 45 in 2001, the lack of data on firm changes before 1980 is problematic as these workers may have sorted into high-paying jobs through a unobserved (in our data) search process in their earlier years.

The wage regressions focus on the six-year period 1996–2001. To make the analysis transparent by including only one observation per worker, most of our wage regressions focus on data for 2001. Some regressions use log wage changes as the dependent variable. Wage changes are measured over either 1996–2001 or 2000–2001.

Table 1 provides summary statistics for 2001. The sample consists of 731,358 workers, 44% of which are full time (defined as working more than 30 hours a week). The total number of Danish workers in 2001 is 2,430,178, so private sector and age restricted sample contains 30% of workers in Denmark in 2001. Table 1 shows some notifiable differences between part time and full time workers. Part time workers are more likely to be female, work in larger firms (measured by the size of full time equivalent workers), have less experience and have more schooling than full time workers.The higher schooling for part time workers appears even for men above age 35, so it is probably not an artifact of college graduates working part time while earning graduate degrees.

3.2 Labor Market History Measures

I use the full time period, 1980–2001, to track labor market history variables such as the tenure of a worker at his current firm, the tenure of a worker in his industry and a worker's number of past firm changes. As I am concerned

with spurious changes in firm identification codes, we only code a worker as switching firms if both his firm and establishment identifiers change at the same time. I calculated alternative versions of some of labor history measures using social security records from 1969–1979. My versions of the 1969–1979 data lack establishment identifiers, so I cannot correct tenure and the number of firm changes for spurious firm identifier changes. Nevertheless, to check the robustness of the results, I constructed firm tenure using data back to 1969. I also computed tenure taking into account the fact that workers can hold multiple jobs at the same time, as considering only the primary job could lead to an undercounting of firm tenure. The wage regression results in both cases were economically quite similar. Industry is recorded at the establishment or plant level. I construct industry tenure using the 8 following groups of industries: (1) agriculture and mining, (2) manufacturing, (3) construction and transport, (4) retail, hotels and restaurants, (5) finance, real estate and R&D activities, (6) public sector, (7) private households and extraterritorial activities and (8) others. The estimation sample considers workers only in the first five industry groups, which we call the private sector. I also constructed industry tenure using more detailed 2, 3 and 4-digit industry codes. The wage regression coefficients are similar with the narrower definitions of industry tenure. Denmark is a small country, so narrowly defined industries have only a few firms in them.

I construct several measures of firm changes. I first count the number of past firm changes, meaning the number of different employers a worker has experienced since he is active in the labor market. I only count the number of firm changes that occurred after a worker's last graduation from school, as the type of work a graduate does may be unrelated to work done before or during school. Second, we decompose the number of firm changes into what we call "exits" and "non-exits". Exits occur when a worker changes his employer but disappears from the active labor force for at least a year in the

data. Reasons for not being in the active labor force can be unemployment, temporary leave, maternity leave, and leaving Denmark, among others. Non-exits are firm changes where the worker is observed to be employed in two consecutive years. As we are concerned that later career firm changes may be of a different nature than early-career moves, we disaggregate the variables exits and non-exits by two age intervals: exits (non-exits) when the worker is 25 to 34 years old and exits (non-exits) when the worker is 35 to 44 years old.

Firm and industry tenure are topcoded at 21 years for those workers who did not switch employers over the entire period. As we use indicator variables in tenure ranges to capture nonlinearities, the topcoded observations are lumped into the top categories. Total labor market experience is computed by the national statistics agency, using social security records from 1969–2001.

Table 2 reports summary statistics for labor market history measures for the year 2001. Firm tenure and industry tenure are higher for full time than for part time workers. In terms of the number of past firm changes and its decomposition into exits and non-exits, both types of workers exhibit similar patterns: the mean number of firm switches is three, and 80% (2.2/3) of the switches do not involve an exit from the labor market for at least a year. More firm switches occur between ages 25–34 then between ages 35–44. In Table 2, the number of exits in the two listed age categories do not sum to the total number of exits after graduation because workers with lower levels of schooling may have their last graduation before age 25. The data list the last graduation year of each individual because the data are collected from governmental registers.

Figure 1 plots histograms of the total number of firm changes as well as the numbers of exits and non-exits since the last graduation for the sample. For

the year 2001, roughly 10% of the workers aged 25–45 had zero firm changes since graduation. The modal number of firm changes is two. Workers who have experienced at most four changes of employers represent 75% of the distribution. Regarding exits, nearly 50% of the workers between 25 and 45 years old in 2001 have never been out of the labor market while 20% have exited the labor market at least twice.

Table 3 shows summary statistics by industry for the sample of private sector workers aged 25–45 in 2001. Manufacturing and agriculture have the highest share of full time workers, while finance and retail have the smallest share. Agriculture and construction & transport have the lowest shares of women. There is across-industry heterogeneity in the size of firms, with agriculture being dominated by small firms, which may be small family-owned firms. Mean firm tenure for the sample of younger workers is relatively constant across industries at 3.5 years, but for manufacturing it is 4.4 years. All the private sector industries have mean levels of industry tenure of five years or more. An important variable in this paper is the number of past firm changes. In the sample of workers aged 25–45, workers change firms times on average between 2.6 and 3.5 times since graduation.

One concern with Table 3 is that many of the labor market history variables are correlated with worker age and experience, and the distribution of age and experience may vary across industries. The bottom half of Table 3 repeats the sample statistics on the labor market history variables for workers of the constant age of 35. Many of the across-industry differences remain, although there are decreases in the across-industry variation in the number of past firm changes and industry tenure.

4 Labor Market Histories and Wages

Section 2 outlines two extreme empirical possibilities, both consistent with assortative matching between firms and workers. Workers may seek out good matches and invest in specific human capital, and those workers switching firms either have had poor matches or have been laid off. Alternatively, worker switching may be dominated by workers who have voluntarily switched for more attractive outside offers. I estimate log wages regressions with the standard proxies for firm, industry and general human capital, and then consider if and how the number of past firm changes is correlated with workers' wages. I present a new empirical fact that wages are positively correlated with the number of past firm changes. This is surprising, as rough evidence in Mincer and Jovanovic (1981) suggests that wages of American workers are negatively correlated with the number of past jobs. To check that my result is not purely a consequence of institutional details of the Danish labor market, I use data from the American National Longitudinal Survey of Youth (NLSY) to show that wages of American workers are positively correlated with the number of past firm changes.

4.1 Danish Data

Table 6 reports regression results from estimating a variant of equation (1) with the Danish data. I use as control variables an indicator for being female, four groups of completed degrees (compulsory, vocational training, the Danish equivalent of community college, college and above) and the log of firm size. The log of firm size controls for the often reported finding that larger employers pay higher wages. Most specification include two-digit industry fixed effects to control for differences in compensation policies across industries. Aside from total labor market experience, all of the labor mar-

ket history coefficients that we report modify indicator variables for different intervals, as in many cases the estimated effects are nonlinear. The first column reports estimates of the predicted wage effects of firm tenure, with tenure split into intervals of 1–2 years, 3–5 years, 6–9 years, and more than 10 years. The excluded category is workers brand new to an employer, with 0 years of firm tenure. The second column adds industry tenure while the third column adds the number of past firm changes. I experimented with different intervals, and choose these to represent both the variation in the point estimates and the fraction of the worker observations in each of the intervals. I include total labor market experience as a quadratic because experience is not a focus of this analysis.

The first column of Table 4 is a base specification that estimates the correlation of wages with general and specific human capital variables, education, experience and firm tenure. The quadratic of experience is maximized at 19 years at a log-wage effect of 0.36 points. Firm tenure exhibits a inverted U-shape: workers with 1–2 years of firm tenure are predicted to earn 2.2% more than workers brand new to an employer, and this predicted correlation grows to 4% for workers with 6–9 years of tenure. Workers with more than 10 years of tenure at the same firm earn a predicted 2.0% more than brand new workers, but the same coefficient implies they earn 4.0-2.0=2.0 less than workers with 6–9 years of tenure. The lower point estimates for workers with high levels of firm tenure is the first suggestive evidence that workers who switch firms are not heavily penalized. Also, note that the overall magnitude of the firm tenure coefficients is relatively small, with at most a 4% gap between categories of workers.

Neal (1995), Kambourov and Manovskii (2002) and Pavan (2005) present evidence that the (larger) firm tenure coefficients in American data go away when measure of industry, occupational or "career" (a combination of industry and occupation) tenure variables are included. The second column of

Table 4 controls for industry tenure and, as in the US, the estimated firm tenure coefficients change dramatically. Industry tenure appears to have a very strong predictive correlation with wages (between 3.3% and 9.4%, peaking at the end of the distribution of industry tenure) and crowds out completely the effect of firm tenure. Now firm tenure is negatively correlated with wages, meaning that workers who remain at a single firm longer tend to earn lower wages. Barring explanations focused on correlation with unobservables, a likely explanation for the change in signs on the industry tenure coefficients is that it is the type of work that a worker has experience in that matters, not the specific project he is working on at his current firm. A worker's industry is a proxy for the type of work he does.

The primary theoretical goal of this section is to establish whether my data on firm switching is dominated by workers voluntarily switching for higher outside offers, or workers being laid off and accepting worse jobs. The third column adds the number of past firm changes. Having changed firms often in the past is highly correlated with the wages of workers. A worker who has switched firms once previously is predicted to earn 1.8% higher wages than a worker who has never switched firms since his last graduation. The coefficient for the firm changes intervals increase with the number of changes. A worker who has moved between six and nine times in the past earns 6.1% more than a worker who has never moved. The magnitude of the effects of firm tenure almost completely die off towards zero, while the coefficients on total labor market experience and industry tenure are remarkably invariant to the inclusion of the number of past firm changes.

The result that wages are positively correlated with the number of past firms is, to my knowledge, new to this paper. I replicate a similar result using US panel data below, so the result is unlikely to be due to some institutional peculiarity of the Danish labor market. In the assortative matching framework of Section 2, the positive correlation between wages and the number of

past firm changes is consistent with the hypothesis that those workers who switch firms often have better unmeasured matches than those who do not switch firms. It is also consistent with a story where switching firms causes a worker to accumulate broad general human capital, although we do not emphasize the broad general human capital story here.

The fourth column considers only male full time workers. These workers are likely to be highly committed to the labor market. For this group, firm tenure has an ever smaller (in absolute value) correlation with wages, and the magnitudes of the correlation between wages and experience and industry tenure are smaller. The coefficients on the number of past firm changes remain similar.

The previous results show the within-industry but across-firm wage outcomes of workers with different labor market histories. These regressions document variation that is relevant when investigating the wage outcomes of workers as they switch between firms in the same industry, the motivating mental experiment in this paper.

Some of the previous results may represent the matching of workers to firms with different levels of compensation. It is interesting to investigate whether the labor market histories of workers matter once they match to the same firm. The fifth column of Table 4 uses the fact that we observe all the workers at each firm to estimate the labor history coefficients while controlling for a firm fixed effect, using the same 2001 cross section. Adding a firm fixed effect restores the positive coefficients on firm tenure found in the first column, and reduces the coefficients on the number of past firm changes by about half. Now a worker with no past firm changes and six years of tenure at his current firm earns about the same as a worker at the same firm with no firm tenure and six past firm changes.

Including firm fixed effects is not possible in typical US panel datasets, so

the results when controlling for firm fixed effects questions the interpretation of the across-firm results of Neal (1995), Kambourov and Manovskii (2002) and Pavan (2005) that find that firm tenure is only weakly correlated with wages once other measures of career capital are included. It is possible that firm tenure is a predictor of wages within a firm, but not across firms[2].

The sixth column of Table 6 estimates the effect of firm tenure and firm changes by using the pooled sample from 1996 to 2001 and adding worker fixed effects. I control for inflation using year indicators. Firm tenure increases in importance when it is identified off of within-worker variation, and industry tenure decreases in importance. What is most interesting is that the coefficients on the number of past firm changes dramatically increase in magnitude. A worker who has had one firm change is now predicted to earn 0.17 log points (19%) more than a worker with no firm changes. Worker fixed effect regressions are identified using changes in log wages, and we look more directly at wage changes below.

One constant in all the specifications in Table 4 is that wages are positively correlated with the number of past firm changes of a worker. Whether one prefers purely cross-sectional results, results using within-firm variation, or results using within-worker variation over a six year interval, the results all show that wages are positively correlated with past firm changes.

Firm switches can be broadly grouped into two categories: switches a worker makes relatively involuntarily (or to satisfy a non-monetary objective) and often end in lower wages, and firm switches that secure a worker a better position at a higher wage. Any data on firm switches will have a combination of these two types of firm changes. While I do not observe

[2]Note that the firm fixed effects estimates do not capture the type of facts that should be of interest to workers considering switching firms. To a first approximation, a worker who wants to switch firms cares whether his wage will increase, not whether his wage will be higher than other workers at his new firm.

the reason for a firm change, I can use the panel aspect of the data to divide past moves into two categories. I consider the number of firm moves that led to an exit from the active labor market for a year (we label these firms changes exits) and the number of firm moves where the worker was employed in consecutive years (non-exits). The reason for switching firms may systematically differ for workers in their mid-twenties and mid-thirties, so we differentiate exits and non-exits by the age intervals of 25–35 and over 35 (labelled # exits btw 35/44). As before, I only consider wages in the year 2001. All specifications include as controls industry tenure, experience, four groups of completed degrees, female, the log of firm size and two-digit industry fixed effects. Importantly, the measures of exits and non-exits are the counts of exits and non-exits. I do not include intervals as before, so we can concisely report the four different measures of past firm changes. Figure 1 reports typical values of exits and non-exits.

Table 5 reports regressions of the log of the hourly wage on the numbers of exits and non-exits. The first column reports the estimates for the entire sample. Workers who at some point in their career exit the labor market are predicted to earn lower wages. One exit in their mid-twenties lowers the prediction of wages by 0.6% while taking a year away from the labor market in the mid-thirties is equivalent to 2.3% decrease. The negative coefficients on exits are quite similar to past findings that workers experience a decrease in wages if they are laid off (Neal, 1995; Farber, 2005). However, experiencing many firm changes without observed gaps in employment is highly positively correlated with one's current wages. The linear prediction suggests that one non-exit firm change in the mid-twenties predicts a 1.7% higher current wage. The coefficient on non-exits in the mid-thirties and above is similar. Compared with the third column of Table 6, firm tenure has a slightly higher impact in that all workers with positive tenures are predicted to earn 0.8%–1.6% higher wages than workers brand new to a firm, the excluded category.

The other columns use different samples to validate the robustness of the fact that firm changes in the form of non-exits are correlated with higher wages. Column 2 considers only full-time men, column 3 considers workers of both sexes with a college degree or more, column 4 uses highly educated men and, in the last two columns, we compare the manufacturing sector to the other private sector industries. For the past firm changes variables, we obtain roughly similar estimates for full-time men and when using the separate subsample for each industry. The firm tenure coefficient estimates are higher in manufacturing than in the other industries.

For workers with a college degree or more (columns 3 and 4), wages are positively correlated with all types of past firm changes. Exits have a positive coefficient, but the incremental difference between the coefficients for exits and non-exits remain similar to the entire sample. For highly educated workers, workers who switch firms often empirically earn higher wages, even if the moves involve time away from employment in the data. Focusing on highly educated men only in column 4 rules out any effect from maternity leave. One possibility is that some of the measured exits reflect work being done in other countries, as workers in the European Union have the flexibility to live and work in other member states. Highly educated workers are presumably more likely to take advantage of this opportunity. The foreign work explanation does not explain the even higher coefficients on non-exists for this sample. A past firm change for a worker between 25–35 predicts a 4% higher wage in 2001. The firm tenure coefficients are large, even though we control for industry tenure and the number of past firm changes. However, it is likely that changes in industry are poor measures of changes in occupation for workers who have lots of general human capital through university level training. These workers may include managers, lawyers and other professionals who can work for firms in multiple sectors.

The specification (column 6) in Table 4 with worker fixed effects uses

innovations in a worker's firm changes variable to predict changes in the worker's wages. However, in a fixed effects regression all of the coefficients on controls are estimated using within-worker variation (differences from the 1996–2001 worker-specific means) as well. I want to more directly look at the correlation between the number of firm changes in a period and the changes in a worker's wage over that period, while allowing for the empirical possibility that wage changes themselves vary across industries, schooling groups, sexes and across the values of the other controls.

Table 6 presents cross-sectional regressions of the change in log wages between 1996 and 2001 on the number of firm changes (exits and non-exits) over that period. I present five specifications: the entire sample employed in the private sector in both 1996 and 2001 (column 1), full-time men (column 2), highly educated men (column 3), the entire sample with a fixed effect for the firm employing a worker in 2001 (column 4) and the entire sample with a fixed effect for the firm where the worker is employed in 1996 (columns 5 and 6). Column 5 contains the 2001 values of other controls for comparisons with the other columns, and column 6 uses the 1996 values of controls.

The mean nominal log wage change between 1996 and 2001 is 0.17 log wage points. As all wage changes are measured over the same time interval, as long as an intercept is included, the other coefficients have the same coefficients that would arise if we used real wage changes. Across the samples (with one exception), one firm change over the period is predicted to increase the log wage change by 0.02 to 0.033 log points. So one firm change corresponds to about 0.025/0.17=0.15, or 15% of the mean level of wage increases.

The last column of Table 8 uses the 1996 values of firm and industry tenure, to control for the worker's labor market history before the intervening firm changes occur.

4.2 Verification Using US Data

The result that wages are positively correlated with the number of past jobs is an empirical fact suggesting that voluntary switches to receive higher outside wage offers to some degree dominate firm switching in Denmark. Previous rough evidence from Mincer and Jovanovic (1981) for the United States suggests the opposite: wages are negatively correlated with the number of past fime changes, at least for older men. A negative correlation suggests that those who switch firms are negatively selected, as they earn lower wages. They present a regression of log wages on tenure, experience, and the number of past moves. For young men from the 1971 NLS, they report a coefficient on the number of firm changes that is tiny in magnitude, with a small t-statistic. For older men in the 1973 NLS, they report a coefficient of -0.048, with a t-statistic of 1.8. While I do not attempt to replicate their result, I suspect it primarily originates from considering early career switches, including those while in school, that occur during a period when younger adults are only tangentially attached to full-time work.

Since one might be concerned that an empirical fact that is true in Denmark but not the United States may be an artifact of a peculiar Danish institution, I test whether the correlation between log wages and the number of past firms is positive or negative in more recent US data. Ronni Pavan has generously provided access to his cleaned version of the NLSY[3]. I use his data on full time male workers, so part time and secondary jobs are not included. Although I lack graduation in dates, in what follows, I follow the same strategy than with the Danish data and consider only men age 25 and older, as well as only firm switches that occur for age 25 and above. The highest age in the NLSY data is 37. I construct the intervals both for firm changes and non-exits to best capture the variation in the data present. There are

[3]More details of the construction of the data can be found in Pavan (2005).

few exits in the sample of full-time men, so we include only an indicator for positive (1+) exits.

Table 7 presents regressions of log wages on the number of past firm switches for the US data. The first three columns report OLS estimations and are differentiated by the tenure variables used as controls. The first column uses industry tenure. Workers with 1 firm change have wages that are 7.3% higher than a worker with no firm changes, workers with 2 to 3 firm changes hav an increase of 3.4% although a worker with 4 or more firm changes is predicted to have lower wages but this effect is only significant at a 10% level (the point estimate is 4%). The results are similar when industry tenure (where there are 14 different industries in the data) or career tenure[4] is added. Table 7 also repeats three regressions when worker fixed effects are included. Universally, adding worker fixed effects increases the positive value of the coefficients. A worker with four or more past firm switches is predicted to have 23% higher wages than a worker who has not switched firms after age 25 (column 3b). The point estimates for firm changes monotonically increase with the number of past firm changes. The NLSY is not a matched employer–employee dataset, so I cannot include firm fixed effects or firm characteristics as controls.

Table 8 reports regressions of the log of the hourly wage on the intervals of exits and non-exits. As in Table 7, the different specifications are differentiated by the tenure variables used as controls. Using industry tenure, workers with more firm changes accompanied by a year away from the labor market are predicted to have 6.1% lower wages than a worker with no firm changes. A worker with 1-3 firm changes not accompanied by an exit has wages that are higher than a worker with no firm changes (respectively 7.4%

[4]Pavan (2005) uses a concept known as career tenure, where career tenure uses both occupational and industry codes to attempt to construct a conservative measure of the number of years since the type of work being performed changed.

for 1 change and 3.7% for 2 to 3 changes) although a worker with 4 or more firm changes is predicted to have wages that are not statistically different than 0 (the point estimate is 3.0%). Adding industry tenure or career tenure eliminates the negative effect of taking a year off the labor market as the estimate becomes not significant from zero. While the estimates of non exits do not change much when we add industry tenure, once we introduce career tenure, the difference between 1 move and 2 to 3 moves inside the labor market becomes very slight (respectively 5.9% and 5.1%) .The last three columns of Table 8 include worker fixed effects. Again, adding worker fixed effects increases the positive value of the coefficients. For firm switches not accompanied by a year off from the labor market, a worker with four or more past firm switches is predicted to have 23% higher wages than a worker who has not switched firms after age 25 (column 3b). As for firm changes, the point estimates for non-exits monotonically increase with the number of no exits.

This section has shown that, in the United States and Denmark, it appears that workers who have switched firms more times in the past (after age 25) earn higher wages. One interpretation of this fact is there is an underlying reality where more firm moves are voluntary switches for higher outside wage offers, rather than involuntary layoffs. The results are sharpened if we focus on firm separations accompanied by time away from the labor market, which in many specifications are negatively correlated with current wages. In both Denmark and the United States, the magnitudes of the correlation between at least some firm changes and wages becomes very large (around 20% with respect to a worker with no firm changes) once worker fixed effects are included. The larger coefficient estimates with worker fixed effects are consistent with the possibility that there is some negative selection in the time invariant ability of the workers that switch firms. For Denmark, I looked directly at log wage changes over a five year period. Regressing log wage changes on the number of firm changes over the five year period

produces coefficients suggesting that log wage changes are predicted to increase by 0.02 per past switch, compared to mean wage change of 0.17 over 1996–2001.

5 Preliminary Conclusions

Using a unique linked employer-employee dataset covering the population of Denmark over more than twenty years, I present strong empirical evidence that workers who have switched firms repeatedly in the past are predicted to earn higher wages. This result is consistent with the idea that workers who move end up with better matches than workers who do not change firms. I use several measures of firm changes to distinguish among different types of changes. Results were not influenced by the choice of a specific past firm changes measure.

To verify that these results are not due to the peculiarities of the Danish labor market, I replicate the analysis using the U.S. NLSY data. Results were surprisingly similar accross the two countries, in contrast with the early work of Mincer and Jovanovic (1981). These results have important policy implications regarding labor market flexibility and active labor market policies, and therefore deserve a more thorough examination.

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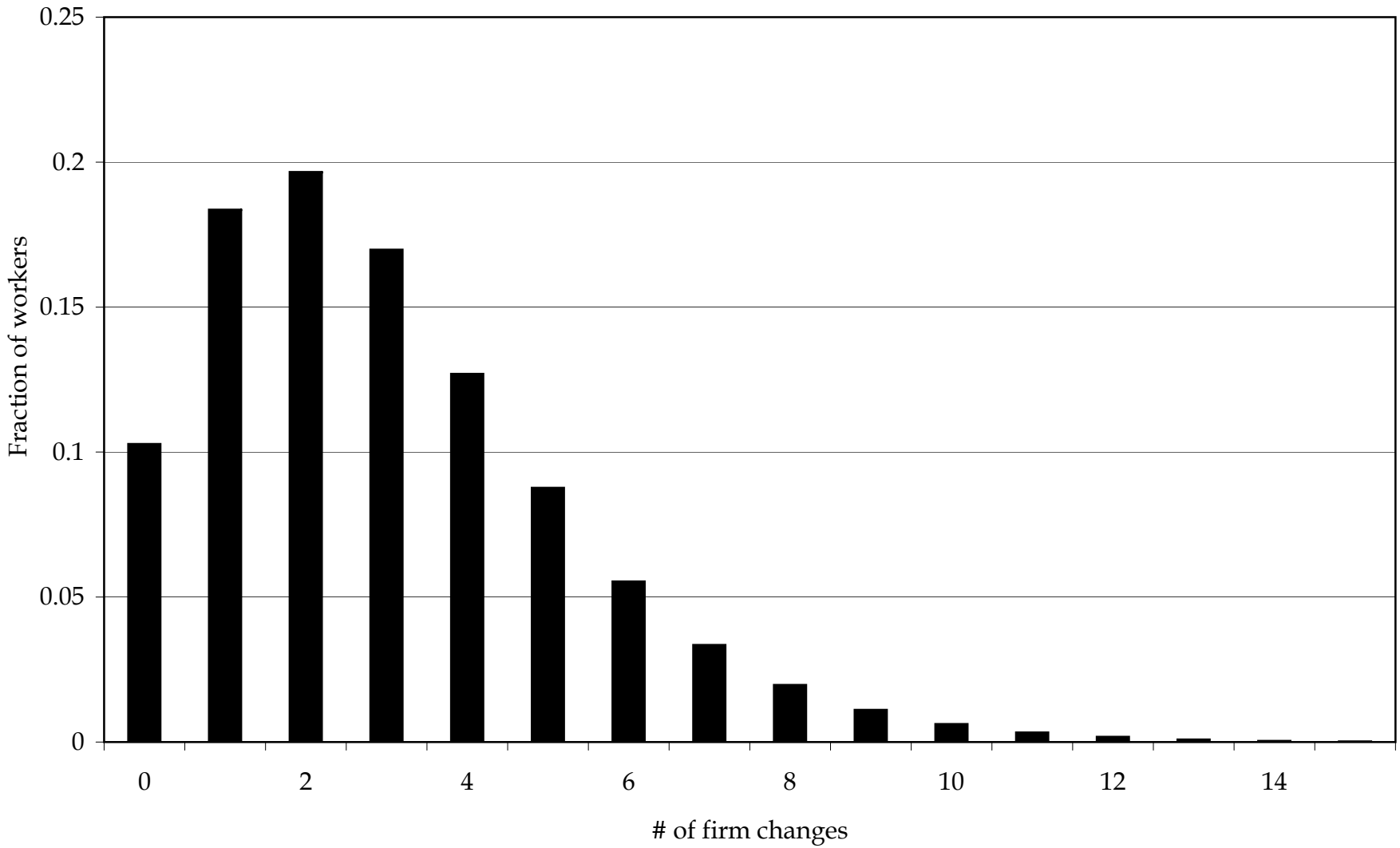
TABLE 1: DANISH DATA - Demographic Variables
Workers (25 to 44 years old in 2001)

Demographic Variables	Full time workers	Part time workers
Age	34.5	34.1
Female	0.25	0.44
Hourly wage (kroner)	189.3	189.8
Vocational	0.56	0.58
Community college	0.13	0.17
College & masters	0.04	0.06
# observations	319,003	412,355

TABLE 2: DANISH DATA - Labor Market History Variables
Workers (25 to 44 years old in 2001)

Labor Market History Variables	Full time workers	Part time workers
Experience	13.0	11.7
Firm tenure	4.6	3.2
Industry tenure	6.0	5.0
# firm changes after graduation	3.00	3.02
# exits after graduation	0.77	0.81
# exits - age 25/34	0.41	0.45
# exits - age 35/44	0.09	0.12
# non exits after graduation	2.23	2.21
# non exits - age 25/34	1.12	1.17
# non exits - age 35/44	0.28	0.35
# observations	319,003	412,355


Histogram of firm changes - 2001
0.25
0.2
0.15
0.1
0.05
0
Fraction of workers
0
2
4
6
8
10
12
14
# of firm changes

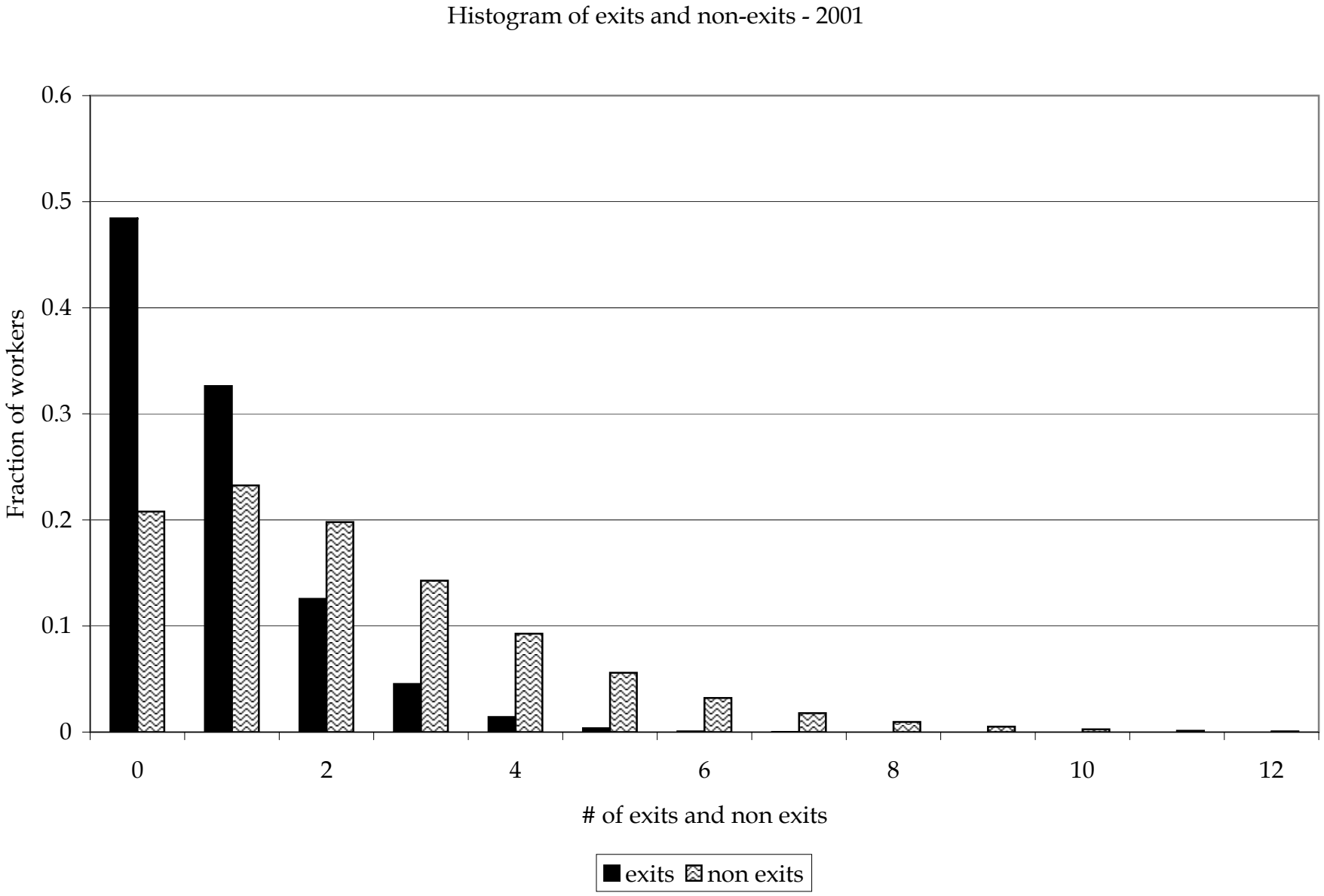

Histogram of exits and non-exits - 2001
0.6
0.5
0.4
0.3
0.2
0.1
0
Fraction of workers
0
2
4
6
8
10
12
# of exits and non exits
exits
non exits

TABLE 3: DANISH DATA - Summary Statistics by Industry
Workers (25 to 44 years old in 2001)

Variables	Agriculture	Manufacture	Construction	Retail	Finance
Full time	0.55	0.56	0.47	0.35	0.31
Female	0.27	0.33	0.21	0.42	0.45
Firm tenure	3.3	4.4	3.4	3.6	3.3
Industry tenure	5.0	5.4	5.5	5.5	5.2
# firm changes	3.0	2.9	3.5	2.9	2.6
# observations	16,413	230,775	159,144	187,951	149,496
			Workers 35 years old only		
Full time	0.57	0.56	0.45	0.36	0.32
Female	0.26	0.34	0.23	0.41	0.46
Firm tenure	3.8	4.4	3.5	3.8	3.4
Industry tenure	5.6	5.4	5.6	5.9	5.5
# firm changes	3.6	3.2	3.9	3.3	2.8
# observations	833	14,525	9,257	10,400	9,388

TABLE 4: DANISH DATA - Wages and Past Firm Changes

Dept. Variable: Log of Hourly Wage		(1)	(2)	(3)	Men - Full time	Firm fixed effect	Panel 1996-2001
Experience		0.038***	0.036***	0.031***	0.026***	0.029***	0.027***
		(0.0002)	(0.0002)	(0.0002)	(0.0004)	(0.0002)	(0.0003)
Experience²		-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FIRM TENURE	1 to 2 years	0.022***	-0.00001	0.005***	0.0001	0.017***	-0.003**
		(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.0004)
	3 to 5 years	0.040***	-0.006***	0.006***	0.001	0.035***	0.013***
		(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
	6 to 9 years	0.040***	-0.016***	0.002	-0.005	0.039***	0.029***
		(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
	10 years and up	0.020***	-0.039***	-0.007***	-0.009***	0.032***	0.049***
		(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
INDUSTRY TENURE	1 to 2 years	-	0.033***	0.032***	-0.009***	0.024***	0.002***
			(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
	3 to 5 years	-	0.069***	0.068***	0.021***	0.058***	0.014***
			(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
	6 to 9 years	-	0.086***	0.087***	0.046***	0.081***	0.014***
			(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
	10 years and up	-	0.094***	0.97***	0.060***	0.097***	0.012***
			(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
FIRM CHANGES	1 to 2 changes	-	-	0.018***	0.015***	0.001	0.172***
				(0.002)	(0.002)	(0.002)	(0.001)
	3 to 5 changes	-	-	0.042***	0.039***	0.018***	0.220***
				(0.002)	(0.002)	(0.002)	(0.001)
	6 to 9 changes	-	-	0.061***	0.058***	0.029***	0.236***
				(0.002)	(0.003)	(0.002)	(0.002)
	10 changes and up	-	-	0.068***	0.068***	0.030***	0.227***
				(0.002)	(0.003)	(0.002)	(0.002)
Controls		female, education (3 groups), log of firm size				female education	log of firm size year dummiers
Fixed effect		industry 2 digit				firm	worker
# observations		730,492	730,492	730,492	240,005	730,492	4,314,813
R^2		0.27	0.27	0.27	0.28	0.49	0.78

TABLE 5: DANISH DATA - Wages and Past Firm Changes by Exits vs. Non Exits

Dept. Variable: Log of Hourly Wage		All sample	Full time men	College+	College+ Men	Manufacture	Non Manufacture
FIRM CHANGES	# exits btw 25/35	-0.006***	-0.013***	0.019***	0.011***	-0.013***	-0.003***
		(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
	# exits btw 35/45	-0.023***	-0.020***	0.006	0.022***	-0.032***	-0.019***
		(0.001)	(0.002)	(0.004)	(0.005)	(0.002)	(0.002)
	# non exits btw 25/35	0.017***	0.014***	0.036***	0.040***	0.011***	0.019***
		(0.0003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
	# non exits btw 35/45	0.019***	0.017***	0.040***	0.041***	0.016***	0.019***
		(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
FIRM TENURE	1 to 2 years	0.010***	0.003	0.036***	0.046***	0.015***	0.007***
		(0.002)	(0.003)	(0.004)	(0.005)	(0.003)	(0.002)
	3 to 5 years	0.016***	0.007**	0.052***	0.064***	0.021***	0.013***
		(0.002)	(0.003)	(0.005)	(0.006)	(0.003)	(0.002)
	6 to 9 years	0.015***	0.004	0.084***	0.098***	0.016***	0.017***
		(0.002)	(0.003)	(0.006)	(0.008)	(0.003)	(0.003)
	10 years and up	0.008***	-0.0001	0.093***	0.114***	0.018***	0.006***
		(0.002)	(0.004)	(0.008)	(0.009)	(0.003)	(0.003)
INDUSTRY TENURE	1 to 2 years	0.026***	-0.009***	0.007	-0.002	0.011***	0.031***
		(0.002)	(0.003)	(0.005)	(0.006)	(0.003)	(0.002)
	3 to 5 years	0.056***	0.021***	0.038***	0.027***	0.038***	0.064***
		(0.002)	(0.003)	(0.005)	(0.006)	(0.003)	(0.002)
	6 to 9 years	0.072***	0.046***	0.044***	0.031***	0.051***	0.082***
		(0.002)	(0.003)	(0.007)	(0.007)	(0.003)	(0.002)
	10 years and up	0.082***	0.060***	0.051***	0.035***	0.059***	0.089***
		(0.002)	(0.003)	(0.007)	(0.008)	(0.003)	(0.003)
Controls		experience, experience^2 , female, education (3 groups), log of firm size					
Fixed effect		industry 2 digits					
# observations		730,492	240,005	109,481	72,874	226,671	503,821
R^2		0.28	0.28	0.28	0.24	0.29	0.27

TABLE 6: DANISH DATA - Changes in Wages and Past Firm Changes
Period 1996-2001

Dept. Variable: Log of Hourly Wage	All sample	Full time men	College+	2001 fixed effect	1996 fixed effect	1996 fixed effect
# firm changes over 1996 - 2001	0.022*** (0.001)	0.033*** (0.001)	0.026*** (0.003)	0.020*** (0.001)	0.023*** (0.001)	0.008*** (0.001)
Controls	experience, experience^2 , female, education (3 groups), log of firm size					
	2001 values for firm and industry tenure					1996 firm & industry tenure
Fixed effect	industry 2 digits			2001 firm	1996 firm	1996 firm
# observations	545,716	196,522	49,687	545,716	545,716	545,716
R^2	0.10	0.15	0.10	0.31	0.31	0.31

TABLE 7: US DATA (NLSY) - Wages and Past Firm Changes

Dept. Variable: Log of Hourly Wage		(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
FIRM CHANGES	1 change	0.073*** (0.014)	0.076*** (0.014)	0.061*** (0.014)	0.121*** (0.018)	0.117*** (0.019)	0.130*** (0.018)
	2 to 3 changes	0.034** (0.017)	0.049*** (0.017)	0.056*** (0.016)	0.157*** (0.025)	0.160*** (0.025)	0.189*** (0.025)
	4 changes and up	-0.040* (0.024)	-0.040* (0.024)	0.027 (0.024)	0.171*** (0.035)	0.173*** (0.040)	0.229*** (0.036)
Experience		0.039*** (0.006)	0.032*** (0.006)	0.010 (0.006)	0.060*** (0.021)	0.064** (0.029)	0.034 (0.021)
Experience^2		-0.0005* (0.0000)	-0.0003 (0.0003)	0.0004 (0.0003)	-0.001*** (0.0002)	-0.001*** (0.0003)	-0.001*** (0.0003)
Firm tenure		0.065*** (0.005)	0.058*** (0.005)	0.014** (0.006)	0.050*** (0.004)	0.047*** (0.005)	0.035*** (0.005)
Firm tenure^2		-0.003*** (0.0003)	-0.003*** (0.0004)	-0.0006 (0.0004)	-0.002*** (0.0003)	-0.002*** (0.0003)	-0.002*** (0.0003)
Industry tenure		-	0.021*** (0.005)	-	-	0.006 (0.004)	-
Industry tenure^2		-	-0.0007* (0.0003)	-	-	0.0000 (0.0003)	-
Career tenure		-	-	0.083*** (0.005)	-	-	0.032*** (0.005)
Career tenure^2		-	-	-0.003*** (0.0004)	-	-	-0.001*** (0.0003)
Controls		black, education (4 groups), year dummies					
Fixed effect		no			worker		
# observations		12,776	12,285	12,776	12,776	12,285	12,776
R^2		0.22	0.23	0.25	0.70	0.70	0.70

TABLE 8: US DATA (NLSY) - Wages and Past Firm Changes by Exits vs. Non Exits

Dept. Variable: Log of Hourly Wage		(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
FIRM CHANGES	1 exit or more	-0.061***	-0.031	-0.020	0.041	0.178**	0.065
		(0.019)	(0.022)	(0.018)	(0.046)	(0.070)	(0.046)
	1 non exit	0.074***	0.075***	0.059***	0.108***	0.112***	0.119***
		(0.014)	(0.014)	(0.013)	(0.018)	(0.018)	(0.018)
	2 to 3 non exits	0.037**	0.041**	0.051***	0.148***	0.157***	0.180***
		(0.016)	(0.017)	(0.016)	(0.024)	(0.025)	(0.024)
	4 non exits and up	-0.030	-0.031	0.036	0.166***	0.172***	0.229***
		(0.024)	(0.024)	(0.024)	(0.034)	(0.035)	(0.035)
Experience		0.040***	0.033***	0.011*	0.062*	0.141***	0.041
		(0.006)	(0.006)	(0.006)	(0.033)	(0.049)	(0.033)
Experience^2		-0.0006*	-0.0004	0.0003	-0.001***	-0.001***	-0.001***
		(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Firm tenure		0.064***	0.058***	0.014**	0.048***	0.046***	0.034***
		(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)
Firm tenure^2		-0.003***	-0.003***	-0.0006	-0.002***	-0.002***	-0.002***
		(0.0003)	(0.0004)	(0.0004)	(0.0002)	(0.003)	(0.0003)
Industry tenure		-	0.020***	-	-	0.005	-
			(0.005)			(0.004)	
Industry tenure^2		-	-0.0006*	-	-	0.0001*	-
			(0.0004)			(0.0003)	
Career tenure		-	-	0.082***	-	-	0.032***
				(0.005)			(0.005)
Career tenure^2		-	-	-0.003***	-	-	-0.0008**
				(0.0004)			(0.0003)
Controls		black, education (4 groups), year dummies					
Fixed effect		no			worker		
# observations		12,776	12,285	12,776	12,776	12,285	12,776
R^2		0.22	0.23	0.25	0.70	0.70	0.70