WHO ARE THE JOB LEAVERS AND WHY DO THEY QUIT? EVIDENCE FROM A MANUFACTURING FIRM

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Abstract

Utilizing data on daily performance for newly hired workers at a light-manufacturing firm in central New York from January 1999 to April 2005, this study explores how innate productivity affects the propensity of voluntary quitting of fixed-wage workers and uncovers underlying mechanisms by estimating time effects on job performance. The regression analysis suggests high production quality increase the propensity of quitting; production speed and time spent in production have no effect on quitting. Dividing workers into high and low productivity groups to exploit the innate behavioral differences, I find initially low-performing workers increase production quality over time, yet there is no significant difference between high and low-performing workers. Further splitting workers into job leavers and stayers, the regression estimates show the production quality of initially high-performing job leavers decreases over time, and production quality of low-performing job leavers increases. Stayers show no time effect on product quality. The results suggest that high-performing workers quit for they discover their overqualification and find better outside job offers through on-the-job-search.

Keywords: job quitting, worker performance, fair wage, comparison effect

I. Introduction

Economists have long been interested in the study of worker voluntary turnover and the reasons behind an individual quit decision. A growing body of literature has discovered various external and internal factors contribute to the decision of quitting. Multiple external factors, such as High-Performing Human Resource practices and unionization, are shown to have significant effects on turnover. As for internal factors, tradition turnover theories are largely modeled after the individual utility-maximizing behavior, as some recent literature has shifted focus to comparison effect and labor market outcomes. For example, quits are negatively correlated with the average wage conditioning on the worker's wage (Galizzi & Lang, 1998); workers with relatively high wage position within their firms are more likely to quit compared to those with lower position (Pfeifer & Schneck, 2012); High-paying workers are more likely to quit a firm with more compressed compensation (Burdin, 2016); individuals with higher income in the past exert lower levels of efforts in current period (Clark et al., 2010). However, little is known about the comparison effect on quit decisions and levels of efforts of fixed-wage workers.

In this paper, I attempt to analyze the effect of innate productivity on quit decisions of fixed-wage workers using the econometric case-study method. I assume that when wages are fixed, workers compare their job performance instead of wages and workers' utility and future productivity depends on relative initial job performance. Using data on daily productivity for newly hired operators in a light-manufacturing firm in central New York, this paper provides evidence for positive productivity effect on the quit decisions of fixed-wage workers and suggests declining productivity as a pre-trend of high-performing worker quitting. I find that workers who produce better-quality products are more likely to quit, and high-performing job

leavers reduce production quality over time before separation. Workers quit decisions are sensitive to both absolute and relative job performance when monetary incentives are absent. The direction of the comparison effect is consistent with existing relative income literature. I further investigate if workers' intrinsic motivations of voluntary job separations can be implied by the differential behaviors between high and low-performing job leavers and stayers. The results provide supportive evidence for feelings of unfairness as push factors of quitting and feelings of competence as pull factors.

This case study of productivity effect on quit decision of fixed-wage workers is important in the context of two streams of literature. Rich literature of turnover theory has been proposed by labor economists and management scientists, but the lack of individual-level productivity data and the difficulty of identifying voluntary quitting have constrained the discovery of empirical evidence. On my reading of literature, this study is the first econometric case study that uses individual-level, objective productivity measures, and provides new evidence on the interplay between individual productivity and the odds of quit. Second, it extends the fair wage-effort hypothesis to introduce "voluntary quitting" as an alternative to withdrawing effort and provide novel evidence for productivity comparison effect. The results of this study also yield useful insights on the study of unemployment and job choice.

The rest of the article is organized as follows: Section II proposes the conceptual framework and presents testable hypotheses; Section III provides detailed information of the case. Section VI explains empirical strategy and provides suggestive evidence; Section V specifies regression equations and discusses regression results; Section VI summarizes findings and discusses limitations.

II. Conceptual Framework and Hypotheses

Considering individual quit decision as intrinsic utility-maximizing behavior, existing literature on turnover theory fall into two major categories: job match model (Jovanovic, 1979; Miller, 1984) and job search model (Burdett, 1977; Morten, 1978). Job match model treats job as an experiencing good: workers learn about the quality of match through experiencing a job. The theory predicts workers who revealed high productivity remain on the job when wages are contingent worker marginal productivity. The feelings of competence and the corresponding monetary rewards motivate workers to stay. Using the data of new hires from the National Center for Research in Vocational Education (NCRVE) longitudinal data, Bishop (1990) found that less productive workers are more likely to quit. Jackson (2013) utilized longitudinal data of student test scores linked to teachers and schools in North Carolina from 1996 to 2006 and found that teachers with high school-specific quality are more likely to exit the profession. Since teacher wages are essentially unrelated to productivity, fixed-wage workers are more likely to behave like the teachers. Therefore, I hypothesize:

Hypothesis 1: High productivity has limited motivation for fixed-wage workers to stay.

On-the-job search theory states that workers can search for better outside opportunities with a cost while working on the job. Workers quit when a better outside opportunity is found. Assuming workers do not start job search immediately after initial hiring and only start searching after they have learned that they're overmatched, I hypothesize:

Hypothesis 2: Later productivity of job leavers is lower than the initial productivity.

The fair wage-effort hypothesis (Akerlof & Yellen, 1990) supposes workers from a conception of "fair wage" given the wages of their peers and proportionately withdraw effort

when their actual wage is lower than the fair wage. Recent empirical literature provides supportive evidence for comparison effect on both quits and levels of efforts: worker utility and productivity depend on relative income (Clark & Oswald, 1995; Clark et al., 2010; Gächter & Thöni, 2010). In this study, I assume quitting is a radical behavior of withdrawing effort, for that quitting can be interpreted as reducing levels of effort to zero. I further assume that fixed-wage workers compare productivity instead of wage; then they form "fair productivity" with a given wage. "Fair-productivity" is conditional on the worker's own productivity as well as his peers' productivity. The further a worker's initial productivity is away from its "fair productivity," the stronger the feelings of unfairness he feels. These assumptions lead to the following two hypotheses:

Hypothesis 3: Initially low-performing workers increase productivity to achieve their "fair productivity"; initially high-performing workers reduce productivity to reach their "fair productivity."

Hypothesis 4: High-performing workers are more likely to quit, because they have stronger feelings of unfairness.

Wage has always been the most important factor that shapes worker quit decision. Overall, empirical evidence supports higher wages reduce quitting. Powell et al (1994) analyzed the wage effect in the child-care sector and found that increasing wage level reduces quit rates for both teachers and TAs. Batt et al. (2002) showed establishment quit rate decreases 0.6 percent when average annual wages increase $4,800, using telecommunication industry survey data. Female employees are typically considered to have weak job attachment and are more prone to voluntary job separation (Viscusi, 1980). Early principal study of Barnes and Jones (1974) analyzes the difference in aggregative quit rates by sex. Their findings are consistent with

the stereotypical view. One standard argument of female quitting is that females need to take care of family and children. Therefore, in this study, marriage and child effects are both controlled. At the same time, female workers have less self-expect pay than male workers (Jackson et. al., 1992). At the same time, education and training raise worker expectations and increase quitting (Lynch, 1991; Veum, 1997; Dolton & Kidd, 1998; Fallickk & Fleischman, 2004). Education also cultivates habits of hardworking and senses of equality. Given the potential differential behaviors, I can hypothesize that:

Hypothesis 5: Gender, education attainment, and wage might have differential productivity effects on quitting.

III. The Case

This case study is based on the fieldwork done by Professor Takao Kato and his coworkers from January 1999 to April 2005. Fieldwork has several dimension, including data collection for operators, questionnaires for all employees, interviews with management, and worker shadowing exercises. The data and information were made available for me to this study. An earlier study investigating the direct impact of offline team on productivity utilized the same data set. A more detailed case description can be found at Jones and Kato (2011). To be consistent, this study adopts the same form of address as Jones and Kato.

Company Information

The case, hereafter PARTS, is a privately owned, non-unionized subsidiary of a multinational light-manufacturing firm. At the end of November 2001, PARTS employed 225

employees, including 134 operators who were directly involved with the production. The company has grown rapidly from 30 workers in 1988 and real sales had tripled since 1995.

PARTS produces small components[1] that are used by larger manufacturers in a number of industries and applications. The industry is very competitive and profit margins are thin, for the unit price of its product is low and the technology is fairly simple. PARTS firm culture emphasizes producing reliable products. PARTS stresses the importance of "high quality standard and durability to achieve customer satisfaction and ensure competitive ability" on the company website and downloadable products catalog. "Zero Defects" is frequently mentioned during team meetings. To motivate workers to achieve a higher quality standard, PARTS conducts quality audits on overage once every other day and publishes the rejection rates of all operators.

Production method at PARTS is batch production. A single operator operates a specific machine to complete one operation; a typical product takes only a few operations. The nature of technology limits the rates of production, but it still permits some production quality and speed variations among different operators who use the same machine.

In its recent history, PARTS has never laid off any employees although occasionally it had dispatched workers on a fixed six-month time to neighbor firms. PARTS hire temporary student workers during summer. Temporary student workers are not included in this study, and dispatch is carefully handled by using longer quitting cutoff (see robustness check).

PARTS pays fixed wages to its workers: wage is not contingent with performance. Hourly wages typically started at $6 and normally increase to $7.5 within a year. The minimum wage in New York State was $4.25 at the beginning of the study. It was raised to $5.15 on March

[1] The confidentiality agreement with PARTS prohibits identifying the specific products.

31, 2000, raised again to $6 on January 1, 2005, and then remained unchanged until the end of the study. Therefore, despite the high requirement of quality, workers at PARTS were paid only slightly above the minimum wage.

PARTS is a single-plant firm. All operators work in the same plant but are divided into 16 separate departments and three shifts. Team was introduced into PARTS in June 1999. Workers voluntarily chose whether to join a team, even though the firm management sometimes solicited certain workers. Teams at PARTS are "offline"—team members meet outside of production—rather than self-directed team production union.

Data Information

The two types of data were collected from PARTS: survey data and objective measures of productivity. The survey for all employees was undertaken in March 2001 and received a close to 90% response rate. The survey asked for workers' personal characteristics and attitudes towards multiple aspects of their current employment.

The individual-level productivity data were collected in three key measures: Efficiency, Downtime, and Rejection Rate. Each worker's daily output is automatically recorded by the counter of a machine. Efficiency expresses individual production as a percentage of "norm" set for each machine. Downtime measures hours per day that each worker spends outside of production, such as setting up a station, repairing machines, attending meetings, etc. Rejection Rate records the number of defective products as a percentage of total output. The frequency of quality auditing is on average once every other day. In this study, Qualified Rate[2] is used instead of rejection rate, a percentage of qualified output compared to total output.

[2] Qualified Rate = 100*(1 – Rejection Rate)

Sample Selection

Assuming workers show full innate productivity when they first join the firm, I restrict my sample to operators who joined PARTS after the beginning of the study. To remove temporary summer student workers, I only keep workers who worked for PARTS for at least 100 days. In New York state, senior citizens can start to collect the pension without early penalty since the age of 62. In order to distinguish voluntary quitting from retirement, I drop all the observations whose age is 62 or above. Workers whose wage is two times as much as the average wage are likely to work on different tasks from tasks of operators, such as engineering or managing tasks. Also, only a small portion of workers earn more than $14 per hour and they appear to be the outliners in the wage distribution. Thus, all workers paid over $14 per hour are recognized as non-operators and dropped from the data set. PARTS is located in central New York, where people of color only makes up for a small share of the population. The lack of racial diversity was reflected in the demographics of workers at PARTS. Extremely small number of non-white workers prevents me from exploring the racial differences. This study focuses on white workers only. The sample[3] consists of 52 long-term, white, non-retiring, newly hired operators.

IV. Empirical Strategy and Descriptive Statistics

This study consists of two stages. In the first stage, I construct a cross-sectional data and estimate linear probability model (LPM) to explore the productivity effect on quitting. In the second stage, I utilize panel data and estimate time effect on productivity using individual fixed-

[3] Small sample size is one of the biggest challenge of this study. More detailed discussion is presented in the concluding section.

effect model. The assumptions, identification strategy, and dataset construction methods are specified in the following paragraphs. Descriptive statistics are summarized in Table 1.

Workers are characterized as job leavers if their last productivity data entry was made at least 6 days prior to the last days of the study, for the average off-duty span at PARTS is approximately 6 days. The workers who are characterized as job leavers were found to be insensitive to the use of 6, 11, 16, or 100-day cutoff. Fewer people are identified as job leavers using the 200-day cutoff, but the change doesn't affect the direction or significance of the estimates. (See Appendix 1 for more details.) Since workers whose age is over 62 are removed from the sample and PARTS never fired employees in its recent history, it is reasonable to believe the recognized job leavers are the ones who chose to voluntarily separate from PARTS. Among the sample of 52 workers, 30 are recognized as job leavers, 20 are stayers.

Qualified Rate, Efficiency, and Downtime are the job performance measures. Assuming the initial performance is the true innate productivity of each worker, I identify the first 60 days of employment as the trial period and calculate the average productivity over the trial period as innate productivity. The average initial productivity is used in the first stage LPM regression. Since the length of 60 is arbitrarily chosen, I conduct robustness check using the length of 40 and 80 days. The magnitude of the estimates is only affected by a very small margin by the change. (More details are shown in Appendix 2.) The motivation of using the productivity during a trial period comes from the summer internship programs of many firms. A summer internship program is usually 10-12 weeks. Before the beginning of a program, interns are assigned to specific groups. Interns experience the job as well as their peers during the "tryout" period, form expectations, and decide whether to accept or reject the return offers.

Among three productivity measures, Efficiency captures the speed of production. The speed of operating naturally increases as workers become more familiar with the machine. The average efficiency of the sample is 70.14 percent with a standard deviation of 12.14. Job leavers seem to produce faster than stayers, but the difference is not statistically significant.

Qualified Rate captures the quality of production. Initial high qualified rate is associated with the innate carefulness of workers; later high qualified rate can be achieved by innately less careful workers through on-the-job learning and paying additional attention during operating. Overall, workers at PARTS have very high production quality. The average qualified rate is 98.96 percent with 1.76 percent standard deviation. Job leavers on average have higher production quality than stayers with the difference of 0.635 percent, but the difference is not statistically significant. Looking at the histograms of the qualified rates of job leavers and stayers separately (see figure 1), however, I find that distribution of job leavers is more left-skewed than that of stayers and has a higher peak on the right end. Figure 1 suggests that super high performers are the job leavers. Considering the emphasis PARTS puts on product quality, workers are most likely to react to qualified rate compared to other productivity measures.

Downtime measures hours that each worker spends outside of production, such as setting up a station, repairing machines, attending meetings, etc. The average downtime is 0.795 hours and there is almost no difference between downtime of stayers and job leavers.

PARTS publishes rejection rate of all operators, so each worker learns about his position in the distribution of qualified rates. The relative efficiency and relative downtime are harder to obtain.

During the early 2000s, a recession affected the United States. In 2001 and 2002, the annual growth of the real GDP of the U.S. fell below 2%.[4] When economic growth slows down, firms cut costs by downsizing and slow down recruiting. It is harder for a worker to find outside jobs during recessions. To control for the macroeconomics effect, this study identifies quitting in 2001 and 2002 as crisis year effect and includes crisis year effect as a dummy variable.

Additional control variables are compensation, age, gender, education, offline team, married, and child. Compensation is represented by wage residuals after estimating hourly wages using the Mincer wage equation[5]. College education is labeled as higher education contrary to elementary or secondary education, so I suppose having some college education may affect job expectations and behaviors at work. Thus, education attainment is captured by a dummy variable that takes on the value 1 if workers attained education beyond high school and zero otherwise.

The average age of workers at PARTS is 35.9; job leavers on average are 6.06 years younger than stayers. The workforce at PARTS is female dominated: only 38.5% of workers are male. Within the subsample of job leavers, however, the proportion of male rises to 46.7%. Within stayers, male workers only take up 27.3% of the subsample. Around 40.4% of workers have some college-level education but virtually no one has a college degree. Job leavers on average are paid less than stayers and less involved in offline teams.

In the second stage, I label a worker as a high-performing worker if his or her initially qualified rate is above the median. I construct a panel data with individual monthly productivity and worker tenure in months. There is no significant structural difference between job stayers and leavers in terms of numbers of high-performing workers (see figure 2).

[4] Source: BEA; US Department of Commerce.
[5] I regressed hourly wage on experience, experience squared, efficiency, downtime, rejection rate, education, gender, race, and participation in offline team, the predicted the wage residuals.

V. The Results

The Effects on Quitting

I estimate a simple linear probability model as my baseline:

$$\text{QUIT}_i = \beta_0 + \beta_1(\text{Job Performance})_i + \text{Control} + \text{Crisis Year} + u_i \quad (1)$$

In this equation, QUIT_i is a dummy variable that takes on values 1 if the worker *i* is identified as job leaver and takes on value 0 if worker *i* is identified as a stayer. Explanatory variables are three types of innate productivity measures: Qualified Rate, Efficiency, and Downtime. The coefficients of productivity measures are used to test for productivity effects. Control variables are age, gender, education, participation of offline teams, wage residual, if married, and if have children. The recession is captured in crisis year dummy variable. The baseline equation allows me to test for Hypothesis 1, 4, and 5.

Table 2 summarizes the estimates of equation (1). Column (2) presents the results of the full model: one percent increase in Qualified Rate raises the propensity of quitting by 7.51 percent. The coefficient of Qualified Rate is statistically significant at 1% level. The positive coefficient of Qualified Rate shows that high-performing workers are more likely to quit. This finding provides supportive evidence for Hypothesis 1. Discovering a high job match does not motivate workers to stay. The feelings of competence are not enough to keep high-performing workers at the low-wage, low-skilled job, high quality-demand job at PARTS.

At the same time, Efficiency and Downtime do not show any significant effect on the propensity of quitting. The fact that only Qualified Rate has a strong effect on quitting yet other measures have no effect might be due to having the knowledge of other workers' production quality and the "Zero Defects" firm culture. The reinforcement of the importance of high quality

from the management and coworkers makes workers internalize the importance of high quality in their own utility functions. Production speed and time spent in production are interpreted as less important. Additionally, knowing the production quality of all operators allows workers to learn about their positions in the distribution. No finding on Efficiency and Downtime along with the positive coefficient of Qualified Rate provides supportive evidence for Hypothesis 4. Workers do compare their productivity with each other, and their quit decisions positively correlated to productivity when other people's productivity is known and they feel unfair. The feelings of unfairness overtake the feelings of competence for high-performing workers at PARTS, so high performance predicts quits in this case firm.

To check for robustness, I run a Probit model using the same explanatory variables and control variables as equation (1). The coefficients are reported in Column (3). I also estimate equation (1) without controlling for the recession effect and report the estimates in Column (1). Both regressions show a positive and statistically significant coefficient of Qualified Rate and no effect of Efficiency and Downtime. Sensitivity analysis of quitting cutoff and trial period length are included in the appendix section. The positive productivity effect is robust in any check.

Age and gender variables have statistically significant effects on the propensity of quitting. An increase in age seems to reduce the propensity of quitting. Compared to female workers, male workers are more likely to quit. Education seems to have no effect on quitting. To test for hypothesis 5, I include interaction terms of Qualified Rate and education attainment, gender, and wage residual correspondingly. Table 5 summarizes the heterogeneous effect. Unlike my prediction, none of the three coefficients is significant at any level. I fail to find evidence for Hypothesis 5.

Time Effects and the Behavior of Quitting

Intuitively, workers learn from their experiences and the Qualified Rate should increase over time. However, as predicted by fair wage-effort hypothesis, high-performing workers reduce their levels of efforts to match their wages. To fully examine Hypothesis 2 and 3, I construct a monthly performance panel data of all new workers and run an individual fixed-effect model for all new hires[6] after trial period[7]:

$$(\text{QUALIFIED RATE})_{it} = \beta_0 + \beta_1(\text{Months at PARTS})_{it} + \beta_2(\text{Months at PARTS}) * (\text{High Performing})_{it} + \text{Monthly Time Dummy Variable} + \text{Individual fixed effect} + \varepsilon_{it} \quad (2)$$

In this fixed effect model, $(\text{QUALIFIED RATE})_{it}$ is the average monthly Qualified Rate of worker *i* in his *t*'th month at PARTS. $(\text{Months at PARTS})_{it}$ worker *i*'s tenure in the unit of month at month *t*. The coefficient of $(\text{Months at PARTS})_{it}$ captures the time effect of low-performing workers. $(\text{Months at PARTS}) * (\text{High Performing})_{it}$ is the interaction between high-performing dummy variable and tenure. High Performing is a time-invariant dummy variable that takes on value 1 if the worker's average qualified rate during the trial period[8] is above the median and zero otherwise. The coefficient of the interaction term captures the difference between high and low-ability workers. I linearly combine the coefficients of Months at PARTS and the interaction term to estimate the time effect for high-performing workers and test it significance using t test. Since this case study is not a randomized control trial, it is important to apply individual fixed effect to control for unobservable individual characteristics.

[6] Since fixed-effect model is applied, the newly hired operators are not restricted to those who completed the survey. We observe a slight increase in sample size. There are 66 workers in the sample with 28 stayers and 38 job leavers.
[7] That is for the third months onward for each worker
[8] Trial Period Length=60 Days

Each nature month over the entire period of study is represented by one dummy variable to capture the external shocks or firm-wide changes that apply to both high and low-performing workers.

One potential objection to the functional form is non-linearity of the time effect. I estimate the time effect with each tenure month *t* as a dummy variable (dropping the first month as the baseline) and plotted the coefficient for each month separately for low-performing stayers, low-performing leavers, high-performing stayers, and high-performing leavers. The scatter plots of coefficients are presented in Figure 3. All groups other than low-performing stayers seem to have linear time effect; low-performing leavers seem to increase qualified rate in the first year and then show a flat pattern. Notice that coefficients for the first 12 months are not statistically significant. Thus, the lack of precision prevents me from making any further conclusion about the early career of workers. I also estimate the time effect using quadratic functional form, the estimation results not seem to be in favor of quadratic time effect. Thus, I continue using linear model to test Hypothesis 2 and 3.

Table 4 summarizes the time effect of the full sample, stayers, and job leavers correspondingly. Overall, the average time effect for low-performing workers is positive. The production quality of low-performing workers seems to improve over time. The estimated high-performing worker time effect is neither statistically nor economically significant. The production quality of high-performing workers seems to be unaffected by time. If I split the sample into job leavers and stayer, these two groups show different patterns. Stayers do not adjust their production quality with the accumulation of experience. The behavior of stayers fails to provide evidence for Hypothesis 3. It is likely that job leavers are less sensitive to the feelings

of unfairness. For high-performing stayers, it is also possible that the feelings of competence overtake the feelings of unfairness, so they choose to stay and work with non-reduced efforts.

Low-performing job leavers have a positive time effect that is statistically significant at 5% level. One additional month at PARTS increase production quality by 0.023%. Even the magnitude is small, considering the long study period and small standard deviation of Qualified Rate, the finding is meaningful. The low-performing job leaver learning behavior is not consistent with Hypothesis 2 but provide supportive evidence for Hypothesis 3. Thus, low-performing job leavers are not likely to search for outside opportunities on the job. They chose to voluntarily separate from PARTS for different reasons, which is beyond the scope of this study. High-performing workers have negative time effect on Qualified Rate. High-performing workers seem to withdraw effort before quitting. The negative time effect is consistent with the prediction of Hypothesis 2 and 3. Therefore, high-performing job leavers are the ones who conduct on-the-job search. Job search is unable to explain the gradually declining pattern of the high-performing job leavers. It is likely that high-performing also feel unfair, so they reduce effort the match the formed "fair productivity" while conducting on-the-job search.

To test if the feeling of "unfairness" is stronger for early job leavers compared to later job leavers, I focus on the subsample of job leavers only and divide them into early, middle, and late leavers. Early leavers are the workers who quit within the year, which take up 25% of the sample. Middle leavers are the workers who quit during the second year, which take up another 25% of the sample. The rest leavers are labeled as late leavers. I estimate equation (2) separately on early, middle, and later leavers to investigate the differential time effects for early leavers and survivors. The estimates are reported in Table 5. Intuitively, early leavers are more likely to be the ones who react more drastically to the feelings of unfairness. However, due to the limitation

of numbers of observation, I am unable to find supportive evidence for such a guess. The time effect of later leavers is consistent with the overall pattern, even though both the magnitude and the statistical significance are both slightly lower. This finding suggests that the overall time effect might be an underestimation for early leavers, but I am unable to test it using the current data set.

VI. Conclusion and Discussion

In this study, I empirically estimate the relation between innate productivity and voluntary quitting, and uncover the underlying mechanisms of individual quit behavior. Regression analysis indicates that workers who produce higher-quality products during the trial period are more likely to quit. Production speed and time spent in production have no significant effect on quitting. The strong production quality effect might be the results the "Zero Defects" firm culture and the knowledge of other workers' production quality. The results suggest that high-performing workers are more likely to quit. Workers learn about their own productivity as well as their position in the distribution at the beginning of their careers, and their decisions of quitting depend on their initial performance as well as their initial position within the distribution. The primary findings provide supportive evidence for the fair wage-effort hypothesis and extend the scope of analysis to the behavior of quitting.

Estimating time effect on qualified rate, I find high-performing job leavers show a declining trend of qualified rate and low-performing job leavers show an increasing-trend of qualified rate. There is virtually no time effect on qualified rate of stayers. One possible explanation for the difference in pattern is that high-performing leavers learn about their

overmatch at the beginning of their career and form a sense of "fair productivity". They gradually reduce effort to match the "fair productivity" later on in their career while searching for better outside opportunities. The lack of overall difference between high and low-performing workers suggests quitting is unlikely to be a prosocial behavior or gift-exchange behavior.

Additionally, age and gender seem to affect individual quit decision at PARTS. Young and male workers are more likely to quit. Education attainment has no significant effect on quitting. No heterogeneous productivity effect is found at PARTS. Among gender, education attainment, and wage, none of these three characteristics affect the magnitude or direction the productivity effect on quitting.

Even though the case-study method focuses on a single organization and collects data on individual-level that eliminates unobservable industry and firm effects and provides detailed, objective data, the biggest limitation of the results from a case study is external validity. In the future, more case studies about the productivity effects on quitting of fixed-waged workers are expected. However, finding similar cases that pay fixed wages and have no firing history can be challenging. Additionally, it is possible that some shared firm characteristics are unique among the firms that choose not to fire employees and adopt a fixed-wage compensation system that prevents the results from generalization. Therefore, lab experiments can be an alternative method to verify the findings of this study.

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***Table 1*. Summary Statistics of Job Leavers and Stayers**

	Full		*Job Leavers*		*Stayers*		*Difference*
	mean	*sd*	*mean*	*sd*	*mean*	*sd*	*mean*
Age	35.901	11.161	33.336	10.538	39.397	11.267	6.061**
Proportion male	0.385	0.491	0.467	0.507	0.273	0.456	-0.194
Proportion with education beyond high school	0.404	0.495	0.433	0.504	0.364	0.492	-0.070
Hourly wage	6.863	0.602	6.758	0.552	7.005	0.650	0.247*
Proportion participate in offline team	0.692	0.466	0.633	0.490	0.773	0.429	0.139
Efficiency (%)	70.142	12.137	71.228	12.804	68.661	11.285	-2.568
Downtime	0.795	0.646	0.793	0.620	0.797	0.695	0.004
Qualified Rate (%)	98.957	1.760	99.225	1.220	98.591	2.285	-0.635
Observations	52		30		22		

Notes : Job leavers are workers whose last productivity data entry was made at least 6 days before the end of study. Minimun wage in New York State was $4.25 when this study started. It was raised to $5.15 on March 31, 2000, raised again to $6 on January 1, 2005, and then remained unchanged until the end of this study. Qualified Rate = (1-Reject Rate)*100.

** The difference between job leavers and stayers are statistically significant at the 0.05 level

* The difference between job leavers and stayers are statistically significant at the 0.10 level

Source: All data provided by PARTS. Productivity data (Efficiency, Downtime, and Qualified Rate) are average first-sixty-day-after-employement productivity.

***Table 2*. The Effects on Quitting**

VARIABLES	Standard Deviation	(1) LPM	(2) LPM	(3) Probit
Qualified Rate	1.760	0.0970***	0.0751***	0.390**
		(0.0335)	(0.0261)	(0.164)
Efficiency	12.137	-0.00844	-0.00661	-0.0308
		(0.00757)	(0.00472)	(0.0237)
Downtime	0.646	-0.0437	-0.00404	-0.157
		(0.108)	(0.0497)	(0.317)
Age	11.161	-0.0200**	-0.0146**	-0.0692**
		(0.00793)	(0.00607)	(0.0276)
Male	0.491	0.418***	0.218*	1.551***
		(0.148)	(0.114)	(0.561)
College	0.466	0.0673	0.0575	0.193
		(0.148)	(0.115)	(0.437)
Personal Characteristics		Yes	Yes	Yes
Control for crisis years		No	Yes	No
Include Switchers		Yes	Yes	Yes
Observations		45	45	45
R-squared		0.305	0.660	

Notes: Data are for all white operators who joined PARTS after January 1, 1990, completed the survey conducted on March 1, 2001, paid less than $14 per hour, and are less than 62 years old when taking the survey. College takes on value 1 if the worker had any level of college education (including community college, college dropouts, etc.), zero otherwise. Additional control personal characteristics variables are offline team, wage residual, if married, if have children. Crisis years takes on value 1 if workers quitted in 2001 or 2002. Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: All data provided by PARTS.

***Table 3*. Heterogenous Effects of Qualified Rate on Quitting**

	(1)	(2)	(3)	(4)
VARIABLES	Baseline	College	Male	Wage Residuals
Qualified Rate	0.0751***	0.0751	0.0634**	0.0816**
	(0.0261)	(0.0584)	(0.0253)	(0.0336)
Efficiency	-0.00661	-0.00661	-0.00614	-0.00637
	(0.00472)	(0.00600)	(0.00514)	(0.00503)
Downtime	-0.00404	-0.00407	-0.00547	0.00155
	(0.0497)	(0.0557)	(0.0514)	(0.0533)
Age	-0.0146**	-0.0146**	-0.0161**	-0.0147**
	(0.00607)	(0.00665)	(0.00671)	(0.00617)
Male	0.218*	0.218*	-3.735	0.222*
	(0.114)	(0.116)	(4.742)	(0.115)
College	0.0575	0.0481	0.0522	0.0486
	(0.115)	(8.002)	(0.120)	(0.125)
Interaction with Qualifed Rate		9.49e-05	0.0400	0.0490
		(0.0815)	(0.0481)	(0.127)
Personal Characteristics	Yes	Yes	Yes	Yes
Control for crisis years	Yes	Yes	Yes	Yes
Observations	45	45	45	45
R-squared	0.661	0.661	0.665	0.662

Notes: Data are for all white operators who joined PARTS after January 1, 1990, completed the survey conducted on March 1, 2001, paid less than $14 per hour, and are less than 62 years old when taking the survey. Job leavers are workers whose last productivity data entry was made at least 6 days before the end of study. College takes on value 1 if the worker had any level of college education (including community college, college dropouts, etc.), zero otherwise. Additional control personal characteristics variables are offline team, wage residual, if married, if have children. Crisis years takes on value 1 if workers quitted in 2001 or 2002. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Source: All data provided by PARTS.

***Table 4*. Time Effect on Qualified Rate: Individual Fixed Effect Estimates**

VARIABLES	(1) Full Sample	(2) Stayers	(3) Leavers
Months at PARTS	0.0185*	-0.0155	0.0234**
	(0.0108)	(0.0294)	(0.00865)
(High Performing)*(Months at PARTS)	-0.0378	0.0165	-0.0760**
	(0.0231)	(0.0431)	(0.0282)
Constant	99.20***	99.65***	99.40***
	(0.150)	(0.565)	(0.148)
Estimated High-Performer Time Effect	-0.0192	0.001	-0.0526**
Standard Error	(0.0143)	(0.0169)	(0.0227)
t-statistic	-1.35	0.06	-2.32
Monthly Dummy	Yes	Yes	Yes
Observations	946	403	543
Number of Workers	66	28	38
R-squared	0.089	0.094	0.123

Notes: Data are for all white operators who joined PARTS after Januray 1, 1999, paid less than $14 per hour, and were less than 62 years old when taking the survey on March 1, 2001. Job leavers are workers whose last productivity data entry was made at least 6 days before the end of study. Months at PARTS is the number of months a worker has been employed by PARTS. High-Performing takes on value 1 if workers trial period average Qualified Rate is higher than the median, zero otherwise. Estimated High-Performer Time Effect is the linear combination of the coefficients fo Months at PARTS and the interaction term. The observations of the first two month after initially hiring are dropped because they are recognized as innate productivity. All models include individual fixed effects and monthly time dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Source: All data provided by PARTS.

***Table 5*. Time Effect on Qualified Rate: Early, Middle, and Late Leavers**

VARIABLES	(1) Early	(2) Middle	(3) Late
Months at PARTS	0.494	0.272**	0.0226**
	(1.800)	(0.104)	(0.00883)
(High Performing)*(Months at PARTS)	-0.287	-0.242*	-0.0648*
	(0.654)	(0.106)	(0.0309)
Constant	95.23***	95.63***	99.41***
	(14.36)	(0.592)	(0.157)
Estimated High-Performer Time Effect	0.207	0.0298	-0.0421
Standard Error	(1.169)	(0.0559)	(0.0251)
t-statistic	0.18	0.53	-1.68
Monthly Dummy	Yes	Yes	Yes
Observations	53	71	372
Number of Workers	11	9	18
R-squared	0.224	0.618	0.128

Notes: Data are for all white operators who joined PARTS after Januray 1, 1999, paid less than $14 per hour, and were less than 62 years old when taking the survey on March 1, 2001. Early job leavers quitted within a year; middle leavers quitted in the second year; later leavers quitted after the second year. Months at PARTS is the number of months a worker has been employed by PARTS. High-Performing takes on value 1 if workers trial period average Qualified Rate is higher than the median, zero otherwise. Estimated High-Performer Time Effect is the linear combination of the coefficients fo Months at PARTS and the interaction term. The observations of the first two month after initially hiring are dropped because they are recognized as innate productivity. All models include individual fixed effects and monthly time dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Source: All data provided by PARTS.

Appendix 1. Quitting Cutoff Sensitivity Analysis

	(1)	(2)	(3)	(4)	(5)
VARIABLES	6 Days	11 Days	16 Days	100 Days	200 Days
Qualified Rate	0.0751***	0.0751***	0.0751***	0.0751***	0.0609**
	(0.0261)	(0.0261)	(0.0261)	(0.0261)	(0.0252)
Efficiency	-0.00661	-0.00661	-0.00661	-0.00661	-0.00592
	(0.00472)	(0.00472)	(0.00472)	(0.00472)	(0.00374)
Downtime	-0.00404	-0.00404	-0.00404	-0.00404	0.0163
	(0.0497)	(0.0497)	(0.0497)	(0.0497)	(0.0377)
Age	-0.0146**	-0.0146**	-0.0146**	-0.0146**	-0.0124**
	(0.00607)	(0.00607)	(0.00607)	(0.00607)	(0.00574)
Male	0.218*	0.218*	0.218*	0.218*	0.155
	(0.114)	(0.114)	(0.114)	(0.114)	(0.0992)
College	0.0575	0.0575	0.0575	0.0575	0.132
	(0.115)	(0.115)	(0.115)	(0.115)	(0.104)
Personal Characteristics	Yes	Yes	Yes	Yes	Yes
Control for crisis years	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45
R-squared	0.661	0.661	0.661	0.661	0.746

Notes: Data are for all white operators who joined PARTS after January 1, 1990, completed the survey conducted on March 1, 2001, paid less than $14 per hour, and are less than 62 years old when taking the survey. College takes on value 1 if the worker had any level of college education (including community college, college dropouts, etc.), zero otherwise. Additional control personal characteristics variables are offline team, wage residual, if married, if have children. Crisis years takes on value 1 if workers quitted in 2001 or 2002. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Source: All data provided by PARTS.

Appendix 2. Trial Period Length Sensitivity Analysis

	(1)	(2)	(3)
VARIABLES	40 Days	60 Days	80 Days
Qualified Rate	0.0537**	0.0751***	0.0683**
	(0.0209)	(0.0261)	(0.0269)
Efficiency	-0.00661	-0.00802	-0.00635
	(0.00472)	(0.00504)	(0.00477)
Downtime	-0.00404	-0.0343	-0.00360
	(0.0497)	(0.0484)	(0.0503)
Age	-0.0146**	-0.0117**	-0.0146**
	(0.00607)	(0.00567)	(0.00619)
Male	0.218*	0.198*	0.219*
	(0.114)	(0.116)	(0.116)
College	0.0575	0.0711	0.0562
	(0.115)	(0.119)	(0.117)
Personal Characteristics	Yes	Yes	Yes
Control for crisis years	Yes	Yes	Yes
Observations	45	45	45
R-squared	0.320	0.660	0.305

Notes: Data are for all white operators who joined PARTS after January 1, 1990, completed the survey conducted on March 1, 2001, paid less than $14 per hour, and are less than 62 years old when taking the survey. College takes on value 1 if the worker had any level of college education (including community college, college dropouts, etc.), zero otherwise. Additional control personal characteristics variables are offline team, wage residual, if married, if have children. Crisis years takes on value 1 if workers quitted in 2001 or 2002. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Source: All data provided by PARTS.

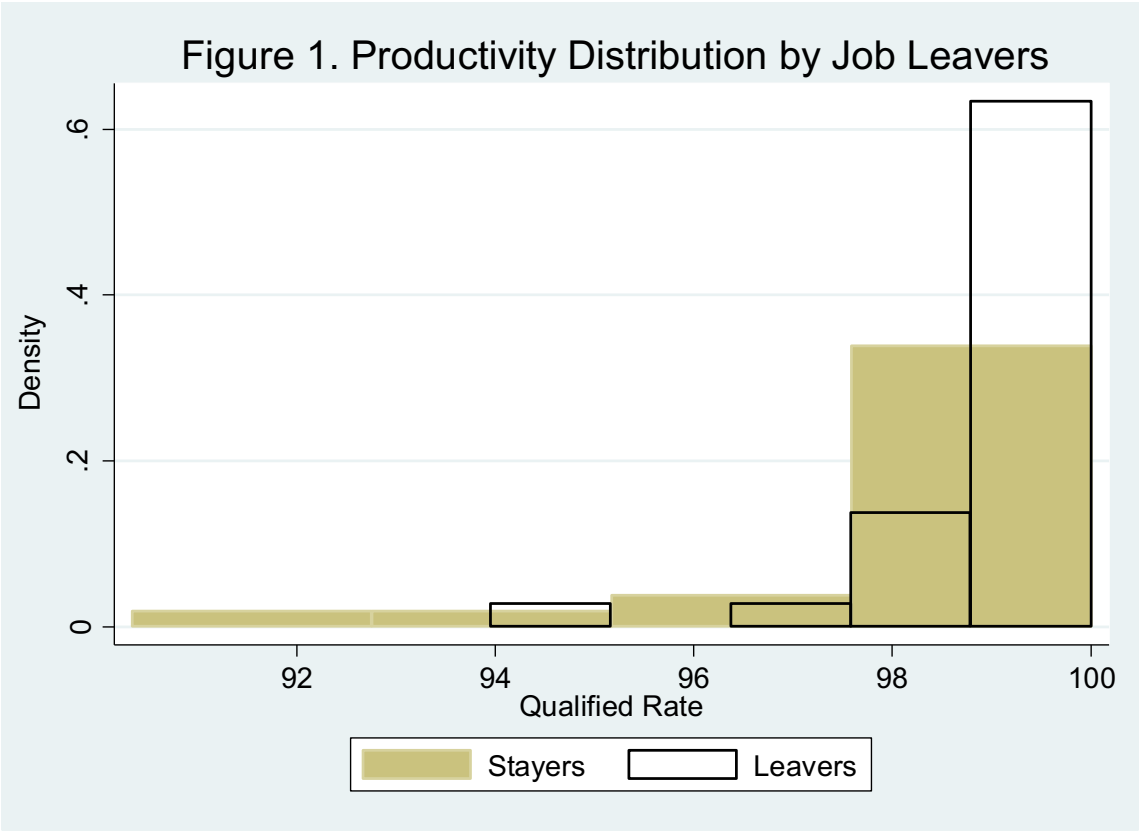


Figure 1. Productivity Distribution by Job Leavers
Density
0
.2
.4
.6
92
94
96
98
100
Qualified Rate
Stayers
Leavers

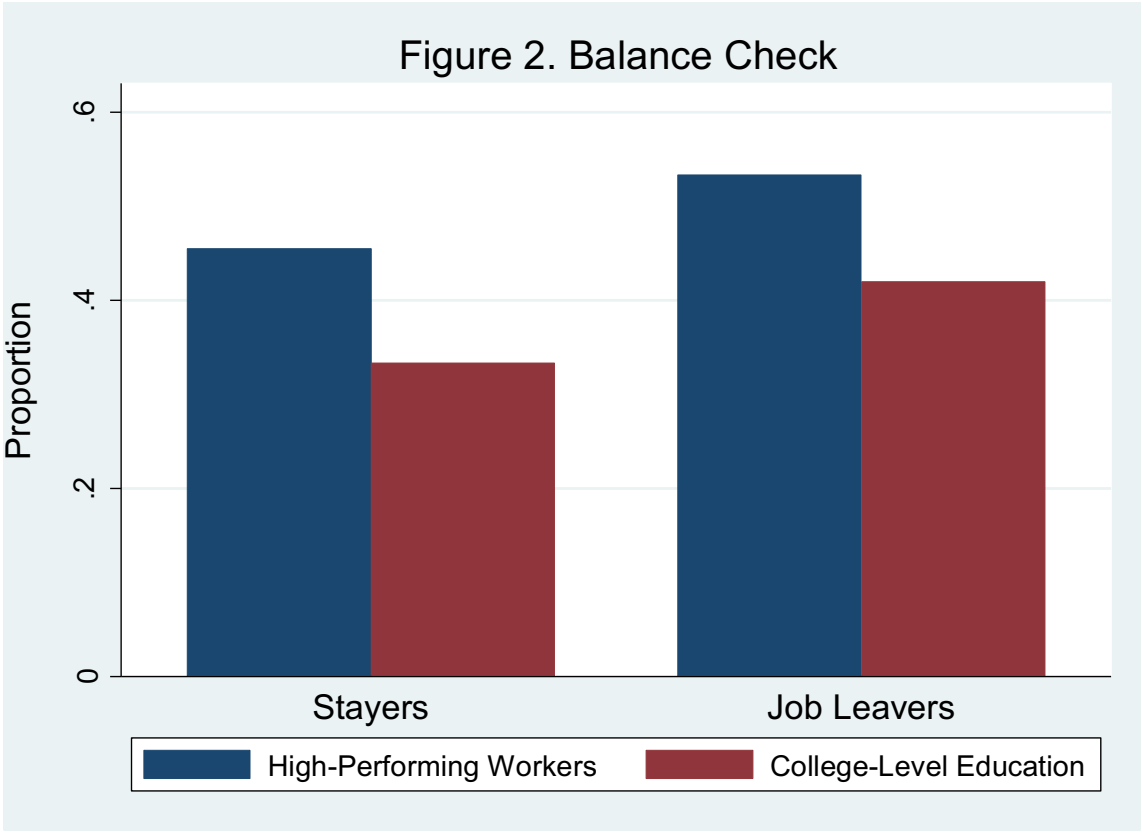
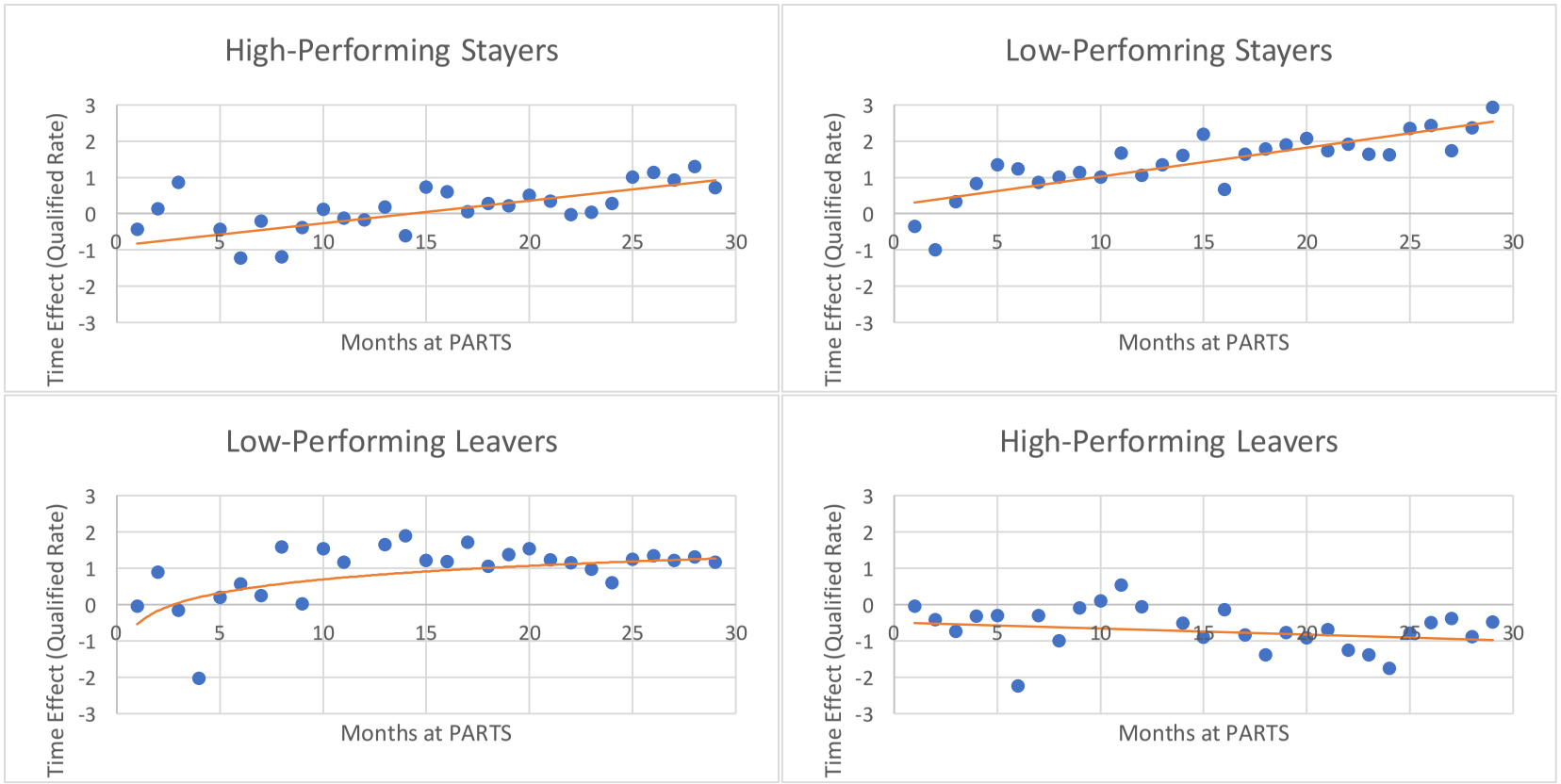


Figure 2. Balance Check
Proportion
0
.2
.4
.6
Stayers
Job Leavers
High-Performing Workers
College-Level Education

Figure 3. Differential Time Effects on Qualified Rate



Notes: Time effects on Qualified Rate in figure 3 are the coefficients of each tenure month *t* dummy variable, which is the difference between the Qualified Rate of the *t*'th month at PARTS of worker *i* compared to his or her Qualified Rate during the first month. Data are for all white operators who joined PARTS after Januray 1, 1999, paid less than $14 per hour, and were less than 62 years old when taking the survey on March 1, 2001. Job leavers are workers whose last productivity data entry was made at least 6 days before the end of study. Months at PARTS is the number of months a worker has been employed by PARTS. High-Performing workers are those whose trial period average Qualified Rate is higher than the median, zero otherwise. Estimated high-performer time effect is the linear combination of the coefficients of Months at PARTS and the interaction term.