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ABSTRACT

This paper examines the behavior of dual jobholders to test a simple model of wage bargaining versus wage posting in which workers facing hours constraints in their primary job take a second, flexible-hours job for additional income. When a secondary job offers a sufficiently high wage, a worker either bargains with the primary employer for a wage increase or separates. The bargaining model provides a number of predictions that we test using matched employer-employee administrative data from Washington State. The estimates match the model's predictions quite well. First, separation probabilities in the primary job are sensitive to wages in the secondary job, but hours are not. Second, hours and separations in the secondary job are sensitive to wages in the primary job due to income effects. Third, wage bargaining takes place mainly among workers in the highest wage quartile; for these workers, wage increases in the secondary job lead to wage increases in the primary job. In contrast, for workers in the lowest wage quartile, wage increases in the secondary job lead to higher separation rates but no significant wage increase in the primary job, consistent with wage posting. These patterns suggest that high-wage workers receive a larger share of the surplus generated by the employment relationship.

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1 Introduction

How wages are set is central to understanding the growth of wages and earnings, worker mobility, wage inequality, and the causes of unemployment, as Hall and Krueger (2010, 2012) have described. Bargaining models and explanations based on them assume that workers have the ability to negotiate compensation and that wages incorporate information about a worker's outside option(s). With renegotiation, wages can adjust in response to new information. The alternative to bargaining is wage posting, whereby employers set wages that individual workers cannot influence and must either accept or reject.[1]

Hall and Krueger (2010, 2012) noted that the scarcity of empirical evidence on the extent of wage bargaining and wage posting in setting wages is puzzling in view of the importance of the question. To obtain such evidence, they surveyed a representative sample of newly hired U.S. workers and found that one-third reported bargaining over pay before accepting their position. Hall and Krueger's work was followed by studies using observational data: Faberman et al. (2017) found that workers who could have stayed in their job before accepting another position reported obtaining a higher wage, and Lachowska (2017) found that workers' subjective assessments of how easy it would be to find an alternative job or to be replaced in their current job are highly correlated with the wage received in their current job. Both suggest an important role for outside options in determining wages.

A more recent approach to obtaining evidence on wage bargaining and wage posting is to observe variation in a worker's outside options (or other differences in bargaining power) that are uncorrelated with labor demand or employer characteristics. This approach has been taken by Caldwell and Harmon (2019), who examine how the wages of Danish workers are affected by changes in information about their outside opportunities. Information about those options is based on networks of former coworkers, and using this approach, Caldwell and Harmon find a significant role for outside options in wage setting.

[1] While wages in a posting model may respond to outside options, this would happen at the market-level—idiosyncratic changes in the outside option of a single worker should not affect wages.

Our approach in this paper is related to Caldwell and Harmon's, but it differs by examining how the wages and separation behavior of dual jobholders in Washington State respond to wage changes in their secondary job. Such a relationship would be evidence of the importance of bargaining in wage setting. One advantage of the approach is that it gives a clear measure of changes in a worker's outside option in the form of the wage earned on another job held by that worker. A second advantage is that the approach can be applied to any setting where there is matched employer-employee data with dual jobholders.

A worker's jobs are classified as primary (job 1) and secondary jobs (job 2) based on the hours worked in each job. To implement the bargaining test, we relate changes in the wage of coworkers in the secondary job to the worker's own wage in the primary job. Specifically, we use wage changes of coworkers in the secondary job as an instrument for wage changes in the secondary job. We can then estimate how primary-job wages, hours, and separations relate to wage changes in the secondary job while controlling for employer fixed effects of the primary job (interacted with quarter). These fixed effects flexibly control for shocks affecting all workers in the primary employer, such as labor demand shocks that might be correlated between the primary and secondary employers.

To interpret the estimates, we embed bargaining in the canonical hours-constrained model for dual jobholding (Shishko and Rostker, 1976). In the model, workers facing hours constraints in their primary job take a second, flexible-hour job for extra income. Employers can respond to a worker's improved outside option by raising the wage if the worker threatens to separate. The model has a number of predictions that are both testable and potentially different from alternative models of dual jobholding, such as the job portfolio model (Renna and Oaxaca, 2006), where workers have preferences for multiple jobs. Hours in the primary job should be invariant to wage changes in the secondary job, while hours in the secondary job should be inversely related to the wage rate in the primary job (due to income effects). Separation from the primary job should be positively related to the wage rate in the secondary job, and separation from the secondary job should be positively related to the wage rate in the primary job.

The model also predicts that wage bargaining is more likely than posting among high-wage than low-wage workers. This is because high-wage jobs tend to generate more surplus for the employer, so it will be in the employer's interest to respond to a worker's outside option by increasing the wage rather than allowing the worker to separate. But low-wage jobs generate low surplus for the employer, so the employer's wage response will be limited and more separations will be observed, consistent with wage posting. Accordingly, the model predicts an inverse relationship between the wage response and the separation response to an improved outside option.

The data strongly support these predictions. First, work hours with the primary employer are insensitive to wage changes at the secondary employer (the outside option). This is consistent with the model, in which a worker's hours with the primary employer are constrained and influence the worker's decisions to take a second job.

Second, we find a statistically significant relationship between changes in the wages of coworkers in the secondary job and changes in the worker's own wage in the primary job, suggesting that bargaining does play a role in wage setting. The estimate is robust to including employer-by-quarter fixed effects and to limiting the sample to workers whose two jobs are in different industries. Bargaining effects are more prominent with employers where wages tend to vary greatly across workers, and when workers have longer tenure in their secondary job. The estimated bargaining effect aggregated over all workers is quantitatively small, though similar to previous studies that have estimated bargaining in other settings (Caldwell and Harmon, 2019, Jäger et al., 2020).

Third, the evidence supports the model's predictions about differences in the importance of bargaining among different groups of workers. In particular, the bargaining effect is relatively important among workers in the top quartile of the wage distribution, whereas workers in the lowest quartile of the distribution respond to improved outside options by separating from their primary job (consistent with wage posting and an absence of bargaining).

In addition to its relevance to the literature on outside options, this paper is related to the literature on estimating income effects (Imbens, Rubin and Sacerdote 2001; Cesarini et al., 2017). and to the literature on multiple jobholding and its determinants. Multiple jobholding has gained

renewed interest with the rise of the electronically mediated gig economy (Katz and Krueger, 2019; Mas and Pallais, 2020). Secondary jobs may serve as a source of extra income due to hours constraints in the primary job (Shishko and Rostker, 1976), to solve underemployment while searching for the optimal wage-hour job combination (Paxson and Sicherman, 1996) or to smooth consumption due to income volatility (Koustas, 2018; Tazhitdinova, 2020). We extend this line of research by using a linked employer-employee panel based on administrative records to test the predictions of the canonical hours-constraint model of multiple jobholding.

In the next section, we develop the hours-constrained model of dual jobholding with bargaining and summarize its testable predictions. Section 3 describes the data and reports summary statistics for the main sample used in estimation. (Appendix A includes additional details about construction of the samples used to estimate the models.) The econometric framework is developed in section 4, and section 5 describes the empirical findings. We start with a discussion of the first-stage effects—that is, the impact of changes in coworkers' wages on a worker's own wage. We then examine the effects of secondary-job wage changes on work hours and the probability of separating from the primary employer; and of primary-job wage changes on work hours and the probability of separating from the secondary employer. Finally, we examine the evidence on wage bargaining, first for the full sample, then for several subgroups of workers, including the upper and lower quartiles of the wage distribution. The final section briefly summarizes the results and discusses their implications.

2 Conceptual Framework

We begin by outlining the canonical hours-constraint model of how workers choose to hold multiple jobs. The model is related to Rueben Gronau's model of home production (Gronau, 1977), which Shishko and Rostker (1976) applied to dual jobholding. In this model, workers take a second job because, although their primary job offers better terms, the primary employer limits work hours. If the worker desires additional income, she will take a second (less attractive) job, provided it offers a wage above the worker's reservation wage at the maximum hours allowed by the primary

employer.

Figure 1 shows the kinked budget constraint facing such a worker, who optimizes among time in the primary job, the secondary job, and leisure. The budget constraint has a slope of $-w_1$ up to the hours limit on the primary job ($\bar{H}$), then a slope of $-w_2$ thereafter.[2] In Figure 1, the worker's optimum is shown by point A, where she works the maximum allowable hours on the primary job ($\bar{H}$), works $\tilde{H} - \bar{H}$ hours on the secondary job, and spends the remaining available hours in leisure.

The employer obtains a surplus from the employment relationship, the size of which depends on the degree of heterogeneity of jobs and workers. Unless the labor market is perfectly competitive, the employer will incur a cost when replacing an incumbent worker because the replacement worker will produce a lower surplus. Denote by λ the incumbent worker's value to the firm over her replacement; that is, if a worker leaves and a firm is forced to fill the vacancy, the firm loses λ in profits. This loss will be greater the greater is the heterogeneity of the labor market in question, and its size will determine the employer's willingness to bargain if a worker threatens to separate.

How does the worker respond to wage changes in this model? Consider first an increase in the wage on the secondary job from w_2 to $w_2^{'}$. If the change is small enough that the wage on the secondary job is still below the primary wage ($w_2^{'} < w_1$), then a worker will continue to work the maximum allowable hours on primary job ($\bar{H}$), and any adjustments will be in hours on the secondary job. This situation is shown in Figure 2, panel (a), with equilibrium moving from point A to point B, both interior solutions in hours for the secondary job.[3] The prediction that hours in the primary job are invariant to secondary-job wages distinguishes this model from the job portfolio model outlined in Renna and Oaxaca (2006), where workers have preferences for multiple jobs. In that model there is a negative cross-elasticity of hours with respect to wages in the alternative job.

Alternatively, if the change in the secondary-job wage results in that wage exceeding he primary job wage ($w_2^{'} > w_1$), then the outcome depends on the relationship between the worker's value over replacement in the primary job (λ) and the difference between the new wage on the secondary

[2]While wage is the only differentiator between firms, the model can be easily adapted to include non-wage amenity differences.

[3]The figure is drawn so that secondary-job hours increase, but this prediction is ambiguous as it depends on the sign of the uncompensated labor supply elasticity.

job the primary job wage ($w_2' - w_1$). If $(w_2' - w_1) > \lambda$, the worker leaves the primary job for the secondary job. If $(w_2' - w_1) < \lambda$, the primary employer matches the new secondary-employer wage. As is apparent, when λ is small there will be a limited bargaining response from the primary firm, and small changes in the secondary job wage will lead to separation. When λ is large there will be a bargaining response from the primary employer, and a reduced tendency for a worker to separate, for a given change in the secondary-job wage.

Consider next an increase in the primary-job wage, from w_1 to w_1'. As shown in Figure 2, panel (b), hours on the primary job remain at the upper limit ($\bar{H}$), and if leisure is a normal good, secondary-job hours decline due to an income effect. We would not expect a bargaining response from the secondary employer because hours in the secondary job are unconstrained, and the secondary-job wage was previously dominated by the primary-job wage.

To summarize, this simple model produces the following predictions:

1. Primary-job hours do not respond to secondary-job wages.

2. Primary-job separation rates increase with secondary-job wages.

3. Secondary-job hours fall and secondary-job separation rates rise with primary-job wages (as a result of income effects).

4. Primary-job wages rise with secondary-job wages (as a result of bargaining)

5. Secondary-job wages do not rise with primary-job wages.

6. When a worker has a high value over replacement, improved outside options will result in wage responses but relatively limited separation effects. When a worker has a low value over replacement, wage responses will be limited, and separation effects will be more pronounced. Therefore, the wage response and the separation response to an improved outside option will be inversely related.

3 Data and Summary Statistics

The data used in this paper are based on quarterly administrative wage records maintained by the Employment Security Department of Washington State to administer the state's unemployment insurance (UI) system. The available quarterly data provide information on earnings and work hours of all workers employed by UI-covered employers in the state between 2001–2014. UI-covered employers in Washington are required to report each worker's quarterly earnings and work hours, which allows us to construct an hourly wage rate in each quarter for most workers in Washington's formal labor market. Lachowska, Mas and Woodbury (2018) examine the reliability of the Washington hours data and conclude they are of high quality.

Dual Jobholders: We begin by restricting the sample to workers who have positive work hours over consecutive quarters. Specifically, for a worker in quarter t to be included in our sample, the worker must work for the same employer in quarter t, $t-1$, and $t+1$; that is, that quarter must be a full quarter of employment. We do this to avoid situation that might lead us to believe that a worker holds more than one job in a quarter, when in fact she is instead transitioning between employers mid-quarter; see the appendix for more details.

If a worker holds more than two jobs under these criteria we retain the two jobs with the most work hours. The job/employer where the worker has worked the most hours in a given quarter is denoted the "primary job/employer." The job/employer where the worker has worked the second-most hours in a given quarter is denoted as the "secondary job/employer."

We further remove from the sample the primary employment spells associated with the Public and the Education Sector.[4] We also removed from the estimation sample employer-by-quarter observations where none of the associated employees is a dual jobholder because these observations do not contribute to the empirical analysis presented in Section 4. Using these criteria, we are able to identify around 2.7 million worker-quarter observations where a worker has at least two jobs (out of about 66 million worker-quarter observations where a worker has at least one job).

[4]We exclude workers in the education sector because of an unusually large number of workers who have a second job in the same sector. We exclude the public sector because bargaining at the worker level is unlikely to take place in that industry.

3.1 Summary Statistics

Table 1 reports the summary statistics for our main estimation sample.[5] Column 1 considers summary statistics for worker-quarter observations where the associated worker is not holding two jobs in the same quarter. Columns 2 and 3 consider worker-quarter observations where the worker is a dual jobholder. Column 2 reports statistics that refers to to the primary job, while column 3 focuses on the secondary job.

We start by highlighting differences between the primary job of a single jobholder vs. the primary job of a dual jobholder (column 1 vs. column 2). The latter tends to pay a lower hourly wage and is associated with fewer hours. Separation rates from primary jobs are higher among dual jobholders. Part of these differences appears to be driven by different employer characteristics, such as firm size which tends to be smaller for people who hold two jobs.

Table 1 also permits us also to evaluate differences between primary and secondary job among dual jobholders (column 2 vs. column 3). By construction, hours in the secondary job are substantially lower. Interestingly, the sum of hours on the primary job and secondary job is higher than the total hours observed among single jobholders, suggesting that dual jobholders are working more hours in a given quarter. Hourly wages are slightly lower in the secondary job, while the probability to observe a separation is much higher in the secondary job. On average, the earnings obtained on the secondary job amount to around 21 percent of one's total pay.

Interestingly, dual-job holding tends to be concentrated among specific types of employers/jobs. For instance, among workers with only one job, the corresponding average share of coworkers who are dual jobholders is only 5 percent. Among dual jobholders, that share jumps to 11 percent (when the coworkers are defined relative to the primary-job employer) and 48% (when coworkers are defined relative to the secondary-job employer). The former is consistent with the hours constraint explanation for dual job holding, as dual jobholders will tend to be concentrated in firms with hours constraints. The latter suggests a secondary employer is likely to "cluster" workers who are

[5]Table A1 in the Appendix reports these summary statistics in the subsample of individuals for whom we have demographic information.

all using such employer as their secondary job.[6]

4 Econometric Framework

Our main specification has the following form:

$$\Delta y_{it}^{j_1} = \alpha + \theta_D Dual_{it} + \theta(Dual_{it} \times \Delta \bar{w}_{-it}^{j_2}) + \psi_{j_1(i,t),t} + r_{it}^{j_1}, \quad (1)$$

where i denotes worker and t denotes quarter. The superscripts j_1 and j_2 indicate whether a particular variable is measured in the primary job (j_1) or in the secondary job (j_2). The function $j_1(i,t)$ returns the identity of the employer associated with the primary job of worker i in quarter t so that $\psi_{j_1(i,t),t}$ capture primary employer by quarter fixed effects. $Dual_{it}$ is a dummy indicating whether worker i has a secondary job in quarter t. Standard errors are two-way clustered at the worker and primary-employer level.

The term $\Delta \bar{w}_{-it}^{j_2}$ is the measure of the change in the outside option of a dual jobholder. Specifically, $\Delta \bar{w}_{-it}^{j_2}$ represents the average change in the log wage between t and $t+1$ for the secondary-job coworkers of worker i in quarter t.[7]

Econometrically, the bargaining tests specifications are similar to those in Caldwell and Harmon (2019) in that we are looking at wage changes within firm and time period as a function of a measure of the outside option. In this case $\Delta y_{it}^{j_1}$ represents the change in log wage from the primary job for worker i between quarter t and quarter $t+1$. Therefore, the θ-coefficient compares changes in log wages of dual jobholders to all other workers in a given firm j and quarter t as a function of wage shocks in a worker's second job. In other specifications we use combinations of log wages, log hours, and separations for $\Delta y_{it}^{j_1}$, depending on the analysis.

Importantly, when looking at the effects of wage shocks from the secondary job on either hours or wages in the primary job, we condition the analysis on stayers, that is, individuals that

[6] Around 14% of all the observed employer-quarter appear in our data only as secondary-job spells; that is, the associated employer in that quarter is no worker's primary job. More than half of the time, these observations are found in the health care sector.

[7] For workers who do not have a secondary job, $\Delta \bar{w}_{-it}^{j_2}$ is set to zero.

remain with the same primary employer between t and $t+1$. Conditioning on stayers allows us to test directly whether incumbent primary employers are "bargaining" employers who respond to a change of the outside option of the worker by raising her wage (Cahuc, Postel-Vinay and Robin, 2006; Manning, 2011).[8]

We also consider a version of model (1) where we restrict the analysis to only dual jobholders so that the regression becomes

$$\Delta y_{it}^{j_1} = \alpha + \theta \Delta \bar{w}_{-it}^{j_2} + \psi_{j_1(i,t),t} + r_{it}^{j_1}. \tag{2}$$

The estimate of θ in model (2) compares changes in outcomes of dual jobholders to other dual jobholders in a primary employer j and quarter t as a function of shocks in a worker's second job. Restricting the analysis to only dual jobholders is expected to reduce statistical power because any worker with one job is excluded from the sample.

We can reverse the analysis in (2) to estimate how the the hours-, wage-, and separations measured on the secondary job respond to a wage shock on the primary job. The associated empirical model reads as follows

$$\Delta y_{it}^{j_2} = \alpha + \phi \Delta \bar{w}_{-it}^{j_1} + \psi_{j_2(i,t),t} + r_{it}^{j_2}, \tag{3}$$

where the variable $Dual_{it}$ is omitted because we are focusing on secondary-job outcomes as a function of primary-job wage shocks and so all the workers must be dual jobholders. In this model, $\psi_{j_2(i,t),t}$ captures secondary-job employer fixed effects by quarter.

The ϕ-coefficient in Equation (3) estimates the response of secondary-job outcomes to an exogenous change in the wage on the primary job after controlling for firm-by-quarter shocks. Note that, when the outcome of interest is log hours, the ϕ-coefficient measures how hours in the secondary job change in response to a wage shock from the primary job. Following the framework presented in Figure 2, panel (b), we expect the ϕ-coefficient for hours to be negative. The ϕ-

[8]Conditioning on stayers also allows us to avoid mismeasurement issues in earnings and hours that might incur in our data during "partial" quarters where the individual is switching employers and might receive as a result extra severance payments.

coefficient allows us to derive an estimate of the marginal propensity to consume out of unearned income due to reduced hours in the second job: $mpe = \frac{w_2}{h_1}\frac{\partial h_2}{\partial w_1}$. (Cesarini et al., 2017).

4.1 Heterogeneity Analysis

To assess the presence of heterogeneous effects, we estimate augmented models of the form:

$$\begin{aligned}\Delta y_{it}^{j_1} = \alpha + \theta_D Dual_{it} + \gamma_C Char_{it} + \gamma(Char_{it} \times Dual_{it}) + \\ + \theta(Dual_{it} \times \Delta\bar{w}_{-it}^{j_2}) + \beta(Dual_{it} \times Char_{it} \times \Delta\bar{w}_{-it}^{j_2}) + \psi_{j_1(i,t),t} + r_{it}^{j_1},\end{aligned} \tag{4}$$

where $Char_{it}$ is some characteristics of either the worker or of her primary/secondary job. We report both the θ- and β- coefficients obtained from (4).

4.2 First-Stage Effects

Models (1) and (3) estimate the effect of a shock to coworkers' wages in a worker's job on the wage in the worker's *other* job. This indirect channel can be thought of as an intent-to-treat or reduced form effect. However, the most direct channel of a shock in a job is on the wage in that same job. This first-order effect for the model in (1) can be estimated as follows:

$$\Delta w_{it}^{j_2} = \alpha + \theta_{FS}\Delta\bar{w}_{-it}^{j_2} + \psi_{j_1(i,t),t} + r_{it}^{j_2}, \tag{5}$$

This model allows us to compare the change in workers' wages in a given secondary employer j_2 as a function of the change in average coworker (leave-self-out) wage from the same secondary employer, j_2. Dividing the intent-to-treat estimates of θ in (1) by the "first-stage" estimate of θ_{FS} from (5) yields the direct effect of a wage increase in the secondary job. The estimate of ϕ in Equation (3) can be rescaled by the corresponding estimate of θ_{FS} in an analogous way.

5 Results

We now turn to the results. We first examine the first-stage effects: the estimated impact of the change in average coworker log wage on a worker's own wage. Next, we test the hours-constraint

model predictions by examining the labor supply response to changes in the outside option at the hours and separations margin. Finally, we present the bargaining estimates.

5.1 First-Stage Effects

We use changes in average coworker log wage as an instrument for an individual's wage in the secondary job. The top panel of Table 2 shows the first-stage estimates for this instrument based on model (5): The effect of average wage of co-workers in job 2 on a worker's wage in job 2. Estimates range from 0.59 to 0.65 and are highly significant. An estimate of 0.6 implies that a 1 percent increase in the average wage of coworkers corresponds to a 0.6 percent increase in a worker's wage. For subsequent regressions we will use intent-to-treat specifications, and these can be scaled up by this first-stage coefficient to quantify the direct effect of a wage increase on primary-job outcomes.

5.2 Hours and Mobility Response to Secondary-Job Wage Changes

Here we test the predictions from the hours-constraint model in Section 2.

The middle panel of Table 3 shows estimates from regressing job 1 change in log hours on change in coworker average log wage in job 2. Consistent with prediction #1, the coefficient in the baseline specification is close to zero and insignificant. Primary-job hours are not responsive to secondary-job wages. This holds also in column 2, which restricts the analysis to cases where the primary-job sector is different from the secondary-job sector. Dropping such observations eliminates cases where the outside option reflects market-wide changes as opposed to an idiosyncratic change to the outside option of a given worker. Again, the point estimate is small and not significantly different from zero. When we restrict the analysis to only dual jobholders, the hours response is positive and statistically different from zero.

While the data largely support the conclusion that primary-job hours are fixed, separations from the primary-job to employment or non-employment are sensitive to secondary-job wage. The top panel of Table 3 presents the estimates on the probability of a worker separating from the primary-

job as a function of the change in the log wage of the secondary job. Consistent with prediction #2, the effects are all positive and significant. When the second job wage rises, primary job adjustment occurs in the separation but not in the hours margin.

If workers are separating from their primary job in response to a wage increase in their second job we would expect the secondary employer to become their primary employer. This is indeed the case, as seen in Table 4. Specifically, if we define as the outcome an indicator for the secondary job becoming the primary job over consecutive periods, an increase in the second job wage leads to a positive and significant (at the 10 percent level) increase in the probability of the secondary employer becoming the primary. The magnitude of this response (0.0032) is close to the separation response from the primary employer in Table 3 (0.0042).

The separation results will be helpful for interpreting the bargaining estimates. A possible limitation to our approach is that second jobs are not credible alternatives. The job mobility findings suggest that workers are on the margin between employers and, thus, second employers can pose a credible outside option.

5.3 Secondary-Job Hours Response to Primary-Job Wage Changes

Table 5 tests the third prediction of the model, that secondary-job hours decline and separations increase in the primary-job wage. In the second panel we regress the change in log hours in job 2 on the coworker average of the change of log wages in job 1. The coefficient is negative and highly significant, consistent with hours in the secondary job being at least somewhat flexible and there being an income effect.[9]

Using this estimate we can compute the marginal propensity to consume out of unearned income due to reduced hours in the second job: $mpe = \frac{w_2 \partial h_2}{h_1 \partial w_1}$. The denominator of this expression represents the change in unearned income from the change in job-1 wage, and the numerator is the change in earnings from the change in labor supply in job 2. Note that the hours elasticity in Table

[9]It is also possible that these reductions in hours are coming from a substitution effect as workers add hours in their primary job and drop hours in the secondary job. However in Lachowska et al. (2021) we estimate an own-firm elasticity of labor supply of approximately zero for workers in primary firms. This kind of inelastic response to the own wage is consistent with inflexible hours in primary firms.

5 scaled by the first-stage estimate is $\frac{-0.0261}{0.58} = \frac{w_1}{h_2}\frac{\partial h_2}{\partial w_1}$. Therefore, using means from Table 1, we compute, $mpe = \frac{-0.0261}{0.58}\frac{h_2}{w_1}\frac{w_2}{h_1} = \frac{-0.0261}{0.58}\frac{137.3}{17.84}\frac{17.24}{436.5} = -0.014$. This estimate implies that, for every dollar of unearned income, workers lower labor supply in the hours margin reduces earnings by 1.4 cents. This estimate is in-line with income effect estimates from lottery studies, such as Cesarini et al. (2017).

The top panel of Table 5 shows the same relationship but for the separations margin. We see statistically strong responses to the primary-job wage, also consistent with income effects.

5.4 Bargaining

We now move to the bargaining test. We begin with the the baseline model that shows how primary and secondary wages covary on average and then examine heterogeneity in responses.

5.4.1 Baseline Effects

In Table 3 we regress the change in coworker log wages in the secondary job on the change in the log wage in the primary job. We find a positive and statistically significant relationship in the baseline specification in column 1. We also see similar magnitude effects when the primary and secondary job are in different sectors (column 2).

To assess magnitudes we divide the intent-to-treat coefficient in column 1 (0.0082) by the corresponding first-stage coefficient in column 2 of Table 2 (0.63). Doing this implies that a 1-percent increase in own wage in job 2 results in a 0.013 percent increase in the main job. While small in magnitude, the estimate is close to the corresponding estimates in Caldwell and Harmon (2019) and Jäger et al. (2020).[10]

The bargaining effects are asymmetrical between job categories. In Table 5, we regress the secondary-job wage on the primary-job wage and cannot reject zero in either of the specifications.

[10]Caldwell and Harmon (2019) have an elasticity of earnings to outside offers of approximately 0.02. They report that 10 new positions at an individual's former coworkers' current firms results in an increase of $50 of annual earnings. Average annual earnings in their sample is $42,650. People have on average 156 connections. Putting these together gives an elasticity of 0.02 (=5*(156/42,650)). Jäger et al. (2020) find that a one dollar increase in UI translates to a 0.01 dollar increase in wages.

This aligns with prediction #5: in an unconstrained job that is dominated by the primary job, the secondary employer does not bargain.

5.4.2 Heterogeneity

Tables 6 and 7 examine the heterogeneous bargaining response by a number of job characteristics.[11] Prediction #6 from the conceptual framework implies that in sub-groups where there are larger wage response to improved outside options we should smaller separation effects. This relationship holds for a worker's position in the wage distribution. In the second panel of Table 6, the bargaining effect is present and statistically significant for top-quartile workers with an elasticity of 0.0228 (column 2). The corresponding coefficient for bottom-quartile workers is statistically indistinguishable from 0 (column 1). Consistent with prediction #6, in the first panel the separation response is positive and significant for bottom-quartile workers but not for top-quartile workers. The results by wage distribution quartile are consistent with bottom-quartile workers having limited surplus while top-quartile workers having surplus that gives employers scope to increase pay.

Relatedly, we also find that separation responses are particularly pronounced for individuals for whom a significant amount of their total earnings is obtained from their secondary job. As expected, these individuals are particularly more likely to make their secondary job their primary occupation (see panel (b), column 4 of Table 4).

In Table 7, we report wage and separation responses by industry. Figure 3 shows the scatterplot of these two responses weighted by the number of dual jobholders by sector. While the relationship is somewhat imprecise (t-statistic = -1.4), there appears to be a negative relationship between the two measures.

We have also examined heterogeneity in a number of measures that we think may be related to the potential and extent of bargaining. Two measures proxy for the credibility of the outside option from the second employer: a worker's tenure with the secondary employer and an indicator

[11] As discussed in Lachowska, Mas and Woodbury (2020), demographic information is available for workers who have at some point claimed UI benefits. Heterogeneity by demographic characteristics are largely underpowered due to relatively small samples, see Table A2.

for whether secondary employer is primary employer for more than 90 percent of its employees. For both of these measures, we expect a stronger bargaining response in response to an outside option, but the evidence is mixed. The wage response is stronger (and statistically significant) for workers with a longer tenure with the secondary employer, but the wage and separation responses are negative for secondary employers where a large share of workers are primary (Table 6).

In Table 6, column 4 we analyze heterogeneity of the estimates based on whether the primary employer is more likely to be a "bargaining" or a "posting" employer. To do so, we assume that posting employers have a low degree of variability in within-firm wage changes. In contrast, bargaining employers are expected to have a large degree of variability; this variability will depend on the heterogeneity in outside options among its workers, see also Manning (2011). Accordingly, we flag an employer as a "bargaining employer" if the employer is in the fourth quartile of the standard deviation of within-firm changes in log wages among stayers. This measure strongly predicts a positive wage response from the primary employer when the wage of the secondary employer increases. This estimate gives us additional assurance that we are detecting a bargaining response.

6 Conclusion

We have examined the market for dual jobholders both to obtain evidence on the reasons for dual jobholding and to test for the extent of wage bargaining in the labor market. The empirical evidence suggest three main conclusions. First, the data are consistent with work hours being constrained in the primary job, which influences workers' decisions about taking a second job. Second, wage bargaining is an observable feature of the labor market, although for dual jobholders in aggregate, the importance of bargaining is limited. That is, wages do respond to an outside option—in this case a wage increase at the secondary job—but for dual jobholders, the overall magnitude of the response is small. Third, wage bargaining is important among workers in the top quartile of the wage distribution. In the model, highly skilled workers generate a relatively large surplus for the employer, which creates an incentive for the employer to raise a worker's wage rather than accept a

separation. In contrast, wage bargaining appears nonexistent among workers in the lowest quartile of the wage distribution, where we observe separations in response to improved outside options. This is consistent with low-wage jobs generating relatively little surplus, which in turn leads to wage posting.

The paper adds to the literature by showing that workers—at least those in the top quartile of the wage distribution—are able to bargain over wages, and that their bargaining power stems from an outside option available to them. The findings imply that, whereas low-wage workers can obtain wage gains only by moving to a different employer, high-wage workers may experience wage growth either by moving up the job ladder (that is, moving to another employer) or by negotiating a higher wage if they have the bargaining power that an outside option gives them. Another implication is that employers, particularly those who employ high-wage workers, have some discretion to discriminate among individual workers in offering compensation. This finding runs counter even to models of imperfectly competitive labor markets, which generally assume that wages are set uniformly for workers in a skill class.

References

Cahuc, Pierre, Fabien Postel-Vinay and Jean-Marc Robin. 2006. "Wage Bargaining with On-the-job Search: Theory and Evidence." *Econometrica* 74(2):323–364.

Caldwell, Sydnee and Nikolaj Harmon. 2019. Outside Options, Bargaining, and Wages: Evidence from Coworker Networks. Unpublished manuscript University of Copenhagen.

Cesarini, David, Erik Lindqvist, Matthew J. Notowidigdo and Robert Östling. 2017. "The Effect of Wealth on Individual and Household Labor Supply: Evidence from Swedish Lotteries." *American Economic Review* 107(12):3917–46.

Faberman, R Jason, Andreas I Mueller, Ayşegül Şahin and Giorgio Topa. 2017. Job Search Behavior among the Employed and Non-employed. Working paper 23731 National Bureau of Economic Research.

Gronau, Reuben. 1977. "Leisure, Home Production, and Work–the Theory of the Allocation of Time Revisited." *Journal of Political Economy* 85(6):1099–1123.

Hall, Robert E and Alan B. Krueger. 2010. Evidence on the Determinants of the Choice between Wage Posting and Wage Bargaining. Working Paper 16033 National Bureau of Economic Research.

Hall, Robert E and Alan B. Krueger. 2012. "Evidence on the Incidence of Wage Posting, Wage Bargaining, and On-the-job Search." *American Economic Journal: Macroeconomics* 4(4):56–67.

Imbens, Guido W., Donald B. Rubin and Bruce I. Sacerdote. 2001. "Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players." *American Economic Review* 91(4):778–794.

Jäger, Simon, Benjamin Schoefer, Samuel Young and Josef Zweimüller. 2020. "Wages and the Value of Nonemployment." *The Quarterly Journal of Economics* 135(4):1905–1963.

Katz, Lawrence F. and Alan B. Krueger. 2019. "The Rise and Nature of Alternative Work Arrangements in the United States, 1995–2015." *Industrial and Labor Relations Review* 72(2):382–416.

Koustas, Dmitri. 2018. Consumption Insurance and Multiple Jobs: Evidence from Rideshare Drivers. Working paper.

Lachowska, Marta. 2017. "Outside Options and Wages: What Can We Learn from Subjective Assessments?" *Empirical Economics* 52(1):79–121.

Lachowska, Marta, Alexandre Mas, Raffaele D Saggio and Stephen A Woodbury. 2021. The Importance of Firms in Hours Determination. Mimeo.

Lachowska, Marta, Alexandre Mas and Stephen A Woodbury. 2018. How Reliable Are Administrative Reports of Paid Work Hours? Unpublished manuscript.

Lachowska, Marta, Alexandre Mas and Stephen A. Woodbury. 2020. "Sources of Displaced Workers' Long-Term Earnings Losses." *American Economic Review* 10(110):3231–3266.

Manning, Alan. 2011. Imperfect Competition in the Labor Market. In *Handbook of Labor Economics*. Vol. 4 Elsevier pp. 973–1041.

Mas, Alexandre and Amanda Pallais. 2020. "Alternative Work Arrangements." *Annual Review of Economics* 12:631–658.

Paxson, Christina H. and Nachum Sicherman. 1996. "The Dynamics of Dual Job Holding and Job Mobility." *Journal of Labor Economics* 14(3):357–393.

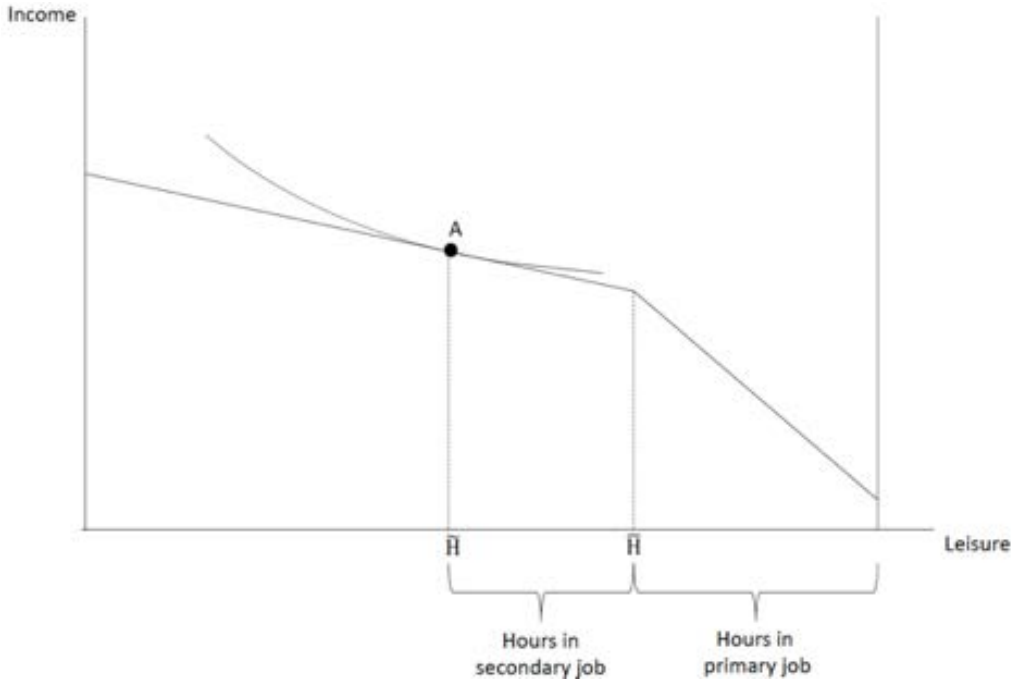
Renna, Francesco and Ronald L. Oaxaca. 2006. The Economics of Dual Job Holding: A Job Portfolio Model of Labor Supply. Discussion Paper 1915 IZA.

Shishko, Robert and Bernard Rostker. 1976. "The Economics of Multiple Job Holding." *American Economic Review* 66(3):298–308.

Tazhitdinova, Alisa. 2020. Increasing Hours Worked: Moonlighting Responses to a Large Tax Reform. Working Paper 27726 National Bureau of Economic Research.

Figures and Tables

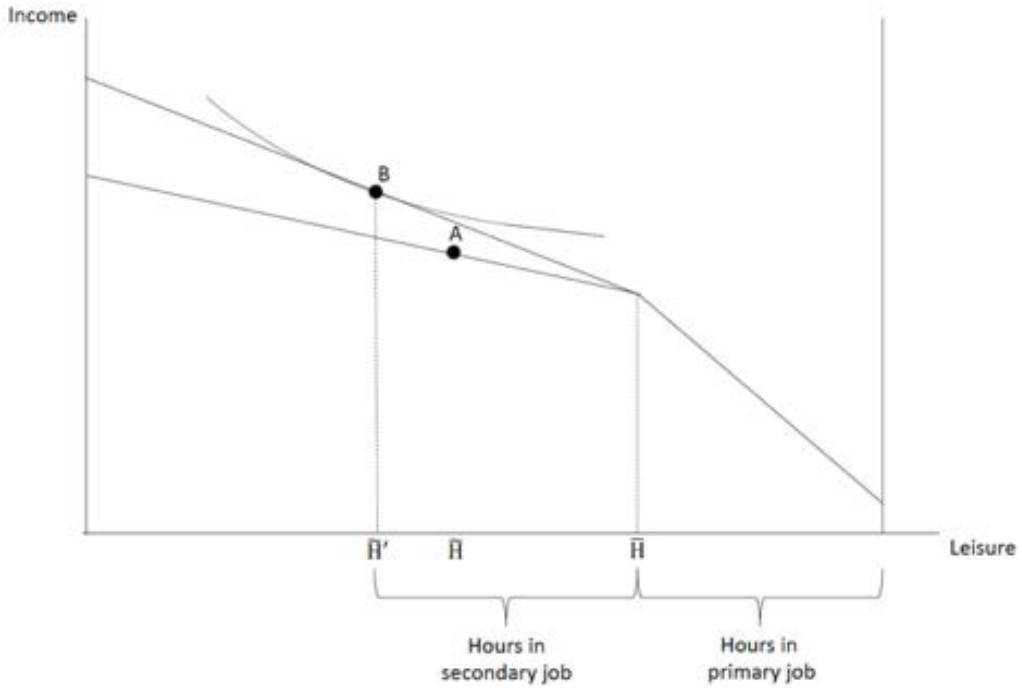
Figure 1: Labor Supply Decision with Dual Jobs



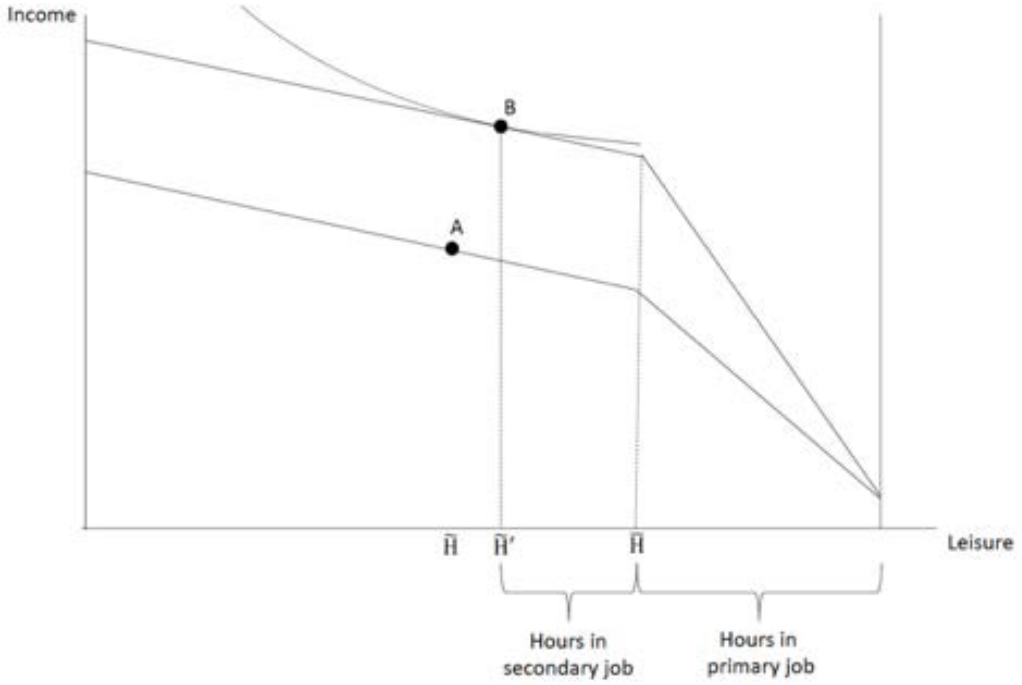
Note: This figure shows a situation where a worker optimizes between time in the primary job, the secondary job, and leisure. The worker first chooses hours worked in the primary job, and once she reaches the limit in hours at $\bar{H}$, additional $\tilde{H} - \bar{H}$ hours are supplied at a lower wage in the secondary job. This lower wage produces a kink in the budget constraint.

Figure 2: Change in Wage

(a) Increase in the Wage of the Secondary Job

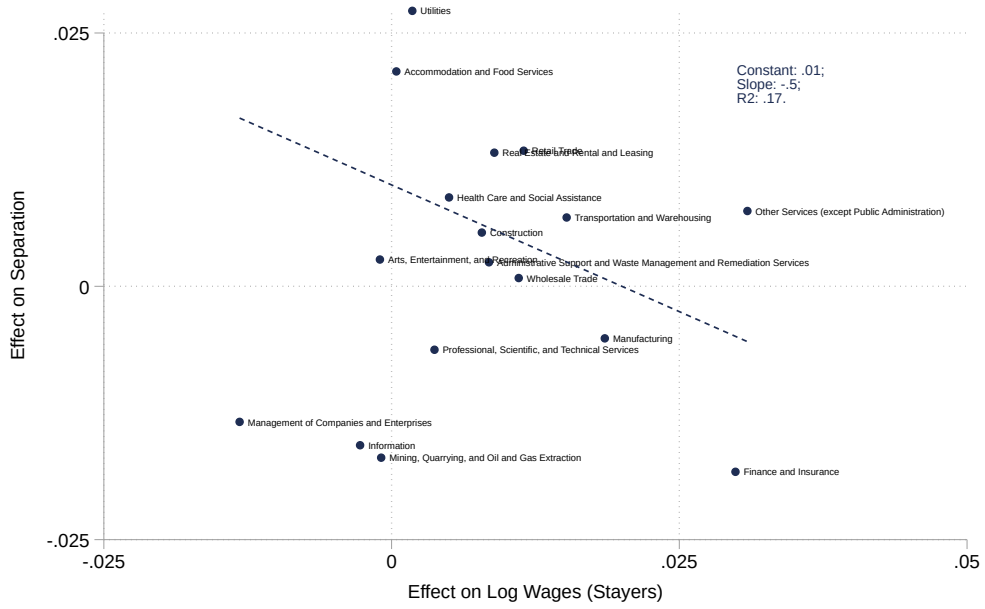


(b) Increase in the Wage of the Primary Job



Note: This figure shows the hours response for a potential change in the wage of the secondary job (Panel a) and for a change in the wage in the primary job (Panel b).

Figure 3: Wage and Separation Response in Primary Job across Sectors



Note: This figure reports estimates from Equation (1), estimated separately for each sector. The y-axis reports how changes in the outside option impact separation rates between quarter t and quarter $t+2$. The x-axis reports how changes in the outside option impact change in log wages in the primary job between t and $t+1$. All regressions control for primary-employer by quarter fixed effects. Standard errors are reported in parentheses and are two-way clustered at the worker and primary-employer level. See text for details.

Table 1: Summary Statistics

	Workers with only one job	*Dual Job Holders*	
	Primary Job	Primary Job	Secondary Job
	[1]	[2]	[3]
Hourly wage	25.55	17.84	17.24
	(21.10)	(12.03)	(16.36)
Hours	468.15	436.50	137.30
	(136.38)	(148.40)	(121.96)
Earnings	12,033.73	7,796.18	2,042.75
	(9944.01)	(5802.09)	(2333.87)
Separation	0.08	0.11	0.25
Separation (Job-to-Job)	0.04	0.10	0.10
Tenure (in Quarters)	13.86	12.10	7.67
	(12.54)	(11.42)	(8.00)
Change in Log Hours	0.01	0.01	0.00
	(0.28)	(0.17)	(0.27)
Change in Log Wage	-0.01	0.00	-0.03
	(0.37)	(0.26)	(0.64)
Firm Size	106.64	81.38	93.58
	(781.15)	(682.22)	(783.36)
Change in Coworkers Log wage	0.01	0.01	0.01
	(0.15)	(0.13)	(0.13)
Share of Coworkers who are Dual Jobholders	0.05	0.11	0.48
	(0.09)	(0.19)	(0.42)
Share of Total Earnings from Job #2		0.21	0.21
		(0.16)	(0.16)
Number of Workers	4,146,548	505,280	505,280
Number of Employers	93,943	134,056	121,831
Number of Quarter-Worker Observations	63,268,985	2,677,798	2,677,798

Note: This table provides summary statistics for various estimation samples. In the first column, we consider worker-quarter observations where the worker is holding one single job. In the second column, we consider worker-quarter observations where the worker is holding two jobs and we report mean and standard deviation (in round brackets) separately for the primary and the secondary job. All statistics are quarter-worker weighted except for firm size, which is weighted by employer-quarter observations.

Table 2: First-Stage Estimates

	Dual Jobholders Only	Job#1 and Job#2 are in Different Sectors
Outcome: Change in Log Wage Job#2 (Stayers)		
Change in Wage of Peers, Job#2	0.6280***	0.6457***
	(0.0206)	(0.0198)
Mean Dependent Variable	.0087	.0092
Observations	1491447	915329
Outcome: Change in Log Wage Job#1 (Stayers)		
Change in Wage of Peers, Job#1	0.5808***	0.5492***
	(0.0285)	(0.0260)
Mean Dependent Variable	.0036	.0037
Observations	1102897	659627

Note: This table reports estimates from the "first stage" regression discussed at the end of Section 4. The first panel corresponds to equation (5) of the main text, where the outcome variable is quarter-to-quarter change in the log wage in the secondary job (for stayers). This outcome variable is regressed on the (leave-out) change in the wage of the peers from the secondary job. The model controls for quarter-*primary* employer fixed effects. In the second panel, the outcome variable is quarter-to-quarter change in the log wage in the primary job (for stayers). This outcome variable is regressed on the (leave-out) change in the wage of the peers from the primary job. The model controls for quarter-*secondary* employer fixed effects. Both regression equations are conditional on having a dual job in a given quarter. Column 1 estimates both panels on our sample of dual job holders. Column 2 restricts this sample so that Job#1 and Job#2 are in different sectors. Standard errors are reported in parentheses and are two-way clustered at the worker and employer of the outcome of interest level.

Table 3: Impact of Changes in Coworkers' Wages from Job #2 on Worker Outcomes in Job #1

	Baseline	Job#1 and Job#2 are in Different Sectors	Only Dual Jobholders
Outcome: Separation from Job#1			
Change in Wage of Peers, Job#2	0.0042*	0.0060**	0.0054*
	(0.0019)	(0.0021)	(0.0024)
Mean Dependent Variable	.0834	.083	.1074
Observations	62630479	61916730	1506110
Outcome: Change of Log Hours in Job#1 (Stayers)			
Change in Wage of Peers, Job#2	0.0011	0.0039	0.0073**
	(0.0022)	(0.0024)	(0.0026)
Mean Dependent Variable	-.0049	-.005	.0017
Observations	58582829	57942744	1347851
Outcome: Change of Log Wage in Job#1 (Stayers)			
Change in Wage of Peers, Job2	0.0082***	0.0077***	0.0059**
	(0.0020)	(0.0018)	(0.0019)
Mean Dependent Variable	.0092	.0092	.0091
Observations	58582829	57942744	1347851

Note: This table reports estimates from of our baseline specification in equation (1). In the first panel, the outcome variable is a dummy equal to 1 if we observe a separation between quarter t and quarter t+2 from the primary job. In the second and third panel, the outcome variable is quarter-to-quarter change in the log hours (second panel) or in log wages (third panel) from the primary job, where both outcomes condition on being a stayer. "Change in Wage of Peers, Job#2" represents the leave-out change in the wage of the peers of a given individual from her secondary job between quarter t and quarter t+1. This variable is set to zero if an individual in a given quarter is not holding two jobs. Column 1 estimates the model on both dual job holders as well single job holders present in the WA data. Column 2 restricts this sample so that Job#1 and Job#2 are in different sectors. Column 3 restricts the analysis to worker-quarter observations where the worker is a dual job holder. All regressions control for primary employer by quarter fixed effects and a dummy for dual job-holding (Column 1-2). Standard errors are reported in parentheses and are two-way clustered at the worker and primary employer level.

Table 4: Effects on Job-to-Job Transitions

	Baseline (No Interactions)	Bottom Quartile Wage Job#1	Top Quartile Wage Job#1	Above Median Share in Earnings Job#2
Outcome: Job-to-Job Transition				
Change in Wage of Peers, Job#2	0.0023	-0.0018	0.0021	-0.0082***
	(0.0018)	(0.0021)	(0.0020)	(0.0021)
Change in Wage of Peers, Job#2 x Job Char		0.0095*	-0.0003	0.0160***
		(0.0041)	(0.0043)	(0.0037)
Mean Dependent Variable	.0459	.0459	.0459	.0459
Observations	62630479	62630479	62630479	62630479
Outcome: Secondary Job Becomes Primary Job				
Change in Wage of Peers, Job#2	0.0032	-0.0021	0.0037	-0.0061***
	(0.0018)	(0.0020)	(0.0019)	(0.0018)
Change in Wage of Peers, Job#2 x Job Char		0.0123**	-0.0070	0.0130***
		(0.0038)	(0.0042)	(0.0034)
Mean Dependent Variable	.0022	.0022	.0022	.0022
Observations	62630479	62630479	62630479	62630479

Note: This table reports estimates from of our heterogeneity specification displayed in equation (4). In the first panel, the outcome variable is an indicator equal to 1 if we observe a job-to-job transition between quarter t and quarter t+2. In the second panel, the outcome is an indicator if the secondary job of the current period (t) becomes the primary job in the next period (t+2). "Change in Wage of Peers, Job#2" represents the leave-out change in the wage of the peers of a given individual from her secondary job. "Change in Wage of Peers, Job#2 x Job Char" interacts the latter variable with a job characteristic listed on top of each column. All regression controls for primary employer by quarter fixed effects, a dummy for dual job holder, a dummy for the characteristic listed in each column, an interaction between that characteristic and the dual job indicator. In Column 4, the characteristic that we used for the interaction is a dummy equal 1 if the share of an individual's earnings coming from the secondary job is above the corresponding sample median for dual job holders. Standard errors are reported in parentheses and are two-way clustered at the worker and primary employer level.

Table 5: Impact of Changes in Coworkers' Wages from Job #1 on Worker Outcomes in Job #2

	Dual Jobholders	Dual Jobholders and Job#1 and Job#2 are in Different Sectors
Outcome: Separation from Job#2		
Change in Wage of Peers, Job#1	0.0147***	0.0155***
	(0.0039)	(0.0044)
Mean Dependent Variable	.2533	.2526
Observations	1660291	1014853
Outcome: Change of Log Hours in Job#2 (Stayers)		
Change in Wage of Peers, Job#1	-0.0261***	-0.0250**
	(0.0072)	(0.0084)
Mean Dependent Variable	-.0306	-.0313
Observations	1210689	737264
Outcome: Change of Log Wage in Job#2 (Stayers)		
Change in Wage of Peers, Job#1	0.0005	0.0027
	(0.0030)	(0.0036)
Mean Dependent Variable	.0038	.004
Observations	1210689	737264

Note: This table reports estimates from equation (3). In the first panel, the outcome variable is a dummy equal to 1 if we observe a separation from the secondary job between quarter t and quarter t+2. In the second and third panel, the outcome variable is quarter-to-quarter change in the log hours (second panel) or in log wages (third panel) from the secondary job, where both outcomes condition on stayers only. The independent variable of interest across all models is the (leave-out) change in the wage of the peers from the primary job, denoted as "Change in Wage of Peers, Job#1". Column 1 estimates the model on the universe of dual job holders that we observe in the data. Column 2 restricts this sample so that Job#1 and Job#2 are in different sectors. All regression controls for secondary employer by quarter fixed effects. Standard errors are reported in parentheses and are two-way clustered at the worker and secondary employer level.

Table 6: Heterogeneity by Job Characteristics

	Bottom Quartile Wage Job#1	Top Quartile Wage Job#1	Above median share in earnings job#2	Q4 of Sd of Within-Firm-Within-Worker variation in Wage	Tenure with Primary Employer	Tenure with Secondary Employer
Outcome: Separation from Job#1						
Change in Wage of Peers, Job#2	-0.0011	0.0045*	-0.0046*	0.0055**	0.0089**	0.0082**
	(0.0022)	(0.0021)	(0.0022)	(0.0021)	(0.0033)	(0.0029)
Change in Wage of Peers, Job#2 x Job Char	0.0133**	-0.0035	0.0130***	-0.0074	-0.0004**	-0.0008***
	(0.0042)	(0.0044)	(0.0038)	(0.0049)	(0.0002)	(0.0002)
Mean Dependent Variable	.0834	.0834	.0834	.0834	.0821	.0821
Observations	62630479	62630479	62630479	62630479	46699891	46699891
Outcome: Change of Log Wages in Job#1 (Stayers)						
Change in Wage of Peers, Job#2	0.0081***	0.0052**	0.0080**	0.0009	0.0037	0.0039
	(0.0022)	(0.0019)	(0.0027)	(0.0010)	(0.0025)	(0.0023)
Change in Wage of Peers, Job#2 x Job Char	0.0000	0.0228**	-0.0001	0.0405***	0.0002	0.0004*
	(0.0036)	(0.0073)	(0.0034)	(0.0096)	(0.0001)	(0.0002)
Mean Dependent Variable	.0092	.0092	.0092	.0092	.0086	.0086
Observations	58582829	58582829	58582829	58582829	44065192	44065192

Note: This table reports estimates from of our heterogeneity specification displayed in equation (4). In the first panel, the outcome variable is a dummy equal to 1 if we observe a separation from the primary job from quarter t to quarter t+2. In the second panel, the outcome variable is quarter-to-quarter change in the log wage from the primary job, measured for stayers only. "Change in Wage of Peers, Job#2" represents the leave-out change in the wage of the peers of a given individual from her secondary job. "Change in Wage of Peers, Job#2 x Job Char" interacts the latter variable with a demographic characteristic listed on top of each column. "Above median share" is a dummy equal to 1 if the share of an individual's earnings coming from the secondary job is above the corresponding sample median for dual job holders. "Q4 of Sd of Within-Firm-Within-Worker variation in Wage Changes" is constructed as follows: we start by computing the within-firm standard deviation of wage changes among its dual job holders stayers. We then construct quartiles of this standard deviation across firms. Q4 means the top quartile of this measure, hence firms in Q4 have the highest variability in wages changes among its employees. The last two columns intearct our independent variable of interest with tenure from either the primary or secondary job. To minimize issues due to left censoring, we measure tenure starting from 2005. All regression controls for primary employer by quarter fixed effects and a dummy for dual job holders. Standard errors are reported in parentheses and are two-way clustered at the worker and primary employer level.

Table 7: Heterogeneity by Sectors

	Effect on Separation	Effect on Log Wage Change (Stayers Only)
Agriculture	-0.0078	0.0539
	(0.0161)	(0.0470)
Mining, Quarrying, and Oil and Gas Extraction	-0.0199	-0.0069
	(0.0550)	(0.0217)
Utilities	0.0286	0.0005
	(0.0155)	(0.0107)
Construction	-0.0072	-0.0002
	(0.0109)	(0.0100)
Manufacturing	-0.0058	0.0096
	(0.0067)	(0.0063)
Wholesale Trade	0.0009	0.0089
	(0.0083)	(0.0084)
Retail Trade	0.0121	0.0112
	(0.0043)	(0.0046)
Transportation and Warehousing	0.0035	0.0175
	(0.0079)	(0.0074)
Information	-0.0170	-0.0002
	(0.0094)	(0.0059)
Finance and Insurance	-0.0180	0.0308
	(0.0077)	(0.0131)
Real Estate and Rental and Leasing	0.0097	0.0120
	(0.0133)	(0.0150)
Professional, Scientific, and Technical Services	-0.0091	-0.0013
	(0.0087)	(0.0084)
Management of Companies and Enterprises	-0.0136	-0.0172
	(0.0487)	(0.0275)
Administrative Support and Waste Management	-0.0035	0.0053
	(0.0079)	(0.0062)
Health Care and Social Assistance	0.0091	0.0038
	(0.0040)	(0.0021)
Arts, Entertainment, and Recreation	-0.0005	-0.0066
	(0.0105)	(0.0069)
Accommodation and Food Services	0.0186	-0.0008
	(0.0067)	(0.0033)
Other Services (except Public Administration)	0.0073	0.0185
	(0.0094)	(0.0139)

Note: This table reports estimates from equation (1), estimated separately in each sector. Column 1 reports estimates of our proxy for the wage shock from the secondary job on separation between quarter t and quarter t+2. Column 2 reports estimates of our proxy for the wage shock from the secondary job on the change in log wage between t and t+1 among stayers. All regression controls for primary-employer by quarter fixed effects. Standard errors are reported in parentheses and are two-way clustered at the worker and primary-employer level.

A Data Appendix

This appendix first describes the data used in the analysis. It then describes the sample restrictions imposed on the estimation sample.

A.1 Further Description of the Data

The data used in this paper are based on quarterly administrative wage records maintained by the Employment Security Department (ESD) of Washington State to administer the state's unemployment insurance (UI) system. The available quarterly data provide information on earnings and work hours of all workers employed by UI-covered employers in the state between 2001–2014. Workers who drop out of the labor force, become self-employed, work in the underground economy, or move out of state will not appear in the records. This is because self-employed workers are not covered by UI, underground earnings are not reported, and out-of-state earnings will be picked up in the earnings records of another state.

UI-covered employers in Washington are required to report each worker's quarterly earnings and work hours, which allows us to construct an hourly wage rate in each quarter for most workers in Washington's formal labor market; in the analysis, earnings and wage rates are CPI-adjusted using the year 2005 as the base. Each worker's quarterly record also includes an employer identifier and the employer's four-digit North American Industry Classification System (NAICS) code, making it possible to construct employment at both the employer and industry level; see also Lachowska, Mas and Woodbury (2020) for further discussion of Washington administrative wage records.

A.2 Construction of the Estimation Sample

We build the estimation sample using the following steps. We begin by using all the available UI wage records from 2001–2014. Using these data, for every worker in a given quarter, we rank a worker's employer by the number of quarterly work hours (we have also ranked employers by earnings; the coefficient of correlation between the hours- and earning-based rank is 0.95). Using

this ranking, we define a worker's primary employer as the employer with whom she worked the highest number of hours in that quarter. A secondary employer is then defined as the employer with whom the worker worked had the next-highest number of hours in that quarter, and so forth.

In the raw data, 87 percent of jobs are jobs with primary employers (that is, primary jobs), 10 percent are secondary jobs, about 1 percent are tertiary jobs, and less than 0.5 percent are quaternary jobs. We compute several variables using the raw data, for example, a firm's size is the number of all employees in a firm in a quarter. We also compute the number of employers a worker had in each quarter. In the raw data, about 23 percent of workers appear to have more than one employer. However, many such observations are workers transitioning between employers mid-quarter rather than having more than one job for longer than a quarter. Accordingly, in the analysis, we exclude such "partial" quarters of employment; see the sections below. Next, we create two subsamples: a subsample of primary jobs and a subsample of secondary jobs that we merge together to a dataset of dual jobholders.

A.2.1 Primary-Job Subsample

We first set up a panel where, for each worker and quarter, there is one primary employer (as mentioned above, a primary employer is the employer with whom a worker worked the highest number of hours in that quarter). We define full-quarter job spells; that is, quarters of employment bookended with the same primary employer. We do this to avoid including "partial" quarters of employment, which might lead us to believe that a worker holds more than one job in a quarter, when she is transitioning between employers mid-quarter. About 70 percent of all worker-quarter observations are full quarter spells with a primary employer. Note that once we restrict this sample to only include full quarters, this leaves us with only job stayers. Note also that, the full quarter restriction implies for a quarter t to be included in the analysis sample, that the worker must be employed with the same primary employer in $t-1$, t, and $t+1$. Therefore, in order to define separations (a transition from a primary employer to another primary employer or to non-employment), we need to look out to quarter $t+2$. Accordingly, we define separation as having a different pri-

mary employer in quarter $t+2$ or not being employed in $t+2$. We drop observations employed in the Public Sector (Education Services and Public Administration), as well as observations with a missing sector.

A.2.2 Secondary-Job Subsample

To create a dataset of secondary jobs, we set up a panel where, for every worker and quarter, there is one secondary employer. As previously, we restrict this dataset to job spells are full quarters. For secondary jobs, about 19 percent of worker-quarter observations are full quarters. This shows that often what appears to be dual-job holding is actually a worker transitioning between employers mid-quarter.

A.2.3 Leave-Self-Out Averages of Wage Changes

Using the primary job dataset for each worker in each quarter, we compute firm-by-quarter leave-self-out averages of changes in log wages. We winsorize average firm-by-quarter log wage changes at -1 and +1 log points. We then merge these leave-self-out averages of wage changes to each employer in the secondary job stayer dataset.

A.2.4 Dataset of Dual Jobholders

Finally, we merge secondary job dataset to the primary job dataset. This merged dataset includes all workers with either one primary job or workers with a primary and a secondary job. Note that, for workers who do not have a second job, the firm-average change in wages on the non-existent secondary job is set to zero. Once we drop observations where in a given firm-quarter there is no dual jobholder, the estimation sample consists of 58–62 million observations (depending on what outcome is studied) of which about 1.3–1.5 million are observations of dual jobholders.

A.2.5 Demographic Information

State employment security agencies typically record workers' characteristics only when they claim UI. Accordingly, we observe demographic characteristics (year of birth, gender, race, and educa-

tion) only for workers who claimed UI benefits at least once during 2001–2014. For gender and race, we assign an indicator with a constant, modal value over this period. We assign the age of a worker in each quarter based on the worker's year of birth. For education, we assign a constant level if we observe the worker only once (that is, if he or she claimed UI only once); however, if a worker claimed UI more than once, we assign the first observed value of education for all quarters until the quarter in which we observe a change. We observe demographics for about 30 percent of the sample.

B Other Results

This appendix presents summary statistics for the sample with worker demographics as well as the main estimation using this selected sample.

Table A1: Summary Statistics (Workers with Available Demographic Characteristics)

	Workers with only one job	*Dual Jobholders*	
	Primary Job	Primary Job	Secondary Job
Hourly Wage	20.44	15.98	14.96
	(13.42)	(8.86)	(11.39)
Hours	476.79	443.39	129.17
	(131.62)	(142.58)	(113.28)
Earnings	9,815.39	7,094.41	1,685.28
	(6796.12)	(4498.85)	(1641.68)
Separation	0.11	0.13	0.29
	0.31	0.34	0.45
Separation (Job-to-Job)	0.06	0.12	0.12
	0.25	0.32	0.32
Tenure	11.07	9.87	6.64
	(10.36)	(9.50)	(7.01)
Change in Log Hours	0.01	0.01	0.00
	(0.25)	(0.17)	(0.27)
Change in Log Wage	-0.01	0.00	-0.03
	(0.40)	(0.27)	(0.69)
Firm Size	124.14	152.27	166.21
	(846.98)	(1042.54)	(1129.44)
Change in Coworkers Log wage	0.01	0.01	0.01
	(0.14)	(0.13)	(0.14)
Share of Coworkers who are Dual Jobholders	0.05	0.11	0.48
	(0.09)	(0.19)	(0.43)
Share of Total Earnings from Job #2		0.20	0.20
		(0.15)	(0.15)
Female	0.45	0.55	0.55
Age	40.31	41.00	41.00
	(12.30)	(12.21)	(12.21)
College Degree	0.19	0.19	0.19
White	0.72	0.66	0.66
Number of Workers	1,362,973	181,154	181,154
Number of Employers	77,541	73,447	67,424
Number of Quarter-Worker Observations	21,446,913	829,982	829,982

Note: This table provides summary statistics for the subsample of individuals who at some point claimed UI benefits in the Washington State UI system and for whom we can then measure their demographics. In the first column, we only consider worker-quarter observations where the worker is holding only one job. In the second colum, we consider worker-quarter observations where the worker is holding two jobs and we report mean and standard deviation (in round brackets) separately for the primary and the secondary job. All statistics are quarter-worker weighted except for firm size, which is weighted by employer-quarter observations.

Table A2: Heterogeneity by Demographics

	Sample with Demographics	Female	White	Young (Age<30)	Old (Age>40)	College
Outcome: Separation from Job#1						
Change in Wage of Peers, Job#2	0.0003	0.0019	-0.0019	-0.0004	0.0047	0.0036
	(0.0034)	(0.0052)	(0.0063)	(0.0038)	(0.0046)	(0.0041)
Change in Wage of Peers, Job#2 x Demographic		-0.0028	0.0031	0.0023	-0.0107	-0.0125
		(0.0071)	(0.0075)	(0.0091)	(0.0066)	(0.0077)
Mean Dependent Variable	.1078	.1078	.1078	.1078	.1078	.1078
Observations	21187115	21187115	21187115	21187115	21187115	21187115
Outcome: Change of Log Wages in Job#1 (Stayers)						
Change in Wage of Peers, Job#2	0.0081**	0.0102*	0.0138	0.0091**	0.0062	0.0087**
	(0.0028)	(0.0047)	(0.0074)	(0.0032)	(0.0032)	(0.0034)
Change in Wage of Peers, Job#2 x Demographic		-0.0039	-0.0081	-0.0061	0.0044	-0.0026
		(0.0057)	(0.0076)	(0.0056)	(0.0047)	(0.0060)
Mean Dependent Variable	.01	.01	.01	.01	.01	.01
Observations	19210890	19210890	19210890	19210890	19210890	19210890

Note: This table reports estimates from of our heterogeneity specification displayed in equation (4), estimated on the subsample sample of individuals for whom we can measure their demographic characteristics. In the first panel, the outcome variable is a dummy equal to 1 if we observe a separation from the primary job from quarter t to quarter t+2. In the second panel, the outcome variable is quarter-to-quarter change in the log wage from the primary job, measured for stayers only. "Change in Wage of Peers, Job#2" represents the leave-out change in the wage of the peers of a given individual from her secondary job. "Change in Wage of Peers, Job#2 x Demographic" interacts the latter variable with a demographic characteristic listed on top of each column. All regression controls for primary employer by quarter fixed effects, a dummy for dual job holder, a dummy for the characteristic listed in each column, an interaction between that characteristic and the dual job indicator. Standard errors are reported in parentheses and are two-way clustered at the worker and primary employer level.