# Contingent Work versus Traditional Employment: A Story of Flexibility

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**Abstract**

This paper studies what motivates individuals' choices between traditional employment and contingent work and firms' hiring decisions. I document greater dispersion and larger changes in hours worked by contingent workers than by traditional employees, as well as an 11 percent gap in hourly wages. I develop a model where contingent work offers hours flexibility to individuals but traditional employment earns a higher wage. Firms hire traditional employees before observing their TFP and must pay to adjust traditional employment from their previous level. They can hire (less productive) contingent workers flexibly without these constraints. I then test how exogenous changes affect the contingent share of the workforce and the wage gap.

# 1 Introduction

The share of the labor force that does contingent work has been increasing since the early 2000's (Jackson, Looney, and Ramnath, 2017). This includes independent contractors, freelancers, consultants, temporary agency workers, and on-call workers. Firms' usage of these workers has also increased, both at the extensive margin and the intensive margin relative to traditional employees (Lim, Miller, Risch, and Wilking, 2019). However, there is still no consensus in the literature about the main drivers of this trend and whether the increasing prevalence of contingent work is a cause for concern, especially considering the lack of policy protections (like minimum wages and unemployment insurance) and employer-sponsored benefits (such as health insurance and pension plans) that are commonly enjoyed by traditional employees.

This paper studies the economic trade offs faced by individuals when deciding to engage in contingent work and by firms when deciding to hire traditional employees and contingent workers. Using household survey data, I document greater dispersion in hours worked by contingent workers than by traditional employees, and larger changes in the weekly hours worked by contingent workers. In addition, I find that contingent workers' annual income is lower by 33 percent, their hourly wages are lower by 11 percent, and their job spells are 11 weeks shorter on average relative to those of traditional employees.

I develop a model where individuals choose either contingent work or traditional employment each period. The main tradeoff they face is that they can flexibly choose the number of hours to work as a contingent worker, whereas if they choose traditional employment they receive a higher wage but must supply a fixed number of hours. Heterogeneous preferences over hours and idiosyncratic productivity shocks give rise to a mix of contingent workers and traditional employees in the equilibrium of the economy.

Firms in the model also face a tradeoff between hiring traditional employees and contingent workers. Each firm receives a persistent idiosyncratic TFP shock each period. They must choose traditional employees before observing their shock but can hire contingent workers afterwards. This creates an asymmetric distortion as firms that receive a high TFP shock can flexibly adjust total employment upwards while firms that receive a low TFP shock cannot immediately lower their total employment. However, traditional employees are more productive since they are hired first and receive training before production starts. In addition, firms must pay hiring or firing costs to adjust traditional employment from its level in the previous period. This further distort firms' decisions because firms with a high TFP shock can hire contingent workers without paying adjustment costs. In contrast, firms with a low TFP shock have to pay firing costs in order to adjust their employment level downwards.

Based on the current calibration, the model generates a similar but slightly higher contingent share of the workforce and wage gap than is observed in the data. I also test how different exogenous changes to technology or preferences would change the equilibrium outcomes in the model. I find that lowering labor adjustment costs increases the wage gap and lowers the fraction of the workforce that chooses contingent work. This captures the effects of lowering administrative costs of hiring and firing employees, such as those imposed by employment protection legislation in Europe. In contrast, increasing contingent workers' productivity (which represents technological changes that reduce the need for firm-specific human capital) or increasing the volatility of firm TFP shocks has the opposite effect: both reduce the wage gap and increase the contingent share of the workforce. Meanwhile, increasing the variance of individuals' disutility from work (which governs how much labor they supply) increases both the wage gap and the contingent share of the workforce. This exercise lays the groundwork for future work to disentangle the reasons why more workers are engaging in contingent work and why firms are hiring more contingent workers in the U.S. in recent decades.

## 1.1 Literature Review

This paper contributes to the literature that studies the use of contingent work and traditional employment by individuals and firms. Several papers have documented that the share of the U.S. labor force engaged in contingent work has been increasing since the early 2000's. For example, Jackson, Looney, and Ramnath (2017) find that the share of the Social Security Administration workforce with self-employment income (Schedule SE) increased from 10 to 12 percent between 1999 and 2014. They infer that this increase was driven by a surge in independent contractors rather than small business owners, based on additional tax information such as expenses. Similarly, Lim, Miller, Risch, and Wilking (2019) examine administrative IRS data and find that the share of independent contractors with Form 1099-K or 1099-MISC income increased from 9 to 11 percent between 2001 and 2016. They also document that the share of firms that hire independent contractors increased from 21 to 26 percent over the same period, and the share of compensation to independent contractors[1] increased from 14 to 17 percent.

In contrast, Katz and Krueger (2019) find that the Contingent Worker Survey supplement to the Current Population Survey (CPS) showed a slight decline in the share of individuals engaged in contingent work, from 10.7 percent in 2005 to 10.1 percent in 2017. However, Abraham, Haltiwanger, Sandusky, and Spletzer (2018) reconcile these differences: by match-

[1]The share of compensation to independent contractors is the total amount firms paid through Forms 1099-K/MISC divided by the sum through Forms 1099-K/MISC (independent contractors) and Form W-2 (wages and salaries to traditional employees).

ing survey data to administrative records, they show that an increasing share of individuals with self-employment activity in administrative data do not report this activity in surveys. Thus, the discrepancy between trends reported from survey data and from administrative records result from misreporting in surveys. My paper contributes to this literature by disentangling the reasons for the increasing prevalence of contingent work in the U.S. and quantifying their relative importance. In order to explain these trends, I develop a theoretical framework designed to jointly analyze the tradeoffs faced by individuals deciding to engage in contingent work and those of firms choosing to hire contingent workers and traditional employees.

Previous papers studying individuals' decisions include Garin, Jackson, Koustas, and McPherson (2020), Koustas (2018), Mas and Pallais (2017), and Lim (2017). Garin, Jackson, Koustas, and McPherson (2020) and Koustas (2018) find that individuals start freelance work in the online platform economy in order to smooth consumption after receiving low-income shocks in their primary job. Mas and Pallais (2017) conduct an experiment to estimate individuals' value of alternative work arrangements. They find that only a tail of workers are willing to pay for scheduling flexibility, although their analysis was limited to job applicants at a national call center and thus is not necessarily representative of the U.S. workforce. Lim (2017) estimates that young mothers value schedule flexibility in self-employment at $\$7,400$ annually, which is about 25 percent of the average wage and salary earnings among this group. My paper develops a model that incorporates an intensive labor supply decision into the choice to be a contingent worker or traditional employee. To my knowledge, this paper is the first to use nationally representative data to estimate the effect of preferences for schedule flexibility on decisions to engage in contingent work for the U.S. labor force.

On the firm side, Dube and Kaplan (2010) find that firms outsourced janitorial and security guard work in order to reduce compensation to workers. Similarly, Goldschmidt and Schmieder (2017) study German firms that outsource logistics, cleaning, security, and food services. They conclude that firms outsource these labor services to avoid paying establishment-level wage premia to workers outside their core workforce. By surveying private sector establishments, Houseman (2001) finds that, in addition to reducing labor costs, firms hire on-call, contract, and temporary agency workers in order to adjust for workload fluctuations and staffing absences and to screen workers for regular positions. In the model of my paper, firms consider relative wages, productivity risk, and labor adjustment costs when choosing how many traditional employees and contingent workers to hire. I contribute to the literature by using this model to quantify the impact of each of these factors in firms' hiring decisions.

To my knowledge, this paper is the first to consider how individuals' choices to engage in contingent work interact with firms' hiring decisions in general equilibrium. Lim, Miller, Risch, and Wilking (2019) document patterns in the data that suggest the increasing trend in contingent work in the U.S. is driven by a combination of demand- and supply-side factors. Studying both sides in a single theoretical framework allows me to estimate how different exogenous changes have contributed to the trend. Furthermore, an analysis of this model shows how these changes affect equilibrium outcomes such as the gap between wages of traditional employees and contingent workers, the share of the workforce that chooses contingent work, the distribution of hours worked, and the ratio of contingent workers to traditional employees hired by firms. The structure of the model also allows me to study the welfare implications of these changes.

**Layout**

The rest of the paper is organized as follows. Section 2 provides details of the data used in this paper and reports the empirical results about the differences between contingent workers and traditional employees. Section 3 describes the model and equilibrium, while Section 4 discusses the mechanisms of the model. Section 5 describes the calibration and Section 6 presents the main results. Lastly, Section 7 concludes.

# 2 Data

The primary data source used in this paper is the National Longitudinal Survey of Youth 1979 (NLSY79). The NLSY79 is a national panel survey of the cohort of individuals born in the years 1957-1964 and it is administered by the U.S. Bureau of Labor Statistics. The survey was conducted annually between 1979 through 1994, and has been conducted biannually in even-numbered years since then. I mainly use the data starting in 1994 as that was the first year that includes questions about whether an individual worked a contingent job (defined below). I also use the survey's data on individual and household demographics, work characteristics, income, and assets.

Starting in 1994 (and except in 2000), the NLSY79 included questions about whether the respondent was an independent contractor, consultant, freelancer, temporary agency worker, on-call worker, or contract worker at each job they had during the survey period. I define each of a respondent's jobs as *contingent work* if they respond "yes" to any of these questions, and *traditional work* if they responded "no" to any of these questions and are not self-employed. Next, I calculated the total income earned by the respondent from each job they worked since the last survey interview, and defined a respondent's *primary job* as the one that earned them the most income. I then defined a respondent as a *contingent worker* if their primary job was contingent work, and a *traditional employee* if their primary job was traditional work.

Table 1: Summary Statistics

| | Employee Only (1) | Contingent Only (2) | Primary Emp, Also Cont (3) | Primary Cont, Also Emp (4) |
|---|---|---|---|---|
| Observations per Year | 5194 | 263 | 80 | 20 |
| Female | 0.48 | 0.46 | 0.47 | 0.55 |
| White | 0.84 | 0.77 | 0.83 | 0.78 |
| Black | 0.13 | 0.19 | 0.15 | 0.18 |
| Non-White, Non-Black | 0.03 | 0.04 | 0.02 | 0.04 |
| No Degree | 0.09 | 0.14 | 0.08 | 0.07 |
| High School Degree | 0.52 | 0.51 | 0.50 | 0.43 |
| Associate or Junior College | 0.09 | 0.08 | 0.12 | 0.14 |
| Bachelor's Degree | 0.18 | 0.17 | 0.18 | 0.19 |
| Graduate Degree | 0.10 | 0.10 | 0.13 | 0.16 |
| Never Married | 0.14 | 0.18 | 0.14 | 0.21 |
| Married | 0.63 | 0.53 | 0.63 | 0.48 |
| Other Marital Status | 0.23 | 0.28 | 0.23 | 0.31 |
| No Children | 0.40 | 0.47 | 0.39 | 0.45 |
| 1 Child | 0.22 | 0.18 | 0.21 | 0.22 |
| 2 or More Children | 0.38 | 0.34 | 0.41 | 0.34 |
| No Health Insurance | 0.12 | 0.29 | 0.15 | 0.37 |
| Current/Former Employer | 0.64 | 0.26 | 0.51 | 0.29 |
| Spouse's Employer | 0.12 | 0.16 | 0.16 | 0.12 |
| Bought Directly | 0.02 | 0.07 | 0.06 | 0.06 |
| Government Program | 0.03 | 0.08 | 0.04 | 0.02 |
| Other Source | 0.06 | 0.13 | 0.08 | 0.15 |

*Contingent Only* are workers who were independent contractors, consultants, freelancers, temporary agency workers, on-call workers, or contract workers at each of their jobs during the survey period. *Employee Only* includes workers who did not hold any contingent work job and are not self-employed. *Primary Emp, Also Cont* are workers whose primary job (the job that earned them the most income in the survey period) was traditional employment but also held at least one contingent work job. *Primary Cont, Also Emp* are workers whose primary job was contingent work but also held at least one traditional employment job.

Table 1 shows summary statistics of individuals in the NLSY79, categorized by job type. Columns (1) and (2) include individuals who only held traditional employment or contingent jobs, respectively. Column (3) includes individuals whose primary job was traditional employment and also worked at least one contingent job in the survey period, while Column (4) includes individuals who were primarily contingent workers but also had at least one traditional employment job in the survey period. Based on the definition of job types, approximately 5 percent of the individuals in the sample are contingent workers. This share is lower than the 10 percent that has previous studies have reported (Katz and Krueger, 2019; Lim, Miller, Risch, and Wilking, 2019), although this is not surprising as Abraham, Haltiwanger, Sandusky, and Spletzer (2018) find that household survey data usually gives lower estimates of the contingent share than estimates from administrative data due to under-reporting.

Relative to traditional employees, a slightly smaller share of contingent workers are white, married, have at least a high school degree, or have children. This is consistent with previous findings (Gale, Holmes, and John, 2018). In addition, they are less likely to have health insurance, and contingent workers who do have health insurance are less likely to receive it from their employer. The next subsection examines empirical differences between the work characteristics of traditional employment and contingent work that are economically relevant for individuals' decisions over job type.

## 2.1 Income, Wages, and Employment Spells

In this subsection, I examine the differences between income and work characteristics of traditional employees and contingent workers. Table 2 shows the regression results from the following equation:

$$\begin{aligned} Y_{it} = \alpha &+ \beta_1 ContOnly_{it} + \beta_2 EmpPrim\&ContSec_{it} \\ &+ \beta_3 ContPrim\&EmpSec_{it} + \beta_4 X_{it} + \gamma_i + \theta_t + \epsilon_{it} \end{aligned} \tag{1}$$

where $i$ denotes households and $t$ denotes the interview year. The dependent variable $Y_{it}$ is the log of the individual's real annual income ($\ln(AnnInc_{it})$, the log of the real hourly wage in the primary job ($\ln(Wage_{it})$), and the number of weeks worked in the primary job ($WksInJob_{it}$) in the respective regressions. $ContOnly_{it}$ is an indicator variable for whether the individual only worked contingent jobs since the last survey interview, $EmpPrim\&ContSec_{it}$ is an indicator variable for whether the individual is primarily a traditional employee but also had contingent work, and $ContPrim\&EmpSec_{it}$ is an indicator variable for whether the individual is primarily a contingent worker but also had a traditional employment job. Thus, the primary coefficients of interest are $\beta_1$, $\beta_2$, and $\beta_3$ as they show the difference in the dependent variables for these groups of workers relative to individuals who only worked traditional employment jobs. The remaining terms are a vector of demographic characteristics[2] $X_{it}$, an individual fixed effect $\gamma_i$, a time fixed effect $\theta_t$, and the residual $\epsilon_{it}$.

The first two columns of Table 2 show that individuals who work any contingent job earn less income than individuals who only have traditional employment jobs. In particular, individuals earn 32.6 percent less per year if they only work in contingent jobs, even after accounting for individual fixed effects. The difference is slightly lower for individuals who are primarily contingent workers but have traditional employment (18.1 percent) and those who are primarily traditional employees with some contingent work (8.4 percent) The magnitude of these differences is about twice as large when individual fixed effects are excluded, as in Column (1). This suggests there is some selection into who chooses to work contingent jobs. Nevertheless, even after controlling for the unobserved heterogeneity, the differences

[2]The demographic characteristics included in $X_{it}$ include the individual's sex, race, education, marital status, and a quadratic in age. In the regressions with individual fixed effects, the sex and race variables are removed from $X_{it}$ as they do not change over time.

in annual income for contingent workers remains both statistically and economically significant.

Table 2: Coefficients from Regressions on Work Characteristics

| | $\ln(AnnInc)$ | | $\ln(Wage)$ | | $WksInJob$ | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *ContOnly* | −0.632*** | −0.326*** | −0.232*** | −0.108*** | −20.40*** | −10.98*** |
| | (0.032) | (0.027) | (0.021) | (0.019) | (1.702) | (2.069) |
| *Emp&Cont* | −0.168*** | −0.084* | −0.026 | −0.032 | 4.87 | 6.44** |
| | (0.044) | (0.038) | (0.026) | (0.022) | (3.987) | (3.122) |
| *Cont&Emp* | −0.286*** | −0.181* | −0.057 | −0.003 | −1.42 | −1.53 |
| | (0.084) | (0.083) | (0.070) | (0.053) | (−0.247) | (10.062) |
| Demographics | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Individual FE | No | Yes | No | Yes | No | Yes |
| $R^2$ | 0.247 | 0.690 | 0.187 | 0.615 | 0.070 | 0.256 |
| N | 55252 | 54626 | 59732 | 59241 | 61011 | 60530 |

Statistically significant at the: *10% level **5% level ***1% level

Huber-White standard errors are in parentheses. Person-level survey weights were used in all regressions. *ContOnly* is a dummy variable for workers who only held contingent jobs in the survey period, *Emp&Cont* indicates workers whose primary job was traditional employment but also held at least one contingent job, and *Cont&Emp* indicates workers whose primary job was contingent work but also held at least one traditional employment job. Thus, coefficients denote differences from only traditional employees.

Next, I analyze how much of the difference in annual income for contingent workers comes from differences in hourly wages, job spell length, and hours worked. Columns (3) and (4) show regression results when the dependent variable is the log of the worker's hourly wage from their primary job, and the dependent variable in columns (5) and (6) is the spell length of the individual's primary job (in weeks). The first row of Column (4) shows that individuals who work only contingent jobs have about a 10.8 percent lower hourly wage and their primary job spell was about 11 weeks shorter, relative to individuals who only have traditional employment. This is a difference of 11.8 percent as the spell length for only traditional employees is 93 weeks. These differences in the hourly wage and job spell length are both statistically and economically significant, and they help explain the lower annual income for individuals only working contingent jobs. This contrasts with the results for individuals with both traditional employment and contingent work. Their hourly wages and job spell lengths are not statistically different from those of individuals with only traditional employment.

## 2.2 Hours Flexibility

Now, I examine the weekly hours of only traditional employees and only contingent workers. On average, both types work approximately 40 hours per week, which is a standard, full-time work week in the U.S. However, the standard deviation for contingent workers is 17 hours, while the standard deviation for traditional employees is 11 hours. The left panel of Figure 1 shows a visual representation of these hours distributions. Looking at the red bars, approximately 50 percent of individuals who are only traditional employees work 40-45 hours per week in their primary job, and an additional 20 percent work 45-55 hours per week. In comparison, the distribution for individuals who are only contingent workers (the light gray bars) is much less concentrated around the standard, full-time workweek. While the greatest share of these workers also falls into the 40-45 hours per week bin, this share is only 35 percent. Furthermore, 50 percent of only contingent workers are fairly evenly distributed over the intervals of less than 40 hours or more than 55 hours per week. Thus, it is more common for contingent workers to work either part-time or over-time, compared to traditional employees who generally have standard, full-time work weeks.

I next consider the possibility that individuals supplement their hours by working multiple jobs. The right panel of Figure 1 displays the distributions of total hours worked per week,

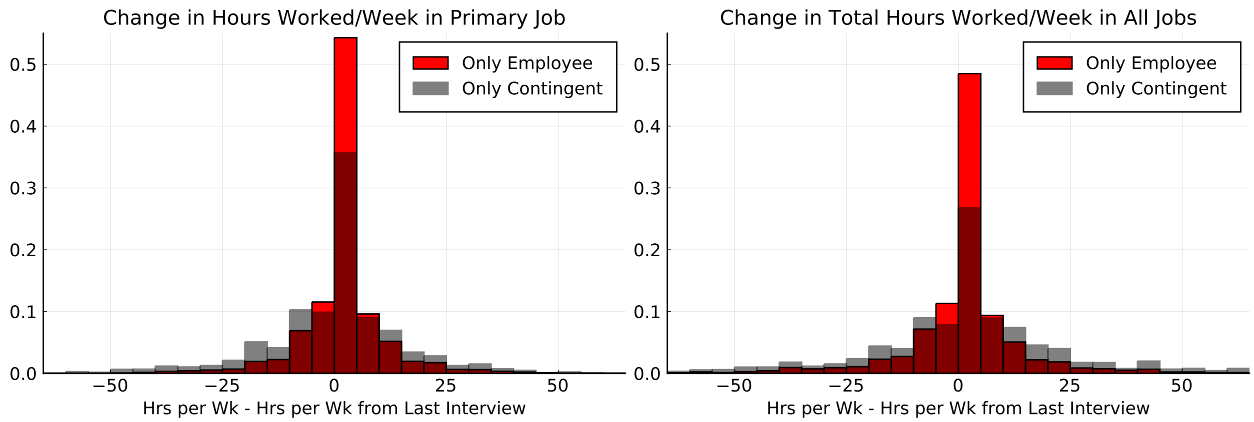
Figure 1: Distribution of Hours Worked, by Job Type


*Only contingent* are workers who were independent contractors, consultants, freelancers, temporary agency workers, on-call workers, or contract workers at each of their jobs during the survey period. *Only employee* includes workers who did not hold any contingent work job and are not self-employed.

which includes hours worked in the primary job and in secondary jobs whose with job spells overlapping with the primary job spell. Contingent workers and traditional employees both work 44 total hours per week on average. The standard deviation of contingent workers is 27 hours, which is nearly double the standard deviation of 15 hours for traditional employees. In addition, the figure shows that total hours is even more uniformly distributed for contingent workers than when considering hours only in the primary job, while the distribution for traditional employees remains mostly unchanged. Thus, the differences in the hours distributions between the two types of workers become even starker when considering both primary and secondary jobs.

The evidence up to this point indicates that contingent workers are more likely to work either part-time or over-time. Now look at whether individuals have more flexibility to change their hours from one period to the next. Figure 2 shows the distribution of the change in hours worked per week, where the change is between the current and previous survey periods (a two-year lag). The left panel includes hours worked in the primary job while the right panel considers total hours worked in all jobs. Most individuals with only

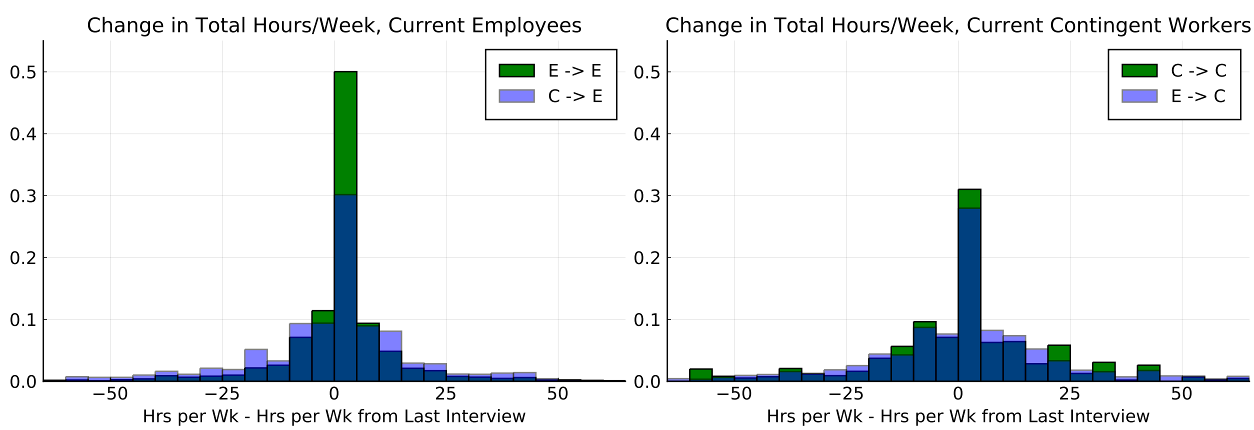
Figure 2: Distribution of Change in Hours Worked, by Job Type




*Only contingent* are workers who were independent contractors, consultants, freelancers, temporary agency workers, on-call workers, or contract workers at each of their jobs during the survey period. *Only employee* includes workers who did not hold any contingent work job and are not self-employed.

traditional employment work the same number of weekly hours from one survey period to the next since their distribution in both panels is concentrated around 0. The distribution for only contingent workers shows that a greater share of these workers have larger changes in hours (in magnitude). This shows that there is greater volatility in the hours worked by contingent workers from one period to the next.

Figure 3: Distribution of Change in Hours Worked for Stayers vs Movers, by Job Type




*Contingent workers* (C) are individuals who were independent contractors, consultants, freelancers, temporary agency workers, on-call workers, or contract workers at each of their jobs during the survey period. *Employee* (E) includes workers who did not hold any contingent work job and are not self-employed.

Figure 3 further divides the distributions of change in total hours based on whether individuals had the same job type (dark green bars) or opposite job type (light blue bars) in the previous survey period. The distributions for individuals who were contingent workers in both periods or traditional employees in both periods are slightly more concentrated around 0 but remain largely unchanged. What is interesting to note is that the distribution for individuals who were contingent workers in both periods is very similar to the distributions for individuals who switched job type (in either direction). These results suggest that it may be easier for contingent workers to adjust their hours than it is for traditional employees.

The data show that contingent workers have lower income, earn lower hourly wages and have a higher dispersion in both weeks and weekly hours worked. The model in the following section captures these features as results of optimal individual behavior in an environment where workers differ in their valuation of leisure and firms, who are subject to productivity shocks, face a trade-off between hiring flexible contingent labor hours and rigid, more productive traditional employees.

# 3 Model

This section presents a model of the labor market for traditional employees and contingent workers. Individuals choose whether to work as a traditional employee or a contingent worker. If they decide to be a contingent worker, they also get to make an intensive labor supply choice and are compensated at the contingent worker wage. Traditional employees must work a fixed, given number of hours. Thus, individuals face a trade-off between hours flexibility and wages.

Firms have persistent idiosyncratic TFP shocks and they choose their labor inputs to maximize the present discounted value of profits. They hire traditional employees before their idiosyncratic TFP is realized, while they can choose contingent worker hours after they receive their productivity shock. Since traditional employees are hired first, firms have time to train them before production starts. In contrast, contingent workers must spend some of their time on the job to train and thus have lower productivity. In equilibrium, this productivity difference supports higher wages for traditional employees. This gives rise to the trade-off individuals face between hours flexibility and higher wages. In addition, firms must pay hiring or firing costs in order to adjust their level of traditional employment from their choice in the previous period. Thus, firms face a trade-off between productivity, ability to adjust their workforce after observing their TFP shock, and administrative costs to adjust their number of traditional employees. Wages for traditional employees and contingent workers are determined in separate Walrasian markets.

## 3.1 Environment

Time is discrete and continues forever. The economy is populated by overlapping generations of finitely-lived individuals. Each period $t$, a continuum of individuals of measure $\varphi$ is born. Each individual $i$ draws a type $\theta_i$ from a distribution $G_1(\theta)$, which is fixed over their lifetime and governs their disutility from work. At each age $s$ of their lifetime, individuals get an idiosyncratic productivity shock $z_{i,s,t} \sim G_{2,s}\left(z \mid z_{i,s-1,t-1}\right)$. These productivity shocks are perfectly observable by firms, and so individuals who work $n$ hours are compensated for their $z_{i,s,t}n$ effective hours. Individuals also receive i.i.d. taste shocks $\epsilon = \left(\epsilon^E, \epsilon^C\right) \sim G_3(\epsilon)$ over job types and choose whether to work as a traditional employee or contingent worker[3].

[3] Assuming that individuals receive taste shocks over job type is a computational convenience to smooth the continuation value in their Stage 2 optimization problems, as in McFadden (1973) and Iskhakov, Jørgensen, Rust, and Schjerning (2017). So long as the variance of the distribution of taste shocks is

Contingent workers choose how much labor to supply $n^C_{i,s,t} \in [0, H]$ for that period and earn wage $w^C_t$. Traditional employees must supply a fixed amount of labor $\tilde{n}^E$ at wage $w^E_t$. All individuals additionally choose consumption $c_{i,s,t}$ and assets $a_{i,s+1,t+1}$ to maximize their expected sum of periodical utilities $u(c, n; \theta)$, discounted by the factor $\beta \in (0, 1)$.

The economy also has a continuum of firms of measure $\varphi_F$. Each firm receives an idiosyncratic TFP shock $z^F_t \sim G_4\left(z^F_t \mid z^F_{t-1}\right)$, which depends on the firm's shock $z^F_{t-1}$ in the previous period. Firms produce output according to the production function $f\left(\ell^E_t, \ell^C_t\right)$, where $\ell^E_t$ and $\ell^C_t$ are the number of traditional employee and contingent worker hours hired[4], respectively. Traditional employees are more productive. However, firms must choose $\ell^E_t$ knowing only the distribution $G_4(\cdot \mid z^F_{-1})$, whereas they can choose $\ell^C_t$ after observing their $z^F_t$ for the period. In addition, firms pay hiring or firing costs $\phi\left(\ell^E_{-1}, \ell^E\right)$ to adjust traditional employment from their level in the previous period $\ell^E_{-1}$. These administrative costs are a waste. Firm owners are risk neutral and infinitely-lived, and so they seek to maximize the expected sum of profits, discounted by the rate $\frac{1}{1+r}$.

## 3.2 Timing

As previously mentioned, time is discrete. Each period is divided into two stages. At the beginning of Stage 1, a new cohort of individuals is born. Individuals are born with initial assets $a_1$ and draw their type $\theta_i \sim G_1(\theta)$. All individuals receive their idiosyncratic productivity shock; newborns draw from the unconditional distribution $G_{2,1}(z)$. Each individual

small enough, this assumption will not drive the main results.

[4] Firms are not restricted to hiring an integer number of workers or all of the hours supplied by a given individual. In addition, firms have perfect information about an individual's idiosyncratic productivity and wages are paid per effective hour. Thus, $\ell^E_t$ and $\ell^C_t$ actually denote the effective hours that a firm hires. While a traditional employee must supply a fixed number of hours $\tilde{n}^E$, these hours can be divided among many firms. This assumption is a simplification to avoid keeping track of firm-worker matches that does not affect the essential trade-offs that the model is meant to highlight.

then receives their taste shock over job type and chooses whether to enter the contingent worker market or the traditional employee market. Firms choose how many traditional employee hours to hire, given their previous period's traditional employment choice and TFP shock. At the end of Stage 1, the wage $w^E$ clears the market for traditional employees and firms pay their employment adjustment costs.

In Stage 2, individuals in the contingent worker market choose how much labor to supply. Firms observe their idiosyncratic productivity for the period. They then choose how many contingent worker hours to hire and the wage $w^C$ clears the market for contingent workers. Firms produce output and pay wages, and individuals consume based on their consumption and asset decisions. At the end of the period, all jobs separate and individuals die with probability $\delta_s$.

## 3.3 Individuals' Problem

This subsection presents individuals' decision problems; I will suppress subscripts $i$, $s$, and $t$ when they are not needed for clarity. First, consider an individual at the beginning of Stage 1. They know their age $s$, type $\theta$, and assets $a$ that they saved from the previous period, and they receive their taste shock $\epsilon = \left(\epsilon^E, \epsilon^C\right)$ for traditional employment and contingent work. Their productivity shock $z$ is also realized, whose log is the sum of a deterministic component in age and a stochastic component that follows a Markov chain. Given their state $(a, s, z, \epsilon; \theta)$, the individual chooses which market to enter by solving:

$$V\left(a, s, z, \epsilon; \theta\right) = \max_{j \in \{E,C\}} \left\{ \mathbb{I}_{\{j=E\}} \left(V^E(a, s, z; \theta) + \epsilon^E\right), \mathbb{I}_{\{j=C\}} \left(V^C(a, s, z; \theta) + \epsilon^C\right) \right\} \tag{2}$$

where $V^E$ and $V^C$ are the value functions of traditional employees and contingent workers, respectively.

In Stage 2, contingent workers take their state $(a, s, z; \theta)$ as given and choose consumption $c$, assets $a'$, and how much labor to supply $n$ to solve the following problem:

$$V^C(a, s, z; \theta) = \max_{c, a', n^C} u\left(c, n^C; \theta\right) + (1 - \delta_s)\beta \mathbb{E}_{z', \epsilon'}\left[V(a', s+1, z', \epsilon'; \theta) \;\middle|\; z\right] + \delta_s \beta V^d(a') \quad (3)$$

$$\begin{aligned}
\text{s.t.} \qquad & c + a' = w^C z n^C + (1 + r)a \\
& c \geq 0 \\
& a' \geq \bar{A} \\
& H \geq n^C \geq 0
\end{aligned}$$

where $\delta_s$ is the probability of dying at age $s$, and $V^d(a')$ is the value of dying with bequests $a'$. Traditional employees solve a similar problem, although they take their labor supply $\tilde{n}^E$ as given and only choose consumption $c$ and assets $a'$. Their Stage 2 problem is:

$$V^E(a, s, z; \theta) = \max_{c, a'} u(c, \tilde{n}^E; \theta) + (1 - \delta_s)\beta \mathbb{E}_{z', \epsilon'}\left[V(a', s+1, z', \epsilon'; \theta) \;\middle|\; z\right] + \delta_s \beta V^d(a') \quad (4)$$

$$\begin{aligned}
\text{s.t.} \qquad & c + a' = w^E z \tilde{n}^E + (1 + r)a \\
& c \geq 0 \\
& a' \geq \bar{A} \\
& H \geq \tilde{n}^E \geq 0 \qquad \text{given}
\end{aligned}$$

### 3.3.1 Preferences

The period utility function is

$$u(c, n; \theta) = \frac{c^{1-\gamma} - 1}{1 - \gamma} - \theta \frac{n^{1+\nu}}{1 + \nu} \quad (5)$$

as in Heathcote, Storesletten, and Violante (2014). $\gamma$ represents the inverse of the intertemporal elasticity of substitution for consumption, $\nu$ controls the elasticity of labor supply.

These parameters are common among individuals. The parameter $\theta$ governors the weight on an individual's disutility from work. It varies among the population but remains fixed throughout a given individual's life. As an individual's ideal labor supply depends on their $\theta$ type, this parameter is important for determining the cross-sectional distribution over job types and hours.

Individuals have a "warm glow" motive to leave bequests, as in Andreoni (1989). Following De Nardi (2004) and French (2005), the functional form for the utility derived from leaving bequests $a$ is:

$$V^d(a) = \frac{\theta_b (a+K)^{1-\gamma}}{1-\gamma} \tag{6}$$

The parameter $\theta_b$ affects the weight of the bequest motive, while $K$ determines the curvature of the bequest function. In particular, when $K = 0$, the individual would get infinite disutility if they left non-negative bequests, while their utility would be finite if $K > 0$.

### 3.4 Firms' Problem

Now, I present the firms' problems. Each firm enters the period knowing their previous period's shock $z_{-1}^F$ and traditional employment level $\ell_{-1}^E$. In Stage 1, they choose how many traditional employees $\ell^E$ to hire for this period in order to maximize expected profits, before observing their TFP shock $z^F$ for the period. Since this productivity shock follows a Markov chain, the firm's Stage 1 value function $V^{F1}\left(z_{-1}^F, \ell_{-1}^E\right)$ can be written as:

$$V^{F1}\left(z_{-1}^F, \ell_{-1}^E\right) = \max_{\ell^E \geq 0} \int V^{F2}\left(z^F, \ell^E\right) dG_4\left(z^F \mid z_{-1}^F\right) - \phi\left(\ell_{-1}^E, \ell^E\right) \tag{7}$$

where $V^{F2}\left(z^F, \ell^E\right)$ is the firm's value function in the second stage. At the beginning of Stage 2, the firm observes its TFP shock $z^F$. They take their choice for traditional employees as given and choose contingent worker hours to solve the following problem:

$$V^{F2}\left(z^F, \ell^E\right) = \max_{\ell^C \geq 0} z^F f\left(\ell^E, \ell^C\right) - w^E \ell^E - w^C \ell^C + \beta V^{F1}\left(z^F, \ell^E\right) \tag{8}$$

### 3.4.1 Production Function

I assume that the firm production function takes the following form:

$$f\left(\ell^E, \ell^C\right) = \left(\ell^E + \lambda \ell^C\right)^{\alpha} \tag{9}$$

where $\lambda, \alpha \in (0, 1)$. Traditional employees and contingent workers are perfect substitutes in production, up to the factor $\lambda$. This parameter represents the share of working time that contingent workers must spend for on-the-job training; traditional employees receive this training when they are hired in Stage 1, before production begins. The parameter $\alpha$ governs the curvature of the production function.

## 3.5 Firm Labor Adjustment Costs

In the model, firms must pay administrative hiring or firing costs to adjust their traditional employment $\ell^E$ from its level in the previous period $\ell^E_{-1}$. Following the prior literature (Hall, 2004; Ejarque and Portugal, 2007) this adjustment cost takes the form:

$$\phi\left(\ell^E_{-1}, \ell^E\right) = \frac{\phi}{2} \frac{\left(\ell^E_{-1} - \ell^E\right)^2}{\ell^E_{-1}} \tag{10}$$

This form implies that adjustment costs are convex in the net change in traditional employment and have constant returns to scale. As a result, firms would prefer to spread out adjustments to traditional employment over several periods rather than making large changes in a single period. The $\ell^E_{-1}$ in the denominator implies that for a given net change, firms with high levels of traditional employment in the previous period have lower adjustment costs. This represents the idea that large firms might maintain a separate division to handle hiring and firing within the firm, and so these administrative duties would be carried out more efficiently and thus at a lower cost.

### 3.6 Equilibrium

**Definition 3.1.** A *recursive competitive equilibrium* in the economy is value functions and policy functions for individuals and firms, wages $\{w^E, w^C\}$, a distribution $\Omega$ of individuals over states $x \equiv (a, s, z; \theta)$, and a distribution $\Psi$ of firms over states $x_{-1}^F \equiv \left(z_{-1}^F, \ell_{-1}^E\right)$, such that:

1. given wages and the distributions, the value functions and policy functions solve the individuals' problems in (2), (3), and (4), and the firms' problems in (7) and (8)
2. the distribution $\Omega$ is derived from individuals' policy functions, initial assets $a_0$, and the exogenous processes of productivity shocks $z$, taste shocks $\epsilon$ over job type, death $\{\delta_s\}_{s=1}^S$, and individual types $\theta$
3. the distribution $\Psi$ is derived from firms' policy functions and the exogenous process of TFP productivity shocks $z^F$
4. the wage $w^E$ is such that the market for traditional employees clears:
$$\varphi_F \int \ell^E \left(x_{-1}^F\right) d\Psi \left(x_{-1}^F\right) = \varphi \tilde{n}^E \int \int z \mathbb{I}_{\{j(x,\epsilon)=E\}} d\Omega(x) dG_3(\epsilon)$$
5. the wage $w^C$ is such that the market for contingent workers clears:
$$\varphi_F \int \int \ell^C \left(z^F, \ell^E \left(x_{-1}^F\right)\right) dG_4 \left(z^F \mid z_{-1}^F\right) d\Psi \left(x_{-1}^F\right) = \varphi \int \int z n^C(x) \mathbb{I}_{\{j(x,\epsilon)=C\}} d\Omega(x) dG_3(\epsilon)$$

# 4 Discussion of Mechanisms

This section discusses the main mechanisms and assumptions in the model. For individuals, the main force that drives their decision over job type is the tradeoff they face between higher wages as a traditional employee and the flexibility to marginally adjust their labor supply if they decide to be a contingent worker. For firms, they must make hiring decisions that take into account 1) the marginal products of traditional employees versus contingent workers relative to their wages, 2) the risk involved in choosing traditional employees before observing their TFP shock and then hiring less productive contingent workers afterward if needed, and 3) administrative costs incurred for adjusting traditional employment from its level in the last period and potential adjustment costs in the following period. Each of these forces are analyzed below.

## 4.1 Individuals: Flexibility versus Wages

In Stage 1 of the model, individuals choose whether to be a traditional employee or a contingent worker. This decision only affects their job type in the current period as all jobs separate at the end of each period[5]. The main factors they consider is that they will receive a higher wage if they choose to be a traditional employee, but they will be able to choose labor hours as a contingent worker. (Individuals will also consider their taste shocks over job types. For this discussion, I assume that the variance of the distribution for taste shocks is so small that they have little influence on individuals' Stage 1 decisions.) Their decision will then depend on the wage gap between $w^C$ and $w^E$, their current productivity shock $z$, and their idiosyncratic weight $\theta_i$ on the disutility from work.

[5]Individuals' job choice in the current period will only influence next period's job type decision indirectly through asset holdings.

In order to illustrate how these factors affect the job choice, I assume for this discussion that individuals' utility function is slightly different than the calibration in subsection 3.3.1[6]:

$$u(c, n; \theta) = \frac{1}{1-\gamma}\left(c - \theta \frac{n^{1+\nu}}{1+\nu}\right)^{1-\gamma} \tag{11}$$

as in Greenwood, Hercowitz, and Huffman (1988). As before, the parameters $\gamma \geq 1$ and $\nu > 0$ are common among individuals while $\theta > 0$ is heterogeneous among the population but fixed across an individual's lifetime.

Individuals who chose to be contingent workers will decide how many labor hours to supply by solving their problem (3). The first order conditions give the following (interior) solution for labor hours:

$$n^{C*} = \left(\frac{w^C z}{\theta}\right)^{\frac{1}{\nu}} \tag{12}$$

Since $\nu > 0$, a contingent worker's optimal labor supply is increasing in their wage $w^C$ and productivity $z$ and decreasing in $\theta$. This makes sense since higher values of $\theta$ means the individual gets more disutility from work. Similarly, if traditional employees were able to choose their labor supply, the solution would be:

$$n^{E*} = \left(\frac{w^E z}{\theta}\right)^{\frac{1}{\nu}} \tag{13}$$

Recall that $\tilde{n}^E$ denotes the given labor hours that an individual must supply if they decide to be a traditional employee. When the productivity shock $z$ and wage $w^E$ is such that the desired $n^{E*}$ that solves equation (13) is very close to $\tilde{n}^E$, then the individual would gain little extra value from being able to choose labor hours as a contingent worker. Thus, for a given productivity shock $z$, individuals with a $\theta^* = \frac{w^E z}{(\tilde{n}^E)^\nu}$ will choose traditional employment.

[6]Using GHH preferences for this discussion simplifies the first order conditions used to solve for an individual's labor supply. However, the same arguments hold true when utility is additively separable in consumption and labor.

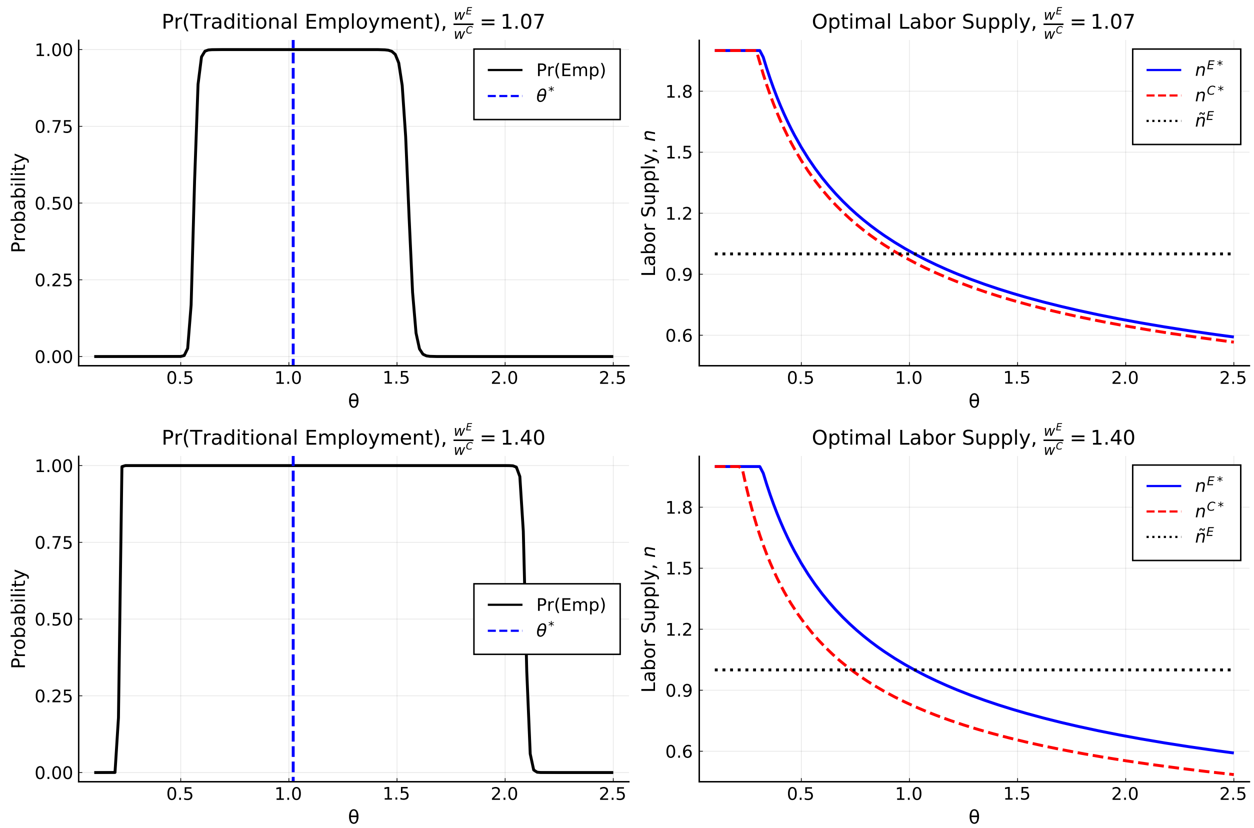
Individuals with $\theta$ above this $\theta^*$ would want to work fewer hours than $\tilde{n}^E$, while individuals with a lower $\theta$ would want to work more hours. However, since $w^E > w^C$, individuals with $\theta$ close enough to $\theta^*$ will still be willing to work the fixed number of hours $\tilde{n}^E$ since the wage difference is enough to overcome their disutility from deviating from $n^{E*}$. For individuals with a substantially higher or lower $\theta$, the utility loss from working a fixed number of hours different from their $n^{E*}$ will be too large to compensate for the higher wage. As a result, there will be some cutoffs $\underline{\theta}, \overline{\theta}$ such that an individual will choose traditional employment if $\underline{\theta} \leq \theta \leq \overline{\theta}$ and contingent work otherwise. Furthermore, as the wage gap between $w^E$ and $w^C$ grows larger, the extra income will incentivize more individuals to choose traditional employment: $\underline{\theta}$ will decrease while $\overline{\theta}$ will increase. Figure 4 illustrates these ideas.

The solid black line in the left panels of Figure 4 show the logit probability that an individual chooses traditional employment[7] as a function of their weight on the disutility of work $\theta$, for a fixed state ($a = 4.0, s = 30, z = 0.9$) and with GHH preferences[8]. The right panels of Figure 4 show the labor that traditional employees would supply if they were able to choose their hours (solid blue line) and contingent workers' labor supply (red dashed line), relative to traditional employees' required labor supply $\tilde{n}^E = 1$ (black dotted line). The traditional employee wage is $w^E = 1.4$. The wage gap $\frac{w^E}{w^C}$ is 1.07 in the top panels and 1.40 in the bottom panels. The traditional employee's desired labor supply $n^{E*}$ intersects with their required labor supply $\tilde{n}^E$ at $\theta^*_z = 1.02$ (dashed blue line in the left panels). The top left panel shows that individuals with $\theta \in [0.55, 1.5]$ would choose traditional employment

[7]The left hand panels are probabilities over the discrete choice of being a traditional employee or a contingent worker due to the assumption that individuals receive taste shocks over job type. Here, I have set the variance of the Type 1 extreme value distribution to 0.001 so the taste shocks have little influence over the job type decision.

[8]These comparative statics also follow for a utility function that is additively separable in consumption and labor.

Figure 4: Probability of Choosing Traditional Employment and Optimal Labor Supply




The right panels show the optimal labor supply at the traditional employment wage (solid blue line) and the contingent work wage (dashed red line) relative to the hours that traditional employees must supply (horizontal dotted black line). The solid black line in the left panels shows the logit probability of choosing traditional employment as a function of the weight on disutility from work, for a fixed state and with GHH preferences. The vertical dashed blue line shows the $\theta^*$ where $n^{E*}$ and $\tilde{n}^E$ intersect. The wage gap is larger in the bottom panels, which causes individuals to choose traditional employment for a larger range of $\theta$.

in order to receive the higher wage, even though they would have to work a sub-optimal number of hours. Individuals outside this range choose contingent work so they can work either substantially more or substantially fewer hours than $\tilde{n}^E$. The wage gap is larger in the bottom panels. As discussed above, this increases the range of $\theta$ over which individuals choose to be traditional employees.

## 4.2 Firms: Tradeoff between Productivity and Wages

This subsection discuss the tradeoffs firms face when choosing how many traditional employees and contingent workers to hire. As is standard, they weigh the marginal product of an additional unit of labor against the marginal cost. First, consider a simpler environment where firms can choose both traditional employment and contingent worker hours after observing their TFP productivity parameter and without any labor adjustment costs. Then, firm's profit maximization problem would be:

$$\tilde{V}^F\left(z^F_{-1}\right) = \max_{\ell^E,\ell^C} z^F\left(\ell^E + \lambda\ell^C\right)^\alpha - w^E\ell^E - w^C\ell^C + \beta\mathbb{E}\left[\tilde{V}^F\left(z^F\right)\ \middle|\ z^F_{-1}\right] \tag{14}$$

In this specification, firms hire traditional employees and contingent workers simultaneously, and the value function no longer depends on the traditional employment level in the previous period because I have assumed there are no adjustment costs. Because traditional employees and contingent workers are perfect substitutes up to the parameter $\lambda \in (0,1)$, the first order conditions show that firms will hire only contingent workers if $\lambda > \frac{w^C}{w^E}$, and only traditional employees if $\lambda < \frac{w^C}{w^E}$.

Since the adjustment costs and timing assumptions (that traditional employees must be chosen before drawing the TFP shock) in the main model constrain the use of traditional employees but not contingent workers, if $\lambda > \frac{w^C}{w^E}$, firms will continue to hire only contingent workers, regardless of the magnitude of adjustment costs or the distribution of firm shocks. Unlike in the simplified model, however, when $\lambda < \frac{w^C}{w^E}$ firms may hire a combination of traditional employees and contingent workers. For the remainder of this section, I assume that $\lambda < \frac{w^C}{w^E}$ and discuss the effects of the additional assumptions on firms' hiring decisions.

## 4.3 Firms: Timing of Hiring Decisions

Next, I consider a model where firms must hire traditional employees before observing their TFP shock $z^F$ but can hire contingent workers afterward. Since I am assuming $\lambda < \frac{w^C}{w^E}$, firms would ideally like to use only traditional employees. However, if they hire a large number of traditional employees and end up receiving a low TFP shock, they will not be able to adjust total labor downward. Thus, firms will make their Stage 1 decision by balancing the higher marginal productivity of traditional employees against the inability to adjust labor downward in case they observe a low TFP shock. Knowing that contingent workers can always be hired to increase total employment in Stage 2 (if they observe a high TFP shock), firms will choose to hire fewer traditional employees in Stage 1.

To see this, consider the firm's Stage 1 problem in this simplified model:

$$\hat{V}^{F1}\left(z_{-1}^F\right) = \max_{\ell^E \geq 0} \int V^{F2}\left(z^F, \ell^E\right) dG_4\left(z^F \mid z_{-1}^F\right) \tag{15}$$

Their Stage 2 problem would be the same as equation (8) in the full model, except that the continuation value does not depend on $\ell^E$:

$$\hat{V}^{F2}\left(z^F, \ell^E\right) = \max_{\ell^C \geq 0} z^F \left(\ell^E + \lambda \ell^C\right)^\alpha - w^E \ell^E - w^C \ell^C + \beta V^{F1}\left(z^F\right) \tag{16}$$

First, note that under the assumption that $\lambda < \frac{w^C}{w^E}$, the firm will hire at least as many traditional employees as they would want to in the event that they receive the lowest TFP shock. Then, the the first order condition of the maximization problem in (16) shows that, given their choice for $\ell^E$ and shock $z^F$, a firm's hiring decision for contingent workers is

$$\ell^C\left(z^F, \ell^E\right) = \max\left\{\lambda^{\frac{\alpha}{1-\alpha}} \left(\frac{\alpha z^F}{w^C}\right)^{\frac{1}{1-\alpha}} - \frac{\ell^E}{\lambda}, 0\right\} \tag{17}$$

Since $\alpha, \lambda \in (0,1)$, the hiring decision $\ell^C\left(z^F, \ell^E\right)$ is increasing in $z^F$ and decreasing in $\ell^E$.

For low enough values of $\ell^E$ or high enough values of $z^F$, the firm will hire a positive number of contingent worker hours, while for high values of $\ell^E$ or low values of $z^F$, the firm will only hire traditional employees. Furthermore, for a fixed hiring choice of $\ell^E$, there will be a cutoff $\hat{z}^F$ such that $\ell^C\left(\hat{z}^F, \ell^E\right)$ is just 0. This cutoff is given by:

$$\hat{z}^F\left(\ell^E\right) = \frac{\left(\ell^E\right)^{1-\alpha} w^C}{\lambda\alpha} \tag{18}$$

Next, I substitute the solution for $\ell^C\left(z^F, \ell^E\right)$ into the firm's value functions and then use the cutoff $\hat{z}^F$ to split the integral in (15) based on whether the firm will hire only traditional employees (low TFP shocks) or a combination of worker types (high TFP shocks):

$$\begin{aligned}\hat{V}^{F1}\left(z_{-1}^F\right) = &\int_{\underline{z}^F}^{\hat{z}^F\left(\ell^E\right)} \left[z^F\left(\ell^E\right)^\alpha\right] dG_4\left(z^F \mid z_{-1}^F\right) \\ &+ \int_{\hat{z}^F\left(\ell^E\right)}^{\overline{z}^F} \left[z^F\left(\frac{\lambda\alpha z^F}{w^C}\right)^{\frac{\alpha}{1-\alpha}} - w^C\left(\lambda^{\frac{\alpha}{1-\alpha}}\left(\frac{\alpha z^F}{w^C}\right)^{\frac{1}{1-\alpha}} - \frac{\ell^E}{\lambda}\right)\right] dG_4\left(z^F \mid z_{-1}^F\right) \\ &- w^E\ell^E + \beta\int_{\underline{z}^F}^{\overline{z}^F} \hat{V}^{F1}\left(z^F\right) dG_4\left(z^F \mid z_{-1}^F\right)\end{aligned} \tag{19}$$

Using Leibniz's Integral Rule and the form for $\hat{z}^F$ given by equation (18) shows that the first order condition for $\ell^E$ is:

$$\int_{\hat{z}^F\left(\ell^E\right)}^{\overline{z}^F} \left(\frac{w^C}{\lambda} - w^E\right) g_4\left(z^F \mid z_{-1}^F\right) dz^F = \int_{\underline{z}^F}^{\hat{z}^F\left(\ell^E\right)} \left(w^E - z^F\frac{\alpha}{\left(\ell^E\right)^{1-\alpha}}\right) g_4\left(z^F \mid z_{-1}^F\right) dz^F \tag{20}$$

Equation (20) shows that firms balance the difference between the effective wages of contingent workers and traditional employees in the event that they receive a high enough TFP shock to hire contingent workers (the left hand side), against the difference between traditional employees' wage and their expected marginal product in case the firm draws a low TFP shock (the right hand side).

## 4.4 Firms: Labor Adjustment Costs

Lastly, I show how labor adjustment costs affect firms' hiring decisions. When firms must pay administrative costs to adjust their traditional employment level, they may choose an $\ell^E$ that is different from what the relative wages and productivity parameters would otherwise imply (without adjustment costs) based on the state $\ell_{-1}^E$. They will also consider how their choice for traditional employment in the current period will affect profits in the following period since their current choice will affect next period's adjustment costs. Furthermore, when a high enough shock $z^F$ is realized such that traditional employment is below its ideal level, firms continue to have the option of using contingent workers to flexibly supplement their total employment.

To see this, it is useful to consider again a model where firms hire both types of labor after observing their TFP shock but with adjustment costs for traditional employment. A firm that had traditional employment $\ell_{-1}^E$ last period and draws TFP shock $z^F$ will solve the following problem:

$$\begin{aligned} \bar{V}^F\left(z^F, \ell_{-1}^E\right) = \max_{\ell^E, \ell^C} \; & z^F\left(\ell^E + \lambda \ell^C\right)^\alpha - w^E \ell^E - w^C \ell^C \\ & - \frac{\phi}{2} \frac{\left(\ell_{-1}^E - \ell^E\right)^2}{\ell_{-1}^E} + \beta \int \bar{V}^F\left(z_{+1}^F, \ell^E\right) dG_4\left(z_{+1}^F \mid z^F\right) \end{aligned} \tag{21}$$

where $z_{+1}^F$ is a TFP shock in the following period. Combining the Envelope Condition and the first order conditions with respect to $\ell^E$ and $\ell^C$, the firm's choice for traditional employees solves the following nonlinear equation:

$$0 = \frac{w^C - \mu^C}{\lambda} - w^E + \phi\left(1 - \frac{\ell^E}{\ell_{-1}^E}\right) + \beta \frac{\phi}{2} \int \left[1 - \left(\frac{\ell_{+1}^E\left(z_{+1}^F, \ell^E\right)}{\ell^E}\right)^2\right] dG_4\left(z_{+1}^F \mid z^F\right) \tag{22}$$

where $\mu^C = w^C - \lambda \alpha z^F\left(\ell^E + \lambda \ell^C\right)^{\alpha - 1}$ is the multiplier on the contingent worker non-negativity constraint and $\ell_{+1}^E\left(z_{+1}^F, \ell^E\right)$ is the policy function for traditional employment in the next period as a function of this period's traditional employment level and next period's TFP shock. There is also the complementary slackness condition:

$$\ell^C \geq 0 \text{ w.e. } \iff \mu^C > 0 \tag{23}$$

Suppose that a firm draws some high TFP shock, $z^F_{high}$. Since I am still assuming that $\lambda < \frac{w^C}{w^E}$, if $\phi = 0$ (no adjustment costs), then the firm would not hire any contingent workers and would hire traditional employees in the amount of $\ell^E = \left(\frac{\alpha z^F_{high}}{w^E}\right)^{\frac{1}{1-\alpha}}$. Now, further suppose that the firm's traditional employment from the previous period $\ell^E_{-1}$ is substantially lower than this amount. If $\phi > 0$, then the firm will incur administrative hiring costs to increase its traditional employment to its desired level. Consequently, the firm will hire $\ell^E < \left(\frac{\alpha z^F_{high}}{w^E}\right)^{\frac{1}{1-\alpha}}$ and will supplement its total employment by hiring contingent workers.

The exact choice for $\ell^E$ solves equation (22) with $\mu^C = 0$. This equation balances the effective wage of a contingent worker ($\frac{w^C}{\lambda}$), the marginal cost of a traditional employee in the current period ($-w^E + \phi\left(1 - \frac{\ell^E}{\ell^E_{-1}}\right)$), and the expected marginal cost next period of adjusting traditional employment from its current level. The firm will then choose contingent workers $\ell^C = \lambda^{\frac{\alpha}{1-\alpha}}\left(\frac{\alpha z^F_{high}}{w^C}\right)^{\frac{1}{1-\alpha}} - \frac{\ell^E}{\lambda}$. In this case, contingent workers provide flexibility to the firm to increase its total employment level after receiving the high TFP shock while spreading traditional employment adjustment costs across several periods.

Now, consider a firm that draws a low TFP shock, $z^F_{low}$. Without labor adjustment costs ($\phi = 0$), the firm would choose $\ell^E = \left(\frac{\alpha z^F_{low}}{w^E}\right)^{\frac{1}{1-\alpha}}$. If the firm came into the period with a higher level of traditional employment $\ell^E_{-1}$, then it will have to pay firing costs to adjust its employment level downward. As a result, it will hire $\ell^E > \left(\frac{\alpha z^F_{low}}{w^E}\right)^{\frac{1}{1-\alpha}}$ traditional employees. Since the employment level is already higher than the ideal level, the firm will not hire any contingent workers. Thus, after setting $\ell^C = 0$ and substituting in for the form of $\mu^C$, equation (22) becomes:

$$\alpha z_{low}^F \left(\ell^E\right)^{\alpha-1} = w^E - \phi\left(1 - \frac{\ell^E}{\ell_{-1}^E}\right) - \beta\frac{\phi}{2}\int\left[1 - \left(\frac{\ell_{+1}^E\left(z_{+1}^F, \ell^E\right)}{\ell^E}\right)^2\right] dG_4\left(z_{+1}^F \mid z_{low}^F\right) \quad (24)$$

The hiring choice for traditional employment $\ell^E$ solves equation (24). It will balance the marginal product of traditional employees against the sum of the marginal cost in the current period and the expected marginal cost of adjusting traditional employment next period. Unlike in the first case with high TFP shocks, the ability to flexibly hire contingent workers does not help firms that draw low TFP shocks and are stuck with employment levels that are too high. Due to this asymmetric distortion, firms will hire fewer traditional employees in the stationary distribution of the economy with labor adjustment costs; the aggregate demand of traditional employees will be lower and the aggregate demand of contingent workers will be positive.

# 5 Calibration

This section presents the calibration of the model parameters and functional forms. The model period is one year and I assume the discount factor is consistent with an annual interest rate of 4 percent. Individuals are born at age 20 and leave the model (die) with certainty at age $S = 80$. I assume that $\theta \sim Uniform(0.5, 1.5)$, which I discretize with a grid of 21 evenly spaced points. The fixed labor supply of traditional employees is $\tilde{n}^E = 1$ and I allow contingent workers to supply up to twice as many hours. Table 3 summarizes the remaining parameter values used to solve the model.

Table 3: Model Parameters

| Parameter | Description | Value |
|---|---|---|
| $\gamma$ | Consumption intertemporal elasticity of substitution | 2.0 |
| $\nu$ | Elasticity of labor supply | 1.7 |
| $\theta$ distribution | Weight of an individual's disutility from work | Uniform(1.0,2.0) |
| $S$ | Maximum age of an individual (born at 20) | 80 |
| $\tilde{n}^E$ | Labor hours of traditional employees | 1.0 |
| $H$ | Maximum hours contingent workers can supply | 2.0 |
| $\bar{A}$ | Borrowing constraint for individuals | 0.0 |
| $K$ | Bequest function curvature | 1.0 |
| $\theta_b$ | Scaling of bequest motive | 0.05 |
| $\varphi$ | Measure of cohorts at birth | 1.0 |
| $\sigma_\epsilon$ | Variance of taste shock distribution | 0.1 |
| $\mu_\eta$ | Mean of individuals' productivity shocks | 1.0 |
| $\sigma_\eta$ | Variance of individuals' productivity shocks | 0.35 |
| $\rho_\eta$ | Persistence of individuals' productivity shocks | 0.8 |
| $r_a$ | Annual interest rate | 0.04 |
| $\beta$ | Discount factor of individuals and firm owners | $\frac{1}{1+r}$ |
| $\alpha$ | Production function curvature | 0.66 |
| $\lambda$ | Share of contingent worker time spent producing | 0.65 |
| $\phi$ | Scale of traditional employee adjustment cost | 1.5 |
| $\varphi_F$ | Measure of firms | 10.0 |
| $\mu_{z^F}$ | Firm TFP shock, AR(1) mean | 1.0 |
| $\sigma_{z^F}$ | Firm TFP shock, AR(1) variance | 0.35 |
| $\rho_{z^F}$ | Firm TFP shock, AR(1) persistence | 0.8 |

## 5.1 Individuals' Productivity Shocks

Each period, individuals receive a productivity shock $z$. The log of this shock is the sum of a deterministic component $\mu_s$ (a quadratic in age) and a stochastic component $\eta$ that follows an AR(1) process with innovations distributed normally. When a new cohort is born at age 20, each individual draws their initial $\eta_{i,19}$ from a Normal distribution. The productivity shock $z$ follows the process:

$$\log(z_{i,s}) = \mu_s + \eta_{i,s} \tag{25}$$

$$\eta_{i,s} = \rho\eta_{i,s-1} + \xi_{i,s} \qquad \text{for } s = 20, ..., S \tag{26}$$

$$\xi_{i,s} \sim N(\mu_\xi, \sigma_\xi)$$

$$\eta_{i,19} \sim N(\mu_{19}, \sigma_{19})$$

In order to solve the model, I discretize the AR(1) process for individual's productivity shocks using Rouwenhorst's (1995) method and 11 grid points. I assume that the initial distribution for $\eta_{i,19}$ has the unconditional mean $\mu_{19} = \frac{\mu_\xi}{1-\rho}$ and variance $\sigma_{19}^2 = \frac{\sigma_\xi^2}{1-\rho^2}$ of the AR(1) process in equation (26).

## 5.2 Individuals' Taste Shocks

Following the literature on discrete choices as in McFadden (1973), I assume that the individuals' taste shocks over job types are drawn i.i.d. from the Type 1 extreme value distribution with scale parameter $\sigma_\epsilon$. For a given state $(a, s, z; \theta)$, the expectation over the individual's Stage 1 problem in (2) is given by the log-sum formula:

$$\mathbb{E}_\epsilon\left[V(a, s, z, \epsilon; \theta)\right] = \sigma_\epsilon \log\left[\exp\left(\frac{V^E(a, s, z; \theta)}{\sigma_\epsilon}\right) + \exp\left(\frac{V^C(a, s, z; \theta)}{\sigma_\epsilon}\right)\right] \tag{27}$$

The logit choice probability that an individual chooses a given job type, conditional on their state, takes the following form:

$$P\left(j \mid a, s, z; \theta\right) = \frac{\exp\left(\frac{V^j(a,s,z;\theta)}{\sigma_\epsilon}\right)}{\exp\left(\frac{V^E(a,s,z;\theta)}{\sigma_\epsilon}\right) + \exp\left(\frac{V^C(a,s,z;\theta)}{\sigma_\epsilon}\right)}, \qquad j \in \{E, C\} \tag{28}$$

I use these formulas to calculate the expected continuation value when solving the contingent worker's problem in (3) and the traditional employee's problem in (4).

## 5.3 Firm TFP Shocks

As discussed in Subsection 3.1, firm TFP shocks are persistent and i.i.d. across firms. Now, I further assume that the log of TFP shocks follow an AR(1) process with innovations distributed normally. This process is described as follows:

$$\log\left(z_t^F\right) = \rho_{z^F} \log\left(z_{t-1}^F\right) + \xi_t^F \tag{29}$$

$$\xi_t^F \sim N(\mu_{\xi^F}, \sigma_{\xi^F})$$

When solving the model, I discretize the AR(1) process for $\log\left(z^F\right)$ using Tauchen's (1986) method and 51 grid points[9].

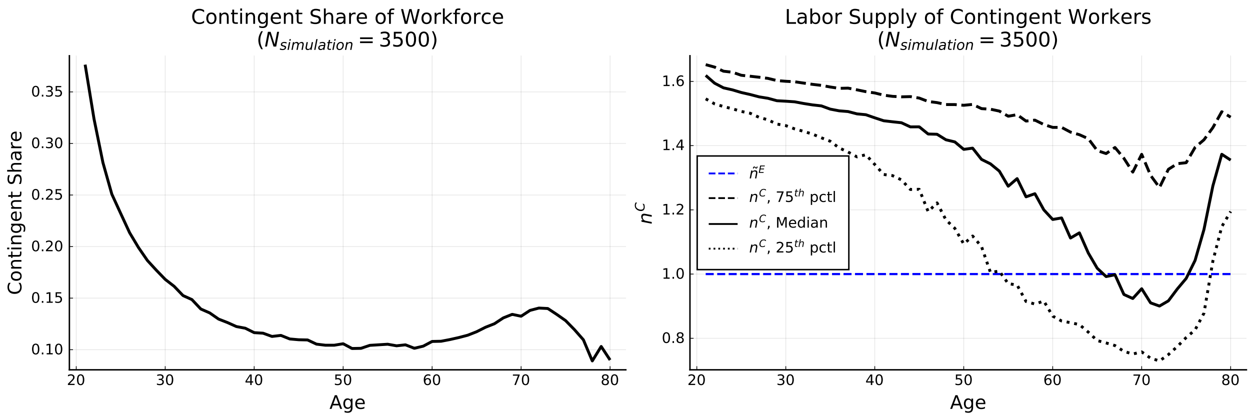
# 6 Results

## 6.1 Contingent Work across the Life Cycle

I now turn to the main results of my model. The left panel of Figure 5 shows the share of individuals who choose to be contingent workers at each age after solving the model for the equilibrium wages and running a simulation of 3,500 individuals. According to this figure, the probability that an individual is a contingent worker is decreasing in age until about 60, at which point the probability again increases. This is consistent with the findings in Bidwell and Briscoe (2009) that individuals are more likely to work as independent contractors early in their careers or later as they near retirement.

[9] I use Tauchen's (1986) method to discretize the AR(1) process for firms' TFP shocks in order to have a fine grid (51 points with bounds 3 standard deviations above and below the unconditional mean) so I can find a reasonable approximation to the stationary distribution of firms. Meanwhile, using a course grid with 11 points for individuals' productivity shocks does not significantly affect the results. Thus, I use Rouwenhorst's (1995) method to discretize this process as Kopecky and Suen (2010) find that this method better matches the conditional and unconditional moments.

Figure 5: Contingent Share and Labor Supply across the Life Cycle (Model)




The left panel shows the life cycle profile of the share of individuals who choose contingent work in the model. The right panel shows the median (solid line), $25^{th}$ percentile (dotted line), and $75^{th}$ percentile (dashed line) of hours supplied by contingent workers at each age relative to the required labor supply of traditional employees (horizontal line). The simulations for these figures includes 3,500 individuals.

The right panel of Figure 5 helps shed light on the life cycle profile of contingent work choices. This figure shows the median (solid line), $25^{th}$ percentile (dotted line), and $75^{th}$ percentile (dashed line) of contingent workers' labor hours at each age relative to traditional employees' required labor supply $\tilde{n}^E = 1$ (horizontal blue dashed line). Early in their careers, individuals who choose contingent work do so in order to work extra hours: since $\tilde{n}^E$ represents a standard full-time, 40 hours per week job, then most contingent workers in the model are working about 60 to 65 hours per week at age 20. This results from the wealth effects on the labor supply. Unlike in Subsection 4.1, here I assume that preferences are additively separable in consumption and labor as described in Subsection 3.3.1, which means the equation for intratemporal substitution between consumption and labor is:

$$n = \left(\frac{w^C z}{\theta c^\gamma}\right)^{\frac{1}{\nu}} \tag{30}$$

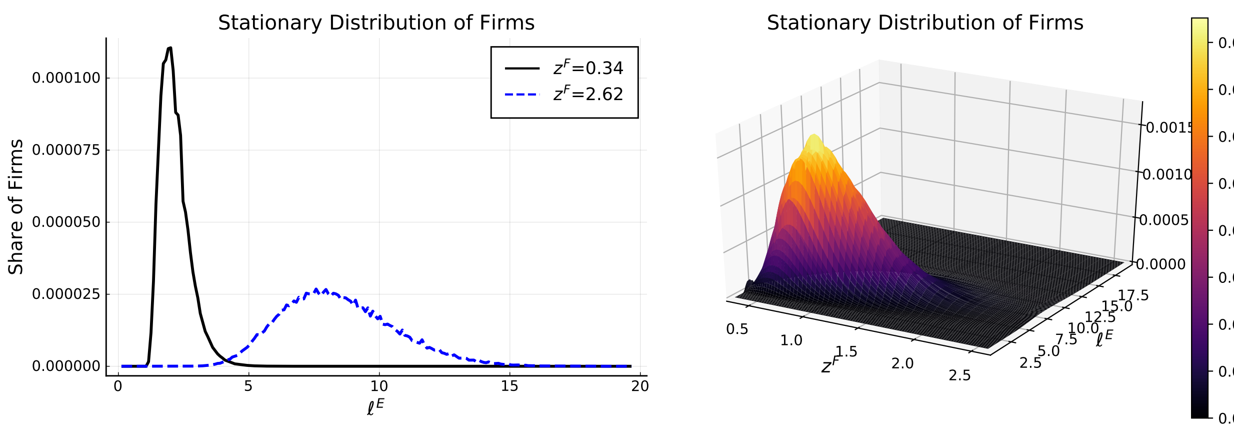
when the solution is interior. Since individuals are born with low asset levels and I have imposed a zero borrowing constraint, individuals want to work more hours at the beginning of their career so they can 1) increase consumption and 2) build up asset holdings to insure against idiosyncratic productivity risk. As their assets increase over their lifetime (through ages 50 to 55), individuals' ideal hours decrease and they more satisfied with working a standard, full-time job. Towards the end of the career, the increase in the share of contingent workers is driven mainly by wealthy individuals who want to work fewer hours. This is consistent with the literature on how individuals use bridge jobs to phase into retirement (Cahill, Giandrea, and Quinn, 2011; James, Swanberg, and McKechnie, 2007).

## 6.2 Stationary Distribution of Firms

I next look at the stationary distribution of firms that results in equilibrium. It is instructive to first consider the distribution that would result if firms were able to hire traditional employees *after* observing their TFP shock and did not have to pay adjustment costs. In this case, all firms with a given shock $z^F$ would choose the same traditional employment level $\ell^{E*}(z^F)$. For a $z^F$, the distribution would be degenerate with the entire mass of firms that receive $z^F$ at $\ell^{E*}(z^F)$. Similarly, if firms had to hire traditional employees *before* observing their TFP shock but still had no adjustment costs, then all firms that came into the period with a given $z^F_{-1}$ would choose the same traditional employment level $\ell^{E*}(z^F_{-1})$. For a given $z^F$ slice of the distribution, there would be a mass of firms at $\ell^{E*}(z^F_{-1})$ for each shock $z^F_{-1}$, where the share of firms in the mass would be the transition probability $\pi_{z^F_{-1},z^F}$.

Once we assume that firms have labor adjustment costs, a firm's choice for traditional employment will depend on both the TFP shock and the traditional employment level in the previous period, which itself depends on the history of shocks and traditional employment choices in all preceding periods. The Markov assumption for the shocks allows us to summarize this history with the pair $\left(z^F, \ell^E\right)$. The right panel of Figure 6 shows the stationary distribution of firms across realizations for TFP shocks and stocks of traditional employment. The left panel shows the slices of this distribution for the lowest TFP shock $z^F = 0.34$ (black solid line) and the highest TFP shock $z^F = 2.62$ (blue dashed line). Given the assumptions I have made for the stochastic process of $z^F$, the unconditional probability of receiving these shocks is the same and so the integral under the curves is also the same. However, the distribution of firms across $\ell^E$ is much more disperse for the high shock than the low shock.

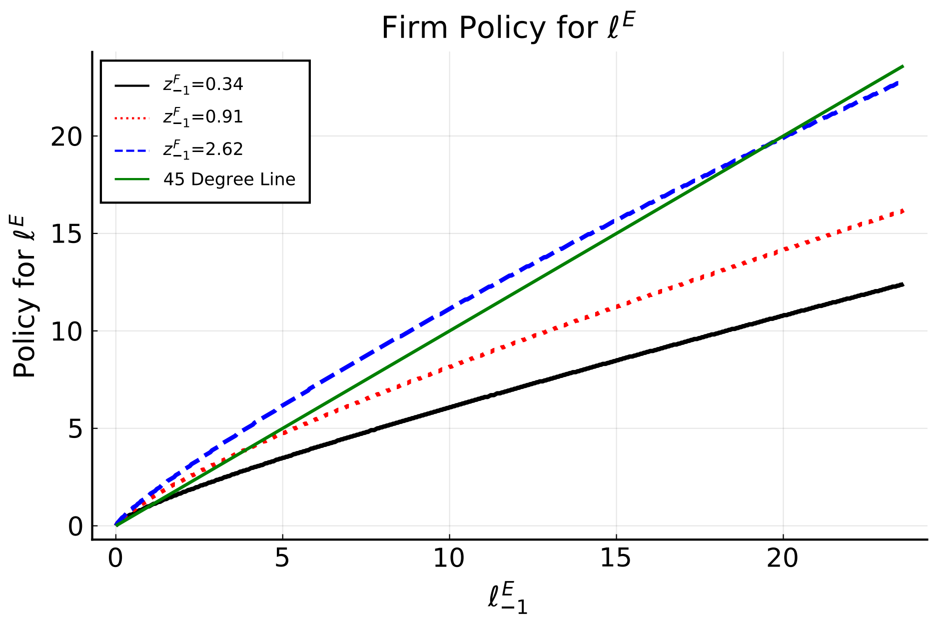
Figure 6: Stationary Distribution of Firms across TFP Shocks and Stocks of Traditional Employment (Model)




These figures show the stationary distribution of firms across TFP shocks and stocks of traditional employment. The left panel shows slices of this distribution for the lowest (solid black line) and highest (dashed blue line) shocks.

To understand this difference in the dispersion, first consider a firm with a stock of traditional employees $\ell^E = 5$ that gets the low $z^F = 0.34$ shock. The firm is over-employed. To see this, note that at $\ell^E_{-1} = 5$, the solid black line (the $z^F_{-1} = 0.34$ policy function) in Figure 7 is below the 45-degree line. If the firm continued to receive the low TFP shock, it would eventually converge to $\ell^E = 2$ (where the black line intersects the 45-degree line in Figure 7). Although adjusting traditional employment is costly, the $z^F_{-1} = 0.34$ policy function shows that even firms that start out with a high level of traditional employment will end up close to $\ell_{low}^{E*}$ after just a few periods with the low shock. Consequently, the $z^F = 0.34$ slice of the distribution in Figure 6 is fairly concentrated near $\ell_{low}^{E*}$.

Figure 7: Firm Policy Function for Traditional Employment




This figure shows the firm policy function for how many traditional employees to hire based on their previous traditional employment level $\ell_{-1}^{E}$ if they had the lowest (solid black line), medium (dotted red line), or highest (dashed blue line) TFP shock in the last period. The solid green line is the 45-degree line.

Now, consider another firm with $\ell^E = 5$ but who receives the high $z^F = 2.62$ shock. They are underemployed as the steady state employment level with the high shock is $\ell_{high}^{E*} \approx 20$. Since shocks are persistent, it is likely that they will receive $z_{high}^{F}$ against next period, so the firm will adjust toward $\ell_{high}^{E*}$. However, adjusting the total workforce upward is less costly since the firm can hire contingent workers to do so. As a result, their traditional employee level adjusts more gradually than for firms with low productivity shocks and they can spread the adjustment cost over many periods. This can be seen by comparing the dashed blue line (high shock policy function) with the solid black line (low shock policy function) in Figure 7. As a result, the distribution of firms with the $z_{high}^{F} = 2.62$ shock is much more disperse across traditional employment levels in Figure 6, and barely any firms ever approach $\ell_{high}^{E*}$.

## 6.3 Comparative Statics

In this subsection, I examine how the equilibrium outcomes change as I change the parameters governing labor adjustment costs, contingent workers' relative productivity, the distribution of individuals' $\theta$ shocks, and the stochastic TFP process. I am particularly interested in how these changes affect the equilibrium wages $w^E$ and $w^C$, the wage gap $\frac{w^E}{w^C}$, the share of individuals who choose contingent work, the aggregate traditional employee effective hours $\ell^E$, and the aggregate contingent worker effective hours $\ell^C$. The results are summarized in Table 4.

Row (1) shows the results for the baseline calibration from Table 3. The model produces the empirical result that the wage of traditional employees is higher than the wage of contingent workers. However, the wage gap of 1.185 in the model is larger than the wage gap of 1.108 in the data[10] in Table 2. The model correctly generates that the majority of individuals are traditional employees. However, the share of contingent workers (14 percent) is slightly higher than the share (10 percent) commonly reported in the data (Katz and Krueger, 2019; Lim, Miller, Risch, and Wilking, 2019).

Table 4: Results with Different Parameters

| | Model Specification | $w^E$ | $w^C$ | $\frac{w^E}{w^C}$ | Contingent Share | Agg. $\ell^E$ | Agg. $\ell^C$ |
|---|---|---|---|---|---|---|---|
| (1) | Baseline from Table 3 | 0.389 | 0.329 | 1.185 | 0.14 | 45.0 | 9.0 |
| (2) | Base & $\phi = 0.15$ | 0.398 | 0.327 | 1.218 | 0.09 | 47.3 | 5.7 |
| (3) | Base & $\lambda = 0.80$ | 0.393 | 0.358 | 1.098 | 0.35 | 34.6 | 22.0 |
| (4) | Base & $\rho_{z^F} = 0.3$ | 0.382 | 0.330 | 1.157 | 0.20 | 42.2 | 12.7 |
| (5) | Base & $\sigma_{z^F} = 0.70$ | 0.437 | 0.415 | 1.054 | 0.47 | 28.2 | 28.0 |
| (6) | Base & $\theta \sim Uniform(0.5, 1.5)$ | 0.386 | 0.304 | 1.269 | 0.20 | 42.0 | 16.6 |
| (7) | Base & $\theta \sim Uniform(1.5, 2.5)$ | 0.391 | 0.342 | 1.142 | 0.12 | 45.5 | 6.3 |
| (8) | Base & $\theta \sim Uniform(0.5, 2.5)$ | 0.388 | 0.315 | 1.231 | 0.17 | 43.5 | 12.7 |

This table summarizes the effects of changing parameters in the model. In the baseline calibration (Row 1), $\phi = 1.5$, $\lambda = 0.65$, $\rho_{z^F} = 0.8$, $\sigma_{z^F} = 0.35$, and $\theta \sim Uniform(1.0, 2.0)$.

[10] I have not yet estimated the model parameters to fit these data moments.

### 6.3.1 Lower Adjustment Costs $\phi$

In Row (2), I examine how decreasing the scale parameter $\phi$ of labor adjustment costs from 1.5 to 0.15 affects the equilibrium. Since lowering the adjustment cost lowers the overall cost of hiring traditional employees, firms increase their demand for traditional employees and lower their demand for contingent workers, which increases $w^E$ and decreases $w^C$. Due to the larger wage gap, the share of individuals who choose contingent work decreases from 14 to 9 percent.

### 6.3.2 Higher Productivity $\lambda$ of Contingent Workers

Recall that $\lambda$ represents the fraction of a contingent worker's hours that are spent producing output, while $1 - \lambda$ is their time spent for on-the-job training. Thus, increasing $\lambda$ from 0.65 to 0.80 increases contingent workers' relative productivity. As a result, firms hire more contingent workers and are willing to pay them higher wages, which reduces the wage gap and attracts more individuals into choosing contingent work.

### 6.3.3 Changes to the Firm TFP Shock Process

Lastly, I examine the results after changing the stochastic process for firms' TFP shocks. Row (4) reports the results when the persistence of the AR(1) process is changed from 0.8 to 0.3, while Row (5) presents the results after increasing the unconditional standard deviation of the distribution from from 0.35 to 0.7. In both cases, a firm's TFP shock from the previous period $z^F_{-1}$ provides less information about their TFP shock in the current period $z^F$. Since firms must choose traditional employment before observing $z^F$, they will hire less $\ell^E$ since they could always adjust total employment upward by hiring contingent workers if they receive a high TFP shock. As a result, aggregate traditional employment demanded decreases while aggregate contingent work demanded increases.

When the persistence $\rho_{z^F}$ decreases, this decreases $w^E$ and increases $w^C$, which decreases the wage gap and pulls more people into contingent work. When instead the variance of the TFP distribution increases, more firms have either very high or very low shocks. While the aggregate demand for traditional employment decreases, the firms with very high TFP shocks (who hire the most traditional employees) drive the wage $w^E$ of traditional employees up. However, since the wage of contingent workers increases by an even greater proportion, the overall wage gap decreases which again increases the contingent share of the workforce.

### 6.3.4 Changes to Distribution of $\theta$

I assume that individuals draw the weight $\theta$ on the disutility from labor when they are born, so this parameter is fixed across an individual's lifetime but heterogeneous among the population. In my baseline calibration, individuals draw $\theta$ from a $Uniform$ with support $[1.0, 2.0]$. For this comparative static, I continue to assume that $\theta$ is uniformly distributed but I change the support.

Row (6) shows the results when I decrease the support to $[0.5, 1.5]$. This decreases the mean to 1.0 but the variance remains the same. Since individuals with a low $\theta$ get less disutility from working, the share of the population who wants to work more hours than $\tilde{n}^E$ increases. This increases the share of the workforce that chooses contingent work and the aggregate hours supplied in the contingent market, which puts downward pressure on the wage $w^C$ and creates a larger wage gap.

When I instead increase the support for $\theta$ to $[1.5, 2.5]$, the mean of the distribution is higher and so on average individuals want to work fewer hours. There are now more individuals at the top of the distribution who want to be contingent workers so they can supply fewer hours than $\tilde{n}^E$. However, there are also fewer individuals with a low $\theta$ who would want to supply more hours as contingent workers. The net effect is a lower contingent share and a reduction of total contingent worker hours supplied, which causes upward pressure on the wage $w^C$.

In Row (8), I consider a mean-preserving spread, where now $\theta \sim Uniform(0.5, 2.5)$. Each moment reported in Row (8) is between the results from the baseline calibration in Row (1) and those from lowering the mean in Row (6). The effects from decreasing the lower bound of the support dominates the effects from increasing the upper bound, which results in a higher share of contingent workers and a larger wage gap.

# 7 Conclusion

In this paper, I documented greater dispersion in hours worked by contingent workers than by traditional employees. I also documented larger changes in the weekly hours worked by contingent workers. In addition, I found that on average contingent workers' annual income is lower by 33 percent, their hourly wages are lower by 11 percent, and their job spells are 11 weeks shorter relative to those of traditional employees.

I developed a model where individuals choose to be either contingent workers (so they can flexibly choose hours) or traditional employees (to receive a higher hourly wage). Firms choose how many hours of each labor type to hire. When making this decision, firms take into account 1) the marginal products of traditional employees versus contingent workers relative to their wages, 2) the risk involved in choosing traditional employees before observing their TFP shock and then hiring less productive contingent workers afterward if needed, and 3) administrative costs incurred for adjusting traditional employment from one period to the next. Based on the current calibration, the model generates a similar but slightly higher contingent share of the workforce and wage gap than I observe in the data.

Using this model, I also tested how different exogenous changes to technology or preferences change the equilibrium outcomes. Lowering labor adjustment costs increases the wage gap and lowers the fraction of the workforce that chooses contingent work, while increasing contingent workers' productivity or increasing the volatility of firm TFP shocks has the opposite effect. Meanwhile, increasing the variance of individuals' disutility from work (which governs how much labor they supply) increases both the wage gap and the contingent share of the workforce. This exercise will be useful for future work to disentangle the reasons why contingent work has become more prevalent in the U.S. in recent decades.

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