Wage Differentials and the Price of Workplace Flexibility

Marshall Drake	Neil Thakral	Linh T. Tô
Capital One	Brown University	Boston University

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Abstract

This paper studies the distribution of workplace flexibility in the labor market and its sources. We collect information on which workers have workplace flexibility along three dimensions, flexible location, flexible scheduling of hours, and flexible total number of hours worked. Low-wage workers can choose to work part-time more flexibly but have a significant disadvantage when it comes to flexible location and scheduling. We overcome challenges in measuring individual-level willingness-to-pay (WTP) by using an adaptive discrete choice experiment, finding WTP for all three dimensions of workplace flexibility to be relatively flat across the wage distribution. Differences in preferences thus cannot account for the facts, suggesting that workers may face unequal compensating prices to obtain the same workplace amenity. Using a structural model of compensating differentials, we quantify that unequal amenity prices explain 7.2% of wage inequality and 8% of total utility inequality. The results highlight that the unequal distribution of workplace flexibility contributes to the widening of wage inequality even in the presence of compensating differentials.

*Drake: Capital One (email: mhdrake@bu.edu). Thakral: Department of Economics, Brown University, Box B, Providence, RI 02912 (email: neil_thakral@brown.edu). Tô: Department of Economics, Boston University, 270 Bay State Road, Boston, MA 02215 (email: linhto@bu.edu).

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1 Introduction

Technological and organizational changes in the US and across the world have the potential to alter the structure of work, as the costs of providing workplace amenities shift over time. A prominent example, widely discussed in the media, is how improved communication technologies and the Internet allow companies to offer greater workplace flexibility.[1] While workplace flexibility and accommodations for work-life balance have been topics of policy debate (Council of Economic Advisors, 2010, 2014), the COVID-19 pandemic has further highlighted the importance of ensuring equal access to workplace flexibility for all workers (Jamous, 2023; van't Noordende, 2023; Poydock, Rhinehart and McNicholas, 2024). Understanding the distribution of workplace flexibility in the labor market and its sources is thus of great interest for welfare and policy.

A key policy-relevant question is whether the unequal distribution of workplace flexibility simply reflects differences in worker preferences. We first present empirical evidence showing that while wages strongly predict access to workplace flexibility, they do not correlate with preferences for it, suggesting that those who value workplace flexibility most may not be the ones who actually receive it. In particular, high wages are associated with having the ability to choose one's work location and schedule, but negatively correlated with the ability to choose how much to work each week. At the same time, workers value workplace flexibility similarly across the wage distribution.

At first glance, the findings seem to be at odds with the seminal theory of compensating differentials, which Rosen (1986) argues has a "legitimate claim to be the fundamental (long-run) market equilibrium construct in labor economics." In the standard textbook model, an amenity's implicit price is determined by heterogeneous worker preferences for the amenity and heterogeneous firm costs of providing that amenity. Workers who have a desirable amenity would be those who value it more, and firms that provide the amenity would be those for whom it is cheaper to do so. Thus, the standard explanation for the positive correlation between wages and desirable amenities, according to compensating differentials theory, is that such amenities are

[1] See, for example, Bayern (2019).

considered normal goods and higher wages are associated with stronger preferences for them.[2]

The story changes when we account for the fact that workplace flexibility is not an amenity with a fixed cost of provision but is itself a crucial component of the production process and interacts with worker characteristics. Unlike amenities like parking facilities, which tend to affect all workers similarly, flexibility can fundamentally alter how and how effectively workers of different skill levels perform their tasks. For instance, if reducing weekly hours makes high-skilled workers relatively less productive compared to low-skilled workers, firms will require a premium to offer fewer hours to these high-skilled employees. If working fewer hours each week makes high-skilled but not low-skilled workers relatively less productive, then firms will demand a premium for providing low hours to high-skilled workers. Consequently, the compensating price for flexibility becomes tied to worker skill, leading to different workers facing different compensating prices for the same amenity. A compensating differentials model can thus be consistent with some workers having more flexibility despite not valuing it more, because they may face different compensating prices. Equalizing access to workplace flexibility would then require assisting firms in changing their production functions, echoing the message conveyed by Goldin (2014) that "changing how jobs are structured and remunerated" is key to enhancing temporal flexibility and closing the gender wage gap.

It is not surprising that the concept of differential compensating prices by worker characteristics also dates back to Sherwin Rosen, hidden in an analysis of the value of saving a life. Thaler and Rosen (1976) show that when worker characteristics and workplace safety are separable in the production function, the market will feature only one risk premium for each value of risk, leading wages to also be separable by worker characteristics and risk levels. However, when there are interactions within the production function, in equilibrium it would be "as if there are separate risk markets for workers with each bundle of personal characteristics," breaking the separability

[2]For example, Lamadon, Mogstad and Setzler (2022)'s model-implied estimates from the U.S. labor market suggest that workers at the 95 percentile of the skill distribution value good amenities three times more than workers at the 5 percentile.

between worker characteristics and risk levels in wages.[3] This insight is often missed in the literature evaluating the role of compensating differentials in the labor market and is particularly relevant for understanding the distribution of workplace flexibility.

In this paper, we clarify the relationship between wages and the incidence of workplace flexibility through the lens of compensating differentials, both theoretically and empirically.

We collect data on wages, whether workers have different forms of workplace flexibility, and their preferences for these amenities. We adopt the classification of workplace flexibility outlined by the Council of Economic Advisors in their reports on work-life balance and workplace flexibility (Council of Economic Advisors, 2010, 2014), examining three specific workplace amenities: the flexibility to work from home (where to work), the ability to arrange one's work schedule (when to work), and the option to work fewer hours at the same wage rate (how much to work). Bringing the data to the model requires having the joint distribution of wages, amenities, and workers' willingness to trade off wages for these amenities. To overcome challenges with standard discrete choice experiments in eliciting willingness to pay (WTP), we employ a novel Bayesian Adaptive Choice Experiment (BACE) method (Drake et al., 2025) to efficiently elicit and estimate these trade-offs at the individual level. Consistent with data from other settings, our survey of participants on the online research platform Prolific who have a primary full-time job reveals that workers' valuations of amenities related to workplace flexibility are highly skewed, with thick tails of workers who put very high value on workplace flexibility in their job choice. Given the relative scarcity of workplace flexibility in the labor market, this suggests that marginal workers may encounter substantial compensating prices for access to workplace flexibility. However, estimating these marginal compensating prices is challenging, particularly when there are effectively separate markets for workers of different skill levels and these skills are unobserved.

To quantify the price gradient, we parameterize the compensating price for each

[3] In Thaler and Rosen (1976)'s example, younger workers who face the same risky situations are often more productive due to having better reflexes, leading firms to pay them a premium for taking on the same level of risk.

amenity as a linear function of worker skill. Worker skill impacts wages directly through productivity and indirectly through compensating prices when workers "pay" for amenities. We estimate the model using maximum likelihood. Our results show that there is a strong negative relationship between worker skill and compensating prices for flexible work location and schedule, but not for the ability to work fewer hours. In particular, workers at the 25th percentile of the skill distribution face compensating prices nearly twice as high as those at the 75th percentile for flexible work location and schedule. The impact of these unequal compensating prices on wage and total utility inequality is substantial. Mechanically flattening the compensating price gradient for flexible work would reduce wage inequality by 15.9 percent and total utility inequality by 6.3 percent. Moreover, allowing for the re-sorting of workers into jobs with different amenities at more equal compensating prices would result in a reduction of wage inequality by 7.2 percent and total utility inequality by 7.9 percent, while also providing more flexibility to those who value it most. The results are consistent with the documented "unexpected compression" of the wage distribution by Autor, Dube and McGrew (2023) and the growing prevalence of remote work and other forms of workplace flexibility for lower-skilled workers since the onset of the COVID-19 pandemic.[4]

This paper contributes to the literature on compensating wage differentials by providing a novel explanation for the absence of compensating differentials in past studies and shedding new light on the wage structure. The idea that different aspects of employment compensate for each other dates back to Adam Smith's *"The Wealth of Nations"*. The theory of compensating wage differentials formalized by Rosen (1974, 1986) explains how the underlying structure of pay differs across workers: In a frictionless labor market where all jobs are available to all workers, the allocation of workers to jobs reflects preferences for non-wage amenities (Rosen, 1986). Across an enormous subsequent literature, many empirical studies have documented that higher wages are often associated with better job amenities, raising difficulties in estimating compensating differentials. This has "led some (e.g., Hornstein, Krusell and Violante 2011) to conclude that compensating differentials are not likely to prove important for

[4]This explanation complements that of Barrero et al. (2022).

understanding overall earnings inequality" (Sorkin, 2018). However, this perspective is challenged by the insight that different compensating prices by worker characteristics will arise when there are interactions between worker characteristics and the presence of amenities within the production function. High-wage workers may have better amenities not because tradeoffs between wages and amenities are absent, but because they face lower compensating prices for the same amenities.

The fact that high-wage workers do not always have more desirable amenities such as flexible total work hours is inconsistent with alternative models emphasizing the failure of detecting compensating differentials due to factors such as search frictions (Hwang, Mortensen and Reed, 1998; Dale-Olsen, 2006; Bonhomme and Jolivet, 2009) or imperfect competition (Lang and Majumdar, 2004). Our findings concur with those of Mas and Pallais (2020), who show that while workers with more educational attainment have more flexibility over the time and location of work, they work in jobs with exceedingly long hours and high measure of stress, with low levels of work-life balance. Our paper provides the lens through which compensating differentials models can explain the facts. The negative price gradient of scheduling and location flexibility with worker skill is consistent with the observation that these amenities complement the production process of higher-skilled workers, one that relies on monitoring outputs rather than worker inputs (Mas and Pallais, 2020). On the other hand, lower-skilled workers are more substitutable and thus the presence of temporal flexibility in total hours worked has a smaller negative impact on firm production than for higher-skilled workers (Goldin, 2014).

Empirically, our paper contributes to two influential strands of work in the recent literature on compensating wage differentials. One set of papers attempts to characterize equilibrium amenity prices, i.e., the *WTP of the marginal worker*, by estimating the slope of the hedonic pricing function using observational data (e.g., Lalive, 2003; Tsai, Liu and Hammitt, 2011; Lavetti and Schmutte, 2018). Another set of papers uses Discrete Choice Experiments (DCEs) that randomly vary job characteristics to isolate the tradeoffs that workers face to obtain estimates of the *average WTP* for amenities (e.g., Eriksson and Kristensen, 2014; Mas and Pallais, 2017; Wiswall and Zafar, 2018; Maestas et al., 2018). Papers in the first strand consider equilibrium outcomes, which are pinned down by marginal workers (and firms), thus providing only limited information on valuations for other workers. Characterizing overall *inequality in the labor market* requires estimates of the average WTP. While the second set of papers delivers estimates of this object, conducting counterfactual analyses requires characterizing the market equilibrium price for job amenities using the WTP distribution. By eliciting individual-level WTP estimates and estimating a model of compensating differentials, our research unifies these strands of research. We thus also contribute to the literature on quantifying inequality in wages and total compensation (Card et al., 2018; Sorkin, 2018; Taber and Vejlin, 2020; Lamadon, Mogstad and Setzler, 2022).

2 Data Collection

In this section we present our data collection procedures. The goal is to collect information on demographics and job characteristics of individuals in the United States, as well as to elicit their willingness-to-pay for different dimensions of workplace flexibility. We follow the classification of workplace flexibility by the Council of Economic Advisors in their reports on work-life balance and workplace flexibility (Council of Economic Advisors, 2010, 2014) and examine three distinct workplace amenities: the ability to work from home (Location Flexibility), the ability to arrange one's schedule (Control over Schedule), and the ability to work fewer hours at the same wage rate (Part-time for Part-pay Option).

2.1 Experimental design

We collect data from 1,500 respondents on the online research platform Prolific. We restrict the respondents to be those based in the US, speak fluent English, whose age is between 18 and 64. The characteristics of our sample are similar to the CPS, as Figure A4 shows.

Prolific was built as a dedicated research subject pool with good recruitment standards including minimum payment requirements (Palan and Schitter, 2018). The platform manages the quality of its subject pool according to research standards and participants are aware that they contribute to research studies.[5] There is little incentive for distortion, as might be the case, for example, when real workers try to appease potential employers by altering statements about their preferences.[6] Nevertheless, we introduce a simple and easy-to-implement incentive based on the survey respondents' demand for information about the surveys they take. We randomize three-quarters of the respondents to an incentive treatment in which they are told near the beginning of the survey that their answers will be used to show them more information about their preferences as well as how they compare to others. Figure 1 provides a summary of the experimental design.

The incentive causes a statistically significant increase of 7 percent in time spent answering the survey questions, as Figure 2 shows. To demonstrate the value of this information to respondents, we also present non-incentivized respondents the end of the survey with the option to view the information. We find that information demand is high, with 75 percent opting to view the information despite having to "pay" for it with their time.

2.2 Collecting willingness-to-pay data

Unlike with demographics and job characteristics, participants may have difficulties assessing their own WTP for individual job amenities in direct questions. A popular alternative to a direct elicitation of WTP is the use of discrete choice experiments (DCEs), designed on the basis that respondents are capable of making pairwise job choice comparisons. The answers to DCEs generate a set of revealed preference choices that can be used to infer preferences. When comparing four elicitation methods (DCE, open-end questions, pay card / multiple price list, and double bounded dichotomous choice questions), Feld, Nagy and Osman (2020) find that only with the DCE is there

[5]A previously popular alternative, Amazon Mechanical Turk, in contrast, is built as a "crowdsourcing marketplace that makes it easier for individuals and businesses to outsource their processes and jobs to a distributed workforce who can perform these tasks virtually" (www.mturk.com).

[6]In Mas and Pallais (2017), the choice scenarios presented to low-skill workers applying for actual telephone-survey jobs are not used to allocate actual jobs, and the researchers carefully reminded the applicants of this fact.

no valuation that is inconsistent with economic theory. The use of DCEs also builds on existing research showing that estimates from choice experiments are often in reasonable ranges and with expected signs (Mas and Pallais, 2017; Maestas et al., 2018), consistent across different subject pools (Mas and Pallais, 2017), and consistent with subsequent choices (Wiswall and Zafar, 2018; Aucejo, French and Zafar, 2021).

In our setting, respondents see two job descriptions at a time. In each choice scenario, respondents are reminded that the two job options are the same except for their wages and two other job characteristics. In particular, each respondent is randomized into seeing two out of three types of workplace flexibility: Location Flexibility, Control over Schedule, and Part-time for Part-pay Option. The exact wordings for the two values that each amenity can take are listed in Table 1. An example of a choice scenario is in Figure 3. Wage is indexed to the respondent's current wage and presented in the same unit, including hourly, weekly, bi-weekly, twice monthly, monthly, and annually.

Most existing research estimating preferences for job characteristics generate choice menus randomly, the downside of such method is then the difficulty with estimating WTPs at the individual level given a small set of choices generated for each respondent. We overcome this challenge with the use of a Bayesian Adaptive Choice Experiment (BACE), following Drake et al. (2025). The method also helps avoid a bias in inferring average preferences when pooling choice data across individuals (Thakral and Tô, 2023). For each respondent, each choice scenario is generated adaptively after considering all of their answers to past scenarios to maximize the amount of information that can be learned in a Bayesian framework.[7] The specific modeling choice in our setting is presented in the next section.

[7]More details can be found in Drake et al. (2025) and from the associate publicly available package at https://github.com/tt-econ/bace.

3 Willingness-to-pay for workplace flexibility

3.1 Discrete choice model of willingness-to-pay

To use the discrete choice framework to infer preferences, we specify the utility function that determines choice as follows: In each choice scenario, two jobs $j \in \{0, 1\}$ are presented that the respondent can choose from. The job options presented consist of earnings y_j, and whether workplace flexibility amenities a_j, b_j are at the base value, 0 (when the flexible option is not present), or the alternative value, 1 (when the flexible option is present). Utility of individual i from job j is $u_{ij} = \log(y_j) + \alpha_i a_j + \beta_j b_j$.[8]

To compute the WTP for having an option for flexibility, for example, for having $a_j = 1$ over $a_j = 0$, we find the increase in income that is needed to keep a respondent equally happy without the amenity all else equal: $\log(y + WTP) = \log(y) + \alpha_i$ or $WTP/y = \exp(\alpha_i) - 1$. A positive α indicates a positive WTP and a desirable amenity a, and a negative α indicates a negative WTP and is associated with a non-desirable amenity a. The logarithm functional form is a standard way to model income effects, and WTP can be expressed as a percent of current income. The goal then is to recover the utility parameters. In our BACE framework, we start with an uninformative prior on the preference space, not taking a stance on whether the amenity is desirable or not, and having the values be distributed uniformly between -70% and 70% of earnings.

Without choice inconsistency, the individual always chooses the bundle with the higher utility. We assume that respondents choose the job with the higher utility, but with $p \in [0, 1]$ chance of being inattentive, which we define as the probability of

[8]This utility function resembles those in Mas and Pallais (2017); Wiswall and Zafar (2018), among others.

picking a choice at random instead.[9] The probability of choosing $x = j$ is then

$$\Pr(x = j \,|\, \theta \equiv \{\beta_i\}, d \equiv \{j, 1-j\}) = (1-p)\mathbb{1}_{\left\{\log(y_j/y_{1-j}) + \left(\beta_i(a_{ij} - a_{i(1-j)})\right) > 0\right\}} + p/2 \tag{1}$$

3.2 The distribution of WTP for workplace flexibility

To account for the noise in our individual estimates of WTP, we adapt the non-parametric empirical Bayes deconvolution estimator of Efron (2016) and follow the procedure by Kline, Rose and Walters (2021).

Specifically, we obtain estimates of the mean and standard errors of the individual estimates $\hat{x}_i$ and s_i. Define $z_i = \hat{x}_i/s_i$ and the population analogs $\mu_i = x_i/s_i$, and assume $z_i \,|\, \mu_i \sim \mathcal{N}(\mu_i, 1)$ and $\mu_i \sim G_\mu$ for all individuals i.

We follow the same steps described in Kline, Rose and Walters (2021) and obtain the empirical Bayes deconvolved distribution G_μ for each type of workplace flexibility.

Figure 4 shows the deconvolved distribution and a log-normal density with the same log mean and log standard deviation. The WTP distributions are highly skewed, with a large fraction of individuals not willing to pay more than 5% of their wage to obtain flexibility but a long right tail. This suggests that the marginal individual may be willing to pay a significant amount for workplace flexibility. The histograms of the raw WTP estimates are also presented in the figure. Given the level of precision from our dynamic elicitation method BACE, the deconvolved distributions are not far off from the ones implied by the histograms. The standard deviation obtained using the default penalization parameter is smaller than that of a bias-corrected estimate in Kline, Rose and Walters (2021).

As another way to assess the precision of our estimates, we report the correlation in WTP estimates after 10 or 16 questions and after 22 questions in Figure A5. The estimates are stable even after only 10 questions. Figure 5 shows the histograms of the posterior means and the histograms of the individual WTP estimates, which are

[9] This formation mirrors Mas and Pallais (2017) who model an across-subject inattentive rate in a similar way. We note that convergence of the preference parameters is robust to this modeling choice (**?**).

highly similar.

In the empirical Bayes deconvolution procedure, we set the support of G_μ to start at 0 as the lowerbound. This follows from the suggestion in Narasimhan and Efron (2020) that the density support should be smaller than the range of the data, and the fact that we cannot reject that all the individual estimates are positive. However, we note that the small fraction of negative estimates may be consistent with individuals wanting to pay for not having flexibility as a commitment device. The negative WTP estimates are largely consistent with qualitative written responses to open-ended questions asking for reasons why respondents would or would not want the amenity. In Table A2, workers mention self-control and commitment as reasons to prefer not having flexibility options, consistent with findings in Mas and Pallais (2017). This further corroborates the validity of our estimation method.

Several recent papers also estimate WTPs for job characteristics, some including workplace flexibility such as Mas and Pallais (2017) and Maestas et al. (2018). Our estimates are in the same range, but are perhaps somewhat higher. However, their estimates are from pooled data across individuals to estimate a population-level average, whereas ours come from individual estimates. We produce comparable estimates by pooling our data and estimate logit, mixed logit (and also correlated mixed logit and panel mixed logit in the Appendix) models on the aggregated data.[10] Consistent with the theoretical results in Thakral and Tô (2023), the pooled estimates are biased when compared to the average of the individual estimates. In particular, the pooled estimates are too low, which helps explain our higher estimates.

4 The unequal distribution of workplace flexibility

In Figure 7, the data show a clear pattern of sorting by WTP. Workers with higher WTP for an amenity are more likely to have the amenity. This is one confirmation that the

However, when we look across the wage distribution, even though wages are highly

[10] Only the panel mixed logit model recovers the average individual estimates, as expected, but they are highly noisy.

predictive of having each of the three types of workplace flexibility, they are not predictive of preferences. This suggests that models that explain the incidence of workplace flexibility across the wage distribution need to account for factors that move with wages independently of workers' preferences. A standard candidate model of explaining the lack of compensating differentials in observational data is that higher wage is correlated with stronger preferences for good amenities when good amenities are normal goods. This explanation does not apply in the case of workplace flexibility in the data, and the results necessitate new ways to look at compensating differentials in the labor market.

In particular, we see that wages are positively correlated with having control over work location and schedule, but negatively correlated with having the ability to work fewer hours at the same pay rate. The fact that higher wages is not always associated with more desirable amenities is noteworthy. It rules out another class of explanation which incorporates the role of labor market frictions. In these models, higher wages tend to be associated with better amenities as workers move up the job ladder. This is not the case with the ability to choose the total number of hours worked. While workers value such flexibility, it is more often lower-wage workers who are more likely to be in jobs with that amenity. It is also possible that amenities interact with each other, which we incorporate directly in our model below.

5 A model of amenity prices

We present a model of compensating differentials in which workers may not all face the same amenity price. In particular, we extend the classic Rosen (1986) model so that amenity prices may depend on worker productivity.

Before presenting the details of the model, we note that allowing prices to vary across workers provides an explanation for two key patterns in the data. First, willingness-to-pay alone is not sufficient to explain who has or does not have the amenity, as workers do not sort perfectly into jobs based on their willingness-to-pay for job amenities. For example, college workers tend to have schedule and flexible Location more often, despite not valuing them more, and schedule and flexible

Location incidence is similar by gender, despite females valuing them more. Second, having the amenity can be positively or negatively correlated with wage, controlling for education and other covariates (e.g., positive in the case of flexible location, and negative in the case of flexible total hours).

An important ingredient of our model is that firms' costs of providing amenities depends on worker productivity. The recent survey article by Mas and Pallais (2020) mentions the possibility that firms' costs may vary by workers' types: "flexibility complements a production process that relies on monitoring outputs rather than worker inputs…with higher-skilled workers having more demanding workplaces that emphasize their output over their inputs." In addition, "differences in job characteristics can be thought of as components of different production processes for higher skill work…flexibility is cheaper for employers to provide in higher-skilled jobs." This assumption is also consistent with the ideas discussed by Goldin (2014): "if there are transaction costs that render workers imperfect substitutes for each other, there will be penalties from low hours depending on the value to the firm." Moreover, "Workplace flexibility is a complicated, multidimensional concept. The term incorporates the number of hours to be worked and also the particular hours worked, being 'on call,' providing 'face time,' being around for clients, group meetings, and the like…idiosyncratic temporal demands are generally more important for the highly-educated workers."

The main implication of our model is that equilibrium amenity prices vary with worker productivity, and therefore workers no longer sort perfectly based on willingness-to-pay. However, conditional on worker WTP, workers sort based on productivity. This allows us to estimate the model to infer equilibrium amenity price as a function of worker productivity, given the joint joint distribution of wages, work arrangements, and WTP for amenities that we elicit using BACE.

The basic version of our model when we consider tradeoffs between wages and one binary amenity highlights the innovations we make to the classic Rosen (1986) framework. We then proceed to introduce the more general version of the model that we estimate, which allows for tradeoffs among different amenities.

5.1 One amenity

Amenities Consider a single binary non-wage job characteristic ("amenity") denoted n.

Productivity and wages Worker productivity has an observed component ω and an unobserved component θ. We denote the worker's productivity as $\pi = \omega + \theta$. Unobserved productivity is distributed $\theta \sim G$. The worker's productivity is unobserved to the econometrician but known to the worker and the firm when wages are set.

In our model, the *amenity price* is a function of productivity, denoted $p(\pi)$; this is distinct from the fixed amenity price in Rosen (1986). *Wages* are set based on productivity net of the amenity price due to compensating differentials. Thus, wages are given by $w = \pi - p(\pi)n + \epsilon$, where we assume that $\epsilon \sim \mathcal{N}(0, \sigma)$. The idiosyncratic term may represent an idiosyncratic match-specific productivity shock, i.i.d. across jobs and across periods. Wages and prices are measured in logs.

Firms (costs) There is a unit mass of firms. Each firm j faces a per-period cost of providing the amenity. We assume that the cost of providing the amenity is monotonic in the worker's productivity π, and we allow for heterogeneity across firms in the form of a cost shifter $f_j \sim F$. The cost of providing the amenity is thus $c_j(\pi) = f_j + k(\pi)$, where $k(\pi)$ is monotonic. *Firms' rents* are given by $\big(p(\pi) - c_j(\pi)\big)n$.

Workers (preferences) There is a unit mass of workers. A worker's utility function is $u = w + xn$, where x denotes the worker's WTP (preference) for the amenity. Let H denote the distribution of worker amenity preferences, which we take to be known. *Workers' rents* are given by $(x - p(\pi))n$.

Amenity prices (equilibrium) In a perfect-sorting equilibrium, amenity prices satisfy a *market-clearing condition*: the supply of jobs with the amenity should coincide with the demand for jobs with the amenity. At price $p(\pi)$, a firm will provide the amenity to workers of productivity π if and only if $c_j(\pi) \leq p(\pi)$, or equivalently

$f_j \leq p(\pi) - k(\pi)$. The fraction of firms that are willing to provide the amenity at price $p(\pi)$ is thus $F(p(\pi) - k(\pi))$. Analogously, since workers demand the amenity if and only if $x \geq p(\pi)$, the fraction of productivity π workers willing to accept a job with the amenity is $1 - H(p(\pi) \mid \pi)$.

The market clearing condition thus requires that $F(p(\pi) - k(\pi)) = 1 - H(p(\pi) \mid \pi)$. Differentiating both sides with respect to π (assuming the appropriate differentiability conditions) and rearranging gives

$$p'(\pi) = \frac{f(p(\pi) - k(\pi))}{f(p(\pi) - k(\pi)) + h(p(\pi) \mid \pi)} k'(\pi),$$

which (given the assumption that $k(\pi)$ is monotonic) leads to the following proposition: The equilibrium amenity price $p(\pi)$ is monotonic in worker productivity. In particular, the equilibrium amenity price is increasing in worker productivity if and only if firms' cost of providing the amenity is increasing in worker productivity. While this result is straightforward to prove, it demonstrates that the comparative statics of equilibrium amenity prices are independent of the distribution of workers' preferences and instead reflects the firms' cost function. In other words, under perfect sorting, inferring equilibrium amenity prices will enable us to learn about the shape of firms' costs.

The model leads to two forms of sorting in the equilibrium allocation of workers to jobs: (1) sorting by WTP given at any given level of productivity, and (2) sorting by productivity at any given level of WTP. The first implication cannot be used in practice since productivity is unobserved. The second implication can only be used in practice if it is possible to condition on individual-level WTP estimates.

While productivity is unobserved, we can make progress toward estimating the distribution of productivity with the following proposition: There is a monotonic relationship between worker productivity and the fraction of workers with the amenity; if the price of the amenity is higher, then the fraction of workers in jobs with the amenity is smaller, and vice versa. This assumption is supported by empirical observations in the literature, for example: (1) that "more- and less-educated workers are willing to give up the same fraction of earnings for different types of flexibility" even when the incidence of the amenity differs by education (Mas and Pallais, 2017), which is consistent with our pilot data; and (2) that it is difficult to predict which workers would volunteer to work from home in a Chinese firm even when ex-ante productivity is accounted for (Bloom et al., 2015). Under standard parametric assumptions about the distributions of unobserved productivity and the idiosyncratic error term, we can estimate the model using maximum likelihood (Flabbi and Moro, 2012; Hall and Mueller, 2018).

5.2 Tradeoffs between different amenities

Extending the model to the case that costs are independent across amenities is relatively straightforward. The challenge arises when the cost of providing one amenity may depend on whether the other amenity is present, i.e., there are complementarity or substitutability across amenities from the firms' perspective. Because complementarity and substitutability can also be present on the demand side when workers' values of individual amenities depend on the bundles they are considering, further assumptions are required to disentangle firms and workers' tradeoffs in equilibrium.

We assume that the cost of providing an amenity is monotonic in the worker's productivity π, and we allow for heterogeneity across firms in the form of cost shifters $f_j^1 \sim F^1$ and $f_j^2 \sim F^2$. The cost of providing amenities are given by $c_j(n_1, n_2; \pi) = (f_j^1 + k_{1,0}(\pi))n_1 + (f_j^2 + k_{0,1}(\pi))n_2 + k_{1,1}(\pi)n_1 n_2$. Firms' rents are given by $p_A(\pi)n_1 + p_B(\pi)n_2 + p_{AB}(\pi)n_1 n_2 - c_j(n_1, n_2; \pi)$. A given firm offers the amenity bundle (n_1, n_2) that maximizes their rent.

Worker i's utility function is $u = w + x_A n_1 + x_B n_2 + x_{AB} n_1 n_2$, where x_A denotes the worker's WTP for n_1 when $n_2 = 0$, x_B denotes the worker's WTP for n_2 when $n_1 = 0$, $x_A + x_{AB}$ denotes the worker's WTP for n_1 when $n_2 = 1$, and $x_B + x_{AB}$ denotes the worker's WTP for n_2 when $n_1 = 1$. Workers' rents are given by $(x_A - p_A(\pi))n_1 + (x_B - p_B(\pi))n_2 + (x_{AB} - p_{AB}(\pi))n_1 n_2$. All else equal, the worker prefers a job with the amenity bundle that maximizes their rent.

In this case, the amenity prices are denoted $p_A(\pi)$, $p_B(\pi)$, and $p_{AB}(\pi)$, with wage given by $w = \pi - p_A(\pi)n_1 - p_B(\pi)n_2 - p_{AB}(\pi)n_1 n_2 + \epsilon$. Given the wage-setting equation above, we have $w_0 = \pi + \epsilon_{0,0}$, $w_A = \pi - p_A(\pi) + \epsilon_{1,0}$, $w_B = \pi - p_B(\pi) + \epsilon_{0,1}$, and $w_{AB} = \pi - p_A(\pi) - p_B(\pi) - p_{AB}(\pi) + \epsilon_{1,1}$.

In equilibrium, amenity prices satisfy a market-clearing condition: for all amenity bundles (n_1, n_2), the supply of jobs with that amenity bundle coincides with the demand for jobs with that amenity bundle.

Firms The firm chooses $(n_1, n_2) = (0, 0)$ if $f_A > p_A(\pi) - k_A(\pi)$, $f_B > p_B(\pi) - k_B(\pi)$, and $f_A + f_B > p_A(\pi) + p_B(\pi) + p_{AB}(\pi) - (k_A(\pi) + k_B(\pi) + k_{AB}(\pi))$. If $f_A \leq p_A(\pi) - k_A(\pi)$, then firm j is willing to provide amenity n_1. If $f_B \leq p_B(\pi) - k_B(\pi)$, then firm j is willing to provide amenity n_2. If $f_A + f_B \leq p_A(\pi) + p_B(\pi) + p_{AB}(\pi) - (k_A(\pi) + k_B(\pi) + k_{AB}(\pi))$, then firm j is willing to provide both amenities together.

Note that $A \preceq_j AB$ if and only if:

$$\begin{aligned} -(f_A + k_A(\pi)) + p_A(\pi) &\leq -(f_A + f_B + k_A(\pi) + k_B(\pi) + k_{AB}(\pi)) + p_A(\pi) + p_B(\pi) + p_{AB}(\pi) \\ \iff f_B &\leq (p_B(\pi) + p_{AB}(\pi)) - (k_B(\pi) + k_{AB}(\pi)) \end{aligned}$$

and $B \preceq_j AB$ if and only if:

$$\begin{aligned} -(f_B + k_B(\pi)) + p_B(\pi) &\leq -(f_A + f_B + k_A(\pi) + k_B(\pi) + k_{AB}(\pi)) + p_A(\pi) + p_B(\pi) + p_{AB}(\pi) \\ \iff f_A &\leq (p_A(\pi) + p_{AB}(\pi)) - (k_B(\pi) + k_{AB}(\pi)) \end{aligned}$$

and $A \preceq_j B$ if and only if:

$$\begin{aligned} -(f_A + k_A(\pi)) + p_A(\pi) &\leq -(f_B + k_B(\pi)) + p_B(\pi) \\ f_B - f_A &\leq (p_B(\pi) - p_A(\pi)) - (k_B(\pi) - k_A(\pi)) \end{aligned}$$

Thus, the firm provides AB if the following conditions hold:

$$\begin{aligned} f_A + f_B &\leq (p_A(\pi) + p_B(\pi) + p_{AB}(\pi)) - (k_A(\pi) + k_B(\pi) + k_{AB}(\pi)) \\ f_B &\leq (p_B(\pi) + p_{AB}(\pi)) - (k_B(\pi) + k_{AB}(\pi)) \\ f_A &\leq (p_A(\pi) + p_{AB}(\pi)) - (k_A(\pi) + k_{AB}(\pi)) \end{aligned}$$

The firm provides A if the following conditions hold:

$$\begin{aligned} f_A &\leq p_A(\pi) - k_A(\pi) \\ f_B &> (p_B(\pi) + p_{AB}(\pi)) - (k_B(\pi) + k_{AB}(\pi)) \\ f_B - f_A &> (p_B(\pi) - p_A(\pi)) - (k_B(\pi) - k_A(\pi)) \end{aligned}$$

And the firm provides B if the following conditions hold:

$$\begin{aligned} f_B &\leq p_B(\pi) - k_B(\pi) \\ f_A &> (p_A(\pi) + p_{AB}(\pi)) - (k_B(\pi) + k_{AB}(\pi)) \\ f_B - f_A &\leq (p_B(\pi) - p_A(\pi)) - (k_B(\pi) - k_A(\pi)) \end{aligned}$$

Workers Define the worker's rent as $\rho_i^{n_1,n_2}(\pi) = x_{n_1,n_2} - p_{n_1,n_2}(\pi)$. In particular:

$$\begin{aligned} &\rho_i^{1,0}(\pi) = x_A - p_A(\pi) \\ &\rho_i^{0,1}(\pi) = x_A - p_B(\pi) \\ &\rho_i^{1,1}(\pi) = x_A + x_B + x_{AB} - p_A(\pi) - p_B(\pi) - p_{AB}(\pi) \end{aligned}$$

The worker chooses $(n_1, n_2) = (0, 0)$ if $p_A(\pi) > x_A$, $p_B(\pi) > x_B$, and $p_A(\pi) + p_B(\pi) + p_{AB}(\pi) > x_A + x_B + x_{AB}$. If $x_A \geq p_A(\pi)$, then worker i is willing to accept amenity n_1. If $x_B \geq p_B(\pi)$, then worker i is willing to accept amenity n_2. If $x_A + x_B + x_{AB} \geq p_A(\pi) + p_B(\pi) + p_{AB}(\pi)$, then worker i is willing to accept both amenities together.

Note that $A \preceq_i AB$ if and only if:

$$\begin{aligned} & x_A - p_A(\pi) \leq x_A + x_B + x_{AB} - p_A(\pi) - p_B(\pi) - p_{AB}(\pi) \\ \iff & p_B(\pi) + p_{AB}(\pi) \leq x_B + x_{AB} \end{aligned}$$

$B \preceq_i AB$ if and only if:

$$\begin{aligned} x_B - p_B(\pi) &\leq x_A + x_B + x_{AB} - p_A(\pi) - p_B(\pi) - p_{AB}(\pi) \\ \iff p_A(\pi) + p_{AB}(\pi) &\leq x_A + x_{AB} \end{aligned}$$

$A \preceq_i B$ if and only if:

$$\begin{aligned} x_A - p_A(\pi) &\leq x_B - p_B(\pi) \\ \iff p_B(\pi) - p_A(\pi) &\leq x_B - x_A \end{aligned}$$

Thus, the worker demands AB if the following conditions hold:

$$\begin{aligned} x_A + x_B + x_{AB} &\geq p_A(\pi) + p_B(\pi) + p_{AB}(\pi) \\ x_B + x_{AB} &\geq p_B(\pi) + p_{AB}(\pi) \\ x_A + x_{AB} &\geq p_A(\pi) + p_{AB}(\pi) \end{aligned}$$

The worker demands A if the following conditions hold:

$$\begin{aligned} x_A &\geq p_A(\pi) \\ x_B + x_{AB} &< p_B(\pi) + p_{AB}(\pi) \\ x_B - x_A &< p_B(\pi) - p_A(\pi) \end{aligned}$$

And the worker demands B if the following conditions hold:

$$\begin{aligned} x_B &\geq p_B(\pi) \\ x_A + x_{AB} &< p_A(\pi) + p_{AB}(\pi) \\ x_B - x_A &\geq p_B(\pi) - p_A(\pi) \end{aligned}$$

For a visual illustration of the equilibrium in this model, see Figure 10 for the case of a positive price interaction and Figure 11 for the case of a negative price interaction.

6 Estimating amenity price functions

We leverage the joint distribution between wages and willingness-to-pay for amenities to estimate the model.

6.1 One amenity

6.1.1 Parametrization

We have $w_i = \pi_i - n_i p(\pi_i)$: wage is productivity net of amenity price if one has the amenity. Amenity price $p(\pi_i)$ is a function of one's productivity.

Let $\pi_i \equiv \mu_i + \epsilon_i = \gamma Z_i + \epsilon_i$ be the productivity of person i with observable characteristics Z_i and unobserved component ϵ_i.

Let $p(\pi) = \alpha + \beta\pi$ the amenity pricing function given productivity level π. This linear form can be relaxed in the future.

We assume that WTPs are measured with a random error term u, i.e., true WTP $x = \tilde{x} - u$, with $\tilde{x}$ our measured WTP.

Assume $u \sim \mathcal{N}(0, \sigma_u)$ and $\epsilon \sim \mathcal{N}(0, \sigma_\epsilon)$ independent of each other. Note that if we work in wage (dollar) unit instead of in log wage unit, then we should perhaps assume that $\log(u) \sim \mathcal{N}(0, \sigma_u)$ and $\log(\epsilon) \sim \mathcal{N}(0, \sigma_\epsilon)$.

Let θ be the parameter vector, consisting α, β, and elements of the vector γ, we are interested in finding $\hat{\theta}$ to maximize the log likelihood: $\hat{\theta} = \arg\max_\theta \sum_i \log \Pr(w_i, n_i \,|\, \tilde{x}, \theta)$.

6.1.2 Likelihood

To facilitate writing down this likelihood function, we will write $\Pr(w_i, n_i \,|\, \tilde{x}, \theta) = \Pr(n_i \,|\, \tilde{x}, \theta) \cdot \Pr(w_i \,|\, n_i, \tilde{x}, \theta)$.

Consider the first piece, $\Pr(n_i \,|\, \tilde{x}, \theta)$. Assume u_i is known, then

$$\Pr(n_i = 0 \,|\, \tilde{x}, \theta, u_i) = \Pr_\epsilon(\tilde{x} - u_i < \alpha + \beta(\mu_i + \epsilon_i))$$
$$\Pr(n_i = 1 \,|\, \tilde{x}, \theta, u_i) = \Pr_\epsilon(\tilde{x} - u_i > \alpha + \beta(\mu_i + \epsilon_i))$$

The reason that we fix u_i here is because, the two pieces should share the same

u_i if it needs to appear in both pieces. If we need to integrate out u_i, we should do that after getting the joint likelihood for person i.

Consider the second piece $\Pr(w_i \,|\, n_i, \tilde{x}, \theta, u_i)$.

If $n_i = 0$, then we want to know the density of $\mu_i + \epsilon_i \sim \mathcal{N}(\mu_i, \sigma_\epsilon)$ evaluated at the data point w_i, given that this density is appropriately truncated such that $\tilde{x} - u_i < \alpha + \beta(\mu_i + \epsilon_i)$. This means, this density is 0 if $\tilde{x} - u_i > \alpha + \beta(\mu_i + \epsilon_i) = \alpha + \beta w_i$. The truncation also means that we need to divide by $\Pr_\epsilon(\tilde{x} - u_i < \alpha + \beta(\mu_i + \epsilon_i))$.

Therefore, in this case:

$$\Pr(w_i \,|\, n_i = 0, \tilde{x}, \theta, u_i) = \frac{\phi(w_i, \mu_i, \sigma_\epsilon) \cdot \mathbb{1}_{\{\tilde{x} - u_i < \alpha + \beta w_i\}}}{\Pr_\epsilon(\tilde{x} - u_i < \alpha + \beta(\mu_i + \epsilon_i))}$$

Here, we denote $\phi(z, \mu, \sigma)$ as the normal PDF with mean μ, standard deviation σ, evaluated at z.

If $n_i = 1$, then we want to know the density of $\mu_i + \epsilon_i - (\alpha + \beta(\mu_i + \epsilon_i)) \sim \mathcal{N}(\mu_i - (\alpha + \beta\mu_i), |1 - \beta|\sigma_\epsilon)$ evaluated at the data point w_i, given that this density is appropriately truncated such that $\tilde{x} - u_i > \alpha + \beta(\mu_i + \epsilon_i)$. This density is 0 if $\tilde{x} - u_i > \alpha + \beta\pi_i = \alpha + \beta\frac{w+\alpha}{1-\beta}$. The last equality is because $w_i = \pi_i - (\alpha + \beta\pi_i)$ with $n = 1$. The truncation also means that we need to divide by $\Pr_\epsilon(\tilde{x} - u_i > \alpha + \beta(\mu_i + \epsilon_i))$.

Therefore, in this case:

$$\Pr(w_i \,|\, n_i = 1, \tilde{x}, \theta, u_i) = \frac{\phi(w_i, \mu_i - (\alpha + \beta\mu_i), |1 - \beta|\sigma_\epsilon) \cdot \mathbb{1}_{\left\{\tilde{x} - u_i > \alpha + \beta\frac{w+\alpha}{1-\beta}\right\}}}{\Pr_\epsilon(\tilde{x} - u_i > \alpha + \beta(\mu_i + \epsilon_i))}$$

Now we can combine the two pieces, noting the cancellation.

If u_i is observed, then

$$\Pr(w_i, n_i = 0 \,|\, \tilde{x}, \theta, u_i) = \phi(w_i, \mu_i, \sigma_\epsilon) \cdot \mathbb{1}_{\{\tilde{x} - u_i < \alpha + \beta w_i\}}$$
$$\Pr(w_i, n_i = 1 \,|\, \tilde{x}, \theta, u_i) = \phi(w_i, \mu_i - (\alpha + \beta\mu_i), |1 - \beta|\sigma_\epsilon) \cdot \mathbb{1}_{\left\{\tilde{x} - u_i > \alpha + \beta\frac{w+\alpha}{1-\beta}\right\}}$$

Because u_i is actually unobserved, we need to integrate it out. Note that u_i only appears in the indicator term. Therefore,

$$\begin{aligned}
\Pr(w_i, n_i = 0 \mid \tilde{x}, \theta) &= \phi(w_i, \mu_i, \sigma_\epsilon) \cdot \Pr_u[u_i > \tilde{x} - (\alpha + \beta w_i)] \\
&= \phi(w_i, \mu_i, \sigma_\epsilon)[1 - \Phi(\tilde{x} - (\alpha + \beta w_i), 0, \sigma_u)] \\
\Pr(w_i, n_i = 1 \mid \tilde{x}, \theta) &= \phi(w_i, \mu_i - (\alpha + \beta\mu_i), |1-\beta|\sigma_\epsilon) \cdot \Pr_u\Big[u_i < \tilde{x} - \Big(\alpha + \beta\frac{w+\alpha}{1-\beta}\Big)\Big] \\
&= \phi(w_i, \mu_i - (\alpha + \beta\mu_i), |1-\beta|\sigma_\epsilon)\Phi\Big(\tilde{x} - \Big(\alpha + \beta\frac{w+\alpha}{1-\beta}, 0, \sigma_u\Big)\Big)
\end{aligned}$$

Here, we denote $\Phi(z, \mu, \sigma)$ as the normal CDF with mean μ, standard deviation σ, evaluated at z.

We then estimate the model using maximum likelihood.

6.2 Tradeoffs between different amenities

6.2.1 Parametrization

We have $w_i = \pi_i - n_i^A p^A(\pi_i) - n_i^B p^B(\pi_i) - n_i^A n_i^B p^{AB}(\pi_i)$: wage is productivity net of amenity price if one has the amenity. There are two amenities here, A, and B, each with its own pricing function p^A and p^B. If a person has both amenities, they also have to pay p^{AB}.

Let $\pi_i \equiv \mu_i + \epsilon_i = \gamma Z_i + \epsilon_i$ be the productivity of person i with observable characteristics Z_i and unobserved component ϵ_i.

Let $p^A(\pi) = \alpha^A + \beta^A\pi$ the amenity pricing function for amenity A given productivity level π. Let $p^B(\pi) = \alpha^B + \beta^B\pi$ the amenity pricing function for amenity B given productivity level π. Let $p^{AB}(\pi) = \alpha^{AB} + \beta^{AB}\pi$ the amenity pricing function for the additional (could be negative) price for having both A and B given productivity level π.

We assume that WTPs are measured with random error terms:

$$x^A = \tilde{x}^A - u^A$$
$$x^B = \tilde{x}^B - u^B$$
$$x^{AB} = \tilde{x}^{AB} - u^{AB}$$

with x^A measured WTP for amenity A, x^B for amenity B, x^{AB} additional (can be negative) WTP for having both.

Assume $u^A \sim \mathcal{N}(0, \sigma_u^A)$, $u^B \sim \mathcal{N}(0, \sigma_u^B)$, $u^{AB} \sim \mathcal{N}(0, \sigma_u^{AB})$, $\epsilon \sim \mathcal{N}(0, \sigma_\epsilon)$, all independent of each other.

Let θ be the parameter vector, consisting α^A, β^A, α^B, β^B, α^{AB}, β^{AB}, and elements of the vector γ, we are interested in finding $\hat{\theta}$ to maximize the log likelihood: $\hat{\theta} = \arg\max_\theta \sum_i \log \Pr(w_i, n_i^A, n_i^B \,|\, \tilde{x}_i^A, \tilde{x}_i^B, \tilde{x}_i^{AB}, \theta)$.

6.2.2 Likelihood

Following the same steps as above: Consider u_i^A, u_i^B, u_i^{AB} as known.

If $n_i^A = 0$ and $n_i^B = 0$ then $w_i = \mu_i + \epsilon_i \sim \mathcal{N}(\mu_i, \sigma_\epsilon)$ and $\pi_i = w_i$.

$$\begin{aligned}\Pr(w_i, n_i^A = 0, n_i^B = 0 \,|\, \theta, \tilde{x}_i\text{'s}, u_i\text{'s}) = \phi(w_i, \mu_i, \sigma_\epsilon)& \\ \cdot \mathbb{1}_{\{\tilde{x}_i^A - u_i^A < \alpha^A + \beta^A w_i\}}& \\ \cdot \mathbb{1}_{\{\tilde{x}_i^B - u_i^B < \alpha^B + \beta^B w_i\}}& \\ \cdot \mathbb{1}_{\{\tilde{x}_i^A - u_i^A + \tilde{x}_i^B - u_i^B + \tilde{x}_i^{AB} - u_i^{AB} < \alpha^A + \alpha^B + \alpha^{AB} + (\beta^A + \beta^B + \beta^{AB}) w_i\}}&\end{aligned}$$

If $n_i^A = 0$ and $n_i^B = 1$ then $w_i = \mu_i + \epsilon_i - (\alpha^B + \beta^B \mu_i + \beta^B \epsilon_i) \sim \mathcal{N}(\mu_i - (\alpha^B + \beta^B \mu_i, |1 - \beta^B| \sigma_\epsilon)$

and $\pi_i = \frac{w_i+\alpha^B}{1-\beta^B}$.

$$\Pr(w_i, n_i^A = 0, n_i^B = 1 \,|\, \theta, \tilde{x}_i\text{'s}, u_i\text{'s}) = \phi(w_i, \mu_i - (\alpha^B + \beta^B \mu_i), |1-\beta^B|\sigma_\epsilon) \cdot \mathbb{1}_{\left\{(\tilde{x}_i^B - u_i^B) - (\tilde{x}_i^A - u_i^A) > (\alpha^B - \alpha^A) + (\beta^B - \beta^A)\frac{w_i+\alpha^B}{1-\beta^B}\right\}} \cdot \mathbb{1}_{\left\{\tilde{x}_i^B - u_i^B > \alpha^B + \beta^B \frac{w_i+\alpha^B}{1-\beta^B}\right\}} \cdot \mathbb{1}_{\left\{\tilde{x}_i^A - u_i^A + \tilde{x}_i^{AB} - u_i^{AB} < \alpha^A + \alpha^{AB} + (\beta^A + \beta^{AB})\frac{w_i+\alpha^B}{1-\beta^B}\right\}}$$

If $n_i^A = 1$ and $n_i^B = 0$ then $w_i = \mu_i + \epsilon_i - (\alpha^A + \beta^A \mu_i + \beta^A \epsilon_i) \sim \mathcal{N}(\mu_i - (\alpha^A + \beta^A \mu_i, |1-\beta^A|\sigma_\epsilon)$ and $\pi_i = \frac{w_i+\alpha^A}{1-\beta^A}$.

$$\Pr(w_i, n_i^A = 1, n_i^B = 0 \,|\, \theta, \tilde{x}_i\text{'s}, u_i\text{'s}) = \phi(w_i, \mu_i - (\alpha^A + \beta^A \mu_i), |1-\beta^A|\sigma_\epsilon) \cdot \mathbb{1}_{\left\{\tilde{x}_i^A - u_i^A > \alpha^A + \beta^A \frac{w_i+\alpha^A}{1-\beta^A}\right\}} \cdot \mathbb{1}_{\left\{(\tilde{x}_i^A - u_i^A) - (\tilde{x}_i^B - u_i^B) > (\alpha^A - \alpha^B) + (\beta^A - \beta^B)\frac{w_i+\alpha^A}{1-\beta^A}\right\}} \cdot \mathbb{1}_{\left\{\tilde{x}_i^B - u_i^B + \tilde{x}_i^{AB} - u_i^{AB} < \alpha^B + \alpha^{AB} + (\beta^B + \beta^{AB})\frac{w_i+\alpha^A}{1-\beta^A}\right\}}$$

If $n_i^A = 1$ and $n_i^B = 1$ then $w_i = \mu_i + \epsilon_i - (\alpha^A + \beta^A \mu_i + \beta^A \epsilon_i) - (\alpha^B + \beta^B \mu_i + \beta^B \epsilon_i) - (\alpha^{AB} + \beta^{AB} \mu_i + \beta^{AB} \epsilon_i) \sim \mathcal{N}(\mu_i - (\alpha^A + \alpha^B + \alpha^{AB} + (\beta^A + \beta^B + \beta^{AB})\mu_i), |1 - \beta^A - \beta^B - \beta^{AB}|\sigma_\epsilon)$ and $\pi_i = \frac{w_i + \alpha^A + \alpha^B + \alpha AB}{1-\beta^A-\beta^B-\beta^{AB}}$.

$$\Pr(w_i, n_i^A = 0, n_i^B = 0 \,|\, \theta, \tilde{x}_i\text{'s}, u_i\text{'s}) = \phi(w_i, \mu_i - (\alpha^A + \alpha^B + \alpha^{AB} + (\beta^A + \beta^B + \beta^{AB})\mu_i), |1 - \beta^A - \cdot \mathbb{1}_{\left\{\tilde{x}_i^A - u_i^A + \tilde{x}_i^{AB} - u_i^{AB} > (\alpha^A + \alpha^{AB}) + (\beta^A + \beta^{AB})\frac{w_i+\alpha^A+\alpha^B+\alpha AB}{1-\beta^A-\beta^B-\beta^{AB}}\right\}} \cdot \mathbb{1}_{\left\{\tilde{x}_i^B - u_i^B + \tilde{x}_i^{AB} - u_i^{AB} > (\alpha^B + \alpha^{AB}) + (\beta^B + \beta^{AB})\frac{w_i+\alpha^A+\alpha^B+\alpha AB}{1-\beta^A-\beta^B-\beta^{AB}}\right\}} \cdot \mathbb{1}_{\left\{\tilde{x}_i^A - u_i^A + \tilde{x}_i^B - u_i^B + \tilde{x}_i^{AB} - u_i^{AB} > \alpha^A + \alpha^B + \alpha^{AB} + (\beta^A + \beta^B + \beta^{AB})\frac{w_i+\alpha^A+\alpha^B+\alpha AB}{1-\beta^A-\beta^B-\beta^{AB}}\right.}$$

To find $\Pr(w_i, n_i^A, n_i^B \,|\, \theta, \tilde{x}_i\text{'s})$, we would then integrate the indicator terms above over the u_i^A, u_i^B, and u_i^{AB}.

6.3 Results

The model can rationalize important patterns in the data. In Table 3, the model fits the distribution of wages, the presence of the amenity, and the distribution of utility well. More importantly, the model fits the relationship between wages and amenity, wages and willingness-to-pay, as well as amenity and willingness-to-pay. There is strong sorting by willingness-to-pay, and high-wage workers are more likely to have the amenity than low-wage workers.

In one counterfactual, we eliminate heterogeneity in cost by productivity by flattening out $p(\pi)$ at the price that would arise if everyone sorted perfectly by WTP. This results in better sorting by WTP, with higher-wage workers now tend to be those without the amenity due to compensating differentials. Even then, we see 6% decrease in wage dispersion and 8% decrease in utility dispersion, despite average wages remaining unchanged. The results suggest an important role for changes in technology or how jobs are structured in shaping income inequality (Goldin, 2014).

7 Conclusion

This paper studies the interplay between how much workers value workplace flexibility, whether they have such amenities, and how the presence of amenities affects their wages. Even within firms, workers differ in the benefits they receive. In a survey of over 30,000 workers, Barrero, Bloom and Davis (2021) document that workers desire workplace flexibility more than what firms provide, on average, and moreover, the gap is much larger at the lower end of the earnings distribution. Inequality is exacerbated when "good amenities" go to high-earning workers rather than those who desire them most. The pandemic has further highlighted the unequal distribution of workplace flexibility.

Collecting new data of individual workers' job details including their work arrangements and wages, together with quantitative measures of their willingness-to-pay

(WTP) for different forms of workplace flexibility. Capturing how much workers are willing to forgo in wages to trade off having more workplace flexibility at such a fine level is a technical challenge we overcome by developing a novel dynamic elicitation tool.

The project examines a new model of compensating differentials (Rosen, 1986) in which workers face different "prices" of workplace flexibility. The model provides a novel explanation for why high wages often go with "good" amenities, even in a compensating differential framework: high-wage workers face a lower wage penalty to obtain amenities, independent of their WTP.

Workplace flexibility has been the subject of an ongoing policy debate as to the role of the government in promoting work arrangements that facilitate work-life balance, as reflected in reports from the Council of Economic Advisors (2010, 2014). Combining our model of firms' costs with the full distribution of workers' preferences therefore fully characterizes the labor market equilibrium, which enables us to estimate a structural model to evaluate policy counterfactuals and measure welfare. We further estimate the model using the new data to explore how equalizing firms' costs of providing workplace flexibility (e.g., with technological investment) may have the potential to realign workers with their desired workplace flexibility across the income distribution and to explore the impact of such changes on the structure of wages and welfare.

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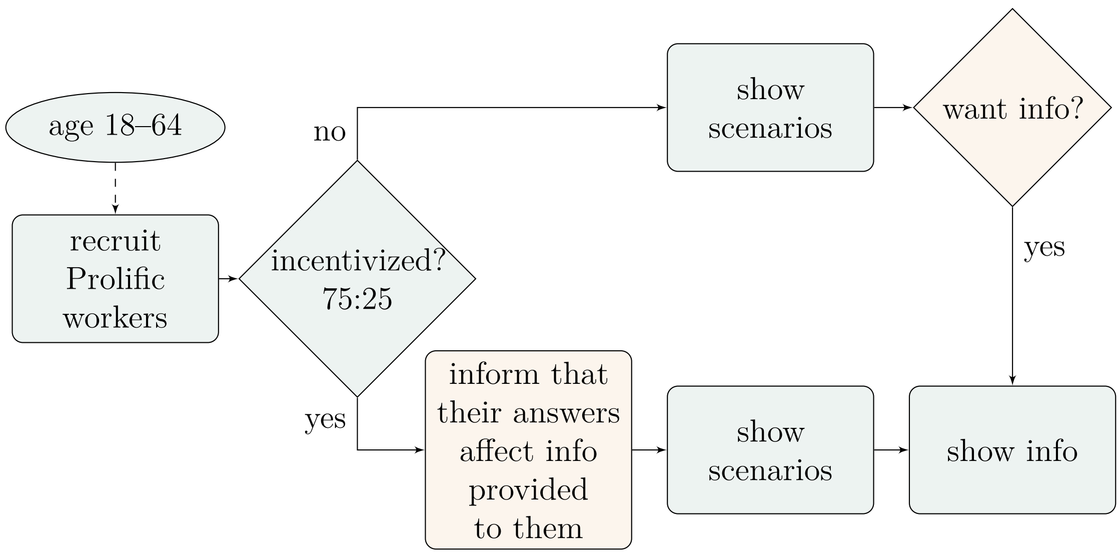
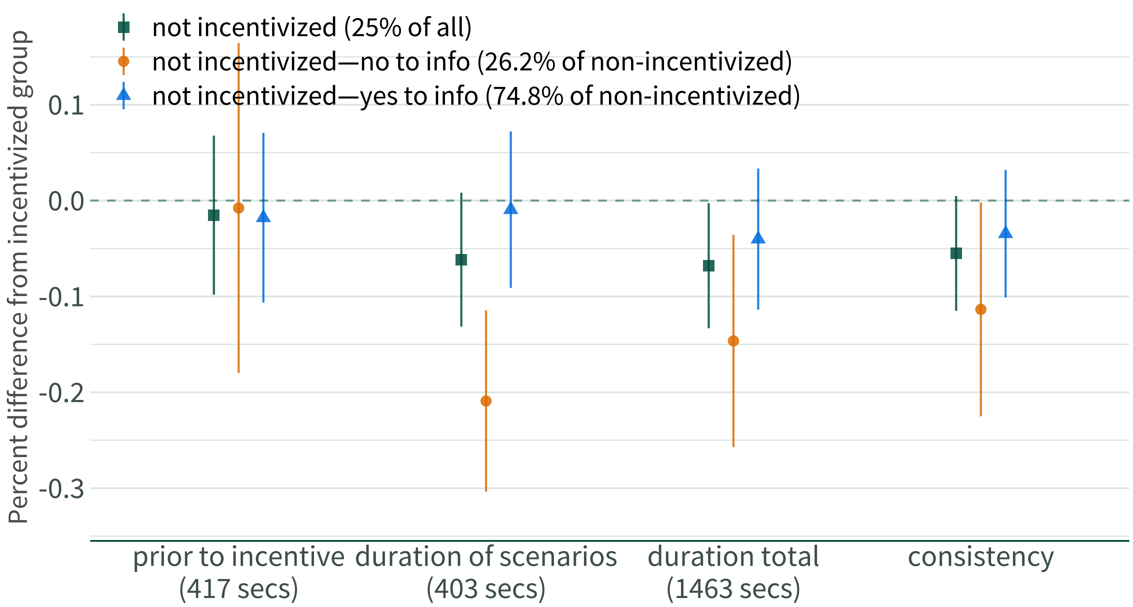
Figure 1: Sample and experimental design



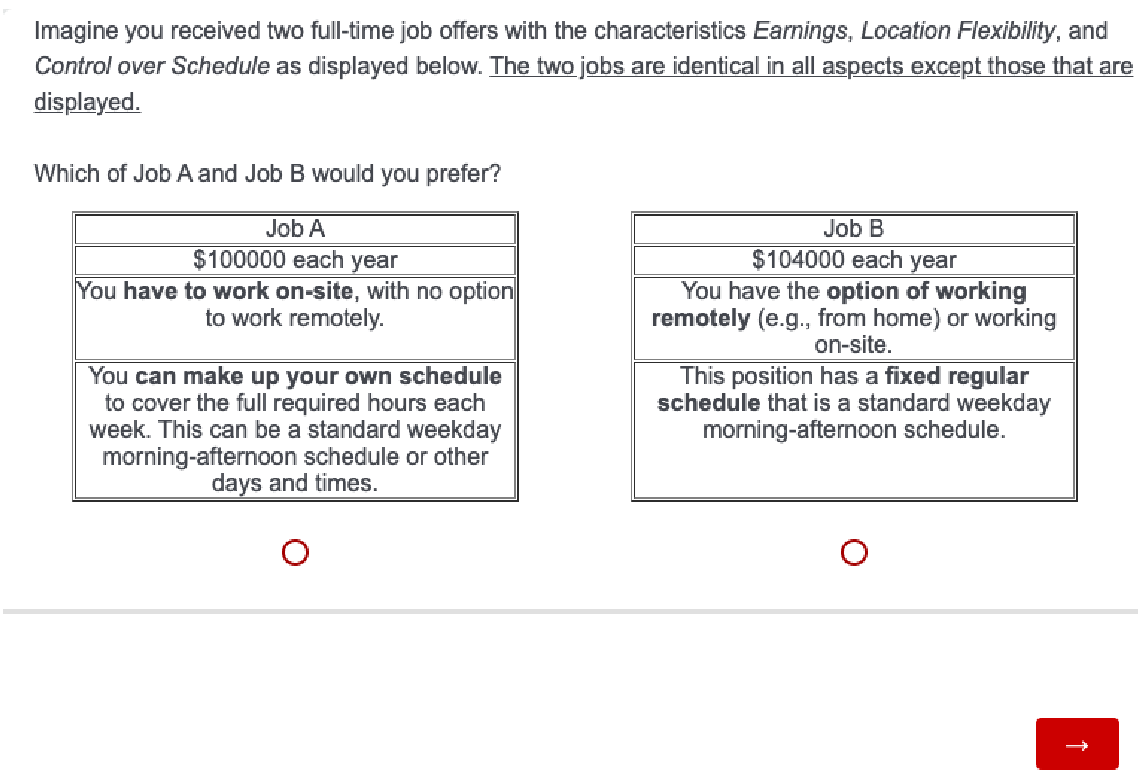
Note:

Figure 2: Effects relative to incentivized group



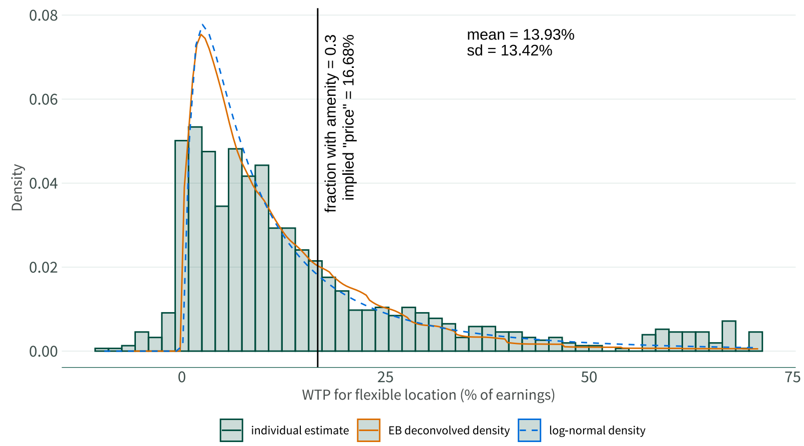
Note:

Figure 3: Example of job choice scenario

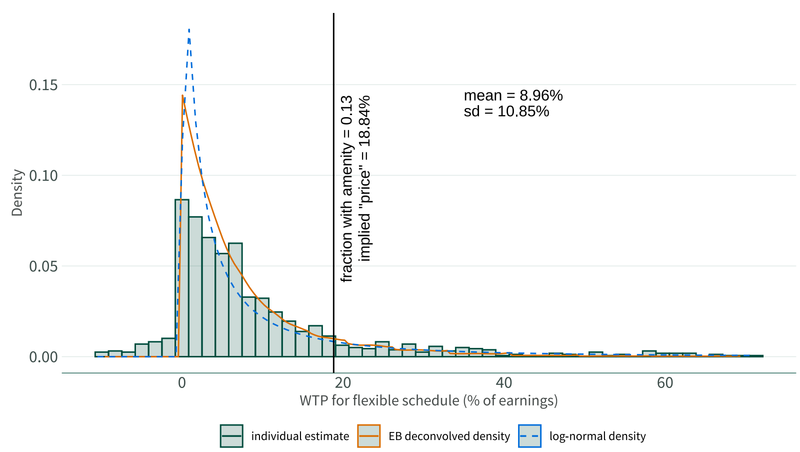


Note: See Table 1 for the definitions of the job characteristics considered.

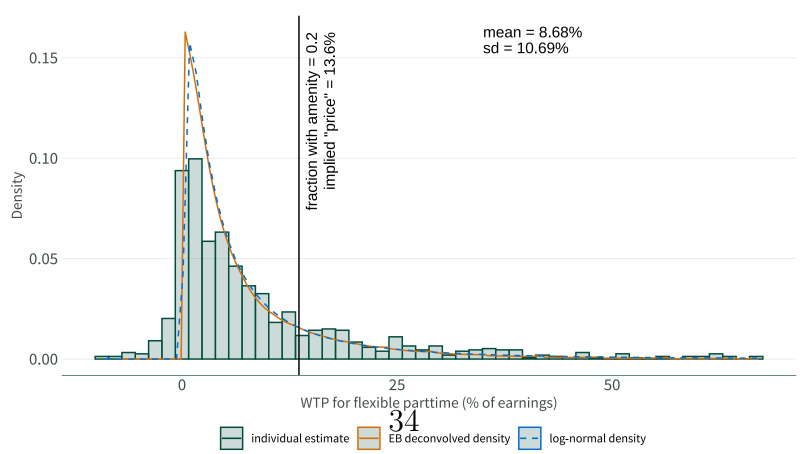
Figure 4: Individual WTP distribution



(a) Flexible Location



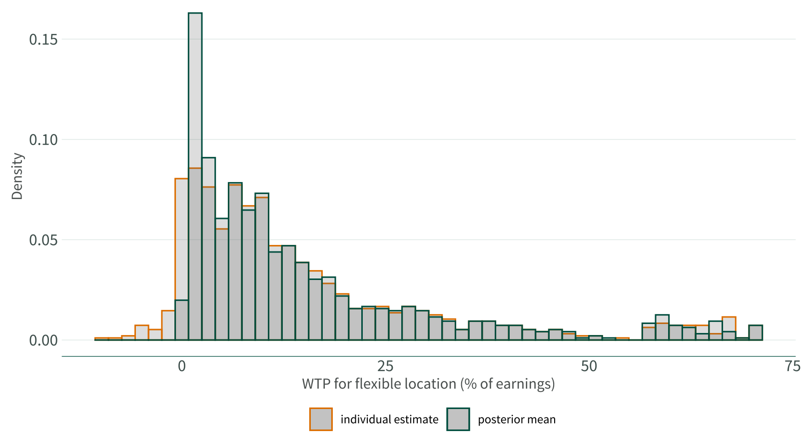
(b) Flexible Schedule



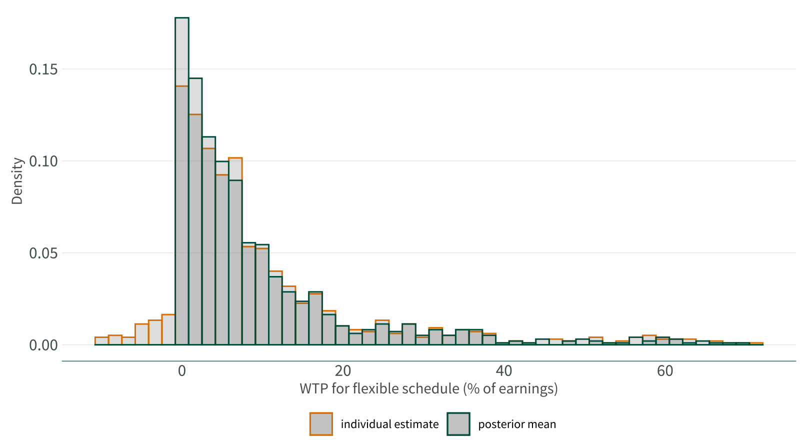
(c) Flexible Part-time

Note: This figure shows the non-parametric estimates of the distribution of individual-level WTPs for the three types of workplace flexibility. Green histograms show the distribution of estimated individual WTPs. Orange solid line shows estimates of population WTP distributions by the deconvolution procedure described in Kline, Rose and Walters (2021).

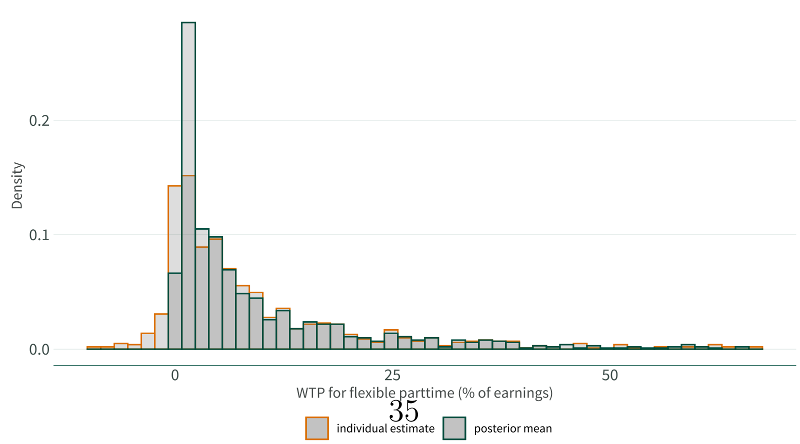
Figure 5: Posterior means of individual WTP estimates



(a) Flexible Location



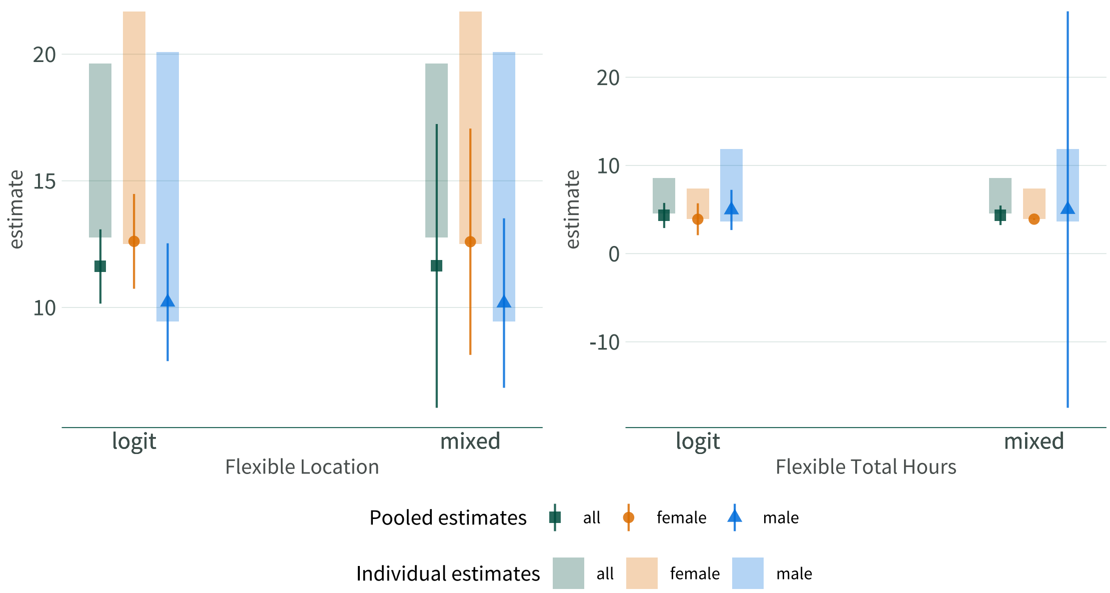
(b) Flexible Schedule



(c) Flexible Total Hours

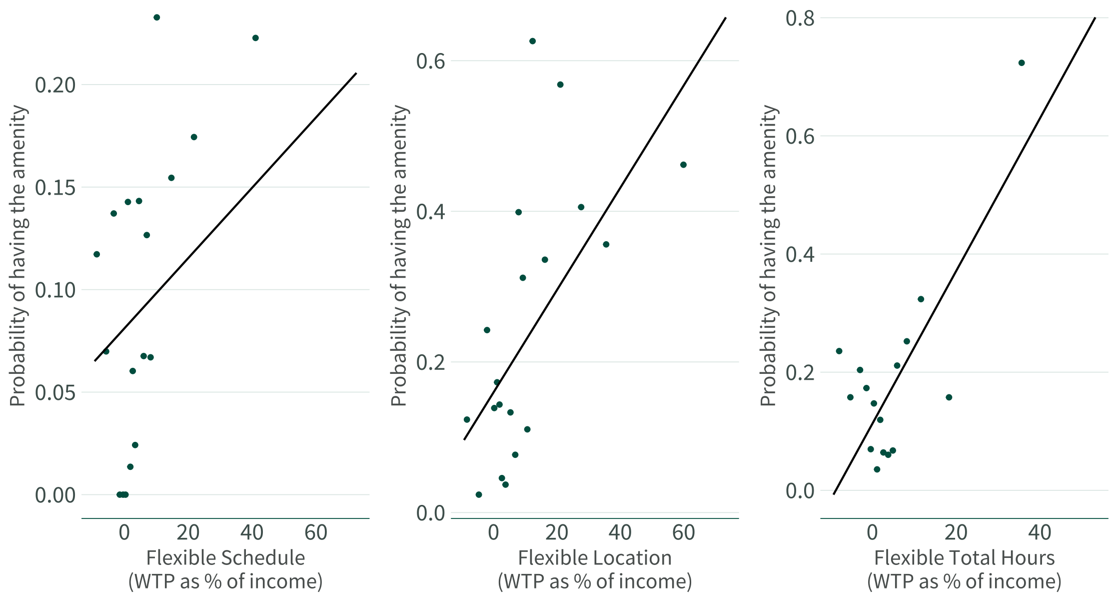
Note: This figure shows the histogram of the individual WTP estimates in orange and the histogram of the corresponding posterior mean WTPs in green.

Figure 6: Mean parameter comparison to the standard pooling approach



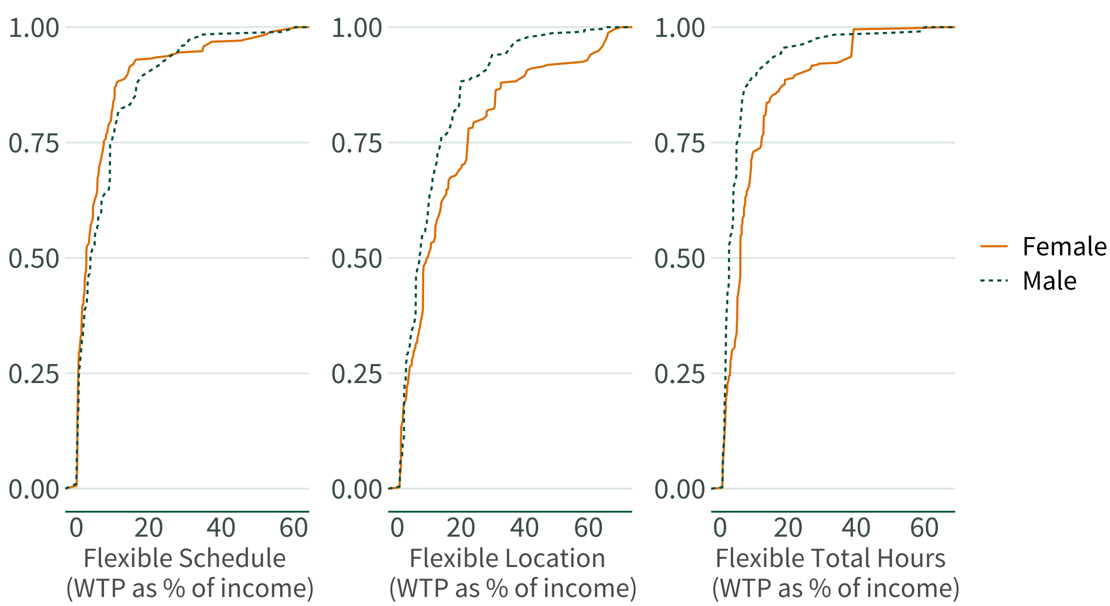
Note: This figure compares the mean of the individual-level WTP estimates to estimating the mean WTP when pooling together responses across all individuals.

Figure 7: Sorting by WTP



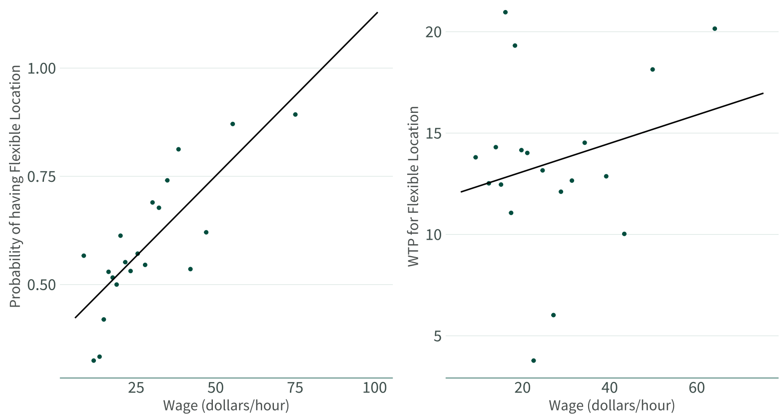
Note: The panel shows the binscatters of WTPs and the probability of having each of the three amenities considered: Location Flexibility, Control over Schedule, and Part-time for Part-pay Option

Figure 8: Empirical Cumulative Distributions of WTP by Gender

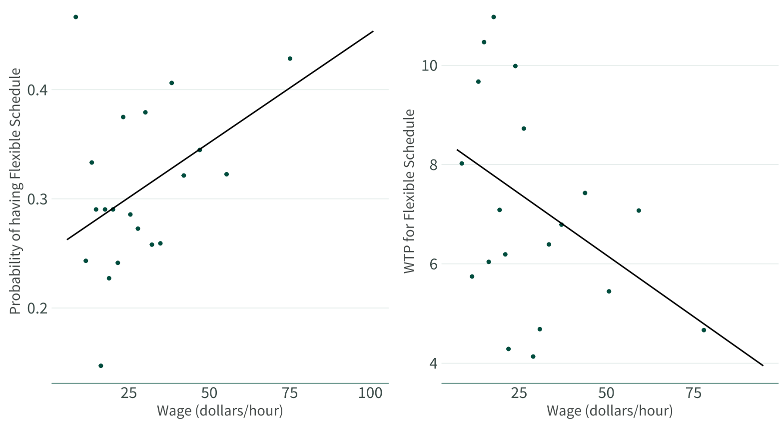


Note: The panel shows the empirical cumulative distributions of WTPs by gender for each of the three types of workplace flexibility: Location Flexibility, Control over Schedule, and Part-time for Part-pay Option

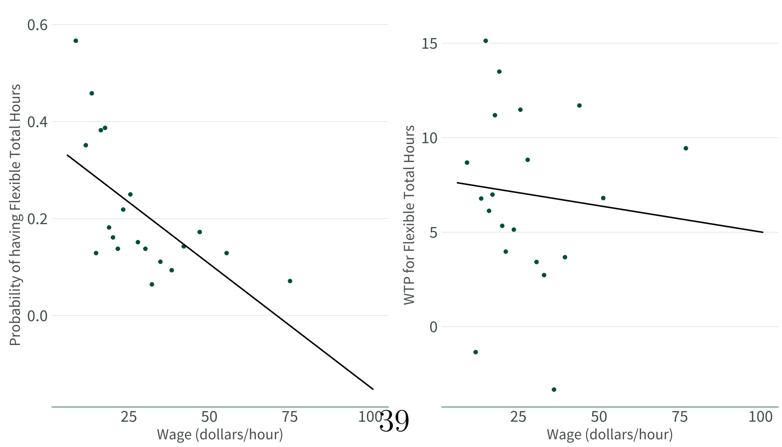
Figure 9: Amenity and WTPs across the Wage Distribution



(a) Flexible Location



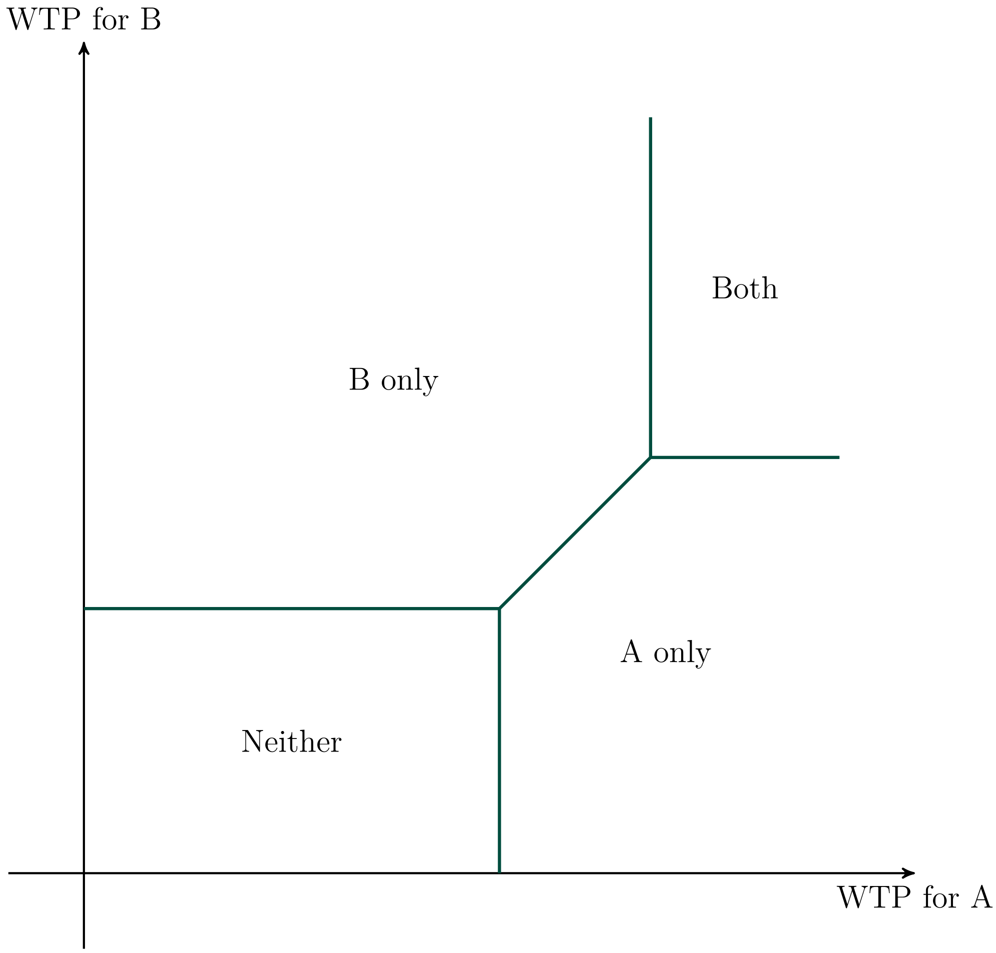
(b) Flexible Schedule



(c) Flexible Total Hours

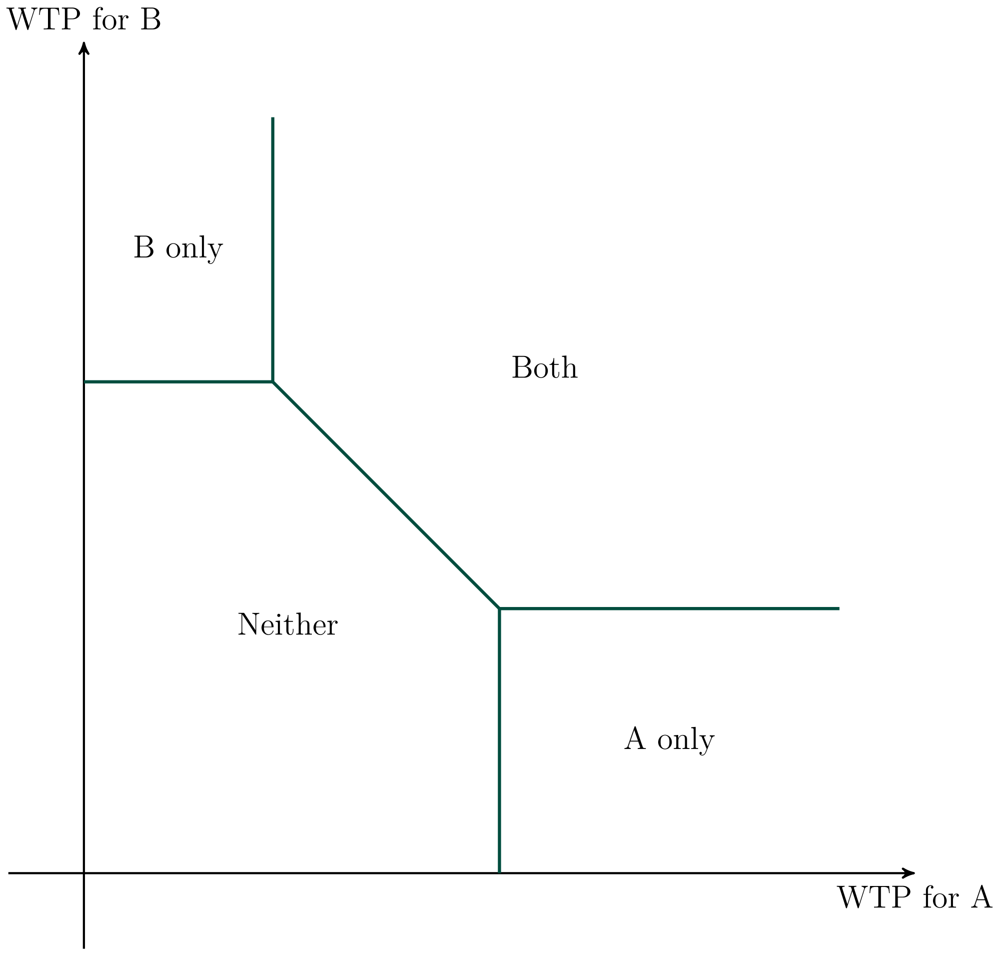
Note: The panel shows how amenity (left panels) and amenity (right panels) vary with wages for each of the three types of workplace flexibility: Location Flexibility, Control over Schedule, and Part-time for Part-pay Option

Figure 10: Sorting with two amenities: Positive price interaction



Note: This figure shows equilibrium demand for jobs with different amenity bundles in a case where the interaction between the amenity prices is positive.

Figure 11: Sorting with two amenities: Negative price interaction



Note: This figure shows equilibrium demand for jobs with different amenity bundles in a case where the interaction between the amenity prices is negative.

Table 1: Amenities and Assigned Values

Job characteristic	Base Value	Alternative Value
Part-time for Part-pay Option	Have to work regular full-time (same total number of hours) each week	Have the option to work part-time, any number of hours up to regular full-time, prorated at the same wage rate
Control over Schedule	Has a fixed regular schedule that is a standard weekday morning-afternoon schedule	Can make up your own schedule to cover the full required hours each week
Location Flexibility	Have to work on-site, with no option to work remotely	Have the option of working remotely (e.g., from home) or working on-site

Note: List of job characteristics considered.
Willing-to-pay refers to the fraction of earnings one is willing to give up in order to have the Alternative Value instead of the Base Value.

Table 2: Model estimates

	α	β
Flexible Location	1.458	-0.325
Flexible Schedule	1.267	-0.277
Flexible Total Hours	0.394	-0.0465
Flexible Location & Schedule	-0.1153	0.0135
Flexible Location & Total Hours	0.704	-0.119
Flexible Schedule & Total Hours	0.041	0.009

Note:

Table 3: Model fit

	Model	Data
Log wage	3.21 (0.03)	3.21
Std. log wage	0.54 (0.03)	0.54
Log wage—female	3.09 (0.04)	3.09
Log wage—male	3.35 (0.05)	3.35
Log wage—college	3.34 (0.04)	3.34
Log wage—non-college	2.91 (0.08)	2.91
Utility	3.34 (0.04)	3.27
Std. utility	0.58 (0.03)	0.56
Fraction with flexible location	0.30 (0.03)	0.29
Fraction with flexible schedule	0.34 (0.04)	0.32
Fraction with flexible total hours	0.22 (0.03)	0.21
Fraction with amenity—female	0.29 (0.04)	0.30
Fraction with amenity—male	0.31 (0.05)	0.28
Fraction with amenity—college	0.32 (0.04)	0.30
Fraction with amenity—non-college	0.25 (0.05)	0.27
Frac. amenity | high wage	0.38 (0.04)	0.31
Frac. amenity | low wage	0.26 (0.04)	0.27
Amenity-WTP slope	0.80 (0.05)	0.81
Log wage-WTP slope	-0.30 (0.09)	-0.23
Log wage-amenity slope	0.02 (0.08)	0.04

Note:

Table 4: Price of workplace flexibility

	College	Non-college	Male	Female	Skill 75th	Skill 25th
Flexible Location	0.33	0.47	0.33	0.40	0.25	0.48
Flexible Schedule	0.29	0.42	0.29	0.36	0.23	0.43
Flexible Total Hours	0.23	0.25	0.23	0.24	0.22	0.25
Flexible Location & Schedule	-0.07	-0.07	-0.07	-0.07	-0.06	-0.07
Flexible Location & Total Hours	0.29	0.34	0.29	0.32	0.26	0.34
Flexible Schedule & Total Hours	0.07	0.07	0.07	0.07	0.07	0.07

Note:

Table 5: Mechanical effect of differential prices

Outcome	Value	Change from baseline
Mean log wage	3.31	0.6%
Variance in log wage	0.48	-15.9%
Variance in log utility	0.63	-6.3%
Gender wage gap	0.18	-13.1%
Gender utility gap	0.23	-10.7%
High-skill vs low-skill wage gap	0.73	-12.7%
High-skill vs low-skill utility gap	0.86	-11.1%

Note:

Table 6: Behavioral effect of differential prices

Outcome	Value	Change from baseline
Mean log wage	3.28	-0.3%
Variance in log wage	0.53	-7.2%
Variance in utility	0.62	-7.9%
Flexible location: high skill	43.3%	-4.4%
Flexible location: low skill	41.7%	111.9%
Flexible schedule: high skill	34.7%	-8.2%
Flexible schedule: low skill	33.8%	95.6%
Flexible total hours: high skill	21.4%	16.6%
Flexible total hours: low skill	21.7%	-14.3%

Note:

Table 7: Behavioral effect of price interactions

Outcome	Value	Change from baseline
Flexible location: female/male ratio	0.90	9.3%
Flexible schedule: female/male ratio	0.95	1%
Flexible total hours: female/male ratio	1.04	-0.5%

Note: