Econometrica Supplementary Material

SUPPLEMENT TO "EQUILIBRIUM EFFECTS OF PAY TRANSPARENCY"

(*Econometrica*, Vol. 91, No. 3, May 2023, 765–802)

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THIS SUPPLEMENT IS ORGANIZED as follows. Supplemental Appendix D provides additional details and analysis of ROWTT laws. Supplemental Appendix E gives details on the meta-analysis. Supplemental Appendix F presents additional theoretical results.

APPENDIX D: DETAILS AND EXTENSIONS OF ROWTT ANALYSIS

D.1. *Documentation of ROWTT Laws*

We define an ROWTT as the first law within a jurisdiction which protects the rights of workers to disclose their own pay and inquire about the pay of coworkers, and extends to all workers in the private sector (with minimal exceptions, such as human resource representatives). We identify the enactment of ROWTT by conducting a stemmed search of the labor codes of all 50 states, and the District of Columbia,[1] for the terms "transparency," "discuss," "inquire," "disclose," and "reveal," and verifying the date the law became effective within the jurisdiction. For the state labor codes that contain these terms, we read the relevant statues to verify that they satisfy the above definition of ROWTT. We cross-check the list of identified states and timing of law enactment with a U.S. Department of Labor publication, which lists transparency laws for each state.[2] For 12 of 13 states in our analysis (i.e., those listed in Figure 1 of the main body), the law identified using our search procedure matches with law listed on the Department of Labor website. For one state (CA), the Department of Labor website lists a newer ROWTT with expanded penalties for violating firms that supersedes the ROWTT we identify, and which took effect on 1/1/2019, after the window of our analysis. The Department of Labor website additionally lists six states (WA, NV, CO, NE, LA, MA) which were identified by our search, but not included in our analysis as the ROWTTs in question are enacted after 2016.

D.2. *Public Sector Workers*

In Figure D.1, we replicate our baseline specification on a sample restricted to public sector workers. Public sector workers, by and large, experienced pay transparency earlier than ROWTT enactment. Many local laws made salaries public information for government workers; for example, in California, two-thirds of cities independently chose to disclose the compensation of city employees prior to a 2010 mandate to disclose salaries of all municipal employees (Mas (2017)). When we restrict attention to public sector workers, our standard errors are wider; however, the evidence points to minimal or no change

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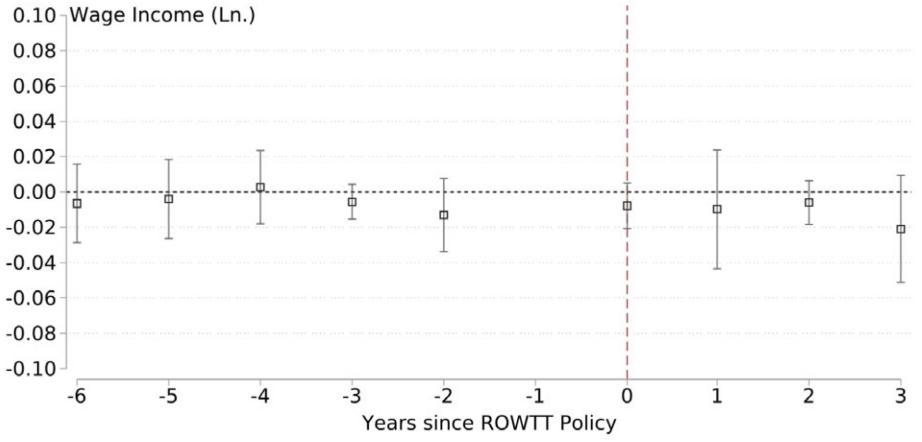
[1]The website for each state's labor office is linked at https://www.dol.gov/agencies/whd/state/contacts.
[2]See https://www.dol.gov/agencies/wb/equal-pay-protections.

 https://doi.org/10.3982/ECTA19788

PANEL A: WAGE INCOME (LN)



PANEL B: EMPLOYMENT

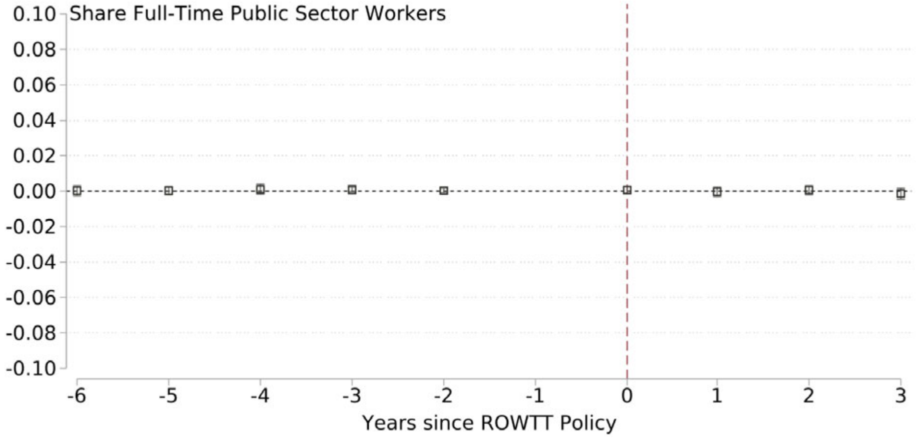


FIGURE D.1.—Effects of ROWTT laws on public sector workers. *Note:* In this figure, we replicate our baseline multi-period difference-in-differences estimates for public sector workers. We report the results from a balanced composition of states following the enactment of the law. Thus, we estimate the dynamic post-period effects for states with events through 2013 separately and report these in periods 0 to +3. See Equation (7) in the main body for more information on this specification. The standard deviation of the state-level mean from 2000 to 2016 is 0.103 for log wage income and 0.017 for the share of full-time private sector workers. We use the current population survey to estimate the share of workers covered by a union or collective bargaining agreement at the occupation level each year and split at the median occupation.

in overall wages following ROWTT enactment in this subsample. The average of all post-period coefficients is -1.1% (p-value $= 0.242$). Visually, point estimates of the change in wages year over year appear to decline only slightly, and the confidence interval always includes 0 effect. Our interpretation of a null effect on wages must be taken with a grain of salt, because the post-treatment confidence interval ranges from -3.0 to $+0.9$.

Figure D.1, Panel B reports the estimated coefficients, replacing our dependent variable with the share of workers employed full-time in the public sector. Our point estimates suggest that employment remains constant leading up to the ROWTT enactment, and continues on the same path after ROWTT. After one year, the coefficient is -0.03%

(p-value $= 0.807$), and after three years, the point estimate is -0.14% (p-value $= 0.355$). We cannot reject zero impact on employment during the three years after ROWTT enactment.

D.3. *Alternative Empirical Specifications*

All Events: 2004–2016

We expand our baseline specification to include all events, resulting in an unbalanced panel of states in the period after ROWTT enactment. We follow Equation (7) from the main body, and include relative lags and leads for each event between 2004 through 2016. Detailed estimates on the effects of ROWTT on wages can be found in column 2 of Table II in the main body. Prior to the enactment of the law, the dynamic effects are small and confidence intervals always include zero. In this specification, we estimate that wages fall by 1.7% (p-value $= 0.019$) in the first year after the law and that they continue to fall to -2.7% (p-value $= 0.041$) by year 3.

Column 2 of Table III in the main body replaces our dependent variable with the share of workers employed full-time in the private sector. Our point estimates suggest that employment remains constant leading up to the ROWTT enactment, and rises modestly after ROWTT. After one year, the coefficient is 0.23% (p-value $= 0.324$), and after three years the point estimate is 0.75% (p-value $= 0.062$).

Including Region-by-Year Fixed Effects

In this specification, we depart from the baseline by adding region-by-year fixed effects α_{tr} using the nine detailed divisions of the U.S. Census.[3] Detailed estimates on the effects of ROWTT on wages can be found in column 3 of Table II of the main body. Prior to the enactment of the law, the dynamic effects are small and confidence intervals always include zero. In this specification, we estimate that wages fall by 2.0% (p-value $= 0.022$) in the first year after the law and that they continue to fall to -2.4% (p-value $= 0.138$) by year 3.

Column 3 of Table III in the main body replaces our dependent variable with the share of workers employed full-time in the private sector. Our point estimates suggest that employment remains constant leading up to the ROWTT enactment, and rises modestly after ROWTT. After one year, the coefficient is 0.16% (p-value $= 0.491$), and after three years, the point estimate is 0.59% (p-value $= 0.053$).

Weighting by Gender-by-Education in $t = -1$

In this specification, we estimate our baseline model, re-weighting to fix the gender-by-education at its level in $t = -1$. The re-weighting factor can be expressed as $\frac{w^t_{\text{egs}}}{w^{E_s-1}_{\text{egs}}}$, where w^t_{egs} is the total weight of all of the workers with education e and gender g in state s at time t. Detailed estimates on the effects of ROWTT on wages can be found in column 4 of Table II in the main body. Prior to the enactment of the law, the dynamic effects are small and confidence intervals always include zero. In this specification, we estimate that

[3]We pool together the "West North Central" and "East North Central" divisions to form the "Midwest" Census region to ensure that there are no singleton divisions.

wages fall by 1.9% (p-value < 0.001) in the first year after the law and that they continue to fall to -2.5% (p-value $= 0.019$) by year 3.

Column 4 of Table III in the main body replaces our dependent variable with the share of workers employed full-time in the private sector. Our point estimates suggest that employment remains constant leading up to the ROWTT enactment, and rises modestly after ROWTT. After one year, the coefficient is 0.36% (p-value $= 0.007$), and after three years, the point estimate is 0.72% (p-value $= 0.038$).

Sun–Abraham Weighted Interaction Estimator

Following the Sun and Abraham (2020) procedure, we fully interact a vector of cohort indicators with the dynamic effect indicators. Thus, we estimate the following equation, recovering the cohort-specific dynamic effects β_{we}:

$$y_{ist} = \alpha_s + \sum_{e\in\mathcal{E}} \Bigg[\mathbf{1}\{E_s = e\} \times \Bigg(\sum_{\ell=-6}^{-2} \beta_{\ell e} \mathbf{1}\{t - E_s = \ell\} + \sum_{\ell=0}^{3} \beta_{\ell e} \mathbf{1}\{t - E_s = \ell\} + \gamma_e \mathbf{1}\{t - E_s < -6\} + \delta_e \mathbf{1}\{t - E_s > 3\} \Bigg) \Bigg] + \boldsymbol{\lambda} \boldsymbol{X}_{ist} + \boldsymbol{\epsilon}_{ist}, \tag{24}$$

where $\mathcal{E}$ is the set of all event times E_s. We then recover the interaction-weighted dynamic effects β_ℓ^{IW} by taking the weighted average of the underlying cohort-specific dynamic effects $\beta_{\ell e}$ in a given period ℓ. We assign each cohort its sample weight ω_e, which is simply the (sample-weighted) number of observations in each cohort divided by the total weight of the sample such that $\sum_{e\in\mathcal{E}} \omega_e = 1$. The IW estimates β_ℓ^{IW} are given by

$$\beta_\ell^{\text{IW}} = \sum_{e\in\mathcal{E}} \omega_e \beta_{\ell e}. \tag{25}$$

To create a valid control for a final cohort, we do not estimate the treatment effects of the 2016 cohort. We then collapse these cohort-specific dynamic effects and report the weighted average, where each cohort is weighted by its share of the estimation sample. To ensure a consistent set of states in the post-period (and to make estimates comparable to the baseline balanced specification), 2014 and 2015 cohorts receive zero weight in the post-period $w \geq 0$.

Detailed estimates on the effects of ROWTT on wages can be found in column 5 of Table II in the main body. Prior to the enactment of the law, the dynamic effects are small and similar to the baseline specification. However, these estimates are much more precisely estimated, so standard errors do exclude zero in periods -3 and -2. Post-period effects are also much more precise and exclude zero with p-values < 0.001 in all periods. The estimate in the first year of the event is a 2.3% decrease, and the estimated effect after three years is -2.9%. The 95% confidence intervals of the average effect in the post-period $\ell \geq 0$ covers -2.7% to 1.8%.

Column 5 of Table III in the main body replaces our dependent variable with the share of workers employed full-time in the private sector. Our point estimates suggest that employment remains constant leading up to the ROWTT enactment, and rises modestly after ROWTT. After one year, the coefficient is 0.32% (p-value $= 0.042$), and after three years, the point estimate is 0.67% (p-value < 0.001).

D.4. *Alternative Tests of Statistical Significance*

Across all specifications in the body of our paper, we use the cluster-robust variance estimator (CRVE) with two-way clustering at the state and year level to calculate standard errors. In this section, we turn to alternative methods of estimating the precision of our dynamic treatment effects, as CRVE may over-reject when the number of clusters is small, and non-homogeneous in size.

Wild Cluster Bootstrap With Random Inference (MacKinnon and Webb (2019, 2020))

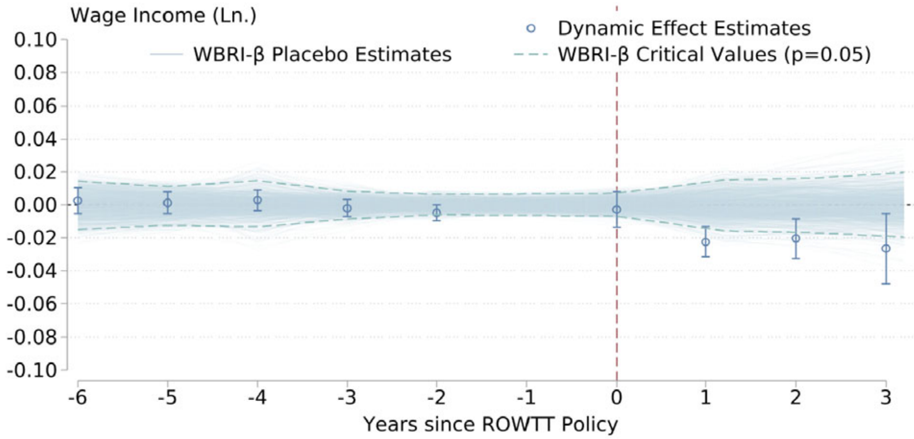
Second, we randomize the timing of ROWTT enactment across all states repeatedly in placebo tests in order to calculate the Wild Cluster Bootstrap with Random Inference (WBRI) proposed by MacKinnon and Webb (2019), and expanded upon in MacKinnon and Webb (2020).[4] Across our micro-data specifications and collapsed-data specifications, we apply WBRI methods and report p-values for our average treatment effect coefficient.

1. We estimate our regression models using two-way cluster-robust variance estimators, and calculate our central test statistics: the coefficient identifying the average treatment effect (mean effect size post-ROWTT-enactment less the mean effect pre-ROWTT-enactment).
2. We next randomly permute ROWTT enactment dates across states and execute the restricted cluster bootstrap on this counterfactual data set. The details are as follows:
   (a) We estimate residuals $u_{it} = y_{it} - X_{it}\beta_R$ from our regression model, excluding the vector of dynamic effect indicators. We refer to this as the restricted regression, since we have estimated β_R under the restriction that all dynamic effects are zero.
   (b) We randomly assign to each state the cluster weight $d_g \in \{-\sqrt{1.5}, -1, -\sqrt{0.5}, \sqrt{0.5}, 1, \sqrt{1.5}\}$ where each weight has probability 1/6.
   (c) We calculate the new pseudo-residual $\hat{u_{it}} = d_g u_{it}$ and the corresponding pseudo-outcome measure $\hat{y_{it}} = X_{it}\beta_R + \hat{u_{it}}$.
   (d) Finally, we estimate the full regression model from step (1) using the pseudo-outcome $\hat{y_{it}}$ and calculate our central test statistic: the mean effect size post-ROWTT-enactment less the mean effect pre-ROWTT-enactment.
3. We repeat step (2) 1000 times for each specification to generate a bootstrap distribution of test statistics under the null hypothesis.
4. We sort the absolute values of our test statistics across re-randomizations and find the location of our "true" test statistic from step (1) corresponding to the regression when treated states were assigned to their true treatment year, and residuals are not replaced with pseudo-residuals. Formally, the symmetric p-values are $\frac{1}{B}\sum_{b=1}^{B}\mathbf{1}(|\lambda| > |\lambda_b|)$, where λ is the true test statistic and λ_b is the test statistic corresponding to iteration b and $B = 1000$.

We extend Figure 3 in the main body to display the WBRI confidence intervals (95th percentile) in Figure D.2 for our main specification. Each gray line represents a single random permutation of the ROWTT enactment dates across states, and the resulting restricted cluster bootstrap on this counterfactual data set. 2.5% of these resulting estimates

[4]MacKinnon and Webb (2017) explained why the Wild Cluster Bootstrap (WCB) without randomization inference does not solve the problem of over-rejection.

PANEL A: WAGE INCOME



PANEL B: EMPLOYMENT

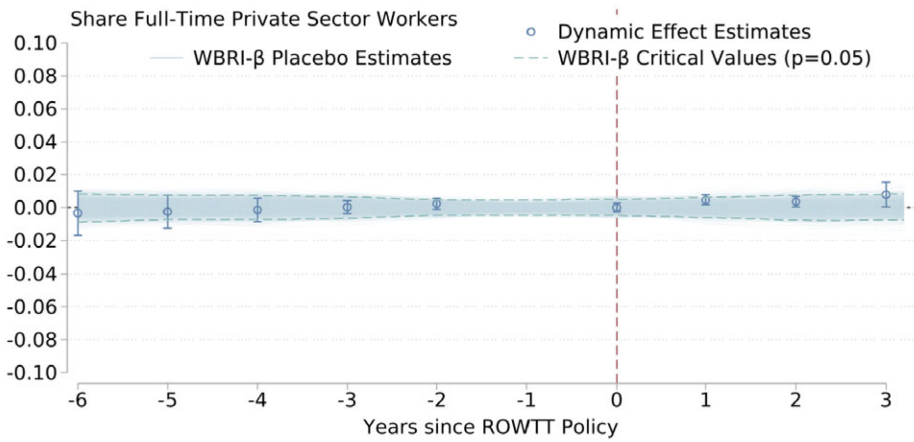


FIGURE D.2.—Randomization inference: effect of ROWTT laws on labor market outcomes. *Note:* We supplement Figure 3 in the main body by overlaying our point estimates and standard errors from our baseline cluster-robust variance estimator (CRVE) with confidence intervals constructed from the Wild Cluster Bootstrap with Randomization Inference (WBRI) procedure. The WBRI procedure involves randomizing the timing of ROWTT enactment across all states repeatedly in placebo tests designed by MacKinnon and Webb (2019). Each gray line corresponds to a permutation of ROWTT enactment dates, and estimation of our main specification under the null of no dynamic treatment effects. Dashed lines correspond to the WBRI critical values of treatment effects corresponding to a p-value of 0.05. The standard deviation of the state-level mean from 2000 to 2016 is 0.103 for the natural logarithm of wage income and 0.017 for the share of full-time private sector workers.

fall above, and 2.5% fall below the dotted line representing the 95% confidence interval. In Tables I and II in the main body, we report the resulting p-values from this procedure across all of our specifications of interest. Relative to p-values associated with CRVE, WBRI p-values are generally larger across specifications, though still consistently below the standard threshold of 0.05. One exception for both sets of p-values is our specification with region-by-year fixed effects. In this highly saturated specification, WBRI and CRVE

p-values hover above 0.10 for both our mico-data specification and our cluster-collapsed specification.

D.5. *Effects of ROWTT by Detailed Levels of Individual Bargaining Power*

In Figure D.3, Panel A, we further break out the education groups, roughly into thirds: those with no college, those with some college, and those with a four-year degree or more. In our sample, 37.3% of workers have only high school education, 23.1% of work-

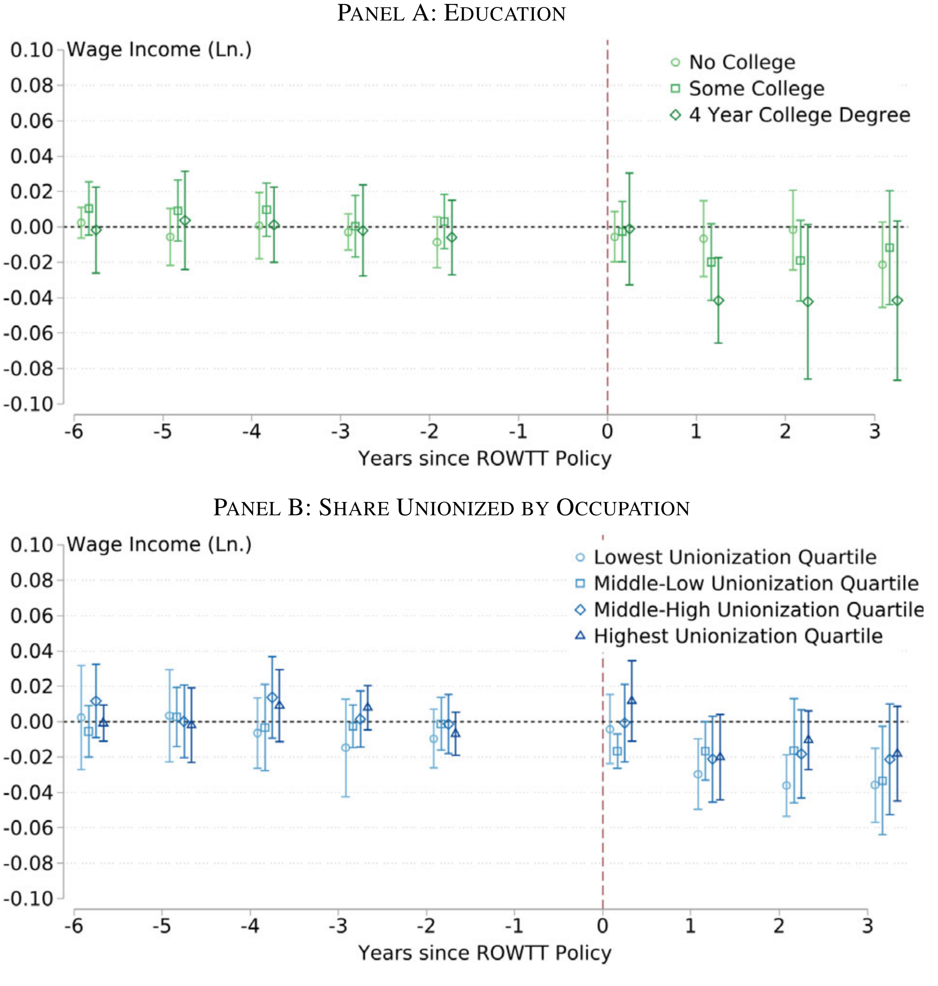


FIGURE D.3.—Heterogeneous effects of ROWTT on wages, by individual bargaining power. *Note:* In this figure, we present estimates on the dynamic wage impacts of ROWTT for workers with different levels of individual bargaining power. Panel A considers heterogeneous education levels: no college education, some college education, and four-year college degree. We fully interact a vector of indicators for each education group with the dynamic effect indicators, and include all controls from the baseline specification. Panel B considers quartiles of occupation-level unionization coverage. We fully interact a vector of indicators for each quartile with the dynamic effect indicators, and include all controls from the baseline specification. We use the Current Population Survey to estimate the share of workers covered by a union or collective bargaining agreement at the occupation level each year. The standard deviation of the state-level mean from 2000 to 2016 is 0.103 for log wage income.

ers have some college experience, and 39.7% have a four-year college degree. For the least-educated group, wages fall by only 0.9% (p-value $= 0.264$) following ROWTT enactment. Those with some college education experience wage declines of 1.3% (p-value $= 0.177$), and, for the most-educated group (those with four-year college degrees), wages fall by 3.1% (p-value $= 0.021$) over the same period. Thus, we see evidence of a gradient whereby the higher the education of workers, the larger the effect of ROWTT on wages. However, we should take these differences with a grain of salt because we cannot statistically distinguish them apart at this level of granularity.

In Figure D.3, Panel B, we show a gradient in the effect of pay transparency on wages corresponding to the unionization rates at the occupation level. When splitting occupations by their unionization rates, on average 1.9% of workers are covered by a union or collective bargaining agreement in the lowest quartile. In the second quartile, that share is 3.5%; in the third, 7.6%; and in the fourth quartile, 19.7%. We find that in the least-unionized quartile, wages fall by 3.6% (p-value $= 0.003$) three years after the event. However, in the most unionized quartile, wages fall by only 1.8% (p-value $= 0.168$) over the same period. The middle quartiles fall in between.

D.6. *Additional Heterogeneity Employment Results*

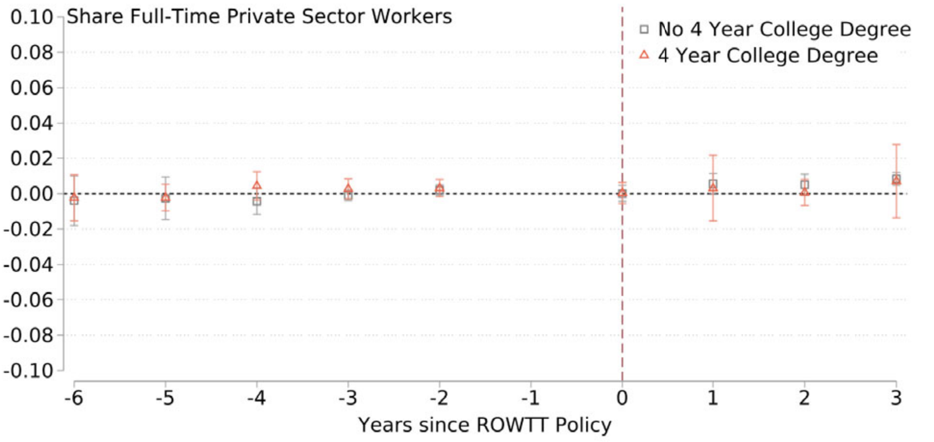
In Figure D.4, Panel A, we separately plot the dynamic effects of ROWTT on the share of workers employed in the private sector among those who do, and do not, have a four-year college degree, estimated jointly following Equation (8) in the main body. Leading up to the enactment of ROWTT, the share employment follows the same trajectory regardless of college education, and remains on the same path in the years following enactment. Among those with a four-year college degree, employment rises by 0.31% (p-value $= 0.723$) one year after enactment and remains at 0.70% (p-value $= 0.473$) three years after enactment. For those without a four-year college degree, employment rises by 0.55% (p-value $= 0.064$) one year after enactment and remains at 0.83% (p-value < 0.001) three years after enactment. We cannot rule out that the effects on employment are equivalent in the post-ROWTT period.

In Figure D.4, Panel B, we separately plot the dynamic effects of ROWTT on the share of workers employed in the private sector for occupations with above and below the median share of unionized workers, estimated following Equation (8) in the main body. Leading up to the enactment of ROWTT, share employment in high and low unionized occupations follows the same trajectory, and remains statistically unchanged in the years following enactment. Among relatively unionized occupations, employment rises by 0.66% (p-value $= 0.063$) one year after enactment and remains at 0.84% (p-value $= 0.016$) three years after enactment. For occupations with relatively low rates of unionization, employment rises by 0.46% (p-value $= 0.434$) one year after enactment and 1.00% (p-value $= 0.222$) three years after enactment. We cannot rule out that employment effects are equivalent for occupations with high and low unionization rates.

Gender Wage Gap

We are unable to directly test the compression of wages between males and females within a firm because we do not observe matched worker-firm data. Women could be disproportionately engaged in markets that are hardest hit by the transparency law vis-a-vis wage declines, for example, low-wage work, and this could offset within-firm relative gains. In Section 2.3 of the main body, we discuss the complexity of across-marketplace comparisons.

PANEL A: WITH VERSUS WITHOUT COLLEGE EDUCATION



PANEL B: BELOW- VERSUS ABOVE-MEDIAN UNIONIZATION RATE

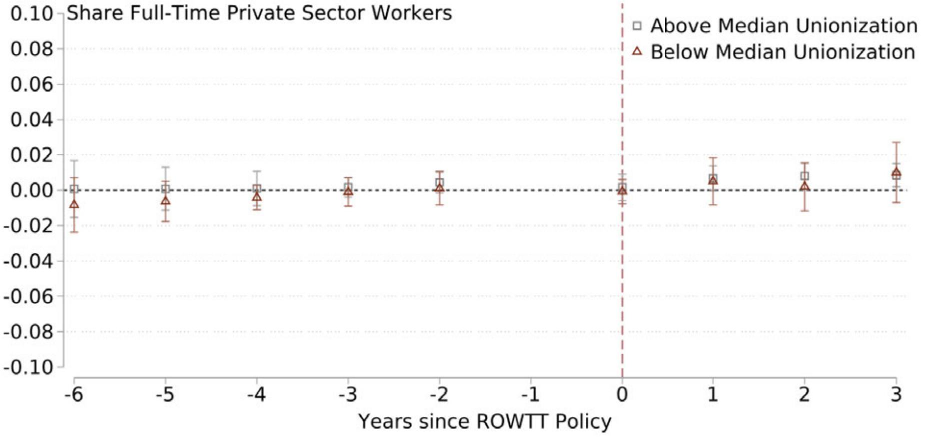
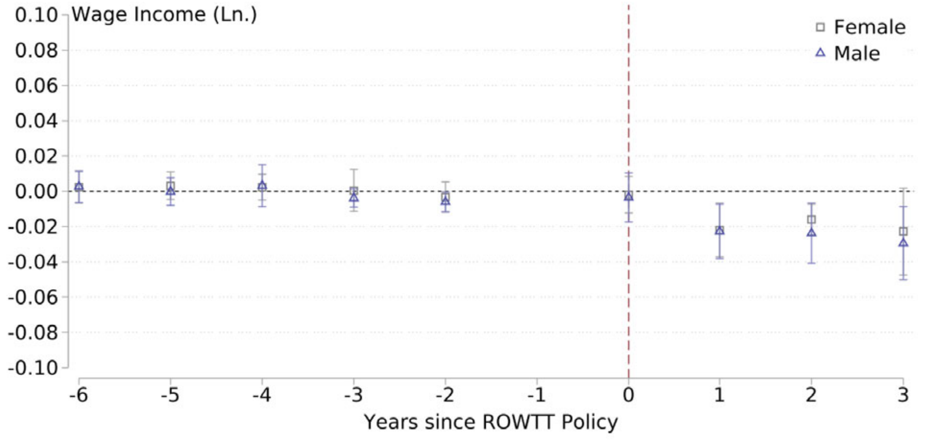


FIGURE D.4.—Heterogeneous effects of ROWTT policies on employment, by individual bargaining power. *Note:* In this figure, we present our baseline multi-period difference-in-differences estimates. In this baseline specification, we report the results from a balanced composition of states following the enactment of the law. Thus, we estimate the dynamic post-period effects for states with events through 2013 separately and report these in periods 0 to +3. See Equation (8) in the main body for more information on this specification. The standard deviation of the state-level mean from 2000 to 2016 is 0.103 for log wage income and 0.017 for the share of full-time private sector workers.

In Figure D.5, Panel A, we replicate our baseline specification separately for male and female full-time workers. The evidence points to similar wage declines for both groups following ROWTT enactment, with only slightly larger declines for male point estimates. The average of all post-period coefficients for women is 1.6% (p-value $= 0.023$) and for males is 2.0% (p-value $= 0.001$). The gender wage gap falls by 0.7 pp (p-value $= 0.198$) by the third year following ROWTT enactment.

Figure D.5, Panel B, displays private sector employment trajectory separately for males and females. Our point estimates suggest that employment remains constant leading up to the ROWTT enactment, and continues on the same path after ROWTT. We cannot reject zero impact on employment for both males and females during the three years

PANEL A: WAGE INCOME



PANEL B: EMPLOYMENT

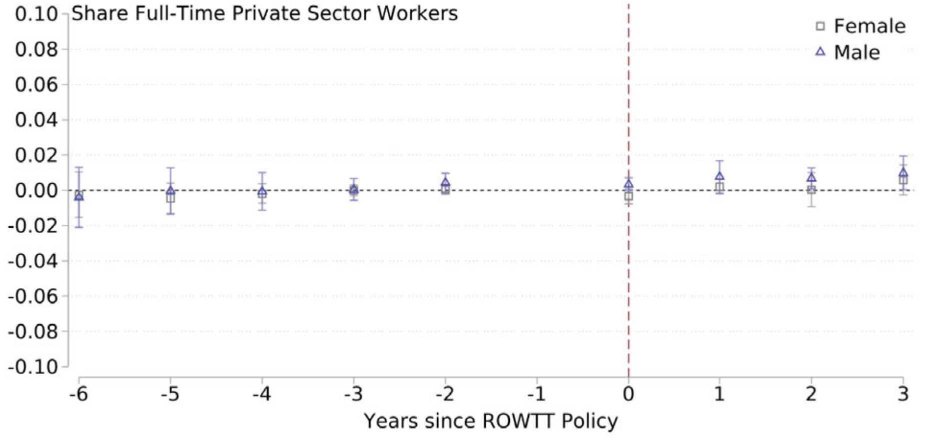


FIGURE D.5.—Heterogeneous effects of ROWTT laws on wages, by gender. *Note:* In this figure, we present our baseline multi-period difference-in-differences estimates. In this baseline specification, we report the results from a balanced composition of states following the enactment of the law. Thus, we estimate the dynamic post-period effects for states with events through 2013 separately and report these in periods 0 to +3. See Equation (8) in the main body (replacing "low BP" with "female") for more information on this specification. The standard deviation of the state-level mean from 2000 to 2016 is 0.103 for log wage income and 0.017 for the share of full-time private sector workers.

after ROWTT enactment; however, we also cannot reject a swing of 1% in private sector employment given the precision of our estimates.

APPENDIX E: STUDY DETAILS FROM META-ANALYSIS

We aim to include the universe of pay transparency studies, subject to certain criteria. First, the study must evaluate a policy including one of the following stemmed search terms: "pay transparency," "wage transparency," "salary transparency," "pay disclosure," "wage disclosure," or "salary disclosure." Second, the study must evaluate the effect of a pay transparency policy in a real-world labor market. Third, the study must evaluate the effect of pay transparency on the wages of all employees in that labor market. We searched for papers on the Econ lit database, SSRN, arxiv, NBER working papers series, IZA working paper series, Google Scholar, and the works cited of other included studies. We performed this search several times, with the final search being conducted in May, 2021.

Our search results in eight independently-conducted papers. Seven of these papers each include one study (Baker, Halberstam, Kroft, Mas, and Messacar (2021), Bennedsen, Simintzi, Tsoutsoura, and Wolfenzon (2019), Blundell (2021), Böheim and Gust (2021), Duchini, Simion, and Turrell (2020), Gulyas, Seitz, and Sinha (2021), Mas (2017), Obloj and Zenger (2022)), while Baker et al. (2021) contains two studies, one for unionized workers and one for non-unionized workers. In total, these papers evaluate six distinct pay transparency policies spanning five countries. In four of these studies, governments mandate disclosure of individual employee salaries, and in the remaining five, wage gaps between men and women.

For each study, we extract information about overall wage effects and labor market unionization. We select the author's preferred specification when clear, as is the case for six of the nine studies. When not specified, we select the specification closest to our theoretical framework, that is, examining wage spillovers within position. Baker et al. (2021) (both studies) and Obloj and Zenger (2022) present two preferred specifications each. In Baker et al. (2021), one specification considers a worker as treated if the wage of a coworker at the same department and institution is revealed. Another specification consider a worker as treated if the wage of a coworker at the same department, institution, and *rank* is revealed. We select the latter specification because our model's predictions are in settings where wages of peers with the same value to the employer are revealed. The authors noted on page 14 that this specification is the one that better captures "horizontal" rather than "vertical" comparisons. We apply the same reasoning to our choice of specification in Obloj and Zenger (2022).

In Table E.1, we include the full set of studies surfaced using our criteria for inclusion, and relevant details of each study. For each study, we include details of the labor market setting studied, the type of transparency intervention studied, the unionization rate, the effect of the policy on men's wages (and the associated standard error), the effect of the policy on women's wages, as well as information necessary to present the imputed wage effect for all workers: the share of men in the market, and the pre-policy female to male wage ratio.

APPENDIX F: THEORETICAL EXTENSIONS

F.1. *Other Transparency Processes*

Other pay transparency laws may not directly promote individual worker observation of the firm's wage profile. Instead, these laws could reveal average wages, average wage gaps across groups, or salary ranges.

We show that such laws have similar equilibrium effects as increasing transparency, as studied in our base model. The central insight is that all of these laws have similar equilibrium effects that reveal information about the firm's willingness to pay for a position. As we show below, the laws we study increase workers' information about the maximum wage they can receive, which in turn affects (re)negotiations, triggering the supply and demand effects.

TABLE E.1

META-ANALYSIS STUDY DETAILS.

Study	Labor Market	Policy Discloses	Union/ CBA rate	Men's wage effect (SE)	Women's wage effect	Share men	W:M pre-policy pay ratio	Imputed wage effect
Baker et al. (2021)	Canada	Individuals' wages	1	−0.009 (0.006)	0.018	0.68	0.89	−0.001
Baker et al. (2021)	Canada	Individuals' wages	0	−0.024 (0.006)	−0.024	0.74	0.89	−0.024
Bennedsen et al. (2019)	Denmark	Relative earnings by gender	0.67	−0.015 (0.0037)	0.0036	0.7	0.84	−0.010
Blundell (2021)	U.K.	Relative earnings by gender	0.3	−0.014 (0.0047)	0.002	0.61	0.83	−0.008
Böheim and Gust (2021)	Austria	Relative earnings by gender	0.99	0.005	−0.008	0.42	0.78	−0.000
Duchini, Simion, and Turrell (2020)	U.K.	Relative earnings by gender	0.3	−0.026 (0.011)	0.001	0.54	0.80	−0.017
Gulyas, Seitz, and Sinha (2021)	Austria	Relative earnings by gender	0.99	0.002 (0.004)	0.001	0.58	0.75	0.002
Mas (2017)	CA	Individuals' wages	0.17	−0.014 (0.017)	−0.07	0.99	2.80	−0.014
Obloj and Zenger (2022)	U.S.	Individuals' wages	0.25	−0.016 (0.008)	0.005	0.614	0.93	−0.009

Note: For all studies, we report coefficient estimates from the specification with the most fixed effects. For studies that report a single treatment effect coefficient, we include that number; otherwise, we report the coefficient from the final year of the analysis. Except as noted below, all numbers are drawn from each paper. Baker et al. (2021): Numbers drawn from Table 4 Col. 4 and 5, Table 2. We assume same W:M pre-intervention pay ratio in unionized and non-unionized workplaces. Bennedsen et al. (2019): Numbers drawn from Table 3 Col. 7, Table 1. Unionization share from Visser (2019). Duchini, Simion, and Turrell (2020): Numbers drawn from Table 5 Col. 1, Table 2. Unionization number calculated as average of male and female unionization rate from Table 2. Blundell (2021): Numbers drawn from Figure 1, Table 1, Table 2 Col. 5. Union/CBA not provided, but sample of firms largely overlaps with that of Duchini, Simion, and Turrell (2020), and therefore, the figure from Duchini, Simion, and Turrell (2020) is used. Böheim and Gust (2021): This study reports wage effects from staggered implementation of a law which successively applies to firms above successively smaller and smaller threshold number of employees. As a result, we provide only a single estimate corresponding to the final cohort analyzed, corresponding to a 150 worker threshold. All cohorts have wage effects that are statistically indistinguishable from zero. Weighing the average change in each cohort by number of workers leads to similar inferences. This study reports the effect on wage levels, not the natural logarithm of wages; therefore, we impute the wage effects for each group as follows: from Table 1, we calculate the share of women and the W:M pay ratio as the average of these numbers from the set of firms above and below the 150 threshold. We use these numbers and coefficient estimates from Table 4, Panel D. Row 2 to calculate the percentage change in men's and women's wages in each group. Union/CBA not provided, but sample of firms largely overlaps with that of Gulyas, Seitz, and Sinha (2021), and therefore, the figure from Gulyas, Seitz, and Sinha (2021) is used. Gulyas, Seitz, and Sinha (2021): Numbers drawn from Table 1, Table B2 Col. 2, Footnote 6. Unlike other papers, women are used as base category. To calculate SE of men's wage effect, we assume 0 covariance between women's wage effect dummy and differential effect for men and women coefficient. Mas (2017): Numbers drawn from Table 2 Col. 5 Row 3, Table 3 Col. 2 Row 3. Additional numbers and unionization rate drawn from the California municipal pay website at https://publicpay.ca.gov and Reese (2019). Disclosure of employee salaries is facilitated by newspapers and other organizations who release salary information garnered through Freedom of Information Act requests. The author reports the effect of transparency on managers' and non-managers' wages. We abuse terminology and refer to managers as "men" and non-managers as "women." Separately, the author presents the differential wage effects of transparency for male and female managers in Table A3, Column 2. Obloj and Zenger (2022): Numbers drawn from Table 1 Col. 6, page 5. Unionization share from Schmidt (2012). Disclosure of employee salaries is facilitated by newspapers and other organizations who release salary information garnered through Freedom of Information Act requests.

Average Salary and Gender Pay Gap Disclosure

We make the following change to our model: suppose the information arrival does not reveal the entire profile wages, but rather reveals average wages of all initially hired workers, that is, the average of $\{w_{i,1}\}_{i\in I_1}$.

By Assumption A3, both $\bar{w}$ and $\underline{w}_{i,1}$ are strictly increasing in v and θ_i, respectively. As workers trace out the set $[a, 1]$ for some $a > 0$ with their initial offers, there is a one-to-one relationship between average wage (prior to information arrival) and $\bar{w}$. Therefore, upon observing the average wage, workers learn $\bar{w}$ in equilibrium.

Workers may similarly learn $\bar{w}$ in equilibrium if the arrival process reveals the wage gap across groups. Suppose there are two groups of workers, M (men) and W (women), and each worker i belongs to exactly one group. Each group contains a positive measure of workers. Let G_ℓ represent the distribution of outside options for type $\ell \in \{M, W\}$, and let $G(x) := qG_M(x) + (1-q)G_W(x)$ for all $x \in [0, 1]$, where $q \in [0, 1]$ is the proportion of M-group workers in the market. If G_M dominates G_W in the likelihood ratio order, that is, $\frac{g_M(x)}{g_W(x)}$ is strictly increasing in x, then as $\bar{w}$ increases, the average wage of M-group workers increases by more than the average wage of W-group workers. Therefore, there is again a one-to-one relationship between the size of the wage gap and $\bar{w}$, implying that workers learn $\bar{w}$ in equilibrium upon observation of the wage gap.

The following result summarizes both of these cases.

PROPOSITION 5: *Suppose the information process arrives with probability* $\tau > 0$.

1. *If the information process reveals the average wages of all workers*, *then the set of equilibrium outcomes satisfying* A1–A3 *is identical to that in our base game*.
2. *If the information process reveals the gap between the average wages of* M- *and* W-*group workers*, *then the set of equilibrium outcomes satisfying* A1–A3 *is identical to that in our base game if* G_M *dominates* G_W *in the likelihood ratio order.*

PROOF: We prove only point 2 of the proposition, as the proof of point 1 is similar.

First, suppose that for any $i \in I_1$ and any $\underline{w}_{i,1}$, i identifies $\bar{w}$ upon the arrival of the information process. Then i will successfully renegotiate her wage to $\bar{w}$ if she is able to renegotiate her wage, as in our base model.

Therefore, the proof is completed by showing that in any equilibrium satisfying A1–A3, each initially employed worker $i \in I_1$ identifies $\bar{w}$ on equilibrium path upon arrival of the information process. In any such equilibrium, both M- and W-group workers with outside option θ_i make the same initial offer. We know that $\underline{w}_{i,1}$ is strictly increasing in θ_i by A3.

Let $L : [0, 1] \to [0, 1]$ be the average wage of hired M-group workers minus the average wage of hired W-group workers in equilibrium as a function of $\bar{w}$, and let $\bar{\theta}_\ell : [0, 1] \to [0, 1]$ be the average outside option of group $\ell \in \{M, W\}$ workers hired in equilibrium as a function of $\bar{w}$. We claim that $L(\cdot)$ is strictly increasing. To see this, take $\bar{w}' > \bar{w}$. The assumption that $\frac{g_M(x)}{g_W(x)}$ is strictly increasing in x implies that there are increasing differences in worker group and firm offer, that is, $\bar{\theta}_M(\bar{w}') - \bar{\theta}_M(\bar{w}) > \bar{\theta}_W(\bar{w}') - \bar{\theta}_W(\bar{w})$. By the arguments in the preceding paragraph, this completes the claim that $L(\cdot)$ is strictly increasing.

Because $L(\cdot)$ is strictly increasing, it is invertible, leading each worker $i \in I_1$ who observes the wage gap to identify $\bar{w}$. *Q.E.D.*

Heterogeneous Worker Qualities and Salary Range Revelation

Until now, we have assumed that all workers are equally productive. Here, we discuss our findings in contexts where there may be significant heterogeneity in worker productivities. Information arrival about wages reveals the range of salaries offered to all workers. Therefore, we refer to transparency in this context as salary range revelation.

First, we extend the results of our base model to the case where each worker's productivity is common knowledge. Suppose each worker $i \in I$ has a publicly observable type $\lambda \in \Lambda$ where Λ is a countable set, each containing a positive measure of workers. Each worker i of type λ has a private outside option $\theta_i \overset{\text{iid}}{\sim} G_\lambda[0, 1]$. Let $v_\lambda \sim F_\lambda[0, 1]$ be the productivity of type λ workers, which is known only to the firm.[5] Mirroring the assumptions of our base model, we assume that, for each $\lambda \in \Lambda$, the distribution of outside options and firm values F_λ and G_λ are twice continuously differentiable with densities f_λ and g_λ, respectively, where $f_\lambda(x) > 0$ for all $x \in (0, 1]$ and $g_\lambda(y) > 0$ for all $y \in [0, 1)$. We also assume agents have strictly increasing virtual values, that is, $\theta + \frac{G_\lambda(\theta)}{g_\lambda(\theta)}$ is strictly increasing in θ and $v - \frac{1-F_\lambda(v)}{f_\lambda(v)}$ is strictly increasing in v for all $\lambda \in \Lambda$. Our base model is a special case in which $|\Lambda| = 1$, that is, all workers are equally productive.

As before, each worker i of type λ makes an initial wage offer $\underline{w}_{i,\lambda,1}$, and then an additional wage offer after observing peer wage information with probability ρ. The firm picks a maximum wage $\bar{w}_\lambda(v_\lambda)$ for each type λ.

If all workers' types λ are known, then the results of our paper go through within type. That is, each λ forms a different market. On equilibrium path, the firm picks the maximum wage for type λ workers $\bar{w}_\lambda(v_\lambda)$ as in the base model given distributions F_λ and G_λ, and each worker i of type λ picks an initial offer $\underline{w}_{i,\lambda,1}$ as in the base model given distributions F_λ and G_λ. Upon observing wage information, each worker i identifies the maximum wage associated with her productivity type, and offers that amount to the firm in renegotiations.

We shift our focus on the case in which workers are differentially productive, but each worker knows only her own productivity type. To highlight mechanisms at play, we study the extreme case in which at no point prior to bargaining do workers receive a signal of their (relative) productivity type: outside options are distributed independently of productivity type and the value for workers of different productivity are drawn from the same distribution.

Formally, we suppose that there are two productivity types λ and λ'. v_λ and $v_{\lambda'}$ are drawn independently from the same distribution F. Each worker is equally likely to have productivity type v_λ or $v_{\lambda'}$. The firm knows each worker's productivity type, but workers observe only their own productivity type. Denote the maximum wage the firm selects for each productivity type as $\bar{W}_{v_\lambda}$ and $\bar{W}_{v_{\lambda'}}$, where we use capital letters to denote the model where workers observe only their own productivity types.

Under full privacy ($\tau = 0$), the equilibrium outcome mirrors that of the base model. Therefore, firm profits, the expected level of employment, and wage dispersion are the same as before.

For tractability, we consider only the effects of full transparency with common renegotiations ($\tau\rho = 1$) with $k = 0$. Without loss of generality, we assume that $v_\lambda \leq v_{\lambda'}$. Therefore, $\bar{W}_{v_\lambda}(v_\lambda)$ and $\bar{W}_{v_{\lambda'}}(v_{\lambda'})$ denote the maximum wage functions for the less productive and

[5] We do not require that each v_λ is drawn independently. For example, (with minor notational changes to accommodate different supports) we could allow that the productivity of type $\lambda \in \Lambda$ workers is given by $\lambda \cdot v$ where $v \sim F[0, 1]$ as in Mussa and Rosen (1978) and Shaked and Sutton (1982).

more productive workers, respectively. However, we highlight that workers do not know whether $v_\lambda \leq v_{\lambda'}$ or $v_\lambda > v_{\lambda'}$.

We first argue that in any equilibrium satisfying our regularity conditions, $\bar{W}_{v_\lambda}$ and $\bar{W}_{v_{\lambda'}}$ are identified by all workers whose initial offers are not rejected by the firm. (Recall that workers do not know which value corresponds to the maximum wage for their own productivity type, since they do not know whether $v_\lambda \leq v_{\lambda'}$ or $v_\lambda > v_{\lambda'}$.) Given the change in our setting, we make slight changes to our regularity conditions below:

$\bar{A}1$ $0 \leq \bar{W}_{v_\lambda} \leq \bar{W}_{v_{\lambda'}} \leq 1$ for all $v_\lambda, v_{\lambda'}$. If $v_{\lambda'} \leq \underline{w}_{i,1}$ for every worker i according to equilibrium strategies, then $\bar{W}_{v_{\lambda'}} = v_{\lambda'}$.

$\bar{A}2$ $\theta_i \leq \underline{w}_{i,1} \leq 1$ for all i. If there is no $v_{\lambda'}$ such that $\theta_i \leq \bar{W}_{v_{\lambda'}}$ according to equilibrium strategies, then $\underline{w}_{i,1} = \theta_i$.

$\bar{A}3$ $\bar{W}_{v_{\lambda'}}$ and $\underline{w}_{i,1}$ are strictly increasing functions of $v_{\lambda'}$ and θ_i, respectively. Moreover, $\bar{W}_{v_{\lambda'}}$ is continuously differentiable for $v_{\lambda'} \in (\underline{w}_{i,1}(0), 1)$ and $\underline{w}_{i,1}$ is continuously differentiable for $\theta \in (0, \bar{W}_{v_{\lambda'}}(1))$.

LEMMA 1: *Let $\tau\rho = 1$ and $k = 0$. In any equilibrium satisfying $\bar{A}1$–$\bar{A}3$, all workers whose initial offers are accepted by the firm learn $\bar{W}_{v_\lambda}$ and $\bar{W}_{v_{\lambda'}}$ and $\underline{w}_{i,1} = \theta_i$ for all workers.*

PROOF: Suppose an equilibrium satisfying $\bar{A}1$–$\bar{A}3$ exists. Then the distribution of initial offers is given by $G(\gamma^{-1}(x))$ for a continuous and strictly increasing function γ for each $x \in [\gamma(0), 1]$.

As argued in Proposition 1 in the main body, upon observing peer wages, any worker initially employed by the firm infers $\bar{W}_{v_{\lambda'}}$ as equal to the maximum wage observed.

We now turn our attention to $\bar{W}_{v_\lambda}$. First suppose that $v_\lambda < v_{\lambda'}$. Worker i of type v_λ will be hired if and only if $\gamma(\theta_i) \leq \bar{W}_{v_\lambda}$ and a worker j of type $v_{\lambda'}$ will be hired if and only if $\gamma(\theta_j) \leq \bar{W}_{v_{\lambda'}}$. Given our assumption that $g(\cdot)$ has full support and $\gamma(\cdot)$ is continuous, there will be a discontinuity in the density of wages $\{w_{i,1}\}_{i\in I_1}$ at $\bar{W}_{v_\lambda}$, that is, the density of initial wages will be equal to $g(\gamma^{-1}(x))$ for any $x \in [0, \gamma^{-1}(\bar{W}_{v_\lambda})]$ and will be equal to $\frac{g(\gamma^{-1}(x))}{2}$ for any $x \in (\gamma^{-1}(\bar{W}_{v_\lambda}), \gamma^{-1}(\bar{W}_{v_{\lambda'}})]$. Given that we have assumed that $g(\cdot)$ is continuous, the discontinuity at $\bar{W}_{v_\lambda}$ is the unique such discontinuity. If $v_\lambda = v_{\lambda'}$, then there is no such discontinuity.

Finally, we argue that in any such equilibrium, it is the case that $\underline{w}_{i,1} = \theta_i$ for all $i \in I$. Note that given that all workers are able to infer $\bar{W}_{v_\lambda}$ and $\bar{W}_{v_{\lambda'}}$ and renegotiate their wages, and the fact that $\bar{W}_{v_{\lambda'}}$ is strictly increasing and continuous in $v_{\lambda'}$, each worker i with $\theta_i \leq \bar{W}_{v_{\lambda'}}(1)$ will (uniquely) maximize her expected payoff with a strategy that takes the following form: offer $\underline{w}_{i,1} = \theta_i$ and $\underline{w}_{i,2} \in \{\bar{W}_{v_\lambda}, \bar{W}_{v_{\lambda'}}\}$ (where $\bar{W}_{v_\lambda}$ and $\bar{W}_{v_{\lambda'}}$ are identified as in the previous paragraph). By Assumption $\bar{A}2$, all other workers also offer $\underline{w}_{i,1} = \theta_i$. *Q.E.D.*

Consider any equilibrium and any worker $i \in I$. If $\bar{W}_{v_{\lambda'}} < \theta_i$, then i's initial wage offer is rejected by the firm. Otherwise, at $t = 2$, she will offer $\bar{W}_{v_\lambda}$ (and remain employed with probability 1) if $\bar{W}_{v_\lambda} > \frac{1}{2}\bar{W}_{v_{\lambda'}} + \frac{1}{2}\theta_i$ and she will offer $\bar{W}_{v_{\lambda'}}$ (and remain employed with probability $\frac{1}{2}$) if $\bar{W}_{v_\lambda} \leq \frac{1}{2}\bar{W}_{v_{\lambda'}} + \frac{1}{2}\theta_i$. To do away with a multiplicity of payoff-equivalent equilibria, we assume that $\bar{W}_{v_\lambda} \in [\frac{\bar{W}_{v_{\lambda'}}}{2}, \bar{W}_{v_{\lambda'}}]$.

There is clearly a loss in employment (and therefore firm profits) at $t = 2$ caused by the uncertainty workers have over their relative productivity. On the other hand, low-outside-option, productivity $v_{\lambda'}$ workers may offer $\bar{W}_{v_\lambda}$ at $t = 2$, meaning that the firm is able to hire some high-productivity workers at low wages, increasing profits. We show that, because of this latter effect, the firm sets $\bar{W}_{v_\lambda}$ higher than it would have for the same v_λ with publicly known worker productivities.[6]

PROPOSITION 6: *Fix $\tau\rho = 1$ and $k = 0$. There is a unique equilibrium satisfying $\bar{A}1$–$\bar{A}3$. In it, $\bar{W}_{v_{\lambda'}} = \bar{w}_{\lambda'}(v_{\lambda'})$ and all employed workers receive final pay weakly higher than $\bar{w}_\lambda(v_\lambda)$.*

PROOF: We have already explained that workers with $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} > \theta_i$ will offer a wage of $\bar{W}_{v_\lambda}$ and those with $\bar{W}_{v_{\lambda'}} \geq \theta_i \geq 2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}}$ will offer a wage of $\bar{W}_{v_{\lambda'}}$ (at $t = 2$). Therefore, the firm maximizes

$$\left(\frac{1}{2}v_\lambda + \frac{1}{2}v_{\lambda'} - \bar{W}_{v_\lambda}\right)G(2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}}) + \frac{1}{2}(v_{\lambda'} - \bar{W}_{v_{\lambda'}})\big[G(\bar{W}_{v_{\lambda'}}) - G(2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}})\big] \quad (26)$$

with respect to $\bar{W}_{v_\lambda}$ and $\bar{W}_{v_{\lambda'}}$. We solve this maximization problem under the assumption that $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} > 0$ and later deal with the boundary case of $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} = 0$.

Solving the FOCs jointly yields the following two equations that implicitly define $\bar{W}_{v_\lambda}$ and $\bar{W}_{v_{\lambda'}}$:

$$\frac{G(2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}})}{g(2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}})} = v_\lambda - [2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}}], \quad (27)$$

$$\frac{G(\bar{W}_{v_{\lambda'}})}{g(\bar{W}_{v_{\lambda'}})} = v_{\lambda'} - \bar{W}_{v_{\lambda'}}. \quad (28)$$

We make note of several points. First, the virtual value assumptions we make imply that there is a unique solution to these equations, and that said solution maximizes firm surplus. Second, it must be the case that $\bar{W}_{v_{\lambda'}} > \bar{W}_{v_\lambda}$ whenever $v_{\lambda'} > v_\lambda$ (and the firm hires a positive measure of workers in equilibrium). Third, comparing Equation (5) from the main body in the case that $\Omega = 1$, and Equation (27), implies that $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} = \bar{w}_\lambda(v_\lambda)$, which in turn implies that $\bar{W}_{v_\lambda} > \bar{w}_\lambda(v_\lambda)$ (whenever $v_{\lambda'} > v_\lambda$ and the firm hires a positive measure of workers in equilibrium).

In the case in which $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} = 0$, the optimal choice of $\bar{W}_{v_{\lambda'}}$ must satisfy Equation (28). Therefore, all workers will offer $\underline{w}_{i,2} = \bar{W}_{v_{\lambda'}}$, and any employed worker will receive final wages equal to $\bar{W}_{v_\lambda} \geq \bar{w}_\lambda(v_\lambda)$. *Q.E.D.*

In this setting, transparency leads to wage compression as opposed to complete wage equalization. All employed, low-productivity workers earn $\bar{W}_{v_\lambda}$ as the firm rejects all such workers who demand more. Employed, high-productivity workers earn either $\bar{W}_{v_\lambda}$

[6]This effect is similar to "conflationary" strategies of monopolists in a price discrimination model (Loertscher and Muir (2021))—by increasing the wage paid to low-productivity workers, the firm homogenizes the wages it pays, leading low-outside-option workers to opt for the riskless, lower wage.

or $\bar{W}_{v_{\lambda'}}$. Since $\bar{W}_{v_\lambda} \geq \bar{w}_\lambda(v_\lambda)$, and $\bar{W}_{v_{\lambda'}} = \bar{w}_{\lambda'}(v_{\lambda'})$, the gap in pay between low- and high-productivity workers is smaller than in the base model. Interestingly, the firm may set $\bar{W}_{v_\lambda} > v_\lambda$ when v_λ is sufficiently small, incurring a loss on low-productivity workers![7]

The fact that $\bar{W}_{v_\lambda} \geq \bar{w}_\lambda(v_\lambda)$ raises the fraction of low-productivity workers who are eligible for employment, compared to the counterfactual world in which productivity types are observable. Assuming a positive measure of workers are employed at wage $\bar{W}_{v_\lambda}$ in equilibrium (i.e., $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} > 0$), this completely offsets the reduction in employment caused by high-outside-option, low type workers requesting $\bar{W}_{v_{\lambda'}}$. The fact that the firm is able to secure low-outside-option, high-productivity workers at wage $\bar{W}_{v_\lambda}$ also offsets the profit loss caused by missing out on certain low-productivity workers.

PROPOSITION 7: *Let* $\tau\rho = 1$ *and* $k = 0$, *and consider the unique equilibrium satisfying* $\bar{A}1$–$\bar{A}3$. *If* $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} > 0$, *then firm profit, average wages, and the employment level in equilibrium are the same as in the baseline model with observable productivity differences when* $\Omega = 1$.

PROOF: Fix $v_\lambda \leq v_{\lambda'}$, and let $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} > 0$. We first show that the employment rate is the same in the two cases. In the model with unknown worker productivities, the measure of workers hired is

$$G(2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}}) + \frac{1}{2}\big(G(\bar{W}_{v_{\lambda'}})) - G(2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}})\big), \tag{29}$$

as all workers with outside options weakly below $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}}$ are hired as they all offer wage $\bar{W}_{v_\lambda}$ at $t = 2$ and only workers of productivity type $v_{\lambda'}$ are employed if they offer $\bar{W}_{v_{\lambda'}}$ at $t = 2$. In the model with known worker productivities, the measure of workers hired is

$$G\big(\bar{w}_\lambda(v_\lambda)\big) + \frac{1}{2}\big(G\big(\bar{w}_{\lambda'}(v_{\lambda'}) - G\big(\bar{w}_\lambda(v_\lambda)\big)\big), \tag{30}$$

as all workers with outside options weakly below $\bar{w}_\lambda(v_\lambda)$ are hired and all λ' workers with outside options weakly below $\bar{w}_{\lambda'}(v_{\lambda'})$ are hired. Recalling from the Proof of Proposition 6 that $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} = \bar{w}_\lambda(v_\lambda)$ and $\bar{W}_{v_{\lambda'}} = \bar{w}_{\lambda'}(v_{\lambda'})$ implies that Equations (29) and (30) are equal. We further note that since $\bar{W}_{v_{\lambda'}} = \bar{w}_{\lambda'}(v_{\lambda'})$, it is the case that the same measure of $v_{\lambda'}$ type workers are hired in both cases (and therefore that the same measure of v_λ type workers are hired in both cases). This completes the claim regarding employment.

Recalling that $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} = \bar{w}_\lambda(v_\lambda)$, substituting in Equation (26), the difference in firm profits in the two cases is

$$\left(\frac{v_\lambda}{2} + \frac{v_{\lambda'}}{2} - \bar{W}_{v_\lambda}\right)G\big(\bar{w}_\lambda(v_\lambda)\big)$$
$$+ \frac{v_{\lambda'} - \bar{W}_{v_{\lambda'}}}{2}\big[G(\bar{W}_{v_{\lambda'}}) - G\big(\bar{w}_\lambda(v_\lambda)\big)\big]$$

[7]To see this, note that when G follows the distribution family of distributions in Equation (6) in the main body, the following FOC are obtained: $\bar{W}_{v_\lambda} = \frac{s}{2(1+s)}(v_\lambda + v_{\lambda'})$, $\bar{W}_{v_{\lambda'}} = \frac{s}{1+s}v_{\lambda'}$. It is easy to check that $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} > 0$ for any $(v_{\lambda'}, v_{\lambda'}, s) \in [0, 1] \times [v_\lambda, 1] \times [0, \infty)$. One can also see that $\bar{W}_{v_\lambda} > v_\lambda$ whenever $\frac{s}{s+2}v_{\lambda'} > v_\lambda$.

$$
\begin{aligned}
&- \frac{v_\lambda - \bar{w}_\lambda(v_\lambda)}{2} G\big(\bar{w}_\lambda(v_\lambda)\big) - \frac{v_{\lambda'} - \bar{w}_{\lambda'}(v_{\lambda'})}{2} G\big(\bar{w}_{\lambda'}(v_{\lambda'})\big) \\
&= \left[-\bar{W}_{v_\lambda} + \frac{\bar{W}_{v_{\lambda'}}}{2} + \frac{\bar{w}_\lambda(v_\lambda)}{2} \right] G\big(\bar{w}_\lambda(v_\lambda)\big) \\
&= 0,
\end{aligned}
$$

where the first equality comes from canceling terms, and the second equality comes from the fact that $2\bar{W}_{v_\lambda} - \bar{W}_{v_{\lambda'}} = \bar{w}_\lambda(v_\lambda)$. Therefore, the firm earns the same profits in both cases.

Finally, noting that the firm's profit and measure of workers of each productivity type hired is identical in both cases, it must therefore be that average wages are equal in both cases as well. *Q.E.D.*

F.2. *A Model of Collective Bargaining*

We show that the muted effect of transparency on wages when k is large also holds in an augmented model in which unions are involved in wage setting. A key observation is that although unions are designed to increase the bargaining power of workers as a whole, they result in low *individual* bargaining power in that workers frequently receive a TIOLI offer in wage negotiations (as documented in Hall and Krueger (2012)).

We model the union as an entity that allocates a fixed per-worker budget to employed workers under the $k = 1$ bargaining protocol. The union prefers Pareto improvements in the wage profile of workers, but potentially favors some workers over others. We show that when the union is unable to price-discriminate, the equilibrium impact of transparency is as in our base model: it does not impact the equilibrium outcome. If the union is able to price-discriminate, then transparency may impact the equilibrium outcome, but it will not impact average wages, as the union will always disperse all of its budget.

There is an exogenous $\bar{w} \in (0, v]$ known to the union, which represents the per-employed-worker budget, and the set of employed workers cannot receive average pay strictly greater than $\bar{w}$.[8] There exists an exogenous partition Δ of I, where $\Delta = \Delta^1 \cup \Delta^2 \cup \cdots \cup \Delta^{\mathcal{M}}$. For each $m \in \{1, \dots, \mathcal{M}\}$, the set Δ^m has positive measure, and let $G^m(x) = |\{i \in \Delta^m | \theta_i \leq x\}|$ for any $x \in [0, 1]$.

The union has a utility function that depends on the profile of worker wages $\{w_i\}_{i \in I}$ and transparency level τ, $u(\{w_i\}_{i \in I}, \tau)$. The dependence on the profile of wages allows the union to care differently about the wages of different workers (e.g., men vs. women), and the dependence on τ allows the union to prioritize the wages of different workers depending on the level of transparency (e.g., the union may want to have a smaller gender wage gap if the wage gap is likely to be observed).

For each $m \in \{1, \dots, \mathcal{M}\}$, the union sets a maximum wage $\bar{w}_m$, representing that the union can potentially wage-discriminate (the case in which $\mathcal{M} = 1$ prevents the union from doing so). We allow the union, as opposed to the firm, to potentially discriminate because the union may have more knowledge of worker outside options.[9] To capture that

[8]We do not explicitly model the process by which $\bar{w}$ is determined. However, we will show that the value of the union's objective function increases as $\bar{w}$ increases, and therefore, the standard efficient contract assumption in union bargaining models suggests that any (sufficiently high) $\bar{w}$ is viable.

[9]This discrepancy has likely widened with recent laws often referred to as "salary history bans" which attempt to limit firms' ability to acquire information about workers' previous wages. For more details on these laws, see, for example, Hansen and McNichols (2020).

unions set wage contracts (given constraints imposed by the firm) and workers have no individual bargaining power, wages are set with "$k = 1$"; that is, for $t \in \{1, 2\}$, any worker $i \in \Delta^m$ who makes wage offer to the union $\underline{w}_{i,t}$ is rejected if $\underline{w}_{i,t} > \bar{w}_m$, in which case, she consumes her outside option θ_i. Otherwise, i is employed at wage $w_{i,t} = \bar{w}_m$.

We say that a wage schedule $\{w_i\}_{i\in I}$ is *feasible* if the average wage of employed workers is no greater than $\bar{w}$, and each unemployed worker i receives $w_i = 0$. We assume that $u(\{w_i\}_{i\in I}, \cdot) \geq 0$ for any feasible wage schedule $\{w_i\}_{i\in I}$. Let $\{w_i'\}_{i\in I}$ and $\{w_i\}_{i\in I}$ be two feasible wage schedules. For any τ, $u(\{w_i\}_{i\in I}, \tau) = u(\{w_i'\}_{i\in I}, \tau)$ if $w_i = w_i'$ for almost all $i \in I$. For any τ, if $w_i' \geq w_i$ for almost all $i \in I$, and $w_j' > w_j$ for all $j \in J$ where J is a positive measure subset of I, then $u(\{w_i'\}_{i\in I}, \tau) > u(\{w_i\}_{i\in I}, \tau)$. That is, the union's preferences respect Pareto wage improvements for the workers. If $\{w_i\}_{i\in I}$ is not feasible, then $u(\{w_i\}_{i\in I}, \cdot) < 0$. The union's preferences are also continuous: Fix $\epsilon > 0$ and τ. Then there exists δ such that for any two feasible wage schedules $\{w_i'\}_{i\in I}$ and $\{w_i\}_{i\in I}$ such that $|w_i - w_i'| < \delta$ for all $i \in I'$ where $|I'| > 1 - \delta$, it is the case that $|u(\{w_i'\}_{i\in I}, \tau) - u(\{w_i\}_{i\in I}, \tau)| < \epsilon$.

As $k = 1$, each worker i sets $\underline{w}_{i,1} = \theta_i$ in equilibrium.

PROPOSITION 8: *For any τ, there exists at least one equilibrium. The average wage of employed workers equals $\bar{w}$ in any equilibrium, regardless of τ.*

PROOF: To show existence, consider change of variables and associated utility function $u'(\bar{w}_1, \dots, \bar{w}_{\mathcal{M}}, \tau)$ such that $u'(\bar{w}_1, \dots, \bar{w}_{\mathcal{M}}, \tau) = u(\{w_i\}_{i\in I}, \tau)$, where, for all $i \in \Delta^m$ and $m \in \{1, \dots, \mathcal{M}\}$,

$$w_i = \begin{cases} \bar{w}_m & \text{if } \theta_i \leq \bar{w}_m, \\ 0 & \text{otherwise,} \end{cases}$$

for any τ. By virtue of the fact that $k = 1$, the union can achieve utility $u'(\bar{w}_1, \dots, \bar{w}_{\mathcal{M}}, \tau)$ for any $\bar{w}_1, \dots, \bar{w}_{\mathcal{M}}$ subject to the following feasibility constraint:

$$\sum_{m=1}^{\mathcal{M}} \bar{w}_m \cdot G^m(\bar{w}_m) \leq \bar{w} \cdot \sum_{m=1}^{\mathcal{M}} G^m(\bar{w}_m).$$

To see that there exists a maximizer, note that $u'(\cdot, \dots, \cdot, \tau)$ is continuous in the first $\mathcal{M}$ arguments for any τ due to the continuity of $u(\cdot, \tau)$ in the wage schedule and the continuity of G. Moreover, the set of feasible vectors $(\bar{w}_1, \dots, \bar{w}_{\mathcal{M}})$ is a closed and bounded subset of $[0, 1]^{\mathcal{M}}$. Therefore, by the extreme value theorem, an equilibrium vector $\bar{w}_1, \dots, \bar{w}_{\mathcal{M}}$ exists.

We now show that in any equilibrium, the average wage of employed workers is $\bar{w}$. Suppose not, that is, there exists $\epsilon > 0$ such that the average wage of employed workers $\frac{\sum_{m=1}^{\mathcal{M}} \bar{w}_m \cdot G^m(\bar{w}_m)}{\sum_{m=1}^{\mathcal{M}} G^m(\bar{w}_m)} = \bar{w} - \epsilon$.

Consider the following alternative union strategy for each $m \in \{1, \dots, \mathcal{M}\}$:

$$\bar{w}_m' = \begin{cases} \bar{w}_m & \text{if } \bar{w}_m > \bar{w}, \\ \bar{w} & \text{if } \bar{w}_m \in [\bar{w} - \epsilon, \bar{w}], \\ \bar{w}_m + \epsilon & \text{otherwise.} \end{cases}$$

We claim that this alternative strategy $\bar{w}_1', \dots, \bar{w}_{\mathcal{M}}'$ results in a Pareto wage improvement in equilibrium, and is feasible. To see that this leads to a Pareto improvement, note that no worker receives lower pay in equilibrium under this alternative, and a positive measure of workers receive strict increases in pay; the fact that average wages of employed workers is strictly less than $\bar{w}$ implies that there is some positive measure set of workers $J \subset \Delta^m$ for some $m \in \{1, \dots, \mathcal{M}\}$ such that each $j \in J$ has $\theta_j \leq \bar{w}_m < \bar{w}$ and $\bar{w}'_m > \bar{w}_m$.

We now argue that $\bar{w}'_1, \dots, \bar{w}'_{\mathcal{M}}$ is feasible. Let $\bar{w}_m < \bar{w}$ for all $m \leq M_1$ (we have established the existence of such $M_1 \leq \mathcal{M}$ in the preceding paragraph). Then the average wage of employed workers in equilibrium under $\bar{w}'_1, \dots, \bar{w}'_{\mathcal{M}}$ is

$$\begin{aligned}
\frac{\sum_{m=1}^{\mathcal{M}} \bar{w}'_m \cdot G^m(\bar{w}'_m)}{\sum_{m=1}^{\mathcal{M}} G^m(\bar{w}'_m)} &\leq \frac{\sum_{m=1}^{M_1} (\epsilon + \bar{w}_m) \cdot G^m(\epsilon + \bar{w}_m) + \sum_{m=M_1+1}^{\mathcal{M}} \bar{w}_m \cdot G^m(\bar{w}_m)}{\sum_{m=1}^{M_1} G^m(\epsilon + \bar{w}_m) + \sum_{m=M_1+1}^{\mathcal{M}} G^m(\bar{w}_m)} \\
&\leq \epsilon + \frac{\sum_{m=1}^{M_1} \bar{w}_m \cdot G^m(\epsilon + \bar{w}_m) + \sum_{m=M_1+1}^{\mathcal{M}} \bar{w}_m \cdot G^m(\bar{w}_m)}{\sum_{m=1}^{M_1} G^m(\epsilon + \bar{w}_m) + \sum_{m=M_1+1}^{\mathcal{M}} G^m(\bar{w}_m)} \\
&\leq \epsilon + \frac{\sum_{m=1}^{M_1} \bar{w}_m \cdot G^m(\bar{w}_m) + \sum_{m=M_1+1}^{\mathcal{M}} \bar{w}_m \cdot G^m(\bar{w}_m)}{\sum_{m=1}^{M_1} G^m(\bar{w}_m) + \sum_{m=M_1+1}^{\mathcal{M}} G^m(\bar{w}_m)} \\
&\leq \epsilon + \frac{\sum_{m=1}^{\mathcal{M}} \bar{w}_m \cdot G^m(\bar{w}_m)}{\sum_{m=1}^{\mathcal{M}} G^m(\bar{w}_m)} \\
&= \bar{w},
\end{aligned}$$

where the third inequality follows from the fact that $G^m(\cdot)$ is nondecreasing for each m and $\bar{w}_m < \bar{w}_{m'}$ for each $m \leq M_1 < m'$, and the equality follows from the definition of ϵ. This contradicts that $\bar{w}_1, \dots, \bar{w}_M$ is an equilibrium strategy by the union.

That average wages are unaffected by τ in equilibrium follows from the above argument and the fact that $\bar{w}$ is constant in τ. *Q.E.D.*

F.3. *Group-Level Wage Compression*

Theorem 3 in the main body can be used to study transparency's effect on wage gaps across groups of workers within a marketplace. Suppose there are two groups of workers, M (men) and W (women), and each worker i belongs to exactly one group. Each group contains a positive measure of workers. Let G_ℓ represent the distribution of outside options for group $\ell \in \{M, W\}$, and let $G(x) := qG_M(x) + (1 - q)G_W(x)$ for all $x \in [0, 1]$, where $q \in [0, 1]$ is the proportion of M-group workers in the market. As before, the firm sets a single maximum wage $\bar{w}$ that holds across all workers, prohibiting the firm from making group-specific wage offers.[10] Denote the average equilibrium earnings of employed workers of group $\ell \in \{M, W\}$ with outside option θ_i as $Z(\Omega, v, \theta_i, \ell)$. The following result considers the case where the outside options of the M group first-order stochastically dominate those of the W group (see Figure 1 in Caldwell and Danieli (2022) for evidence supporting this assumption).

COROLLARY 2: *Consider the unique linear equilibrium given the family of distributions in Equation* (6) *in the main body. If $G_M(\cdot)$ first-order stochastically dominates $G_W(\cdot)$, then $\frac{\mathbb{E}_{G_W}[Z(\Omega,v,\theta_i,W)]}{\mathbb{E}_{G_M}[Z(\Omega,v,\theta_i,M)]}$ converges monotonically to* 1 *as Ω converges to* 1 *for all v.*

The average earnings of employed W-group workers is rising relative to the average earnings of employed M-group workers as transparency increases, and in the limiting case of $\Omega = 1$, wages are completely equalized across groups.

This result follows when $G_M(\cdot)$ first-order stochastically dominates $G_W(\cdot)$ because it is possible to pair up every W-group worker with an M-group worker with a higher outside option; let $\mu : [0, 1] \to [0, 1]$ specify for each W-group worker i an M-group worker j such that $\theta_j \geq \theta_i$ and $\mu(\theta_i) \neq \mu(\theta_{i'})$ for any $i \neq i'$. The remainder of the argument follows by applying the result of Theorem 3 in the main body.

F.4. *Continuous-Time Model*

In this section, we study a continuous-time version of our model, in which transparency is measured by an arrival rate of peer wage information. In this model, we allow for the possibility that workers can renegotiate wages prior to observing the wages of peers. This model predicts the same effects of transparency as in our base model (Theorems 1–3 in the main body), even in the case that workers can renegotiate their pay prior to observing peer wages.

Time is continuous, and is indexed by $t \in \mathbb{R}_+$. There is a single firm in the economy, and a unit measure of workers I. Each worker $i \in I$ has a private outside option $\theta_i \overset{\text{iid}}{\sim} G[0, 1]$, which is the flow payment i receives when unemployed.[11] The firm has a constant-returns-to-scale production function; the flow productivity of labor is common across all workers, $v \sim F[0, 1]$, and is known only to the firm. All agents exponentially discount the future at rate δ, are risk neutral, and seek to maximize discounted expected flow payments. We assume that F and G are twice continuously differentiable with densities f and g, respectively. We also assume agents have strictly increasing virtual values, that is, $\theta + \frac{G(\theta)}{g(\theta)}$ is strictly increasing in θ and $v - \frac{1-F(v)}{f(v)}$ is strictly increasing in v.

[10] Di Addario, Kline, Saggio, and Sølvsten (2022) empirically found that employers do not tailor wage offers to workers based on outside option. Corollary 2 considers the situation in which the outside options of M-group workers first-order stochastically dominate those of W-group workers. In this case, a wage gap exists across groups when $\tau\rho < 1$ and $k < 1$, due to the "ask gap" between the two groups: M-group workers will typically offer higher initial wages than W-group workers due to the distributions of outside options. Such an "ask gap" between men and women has been documented empirically in Roussille (2022).

[11] There is a known measurability issue with the assumption of a continuum of i.i.d. random variables (Judd (1985)). A solution is to assume that worker outside options are drawn "almost" i.i.d. in the sense of Sun (2006). This solves the measureability issue and has the intuitive and intended property that the distribution of realized outside options is given by the same function $G(\cdot)$.

Before any workers arrive, the firm selects a maximum wage it is willing to pay $\bar{w}(v) \in [0, 1]$. $\bar{w}$ is not immediately observed by workers. An initial round of bargaining takes place at $t = 0$. Each worker i makes offer $\underline{w}_{i,0}(\theta_i) \in [0, 1]$. As in a double auction (Chatterjee and Samuelson (1983)), i is employed if and only if $w_{i,0} \leq \bar{w}$. If hired, i receives flow wage $w_{i,0}$ until wage renegotiation, where $w_{i,0}$ is a random variable that equals $\underline{w}_{i,0}$ with probability $1 - k$ and equals $\bar{w}$ with probability k (independently across workers), where $k \in [0, 1]$ is the known "bargaining weight" of the firm. If $w_{i,0} > \bar{w}$, then i is permanently unmatched from the firm, and she receives flow payments equal to her outside option θ_i.

We model transparency as the (stochastic) arrival of information about current wages. At time $t \geq 0$, each matched worker observes the set of wages the firm pays to employed workers, $\{w_{i,t}\}_{i \in I_t}$, where I_t represents the set of workers employed at time t, according to an independent Poisson arrival process with (commonly known) rate $\mathcal{T} \in [0, \infty) \cup \{\infty\}$, where we take $\mathcal{T} = \infty$ to mean that the process arrives at every time t. For convenience, we assume that $\{w_{i,0}\}_{i \in I_0} = \{\bar{w}\}$.[12] Therefore, higher $\mathcal{T}$ corresponds to more transparency.

Renegotiation opportunities also arrive to each worker i independently according to a known arrival process. To capture that observing peer wages can "speed up" wage renegotiations following empirical evidence from Biasi and Sarsons (2021), the arrival rate of negotiation opportunities for each worker i is $\mathcal{P}_1 \in [0, \infty)$ prior to the first arrival of peer wage information, and $\mathcal{P}_2 \in [\mathcal{P}_1, \infty) \cup \{\infty\}$ thereafter. Each worker i and the firm renegotiate i's wage using the same bargaining protocol in any time period t: i submits a new offer $\underline{w}_{i,t}$ and she remains employed if $\underline{w}_{i,t} \leq \bar{w}$. If employed, i receives flow wage $w_{i,t}$ until wage renegotiation, where $w_{i,t}$ is a random variable that equals $\underline{w}_{i,t}$ with probability $1 - k$ and equals $\bar{w}$ with probability k.

The timing of the stage game is as follows for every worker i who has not yet been permanently unmatched from the firm: First, at each time $t \geq 0$, worker i learns $\{w_{i,t}\}_{i \in I_t}$ independently with arrival rate $\mathcal{T}$. Second, (re)negotiation opportunities arrive: if $t = 0$, each worker negotiates with the firm, or if $t > 0$, a renegotiation opportunity arrives at rate $\mathcal{P}_1$ if the worker has not observed $\{w_{i,t'}\}_{i \in I_{t'}}$ for any $t' \leq t$ and $\mathcal{P}_2$ if the worker has observed $\{w_{i,t'}\}_{i \in I_{t'}}$ for any $t' \leq t$.

We investigate pure strategy perfect Bayesian equilibria (PBE) of the game. Throughout, we write w_i^* to represent worker i's equilibrium wage offer at $t = 0$ assuming that she has not observed $\{w_{i,0}\}_{i \in I_0}$. As in our two-period model, we restrict our attention to equilibria satisfying the following conditions:

- A1′ $0 \leq \bar{w} \leq v$ for all v. If $v \leq w_i^*$ for every worker i according to equilibrium strategies, then $\bar{w} = v$.
- A2′ $\theta_i \leq w_i^* \leq 1$ for all i. If there is no v such that $\theta_i \leq \bar{w}$ according equilibrium strategies, then $w_i^* = \theta_i$.
- A3′ $\bar{w}$ and w_i^* are strictly increasing functions of v and θ_i, respectively. Moreover, $\bar{w}$ is continuously differentiable for $v \in (w_i^*(0), 1)$ and $w_i^*(0)$ is continuously differentiable for $\theta \in (0, \bar{w}(1))$.

There always exists an equilibrium of the game satisfying A1′–A3′. Each worker will earn $\bar{w}$ in any wage renegotiation after observing peer wages, as before. We additionally

[12]Without this assumption, all workers under full transparency (and a measure zero set of workers for any $\mathcal{T} > 0$) face an openness issue of wanting to renegotiate wages at the earliest time $t > 0$. It is possible to deal with this issue as in Simon and Stinchcombe (1989): suppose workers can only renegotiate every $\frac{1}{N}$ periods, $N > 1$. Define a worker's payoff in continuous time as the limiting value as $N \to \infty$. Using this definition, even if a worker observes nothing at $t = 0$, her payoff under full transparency is equivalent to the case in which she receives a wage of $\bar{w}$ for all $t \geq 0$. For ease of notation, we continue with the simplifying, if unrealistic, assumption that $\{w_{i,0}\}_{i \in I_0} = \{\bar{w}\}$.

show that at any time $t > 0$ at which a worker renegotiates prior to observing peer wages, she offers $\underline{w}_{i,t} = \underline{w}_{i,0}$.

PROPOSITION 9: *The set of equilibria is non-empty. In any equilibrium, each worker i offers $\underline{w}_{i,0}$ in any negotiation if she has neither received $\bar{w}$ in a previous negotiation nor observed the wages of peers. Thereafter, she offers (and receives) $\bar{w}$.*

PROOF: It remains to show that each worker will offer a fixed wage following any history in which she neither observes peer wages nor receives $\bar{w}$ in a previous negotiation. Toward a contradiction, suppose there is (for some worker i) an optimal function that maps histories into offers which is non-constant: there exists $w(\cdot)$ mapping histories h_t into $[0, 1]$ which is nondecreasing and satisfies $w(h_t) < w(h'_{t'})$ for some $h_t \subset h'_{t'}$. By the stationarity of the arrival processes in any relevant history, it is without loss of optimality to assume that the worker offers a strictly higher wage during her first renegotiation than during her initial negotiation. We will denote this offer $\underline{w}_i^1 > \underline{w}_{i,0}$, and we similarly define $\underline{w}_i^2, \underline{w}_i^3, \dots$ as subsequent wage offers increases. Therefore, the wage function $w(\cdot)$ is characterized by $\underline{w}_{i,0}, \underline{w}_i^1, w_i^2, \dots$.

Let $u(1)$ represent the additional expected discounted utility (at the time of renegotiation) that i receives by following $w(\cdot)$ as opposed to alternative plan $w'(\cdot)$ which dictates that i offers $\underline{w}_{i,0}$ until she receives or observes $\bar{w}$ and offers $\bar{w}$ thereafter. By the equilibrium hypothesis, it must be that $u(1) \geq 0$.

Suppose for contradiction that $u(1) > 0$. We claim this implies i improves her equilibrium discounted expected payoff at $t = 0$ by altering $w(\cdot)$ to $w''(\cdot)$ such that her initial offer is $\underline{w}_i^1$, her first renegotiation offer is $\underline{w}_i^2$, and so on. To see this, note that since $u(1) > 0$, it must be that i's time-0 discounted utility according to $w(\cdot)$ is non-increasing in the time of the first renegotiation. But as the time of the first renegotiation approaches 0, i's expected utility under $w(\cdot)$ converges to that under $w''(\cdot)$. Contradiction.

Therefore, it must be that $u(1) = 0$. By induction, it must be that i is indifferent between following $w(\cdot)$ and $w'(\cdot)$. Similarly, it must be that i is indifferent between following $w''(\cdot)$ and $w'''(\cdot)$, where $w'''(\cdot)$ dictates that i offers $\underline{w}_i^1$ until she receives or observes $\bar{w}$ and offers $\bar{w}$ thereafter. Therefore, it must be that i is indifferent between $w'(\cdot)$ and $w'''(\cdot)$ which both offer a constant wage before receiving or observing $\bar{w}$. Our proof is complete if we show that there cannot be multiple utility-maximizing "constant" wage offers.

To show this, let $\bar{F}(x) = \Pr(\bar{w} \leq x)$, for all $\mathcal{T} < \infty$. For any equilibrium wage plan that offers a constant wage prior to receiving or observing $\bar{w}$, any worker $i \in I$ negotiates at time $t = 0$ to solve

$$\begin{aligned} w_i^* \in \underset{w}{\operatorname{argmax}} \Bigg(& \frac{k\mathbb{E}(\bar{w}|\bar{w} \geq w)}{\delta} + \frac{1-k}{\delta + \mathcal{T} + k\mathcal{P}_1} \Bigg[w + k\mathcal{P}_1 \frac{\mathbb{E}(\bar{w}|\bar{w} \geq w)}{\delta} \\ & + \frac{\mathcal{T}}{\delta + \mathcal{P}_2} \bigg(w + \mathcal{P}_2 \frac{\mathbb{E}(\bar{w}|\bar{w} \geq w)}{\delta} \bigg) \Bigg] \Bigg) \big(1 - \bar{F}(w)\big) \\ & + \frac{\theta_i}{\delta} \bar{F}(w), \end{aligned} \tag{31}$$

where the first term represents the expected discounted wage the worker receives, given the arrival rate of information, if matched with the firm: she receives a convex combination of w_i and $\bar{w}$ until the transparency process arrives, at which time she renegotiates her wage to $\bar{w}$. The second term represents the discounted earnings of the worker if she exceeds $\bar{w}$ and instead consumes her outside option. When $\mathcal{T}=\infty$, the pricing scheme is a posted price in which all workers elect to either make an offer $\underline{w}_{i,0}=\bar{w}$ or unmatch with the firm.

In a series of steps, we modify the objective function without affecting the maximizer. For $\mathcal{T}\in[0,\infty)$,

$$\begin{aligned}
& w_i^* \in \underset{w}{\operatorname{argmax}}\Bigg(\frac{k\cdot\mathbb{E}(\bar{w}|\bar{w}\geq w)}{\delta}+\frac{1-k}{\delta+\mathcal{T}+k\mathcal{P}_1}\bigg[w+k\mathcal{P}_1\frac{\mathbb{E}(\bar{w}|\bar{w}\geq w)}{\delta} \\
&\qquad +\frac{\mathcal{T}}{\delta+\mathcal{P}_2}\bigg(w+\mathcal{P}_2\frac{\mathbb{E}(\bar{w}|\bar{w}\geq w)}{\delta}\bigg)\bigg]\Bigg)\big(1-\bar{F}(w)\big)+\frac{\theta_i}{\delta}\bar{F}(w) \\
\iff\quad & w_i^* \in \underset{w}{\operatorname{argmax}}\Bigg(k\mathbb{E}(\bar{w}|\bar{w}\geq w)+\frac{1-k}{\delta+\mathcal{T}+k\mathcal{P}_1}\bigg[\delta w+k\mathcal{P}_1\mathbb{E}(\bar{w}|\bar{w}\geq w) \\
&\qquad +\frac{\mathcal{T}}{\delta+\mathcal{P}_2}\big(\delta w+\mathcal{P}_2\mathbb{E}(\bar{w}|\bar{w}\geq w)\big)\bigg]\Bigg)\big(1-\bar{F}(w)\big)+\theta_i\bar{F}(w) \\
\iff\quad & w_i^* \in \underset{w}{\operatorname{argmax}}\Bigg(k\mathbb{E}(\bar{w}|\bar{w}\geq w)+\frac{1-k}{\delta+\mathcal{T}+k\mathcal{P}_1}\bigg[\delta w+k\mathcal{P}_1\mathbb{E}(\bar{w}|\bar{w}\geq w) \\
&\qquad +\frac{\mathcal{T}}{\delta+\mathcal{P}_2}\big(\delta w+\mathcal{P}_2\mathbb{E}(\bar{w}|\bar{w}\geq w)\big)\bigg]-\theta_i\Bigg)\big(1-\bar{F}(w)\big) \\
\iff\quad & w_i^* \in \underset{w}{\operatorname{argmax}}\big(\big(1-\Omega'\big)w+\Omega'\mathbb{E}(\bar{w}|\bar{w}\geq w)-\theta_i\big)\big(1-\bar{F}(w)\big) \\
\iff\quad & w_i^* \in \underset{w}{\operatorname{argmax}}\int_w^1\big(\big(1-\Omega'\big)w+\Omega'x-\theta_i\big)\bar{f}(x)\,dx,
\end{aligned} \tag{32}$$

where $\Omega'=k+(1-k)(\frac{k\mathcal{P}_1}{\delta+\mathcal{T}+k\mathcal{P}_1}+\frac{\mathcal{T}}{\delta+\mathcal{T}+k\mathcal{P}_1}\frac{\mathcal{P}_2}{\delta+\mathcal{P}_2})$. Note that the algebraic steps and the final form mirror those in Equation (10) in the main body. Similarly, letting $\bar{G}(x)=\Pr(\underline{w}_{i,1}\leq x)$, it is the case that, for any $\mathcal{T}\in[0,\infty)$, the firm solves

$$\bar{w}\in\underset{w}{\operatorname{argmax}}\int_0^w\big(v-\big(\Omega'w+\big(1-\Omega'\big)y\big)\big)\bar{g}(y)\,dy. \tag{33}$$

The rest of the proof follows from the argument used to prove Proposition 1 in the main body. *Q.E.D.*

We now show how we can parameterize an equivalent equilibrium to that in our two-period model. In what follows, it is helpful to write $\Omega'=k+(1-k)\Psi$ where $\Psi=\frac{k\mathcal{P}_1}{\delta+\mathcal{T}+k\mathcal{P}_1}+\frac{\mathcal{T}}{\delta+\mathcal{T}+k\mathcal{P}_1}\frac{\mathcal{P}_2}{\delta+\mathcal{P}_2}$. Therefore, $1-\Omega'=(1-k)(1-\Psi)$ and $1-\Psi=\frac{\delta}{\delta+\mathcal{T}+k\mathcal{P}_1}+\frac{\mathcal{T}}{\delta+\mathcal{T}+k\mathcal{P}_1}\frac{\delta}{\delta+\mathcal{P}_2}$.

If $\mathcal{P}_1=0$, then $\Omega'=k+(1-k)(\frac{\mathcal{T}}{\delta+\mathcal{T}}\frac{\mathcal{P}_2}{\delta+\mathcal{P}_2})$. Therefore, denoting $\tau':=\frac{\mathcal{T}}{\delta+\mathcal{T}}$ and $\rho':=\frac{\mathcal{P}_2}{\delta+\mathcal{P}_2}$ implies that $\Omega'=k+(1-k)\tau'\rho'$ as in the two-period model.

To finish showing that our main results extend to this new model, we discuss how increasing k, $\mathcal{T}$, $\mathcal{P}_1$, and $\mathcal{P}_2$ affect Ω'. The following result shows that these affect Ω' in the same ways that k, τ, and ρ affect Ω in our two-period model. It is stated without proof as the results follow from considering the sign of the relevant derivatives.

REMARK 3: Ω' is increasing in k, $\mathcal{T}$, $\mathcal{P}_1$, and $\mathcal{P}_2$. Ω' is submodular in k and $\mathcal{T}$, submodular in k and $\mathcal{P}_2$, and supermodular in $\mathcal{T}$ and $\mathcal{P}_2$.

Finally, we note that if we change the model by requiring a common rate of renegotiation $\mathcal{P} := \mathcal{P}_1 = \mathcal{P}_2$, our conclusions above still hold, that is, Ω' is increasing in $\mathcal{P}$, supermodular in $\mathcal{P}$ and $\mathcal{T}$, and submodular in $\mathcal{P}$ and k.

F.5. *Multiple Firms*

We embed our analysis of pay transparency into a search model by including multiple firms, and show that many of the insights of our continuous-time model carry over to this setting. For tractability, we study only the cases of full privacy ($\mathcal{T} = 0$ and $k = 0$) and full transparency ($\mathcal{T} = \infty$). Let $\mathcal{N} = \{1, 2, \dots, N\}$ be the set of firms, each with a value for labor v^n drawn i.i.d. from distribution F. As before, workers have outside options drawn i.i.d. from distribution G. Workers negotiate with firms in a predetermined order without the possibility of returning to an earlier firm. Without loss of generality, we assume that workers first meet with firm 1, then firm 2, and so on.

If a firm rejects a worker's offer, the two are ineligible to match at any point in the future, and the worker (instantly) moves to the next firm in the sequence. Although we do not do so for simplicity of exposition, it is possible to embed a search friction in this formulation without affecting the qualitative findings.[13] A worker whose offer is rejected by firm N becomes persistently unemployed and consumes her outside option. A worker whose offer is accepted by firm $n < N$ is replaced with a worker of identical outside option who moves on to firm $n + 1$ as if her offer had been rejected at firm n.[14]

Each firm n selects a maximum wage it is willing to pay for a worker $\bar{w}^n(v^n) \in [0, 1]$, where the choice of $\bar{w}^n$ is not immediately observed by workers. As before, each worker i bargains for wages by making wage offers $w_{i,t,n}$ to firm n when she first arrives, or upon the arrival of a renegotiation opportunity at rates $\mathcal{P}_1$ and $\mathcal{P}_2$, depending on whether the worker has observed the wages at her current firm. Workers who at any time offer a wage greater than $\bar{w}^n$ to firm n are permanently unmatched with the firm. If worker i offers $w_{i,t,n} \leq \bar{w}^n$, then i's flow wage until renegotiating is $k\bar{w}^n + (1 - k)w_{i,t,n}$. Let W_t^n denote the set of wages firm n is paying to its employed workers, where $W_0^n = \{\bar{w}^n\}$.

We model transparency as a random arrival process; at time t, workers matched to firm n observe W_t^n according to an independent Poisson arrival process with rate $\mathcal{T} \in \{0, \infty\}$, where we take $\mathcal{T} = \infty$ to mean that the process arrives whenever a worker first matches with a firm, and at every instant while she is employed. The timing of the stage game is as follows:

1. $\boldsymbol{t = 0}$, **Entry:** Initialize $m = 1$, and $\ell_i = 1$ for each worker i.
2. $\boldsymbol{t \geq 0}$, **Search and Bargaining:**
   (a) Unmatched workers match to firm m if $\ell_i = m$.

[13] Each time a worker's offer is rejected, we could instead make the worker unable to meet with subsequent firms with positive probability. Including such a search friction does not meaningfully change the remaining analysis.

[14] This "cloning" assumption is made for tractability, and it is frequently adopted in the search literature (see, e.g., Burdett and Coles (1999), Bloch and Ryder (2000), and Chade (2006)).

(b) Each worker i matched to firm m learns W_t^m independently with arrival rate $\mathcal{T}$.
(c) Newly entering workers must bargain with the firm and any existing, matched worker i renegotiates with arrival rate $\mathcal{P}_1$ or $\mathcal{P}_2$ depending on whether or not she has previously observed wages at firm m.
(d) For any i such that $w_{i,t}^m > \bar{w}^m$, increase ℓ_i by 1.
(e) If $m < N$, for all i such that $w_{i,t}^m \leq \bar{w}^m$, create a new worker j with $\theta_j = \theta_i$ and $\ell_j = \ell_i + 1$, increase m by 1, and repeat Step 2.

We work backward to solve for the unique equilibrium. Workers meeting firm N face the same decision as workers in the base model: they face a firm with value v^N drawn from distribution F and are among an incoming cohort with outside options determined by distribution G. Denote by $\theta_i^{n,\mathcal{T}}$ the expected equilibrium lifetime utility (under transparency level $\mathcal{T}$) of a worker with outside option θ_i immediately upon matching with firm n (before making an offer or learning wages through the transparency process), and denote by $G^{n,\mathcal{T}}$ the distribution of $\theta_i^{n,\mathcal{T}}$. Then, when negotiating with firm $N-1$, workers face the same decision but with θ_i replaced with $\theta_i^{N,\mathcal{T}}$, and firm $N-1$ will face the same decision as firm N but with distribution G replaced with $G^{N,\mathcal{T}}$. Inducting backward toward the first firm, we can characterize the equilibrium actions of agents as the following for $n \leq N$:

$$\text{Workers } \mathcal{T}=0, \qquad k=0: \quad w_i^n - \theta_i^{n+1,0} = \frac{1-F(w_i^n)}{f(w_i^n)},$$

$$\text{Firms } \mathcal{T}=0, \qquad k=0: \quad v^n = \bar{w}^n,$$

$$\text{Workers } \mathcal{T}=\infty: \quad w_i^n = \bar{w}^n \mathbf{1}_{\{\bar{w}^n \geq \theta_i^{n+1,\infty}\}},$$

$$\text{Firms } \mathcal{T}=\infty: \quad v^n - \bar{w}^n = \frac{G^{n+1,0}(\bar{w}^n)}{g^{n+1,0}(\bar{w}^n)}.$$

As θ_i is constant over time, $\theta_i^{\cdot,\mathcal{T}}$ is a non-increasing sequence, and strictly decreasing for workers with $\theta_i < 1$. Therefore, $\frac{G^{\cdot,\mathcal{T}}}{g^{\cdot,\mathcal{T}}}(x)$ is strictly decreasing in n for all $x < 1$, so the assumed monotonicity of the virtual value functions ensures the quasi-concavity of the worker and firm objective functions above. In other words, workers' outside options, which include the option value of bargaining with future firms, decrease as they move along the sequence of firms. Realizing this, under full transparency, earlier firms accept higher wages to incentivize workers to accept their offers rather than wait to meet future firms. We now provide results that are similar to the theorems in the main text.

PROPOSITION 10: *The expected average utility of workers is higher in equilibrium with* $\mathcal{T}=0$, $k=0$ *than* $\mathcal{T}=\infty$. *The expected utility of firms is higher in equilibrium with* $\mathcal{T}=\infty$ *than* $\mathcal{T}=0$, $k=0$.

PROOF: We prove this result for workers, and the converse for firms is similar. As before, the expected utility of any worker who reaches firm N is higher under $\mathcal{T}=0$, $k=0$ than $\mathcal{T}=\infty$. Therefore, $\theta_i^{N,0} > \theta_i^{N,\infty}$ for all θ_i. When meeting firm $N-1$, worker θ_i is in expectation better off under full privacy, for two reasons. First, by the same logic as before, she is able to make a TIOLI offer rather than receive it. Second, her outside option is higher, that is, $\theta_i^{N,0} > \theta_i^{N,\infty}$, implying that for any bid that she places, she is weakly better off. By induction, worker i is better off at every firm she meets under full privacy. *Q.E.D.*

The proof of the following result is omitted, as the logic follows from our previous analysis.

PROPOSITION 11: *When $\mathcal{T} = \infty$, there is no wage dispersion between workers at the same firm in equilibrium. The ex post employment-maximizing level of transparency is weakly decreasing in v.*

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Co-editors Aviv Nevo and Guido Imbens handled this manuscript.

Manuscript received 1 June, 2021; final version accepted 5 February, 2023; available online 13 February, 2023.