

NBER WORKING PAPER SERIES

IS PAY TRANSPARENCY GOOD?

Zoe B. Cullen

Working Paper 31060

<http://www.nber.org/papers/w31060>

NATIONAL BUREAU OF ECONOMIC RESEARCH

1050 Massachusetts Avenue

Cambridge, MA 02138

March 2023

This paper is under revision for the Journal of Economic Perspectives. Thank you to Shengwu Li, Bobak Pakzad-Hurson, Ricardo Perez-Truglia and Nina Roussille for early feedback and invaluable intellectual contributions to the research agenda. Special thanks to Julia Gilman for her research assistance. I have no relevant financial relationship or conflict of interest to disclose. The views expressed herein are those of the author and do not necessarily reflect the views of the National Bureau of Economic Research.

NBER working papers are circulated for discussion and comment purposes. They have not been peer-reviewed or been subject to the review by the NBER Board of Directors that accompanies official NBER publications.

© 2023 by Zoe B. Cullen. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Is Pay Transparency Good?
Zoe B. Cullen
NBER Working Paper No. 31060
March 2023
JEL No. J08,J31,J78

ABSTRACT

Countries around the world are enacting pay transparency policies to combat pay discrimination. 71% of OECD countries have done so since 2000. Most are enacting transparency horizontally, revealing pay between co-workers of similar seniority within a firm. While these policies have narrowed co-worker wage gaps, they have also led to counterproductive peer comparisons and caused employers to bargain more aggressively, lowering average wages. Other pay transparency policies, without directly targeting discrimination, have benefited workers by addressing broader information frictions in the labor market. Vertical pay transparency policies reveal to workers pay differences across different levels of seniority. Empirical evidence suggests these policies can lead to more accurate and more optimistic beliefs about earnings potential, increasing employee motivation and productivity. Cross-firm pay transparency policies reveal wage differences across employers. These policies have encouraged workers to seek jobs at higher paying firms, negotiate higher pay, and sharpened wage competition between employers. We discuss the evidence on pay transparency's effects, and open questions.

Zoe B. Cullen
Rock Center 210
Harvard Business School
60 N. Harvard
Boston, MA 02163
and NBER
zcullen@hbs.edu

I. Introduction

The famous case of Lily Ledbetter supports the logic that co-worker pay information can empower low earners to stand up to pay discrimination. Ms. Ledbetter received a covert message from a male colleague sharing his salary and alerting her to the differences in the paychecks they had received year over year, despite doing the same work. She eventually used this information to press legal charges against her employer for unfair compensation, and the case became the basis for the 2009 Lilly Ledbetter Fair Pay Act, which removed the statute of limitation for pay discrimination lawsuits ([Phillips, 2009](#)).

It's tempting to infer from this case where a little transparency facilitated renegotiation, that greater transparency broadly would help more employees do the same. That's the reasoning behind many transparency mandates ([European Commission, 2017](#); [Obama, 2014](#)). However, this is only one part of the story. Employers have responded to pay transparency between co-workers by setting more equal pay, but they have also responded by lowering average wages ([Baker et al., 2022](#); [Bennedsen et al., 2020](#); [Blundell, 2021](#); [Cullen and Pakzad-Hurson, 2021](#); [Duchini et al., 2020](#); [Obloj and Zenger, 2022](#)). An explanation for this is that "horizontal" pay transparency between co-workers within a firm has created spillovers between negotiations, meaning a dollar raise to one worker is now more costly due to renegotiations with other workers, causing employers to bargain aggressively ([Cullen and Pakzad-Hurson, 2021](#)). Horizontal transparency has also sharpened peer comparisons, at times leaving lesser paid workers disgruntled and prone to working less ([Breza et al., 2018](#); [Card et al., 2012](#); [Cullen and Perez-Truglia, 2022](#)).

Despite this, the outlook for pay transparency policies to benefit workers is promising. The reason is that other aspects of the labor market, unrelated to discrimination per se, improve by shining a light on pay. What we've learned from recent empirical work is that information frictions in the labor market run deep. Not only are some workers in the dark about the pay they can expect in the future and the pay they could earn if they switch jobs, but employers also face barriers to learning about market wages. The reasons for these information frictions are myriad—from taboos around salary discussions, to credible communication obstacles, laws guarding against collusion, privacy demands and strategic obfuscation ([Cullen and Perez-Truglia, 2018](#); [Edwards, 2005](#); [Sun et al., 2021](#); [Trachtman, 1999](#)). While many of the sources for information frictions are hard to overcome entirely, we do know that pay transparency policies make a difference in people's perceptions about pay, and in turn, change behavior. The wage setting games that employers engage in, and the career choices that workers make, respond to pay transparency tools and pay transparency policies. In experimental and quasi-experimental settings, "vertical" pay transparency has increased people's perceptions about what they could earn if they were to be promoted, resulting in

increased effort and productivity in meritocratic environments (Cullen and Perez-Truglia, 2022; Deserrano et al., 2021). “Cross-firm” pay transparency has informed prospective candidates about which employers pay more than others and led applicants to redirect their search toward higher paying firms, and led to renegotiations on-the-job (Caldwell and Harmon, 2018; Roussille, 2021; Skoda, 2022). “Cross-firm” pay transparency policies have also informed firms what their competitors are paying, eroding information rents that allow employers to shade their offers to workers (Cullen et al., 2022). The key design feature for all these pay transparency policies is that they shine the light outward, away from co-workers under the same employer, toward “vertical” and “cross-firm” pay differences.

We describe an open field for pay transparency studies to identify where greater access, and more equal access, to information can improve economic outcomes. The pay transparency lever is, in the end, stunningly cheap and powerful. However, this comes with a warning. Among the lessons learned in the study of pay transparency, as a tool to combat discrimination, is that more information is not always better, and our equilibrium toolkit is essential. Our intuition often helps us see the first use of information, e.g., the lesser paid worker who uses pay information about a coworker to seek a raise. Yet, our economic models can help us also see other players respond to the introduction of more information, e.g., firms adjusting their wage-setting and hiring practices. Our economic toolkit also helps us understand the endogenous choice to seek out and share information for predictions of who accessed information in the absence of a blanket transparency mandate or full compliance.

The remainder of the paper is organized as follows. Section II discusses the implications of “horizontal” transparency, or revealing pay gaps between co-workers. Section III considers how “vertical” and “cross-firm” transparency impact labor market outcomes. Section IV turns to non-labor market outcomes affected by pay transparency, and Section V concludes.

II. Revealing Co-Worker Pay Gaps: Equal Pay for Equal Work

We begin our discussion of pay transparency with a deep dive into the most popular set of pay transparency policies—those seeking to rectify pay discrimination: when an employer pays two people unequally despite doing similar work. To achieve this end goal, policies are designed to either protect the right of two co-workers to discuss pay with one another, or they mandate an employer make information available to employees about the pay of their co-workers doing the same set of tasks. Sometimes the policies are forthright about protecting a particular class of workers, for example women, and ask that employers separately report average wages by gender, within a given position or occupation.

II.A. Pay Transparency Policies Around the World Focused on Equal Pay for Equal Work

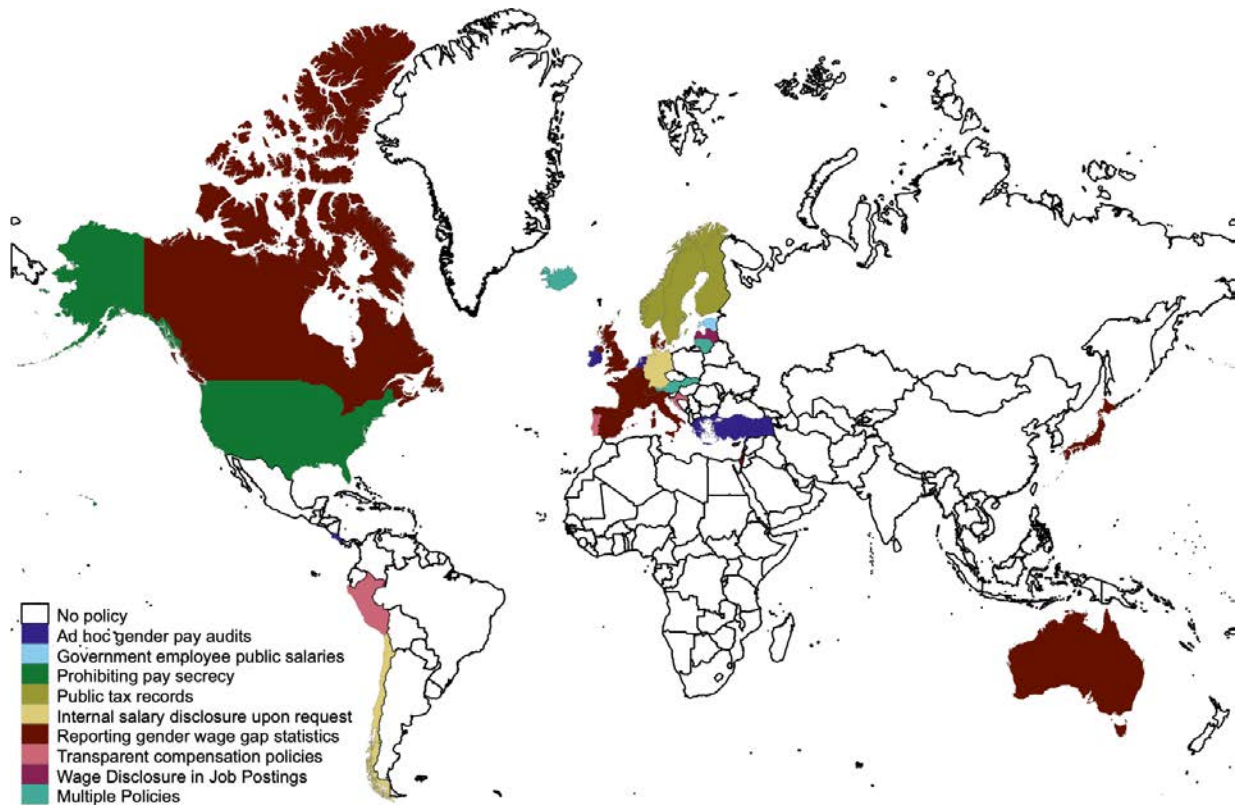
Figure I and Table II describe 18 types of pay transparency policies that exist in 32 countries world-wide. Some are at the national level, others at the state, provincial or municipal level. They range from policies that prohibit employers from punishing workers that share salary information, to policies that mandate firms disclose statistics about internal pay, to public tax returns. These policies are concentrated in North America and Europe, with some coverage of South America, Asia, and Australia. Recently, these laws have gained increasing traction. 71% of OECD countries have passed a law in the past two decades.

The majority of pay transparency policies globally aim to address pay discrimination. Canada's Pay Equity Act uses prototypical language: "the purpose of this Act is to achieve pay equity through proactive means by redressing the systemic gender-based discrimination in the compensation practices" (Canada, 2018). Many policies expressly intend to address the gender wage gap, while others aim to combat pay discrimination more broadly. The most common national policy, implemented by 14 countries, mandates that employers report their internal gender gap. In the U.S., the most popular policies protect the rights of workers to disclose and inquire about salary information. 20 states have enacted "Right of Workers to Talk" laws, an umbrella of laws that penalize employers for retaliating against any employee who discusses pay with their co-workers. An additional 2 countries and 4 U.S. states require that the employer either disclose pay range information or pay statistics about co-workers upon request. For example, in Germany, an employee at a firm with more than 200 employees can ask their employer for pay statistics about their occupation, broken down by gender.

However, fighting pay discrimination is not the only motivation for pay transparency policies. Some countries are also focused on cultivating public trust and accountability. In Norway, Sweden, and Finland, income tax records are public. Norway's tax authority explains they make the records public because "the opportunity to check the tax assessment process in general, as well as for individuals and groups of taxpayers, must be available in our society" (Skatteetaten). In Estonia, as well as 18 U.S. states, government employee salaries are made public, ostensibly to enhance government accountability. The U.S. also has national policies focused on promoting competition, including a ban on salary discussion among human resources professionals.

Overall, of the 18 types of policies implemented worldwide 61% are focused on combating pay discrimination (see Table II). Among the 27 countries that have implemented laws with this intent, 89% are covered by policies that reveal pay gaps between co-workers.

Figure I: Current Global Pay Transparency Policy Types by Country



Notes: Types of pay-transparency policies at the country level. See Table II for data and sources.

II.B. Misperceptions

“You may know about your colleague’s sex life, your friend’s drinking problem, or what your neighbor really thinks of her mother-in-law. But you probably don’t know what they take home in each paycheck.” — Margaret Littman (Working Woman, 2001)

Pay transparency policies revealing co-worker pay gaps only stand to make a difference in a world where people are not fully informed about their co-workers’ paychecks. Indeed, surveys documenting beliefs about co-worker salaries suggest significant misperceptions. Lawler (1965) surveyed 326 managers from four privately owned U.S. companies and found significant misperceptions about what others at their company earn. Cullen and Perez-Truglia (2018) conducted a study at a large commercial bank and found only 32% of employees could guess within 5% of the true average salary among co-workers in the same position and location, even when rewards for a correct answer were as high as two weeks salary. Cullen and Perez-Truglia (2018) find that granting two additional weeks to search for salary information did little to improve the likelihood of guessing correctly. Sun et al. (2021) posit

that the central reason misperceptions among co-workers persist is workplace pay secrecy policies. They survey U.S. full-time workers in 2018, and find that 35.4% of workers report that pay discussion is discouraged in their workplace. Social scientists have pointed to social norms and taboos that curtail conversations about salaries, hypothesizing the information touches on ones' personal worth to society (Edwards, 2005; Trachtman, 1999). Cullen and Perez-Truglia (2018) find quantitative support for social concerns around asking and sharing salary information: at the commercial bank they study, 89% of respondents would feel uncomfortable if they had to ask a coworker about their salary, and 80% would forgo cash rewards to prevent their employer from sharing their individual earnings with co-workers. Following pay transparency mandates, employees report greater access to information; for example, in U.S. states that passed laws protecting workers' rights to inquire and disclose pay between 2010 and 2018, the share of private sector workers reporting their employer prevents them from discussing pay fell from 33% to 10% during this window while other states experienced a modest decline (Cullen and Pakzad-Hurson, 2021; Sun et al., 2021). However, more research is warranted to make a tight connection between pay transparency policies and knowledge about pay.

II.C. A Theoretical Framework for Horizontal Pay Transparency

Theoretically, how should pay transparency policies that reveal pay gaps between co-workers affect labor market outcomes?

For intuition about the economic forces, consider the following scenario: a worker learns that a colleague with the same job is earning significantly more than she is. She reasons that her employer must be willing to pay a higher wage for the work she is doing, and will therefore seek to renegotiate her wage. These renegotiations lead to higher wages, the first part of the story. To see the second part of the story, consider wage negotiations when there is full pay transparency. A worker knows the wages of her peers, but also recognizes that her wage will be visible to her coworkers. The employer can credibly reject her demand for a raise by saying, "If I give you a higher salary, I'll have to give everyone else a raise too, and I can't afford that." Under pay secrecy, the worker might have been skeptical of such a claim and bargained more aggressively, but due to transparency, the worker grasps the (true and costly) ramifications of asking for more than her coworkers make. Therefore, full transparency leads to an unintended side effect: if workers all get the same wage and cannot negotiate this wage upward, the firm gets the power to set the wage. To maximize its profit, the firm acts like a monopsonist and sets a relatively low wage. Thus transparency increases the de facto bargaining power of the employer, becoming the enforcement mechanism for a low wage.

Below is a simple wage setting game to convey the economic forces present when tran-

sitioning from secrecy to transparency. For the complete model, and extensions to other bargaining environments, see [Cullen and Pakzad-Hurson \(2021\)](#).

Consider a continuum of workers, generically denoted i , and each has an outside option θ_i , which is a random variable with full support over $[0, 1]$. There is one employer with constant returns to scale. The employer gets a common surplus $v \in [0, 1]$ for each employed worker at the firm. v is known to the employer but not workers. At time 0, the employer picks a maximum wage $\bar{w}(v)$ which workers don't observe. Workers arrive at time 1 and each makes a take-it-or-leave-it offer to the employer. If the offer is less than or equal to \bar{w} , the employer accepts, otherwise the employer rejects it, and the worker and employer are permanently unmatched. The worker receives flow payments equal to their outside option. At time 2, workers can renegotiate their wages by making a new take-it-or-leave-it offer, following the same protocol as at time 1. Transparency is governed by the probability τ with which workers learn about the wages of their peers. Under full transparency ($\tau = 1$), workers always learn about the wages of their peers when they match with the employer, like in public sector jobs where wages are posted or pay grids are known. Full secrecy ($\tau = 0$) occurs when workers never learn the wages of their peers. Partial transparency ($\tau \in (0, 1)$) occurs when it takes time to learn the wages of co-workers, for example, in private universities where τ is akin to the rate of becoming department chair and receiving the list of salaries for your colleagues. Each worker's payoff, and that of the firm, are determined by the renegotiated salaries.

The first result is that, in (perfect Bayesian) equilibrium, workers will not demand a higher wage in renegotiation until they observe peer wages. If they do observe peer wages, workers demand (and receive) \bar{w} . First consider the equilibrium under full secrecy ($\rho = 0$) when there are no information spillovers and workers never learn each others' wages. Workers only make take-it-or-leave-it offers when first hired. They never see wage information, and hence never renegotiate. The employer sets the maximum wage they are willing to offer equal to the value of labor, $\bar{w} = v$, and accepts all offers less than v , as all offers less than v increase profits. Next, consider the equilibrium under full transparency ($\rho = 1$). Workers who are hired will all receive \bar{w} because, the moment they set foot in the office they observe the maximum wage, \bar{w} , and demand to be paid as much. If the employer sets $\bar{w} = v$, they guarantee themselves 0 profit. Instead, the employer will pick $\bar{w} < v$. In this way, \bar{w} is a posted price. What we've shown is that, under full secrecy, workers make a single take-it-or-leave-it offer. By [Williams \(1987\)](#), this maximizes expected worker surplus and expected wages. Under full transparency the reverse happens, the employer sets a posted price, akin to an employer take-it-or-leave-it offer. And, consequently, the employer maximizes their surplus. Increasing τ shifts bargaining power toward the employer: the expected employer profit is strictly increasing in τ , and expected wages are strictly decreasing in τ . an empirical regularity across, paying a high wage to one worker means many others negotiate to

this high wage. W is decreasing in τ as the firm seeks to mitigate the effect of information spillovers.¹ At the same time, worker initial offers are decreasing in τ as they are less willing to risk rejection during the initial negotiation given the high likelihood of learning W prior to renegotiating.²

So far, we've only considered the bargaining response to pay transparency between co-workers. We can also account for a psychological response: learning your standing relative to others can affect morale and effort. Rather than feel empowered, you may feel disappointed, discouraged, or disgruntled to discover you are earning relatively less than you previously thought; and conversely, learning you are earning more might put a bounce in your step. [Akerlof and Yellen \(1990\)](#) conjectured workers who learned they were underpaid would feel lower morale and reduce their effort at work.

Nesting these psychological effects into a bargaining game, with incomplete information and transparency, does not change the prediction that average wages fall with greater pay transparency between co-worker wages. If workers' effort is an endogenous choice that responds to the extent of inequality, employers will equalize wages to sustain high effort in a pay-transparent environment. If morale were the only consideration, we would expect cases when the employer prefers to let inequities stand because the morale response to inequality does not outweigh the cost of closing the gap. In those cases, we would see a productivity decline, and lower wages to match.³

II.D. Partial-Equilibrium Empirical Evidence

From empirical studies on the *partial* equilibrium effect of pay transparency, where employers' pay strategies are fixed in the short run, we observe both the bargaining channel and the psychological channels at play. In the field, [Roussille \(2021\)](#) showed that after revealing pay information to job applicants, they used this information to ask for higher pay (the *bargaining* channel). [Breza et al. \(2018\)](#) set up a factory in India and hired workers for slightly different fixed wages, finding that the lesser paid expressed discontent about pay, and also reduced effort, cooperation, and work hours (the *psychological* channel). [Card et al. \(2012\)](#) pointed public employees of California to the Sacramento Bee newspaper, which listed the salaries of their colleagues, and they found that workers earning below the median salary were more likely to express dissatisfaction with their job and an interest in seeking different work in the weeks that followed (the *psychological* channel, and hinting at the *bargaining* channel). [Cullen and Perez-Truglia \(2022\)](#) study employees inside a large commercial bank,

¹Akin to “stiffening the backbone” ([Kreps and Wilson, 1982](#); [Milgrom and Weber, 1982](#)).

²Akin to “freeriding off others” ([Kuhn and Gu, 1998, 1999](#)).

³See [Cullen and Pakzad-Hurson \(2021\)](#) for details on nesting morale and bargaining channels.

finding that (randomly) learning peer salaries were higher than expected (true for roughly half of employees) resulted in reduced hours worked and sales revenue, while learning peer salaries were lower than expected had the opposite effect (the *psychological* channel).

II.E. Equilibrium Empirical Evidence

To assess the predictions of the equilibrium theory, we turn to the evaluations of large-scale pay transparency policies from five different countries. Results have been published in nine independent studies which track wages around the time the policy is enacted.⁴ Because these policies have been focused largely on horizontal pay transparency, to combat pay discrimination, the studies have centered on whether these policies have reached their stated objective: closing wages gaps between men and women. Since our equilibrium model predicts that pay will be more equal, but lower, as a consequence of shifting bargaining power toward the firm, we pull from each paper information about the wage gap, and the wage levels. We report study details and results in Table IV.

In Figure II, we plot the percent change in the gender wage gap (along the x-axis) against the percent change in overall wage levels (along the y-axis). Following Cullen and Pakzad-Hurson (2021), we include two data points from each study when available. The darker points capture the effect size directly reported in the paper and refers to the effect of pay transparency on men’s wages along with the 95% confidence interval. The lighter points reflect the imputed estimate of transparency’s effect on the overall population.⁵

The results highlight the key trade-off policy makers face when implementing pay transparency laws revealing co-workers pay gaps. In the cases where transparency achieved greater pay equalization—those in the lower left quadrant of the graph—the reduction in pay gap was accompanied by an overall reduction in wages. This is consistent with our equilibrium

⁴We select studies using the procedure from Cullen and Pakzad-Hurson (2021). First, the policy studied must be referred to as a “pay transparency” policy or a related term. Second, it must study the policy in the context of a real-world labor market. Third, it must assess the effect of the policy on the wages of all employees in that labor market. Of these studies, five evaluate policies (in three countries) that require reporting of wage statistics by gender (Benedsen et al., 2020; Blundell, 2021; Böheim and Gust, 2021; Duchini et al., 2020; Gulyas et al., 2022). Of the policies studied, the UK law requires overall average statistics to be published publicly, while Austria and Denmark require averages by occupational group be disclosed to employees. The Austrian and Danish policies have a clear horizontal focus, while in the UK information could also be used by those either inside or outside the firm. However, the interpretability of firm-specific wage gaps may be challenging for those outside the firm and unfamiliar with precise roles and responsibilities, hence we consider these wage gaps predominantly horizontal policies. The same holds for those policies that post names and salaries online: three studies evaluate policies that mandate posting of individual salaries in university or municipal contexts (Baker et al., 2022; Mas, 2017; Obloj and Zenger, 2022). The final study (Cullen and Pakzad-Hurson, 2021) concerns “Right of Workers to Talk” laws, prohibiting employers from punishing workers who internally discuss or inquire about salaries.

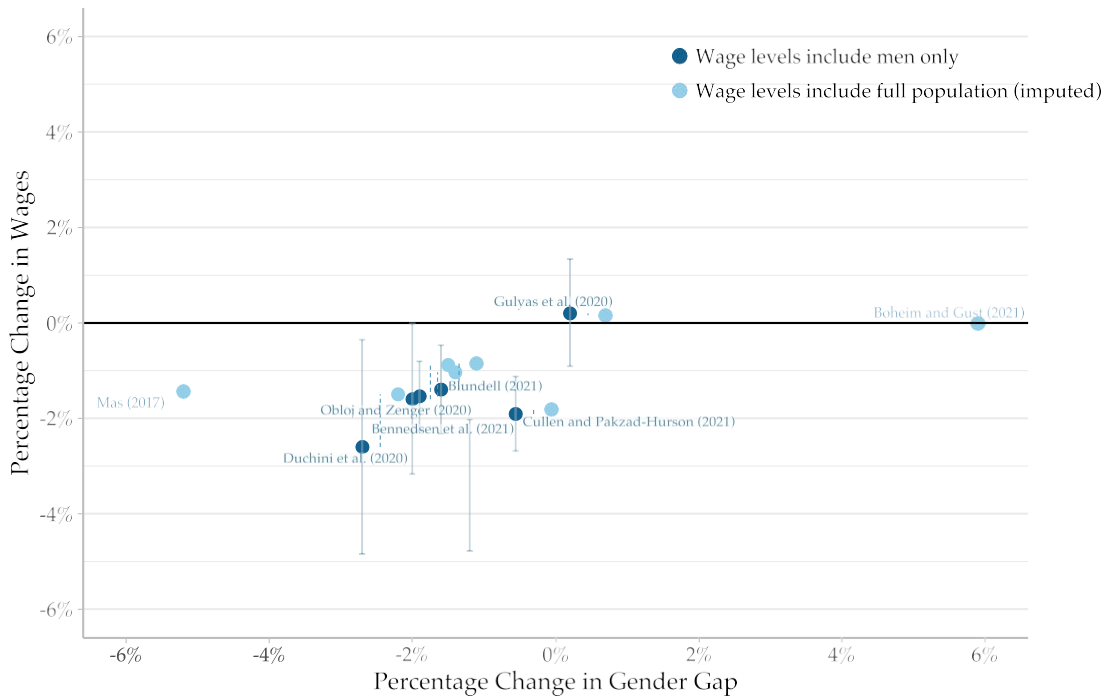
⁵These data points for Mas (2017) and Böheim and Gust (2021) are omitted because wage results for men are not reported. Further details are in Table IV.

predictions that when negotiations are anchored to one another, employers bargain more aggressively. Why did some policies have no effect at all on wages? Our equilibrium theory offers one explanation. Workers must start out with individual bargaining power in order for transparency to affect rebargaining. In many labor markets, workers bargain under a collective agreement (Bhuller et al., 2022). Cullen and Pakzad-Hurson (2021) show a large share of workers are covered by a collective bargaining agreement in cases where transparency mandates had little or no effect on wage levels.

One study examines the consequences of pay transparency for worker productivity. This is our best evidence on the presence of a morale channel that may persist in equilibrium in spite of rebargaining. Bennedsen et al. (2020) study the introduction of a policy in Denmark that requires firms with more than 35 employees to internally report wage statistics by gender and occupation. They find that almost immediately after the policy is introduced, average wages per employee in firms just above the policy size threshold fell by 2.8% relative to those just below the policy size threshold, and one year later, productivity (measured by average sales per employee) was 2.7% lower above the threshold. This fall in productivity is consistent with the demotivating effect of learning one earns less than their peers; it is also consistent with a reaction to slower wage growth overall.⁶ Thus, evidence is consistent with a morale channel persisting in equilibrium but not dispositive, more research is necessary.

⁶Firm profits remain unchanged as the reduced wage costs offset the drop in sales.

Figure II: Effect of Transparency on Wages, Existing Studies



Notes: Each observation is a study of a pay transparency policy from Table IV. The y-axis is the percentage change in wages, and the x-axis represents the percentage change in the gender wage gap. Dark blue dots represent the percentage change in wages for *Men* only, with standard error bars, while light blue dots represent the percentage change in wages for *All Workers*.

III. Beyond Co-worker Pay Gaps: Information Frictions in the Labor Market Addressed through Pay Transparency

Evidence on the effects of revealing wage gaps between co-workers has taught us about two unintended consequences when pay transparency is horizontal. First, the information spillovers between the negotiations of employees under the same employer shift the de facto bargaining power toward the employer. Second, peer co-workers compare themselves to each other. In cases where employers fail to equalize wages, lesser paid employees can experience lower morale and lower effort.

As an empirical and theoretical matter, different forms of pay transparency can circumvent these side-effects. In this section, we think more broadly about the design of pay transparency policies and their effect on the labor market. To generate ideas, we'll walk through key moments where workers and employers form beliefs about the pay being offered in the marketplace, and use this information to guide their decisions.

Consider someone who earns a living by working. We will think about the resources they

garner in the labor market, their well-being, and their policy preferences. Let this worker's earnings be a function of several choices: human capital investments, the intensity of job search, the effectiveness of their negotiations, and their effort on-the-job.

Each of these choices are often made under uncertainty. The pay of others can shape beliefs that in turn influence their choices. For example, reliable information about the value of a promotion might come from sussing out what others have earned at the water cooler, which in turn can influence motivation and effort. Job advertisements might lack pay information or list a wide range, so it may be the pay of a former co-worker at a firm which anchors pay expectations and determines application behavior. The pay of former graduates may be the best available information on the returns to a particular education or training program, and encourage or dissuade enrollment.

On the other side of the labor market, employers make wage setting and hiring decisions as a function of what they believe their competitors are offering, as well as what they believe their employees know about these outside offers. Prima facie evidence that employers face uncertainty about these objects is their willingness to pay a high price for consulting services and information tools, like salary benchmarks, to collect more facts in order to reduce that uncertainty.

Some aspects of misperceptions and uncertainty about pay are embedded in our canonical economic models of the labor market, for example the uncertainty that job seekers face about the full set of outside offers available to them. [Stigler \(1962\)](#) formalized this idea and subsequent search and matching models retain this feature ([Diamond, 1982](#); [Mortensen, 1982, 2005](#); [Pissarides, 1985](#); [Postel-Vinay and Robin, 2002](#)). The limited information workers have about the pay at alternative employment opportunities drives wage differences between similar workers who face different perceptions of their opportunities. However, many forms of misperceptions and uncertainty about pay are not captured by our go-to models of the labor market. For example, in rare instances have economists introduced information frictions on the employer side ([Cullen et al., 2022](#)).

Recent empirical work has made headway documenting pay misperceptions and uncertainty with survey tools to capture truthful beliefs and link these beliefs to ground sources of truth. With the aid of information experiments, researchers have demonstrated how pay information shifts beliefs and behavior. In the following section, we describe documented misperceptions and their estimated effects, and combine these empirical facts with theoretical frameworks. We highlight instances where we expect further pay transparency studies would illuminate consequential information frictions and policy solutions.

III.A. Transparency in Returns to On-the-Job Effort

A rich literature on optimal contracts indicates that incentives should rise steeply over one's career, precisely to encourage employees to work hard and stick with their employer (Dewatripont et al., 1999; Gibbons and Murphy, 1992; Gibbons and Waldman, 1999a,b; Harris and Holmstrom, 1982; Holmstrom, 1999; Lazear and Rosen, 1981; Rosen, 1986). What are people's perception of how steeply these incentives rise, and how would pay transparency influence perception and behavior? Lawler (1965) surveyed 326 managers from four privately owned U.S. companies and found respondents under-estimated the salaries of those in higher positions. This pattern of underestimating vertical inequality has been replicated in other settings (Cullen and Perez-Truglia, 2022; Hvidberg et al., 2020; Kiatpongsan and Norton, 2014). Cullen and Perez-Truglia (2022) carried out a guessing game at a commercial bank, where employees could earn a sizable financial prize if they guessed the average salary of their bosses position within $\pm 5\%$ of the truth. Employees underestimated the truth on average by -14.1%.

Because people systematically underestimate what their superiors earn, the news content of pay transparency inflates perceptions about overall inequality and positively impacts expected future earnings in meritocratic environments. Cullen and Perez-Truglia (2022) find that, with every 10% boost in perceived managers' salary, subjects projected that their own earnings would be 1.7% higher 5 years down the road.

The news of larger pay gaps did not generate resentment, though in theory it might have. In Cullen and Perez-Truglia (2022), employees responded negatively to learning their peers earned more than expected, consistent with morale effects documented by Breza et al. (2018). But, these social concerns did not extend to interpersonal comparisons with higher-ups. Linking these survey data with administrative data on employee performance revealed that employees also increased their sales revenue by 1.1%, they sent 1.3% more emails, and worked 1.5% longer hours for each 10% upward shift in perception about managerial pay.⁷ Deserrano et al. (2021), in the context of the public sector in Sierra Leone, showed the effect of vertical transparency differed depending on whether the environment was perceived as meritocratic. In meritocratic segments of the Ministry of Health, perceptions of steeper salary raises upon promotion increased effort, measured by the number of home health visits. In non-meritocratic segments, perceptions of steeper pay raises lowered morale and reduced home health visits.

What does theory predict happens in equilibrium when vertical pay gaps are made transparent? Vertical transparency also introduces spillovers between the negotiations of employees bargaining with a single employer. Thus, it will have the effect of incentivizing the

⁷In a similar vein, Flynn (2022) finds that National Hockey League players shifted their efforts towards more highly compensated strategies like offense, following pay transparency between teammates.

employer to bargain more aggressively, recognizing that a raise to someone’s boss in turn inflates what their employees will ask for upon promotion. Nevertheless, the motivating effects of revealing a steeper-than-expected reward structure in the organization could very well dominate the effect of shifting bargaining power, and the net effect on wages could be either positive, negative or neutral. In this case, as opposed to horizontal transparency, efficiency gains come from adjustments along the effort margin.

Some existing pay transparency policies, and policies under consideration can be considered “vertical” pay transparency. Most notably, a 2020 UK policy requires UK listed companies with more than 250 to report the ratio of pay between the median, 25th percentile, and 75th percentile employees and the CEO (Clark, 2019). In the U.S., the Securities and Exchange Commission enacted a similar regulation requiring reporting of the median to CEO pay ratio in 2017 (SEC, 2015). Unfortunately, learning what the CEO makes might not help the median earner learn about their earnings trajectory precisely, though it could be informative about the generosity of the employer (e.g., willingness to share rents), and thus have a similar motivating effect through positive news about expected pay. Another set of policies that reveal vertical pay are internal pay grids, for example those implemented in many public sector settings world-wide (see Table II), which allow employees to observe the earnings trajectory within their organization. Currently, we lack direct evidence on the causal impact of these grids.

III.B. Transparency in Returns to Education

Economic theory about human capital investments considers education to be a choice that depends, at least partly, on the perceived market returns to that education. Through this channel, individual education choices are supposed to supply the labor market with an efficient allocation of talent. A reasonable question to ask is, do the young people making these decisions have an accurate perception of how their education decisions are related to their earnings in the short and long run? How might pay transparency affect these perceptions and choices?

In an early answer to this question, Betts (1996) surveyed undergraduates at UCSD and asked them to guess what the average national earnings were for students that recently graduated and also later in their lives. While the questions were about national averages, not expectations about personal returns to education (the relevant theoretical object), answers could be compared to government earnings statistics to measure accuracy of beliefs. Wiswall and Zafar (2014) validate this approach by showing that beliefs about the overall population and beliefs about personal earnings potential are correlated, and students update beliefs about their own earnings expectations when shown information about earnings in the population.

Betts (1996) established that students significantly underestimate the slope of the wage profile, consistent with evidence collected from employees (Cullen and Perez-Truglia, 2022), but the error around the average earnings of recent college graduates was modest (-5.8% was the mean percentage error). Nevertheless, knowledge was not equal across types of students: students from poorer families exhibited much larger errors estimating the salaries of college graduates. In a representative sample of U.S. heads of households, Bleemer and Zafar (2018) also document that disadvantaged households have bigger errors in their perceptions of returns to a college degree, and that giving the returns info helps close the socioeconomic gap in schooling expectations. Jensen (2010) corroborates this outside the U.S. In a poor country, the Dominican Republic, young people making the decision to enter secondary school systematically underestimated the returns to a secondary education, undershooting by 14% on average.

How might pay transparency change beliefs and behavior? Jensen (2010) noted that over 70% of students from the DR reported relying on the people they knew in their community for information about earnings. This underscores the connection between pay transparency and beliefs about returns to education. Jensen (2010) showed eighth-grade boys information about what a typical 30 or 40 year old earns on average as a function of education level. Six months later these participants could recollect this information, and over four years, they ended up completing more years of education (between 0.20 and 0.35 more years). In the U.S. context, Wiswall and Zafar (2014) show students at New York University information about the earnings and labor supply by degree and major and find that this information shifted beliefs about own future earnings and their desire to major in non-humanities/arts fields relative to humanities/arts. The average log odds of majoring in economics/business increased by 46 percentage points, and the log odds of majoring in engineering/computer science relative to humanities increased by 72 percentage points, the two highest paying majors. Bleemer and Zafar (2018) find that information about returns to schooling increased intention to attend college by 0.2 standard deviations over baseline expectations among a representative U.S. sample of households. In sum, salary transparency shifted education choices, especially among poor students, but also in the representative household and among the undergrads of an elite private-college.

Currently pay transparency mandates, captured in Table II, are not tailored to shed light on returns to education. Publicizing the returns to education is not (currently) the motivation for pay transparency policies. The most related U.S. policy is a website designed and maintained by researchers at the U.S. Census Bureau, the Post-Secondary Employment Outcomes (PSEO) data (Bureau, 2020), where students can look-up information about the salaries negotiated by recent graduates as a function of their college and major. One potential drawback to simply making pay information available through government websites is that

search behavior is imperfect, and people with lower literacy have proven less likely to find relevant information (Fuster et al., 2022). As is the case with most forms of pay transparency, the information is “within reach” with only a few conversations, but mandates and clever policies are required to make the information readily accessible at the point decisions are made.

III.C. Transparency in Returns to Job Search

Economists have been writing about information frictions in the job search process, observing that workers could only reasonably collect information about a tiny fraction of suitable jobs (Robinson, 1933; Stigler, 1962). Pay is only one feature of the job to suss out, but it may be an especially opaque and influential aspect of the job. In the U.S., only 30-40% of job postings have information about the pay of the job directly listed (Arnold et al., 2022). According to Hall and Krueger (2012), only 23% of recent hires had a clear expectation about how much the job paid at the time they first interviewed. Belot et al. (2019) show that the wage information in job postings affects where people apply.

An empirical regularity across a range of settings is that workers anchor on their own wage (or most recent wage) when forming beliefs about the pay of job opportunities, whether it be internal promotion opportunities or outside wage offers (Cullen and Perez-Truglia, 2022; Hvidberg et al., 2020; Jaeger et al., 2021). One implication is that low-wage workers, in particular, underestimate the pay associated with job opportunities.

Jaeger et al. (2021) showed this directly by sampling from the German workforce and asking employees hypothetical questions about the wage they would receive if they left their current job and accepted another job within 3 months. When these subjective beliefs about wages were compared with the actual wages that similar co-workers earned after switching employers, they proved to be systematically lower than reality among low-earners. The beliefs of the unemployed are an exception to this pattern; their job prospects can dip below their previous wages, and hence anchoring leads to overoptimism (Arni, 2013; Feldstein and Poterba, 1984; Krueger and Mueller, 2016; Mueller et al., 2021; Spinnewijn, 2015).

Theoretically, more information about the pay at various job opportunities leads candidates to direct their applications toward higher paying firms, all else equal. In the case where employees anchor their beliefs to their current wages, we would expect the news content in pay information to be positive and large for the lowest paid employees. Low earners would be the most motivated by the news to renegotiate their pay or apply elsewhere. Through directed job search, competition between employers increases, placing upward pressure on wages throughout the labor market. In this case, the equilibrium response of employers, vying for candidates with higher perceptions about their job opportunities, further increases wages beyond the partial equilibrium effect. (See Section III.D for theoretical evidence on the

implications of revealing wage data to employers about wages at competing firms, commonly coincident with cross-firm pay transparency policies.)

Observational and experimental studies capture the positive impact that cross-firm pay transparency can have for employees and job seekers. [Caldwell and Harmon \(2018\)](#) offer evidence that news about other job offers arrives through the networks of former co-workers, and those informed are able to use the information to negotiate raises and switch to higher paying jobs. In a natural experiment on Hired.com, a job matching platform geared toward engineers, [Roussille \(2021\)](#) showed that when women were informed about the median offers that other candidates received, the information resulted in higher offer salaries for women on the platform by 2.6%, fully closing the gender gap.

New laws requiring salary information to be included explicitly in the advertisement for a job have taken effect in a few U.S. states and cities—Colorado, New York City, Washington and California—as well as a few European countries—Austria, Slovakia, Latvia, and Lithuania. These may be the policies that allow us to see what happens in equilibrium when cross-firm pay transparency policies are mandated broadly. With Nina Roussille and Simon Jaeger, we interviewed employers using ZipRecruiter, a nation-wide U.S. job posting platform, and asked their expectations about the law’s full impact. [Table I](#) reports their results. Employers generally expect wages to either rise (33.1%) or stay the same (65.1%). Only 1.7% expect wages to fall. On average, they expect wages to rise 2.4%. The majority (56.5%) also expect salary ranges to increase the quality of their applicants. While close to 50% of employers believe turnover will not change, 35.0% believe their higher performing employees will stay longer and 42.7% expect higher churn among their lower performing employees.

Existing evidence on the impact of these laws from other settings suggests U.S. employers’ expectations may be on target. Slovakia’s law went into effect on May 1st, 2018. This particular policy required firms nationwide to include an expected salary in all job advertisements. [Skoda \(2022\)](#) assessed how job-post pay transparency in Slovakia enabled workers to redirect their job search by tracking applications before and after the law. The share of job postings with salary information ranged from 10% in some job titles to 60% in others before the reform. After the reform, all job titles exhibited 90+% compliance. [Skoda \(2022\)](#) finds that applicants applied to a more diverse set of opportunities, spanning a greater number of sectors and wider array of job titles. The earnings of those hired after the reform were, on average, 3% higher than the wages of those hired before the reform, with the largest effect in occupations where rates of salary postings in advertisements were lowest prior to taking effect. [Frimmel et al. \(2022\)](#) study the effects of a similar law in Austria requiring postings to include a minimum wage offer, and [Arnold et al. \(2022\)](#) study Colorado’s law requiring wage ranges in job postings, finding similar effects as those in Slovakia. Based purely on

the change in salaries posted in job advertisements listed with visible salaries before and after the reform, [Arnold et al. \(2022\)](#) observe posted salaries to rise by approximately 3%. We await data on the effects in New York City, California and Washington, which enacted similar legislation in November 2022 and January 2023.

TABLE I: Employer Response to Salary Range Laws

Question	%
Is there a regulation regarding the salary range for the job ads that you will post in [position X]?	
Yes	11.8
No	48.2
Unsure	40.0
Are you planning to post a pay range on the job ad for [position X]?	
Yes	71.2
No	28.8
Which sources do you use to obtain pay information to set pay ranges? (Select all that apply)	
Free online data sources for pay benchmarks	34.2
Government data	16.4
Industry surveys	27.2
Paid online data for pay benchmarks	13.2
The posted pay ranges in employers' job ads	33.6
Other	23.9
How do you think posting a pay range in job ads affects the wage levels in your organization for [position X]?	
Wages go up on average	33.1
Wages go down on average	1.7
Wages stay the same on average	65.1
How do you think posting a pay range changes the quality of applicants you receive for [position X]?	
Improved applicant quality	56.5
No change in applicant quality	30.2
Worsened applicant quality	13.3
How do you think posting a pay range changes employee turnover in [position X]? [highest performing employees]	
Leave more frequently	17.0
Stay longer	35.0
Neither	48.0
How do you think posting a pay range changes employee turnover in [position X]? [lowest performing employees]	
Leave more frequently	42.7
Stay longer	11.8
Neither	45.5
Observations	1630

Notes: Results of survey of employers about future expectations. Questions were in reference to a specific position in which employers report expecting to hire, referenced above as *Position X*.

III.D. Employer-Side Pay Transparency

Until now, we've only discussed information frictions from the perspective of workers, who have imperfect information about the pay they could earn. We have assumed firms are perfectly informed; after all, firms have resources to carry out more extensive research, and they may operate in competitive markets where under-informed firms are driven out of business (or so the theory goes).

However, assuming firms are perfectly informed is not a benign assumption. The employment relationship is likely characterized by two-sided incomplete information: while firms may not share how much they value the work of the employee, workers also have information that they do not necessarily share with their employer about their capabilities, opportunities and intentions. Most economic models suggest workers would be forthcoming about their outside options in order to secure higher pay from their current employer, but empirically, these types of re-negotiations are far from guaranteed. [Dube et al. \(2022\)](#) offer job opportunities to Walmart workers and find that higher paid outside offers prompted quits to rise faster than re-negotiations. Anecdotally, employers think about the possibility of workers getting poached when setting initial salaries. In their human resources textbook, [Berger and Berger \(2008\)](#) write, "No organization wants to waste their financial resources by paying too high relative to the market; and those who pay too low risk unwanted turnover from employees looking for a better deal elsewhere" (p. 125), offering prima facie evidence that employers may not expect a chance to match the outside offer if and when it arrives. [Cullen et al. \(2022\)](#) survey 1,350 members of the Society of Human Resource Management who report setting pay for new and current employees, 81% report limited or no access to outside offer information of their employees, and 20% report not even having easy access to their own internal pay records, which some organizations consider sufficiently sensitive to restrict managers access.

Firms also face legal barriers to collecting and retaining some pay information. For example, firms are legally prohibited from discussing salaries directly with their competitors, a law intended to prevent collusion ([DOJ and FTC, 2016](#)), and some speculate that firms face constraints storing data that can be used against them in discrimination lawsuits ([Adler, 2020](#)).

For these reasons, it is sensible to ask the question, how do firms update their beliefs under pay transparency laws? And, how would a shift in beliefs affect behavior?

Conceptually, pay information could shift firm beliefs about at least two objects of interest: the outside options workers face, and the value of the worker (where other firms' willingness to pay is a signal of worker quality). Classic results from auction theory can help us think through both scenarios.

When firms have perfect information about the value of employees and prospective can-

didates, and they have only partial information about what other firms are offering, the linkage principle put forth by [Milgrom \(1981\)](#) may have predictive power for the impact of releasing pay information in the marketplace. [Milgrom \(1981\)](#) shows that a public signal about what other parties are bidding (in this case firms wage offers for workers), erodes the information rents of individual firms and sharpens competition, leading to higher bids and higher final wages. See [Cullen et al. \(2022\)](#) for a detailed application to the labor market.

When firms do not have perfect information about the value of a candidate, they may infer additional information about the value of the candidate through the bids of other firms. In this case, a common values auction model can shed light on what will happen in equilibrium ([Krishna, 2009](#)). Students of this literature will be familiar with the winner's curse; if firms all bid their (noisy) signal about the value of the candidate, the winning bid would likely overshoot the true value because the winners' signal included positive measurement error. For fear of the winners' curse, firms shade down their bids. When more information about competing bids becomes public knowledge, concerns about a winners' curse subside and firms shade bids less. Again, bids and final wages rise in the presence of greater pay transparency. Cross-firm pay transparency policies provide pay information to both prospective employees, and also competing firms. When [Cullen, Jaeger and Rousille \(2022\)](#) surveyed employers about U.S. state legislation mandating employers include salary ranges in their job postings, over half of employers answering expressed interest in the salary range information included in job advertisements similar to theirs, and 33.6% percent reported that they will use this information when setting their own salary ranges (see [Table I](#)). However, empirically disentangling the impact that pay information has had on firm beliefs and behaviors, from the impact that pay information has had on employee beliefs and behavior, poses challenges in contexts where the information is made simultaneously available to both sides of the market. In one setting studied, however, market wage data was made only available to employers.

[Cullen et al. \(2022\)](#) study the roll-out of a proprietary salary benchmark that allowed clients of the largest payroll processing firm access to detailed salary information, based on their full database of payroll for 650,000 employers in the U.S. Employers who gained access to this high quality salary benchmark shifted their pay-setting behavior in response. Pay-setting converged toward the median pay in the marketplace, reducing dispersion in new hire salaries by over 25%. Among low-skilled positions (capturing approximately half of new hires) where the salary data was likely particularly informative, dispersion fell by 40 percent. Wage levels rose between 1-2% overall, and wages for new hires in lower-skill groups rose by over 6 percent along with corresponding boosts in retention (16 percent higher among low-skilled positions). Indeed, the evidence suggests information about market pay affected firms' beliefs and behavior, reducing dispersion in pay within a position title, raising wages among low-skilled jobs and improving efficiency through longer-lasting job matches.

Much more work on this topic is necessary to fully comprehend the extent of information frictions on the firm-side, and to design the right policies to improve market efficiency. Many of the policies that have potential to improve directed worker search, will also impact employer beliefs about competitor pricing: what is the interaction of these two channels? Are firms only learning about the outside options of workers, or are they also learning about the value an employee can bring? We hope future research provides answers.

IV. Non-labor market outcomes affected by pay transparency: Taxes, preferences for redistribution, and well-being

Labor market outcomes are not the only behaviors affected by pay transparency. Indeed, a number of pay transparency policies are designed without heed for the labor market, but rather in an effort to curb tax delinquency by making income public information. For example Norway, Finland, Sweden and Iceland publicize individual incomes “to check the tax assessment process in general” ([Skatteetaten](#)). Economists have measured the effect of pay transparency on tax compliance. They have also measured its effects on overall happiness and preferences for redistribution.

Are pay transparency policies designed to combat tax evasion successful? [Bø et al. \(2015\)](#) looks at what happened to tax compliance in Norway around the time that the tax records became easily accessible on the internet in 2001. They find that business owners indeed report higher income, rising by about 3% on average, when these disclosures became searchable online. [Perez-Truglia and Troiano \(2018\)](#) study how tax delinquents react when their names are posted in an online list of tax debtors, finding that those with modest debt amounts increased their payment rates in response.

Publicizing tax returns and income across the economy had the unintended side effect of correcting misperceptions about the income distribution. Some of the earliest studies to document misperceptions about pay did so through questions about the overall income distribution ([Hauser and Norton, 2017](#); [Kluegel and Smith, 1986](#); [Norton and Ariely, 2011](#)). In much the way workers anchor on their own wage when asked about the pay of peers, respondents anchor to their own local environment when asked about inequality across the economy ([Hauser and Norton, 2017](#)). On average, people underestimate inequality as a result. The truth thus leads people to update upwardly about the extent of inequality in the economy, and lower earners will be surprised to see how low down they are on the ladder (negative news) while higher earners will learn they are better off than they thought (positive news) ([Hauser and Norton, 2017](#); [Hvidberg et al., 2020](#); [Kuziemko et al., 2015](#); [Norton and Ariely, 2011](#)).

[Luttmer \(2005\)](#) proposed that the information contained in pay transparency about relative standing could be a significant driver of overall well-being, since happiness hinged on

how one's income compared to others. Using self-reported happiness data, along with individual and local-level income, he found that one's happiness declined as one's neighbor's income rose, holding own income constant. [Perez-Truglia \(2020\)](#) showed pay transparency increased the happiness gap between the rich and poor. In Norway, when tax records became highly visible online, people learned about their relative positions: those with lower incomes experienced a drop in happiness, while those with high incomes experienced a symmetric increase in happiness.

Demand for redistribution could also respond to pay transparency. In the context of a study in Buenos Aires, Argentina, with 1,100 representative households, [Cruces et al. \(2013\)](#) exposed participants to accurate information about their own position in the income distribution and found that people (who mistakenly believed they were middle class) reacted by increasing their support for government welfare. [Kuziemko et al. \(2015\)](#) randomized information treatments to a large internet panel of Americans, conveying to people the true U.S. income distribution as well as growth in inequality since 1980. Indeed, the truth shifted people's beliefs about inequality and led them to express concerns about inequality. However the authors concluded that this only increased demand for redistribution when subjects viewed government as effective at combating inequality. For those that believed alternative methods were more effective solutions, e.g., hard work, learning the true extent of inequality did little to change demand for redistribution. ([Cullen and Perez-Truglia, 2022](#)) find that, in the context of the workplace, when employees learn their peers earn more than they were expecting, they also report higher dissatisfaction with the extent of inequality at the firm.

V. Conclusions

We conclude that “horizontal” pay transparency policies that reveal pay gaps between co-workers at the same firm create unintended spillovers between worker negotiations that lower worker bargaining power and wages. This characterizes the strong majority of pay transparency policies that have been put in place over the past two decades. However, policies that focus on ameliorating information frictions in the labor market more broadly have achieved the objectives of raising wages and equity. “Cross-firm” and “vertical” pay transparency policies have proven potential to increase motivation, allocation of talent, and sharpen competition. These policies are not designed to draw attention to employers who pay similar workers different wages, but instead these policies educate workers about the full range of opportunities to earn higher wages when they make decisions about training, where to apply, and how hard to work. Our evidence on misperceptions suggests low earners have the most to gain from improved access to this information. Pay transparency policies can also have pro-competitive effects by educating employers about market wages, eroding

information rents when employers have private knowledge about the value workers bring to the job.

Cross-firm pay transparency policies have recently gained traction among policy makers. In January of 2023, California and Washington became the second and third states in the U.S. to mandate that employers include a salary range in the job postings external job candidates see, following on the heels of Colorado and New York City. This is a big step toward making pay information available at the time workers are choosing where to direct their applications, and employers expect that this will lead applicants to direct their applications toward higher paying firms, increasing wage competition.

Effective pay transparency policies rely on understanding information frictions. Information frictions have long been considered fundamental to modeling the labor market,⁸ but studying these frictions presented obstacles: modeling incomplete information in strategic settings requires judicious choices; the empirical foundation is essential to guide these choices, yet data about employer and employee perceptions has historically been difficult to collect. Our toolkit has expanded to meet these challenges. The combination of field experiments, surveys and administrative data have allowed researchers to collect beliefs, shift those beliefs through pay transparency interventions, and compare beliefs to the truth contained in administrative data. New connections to rational inattention frameworks and auction theory yield useful partial and full equilibrium predictions. These advances have created more opportunities both on the modeling side, admitting two-sided incomplete information into our workhorse models, and on the empirical front, designing transparency policies and testing their impact on beliefs and behavior.

References

Portal de transparencia. *Gobierno de la Provincia de Córdoba*, 2022.

Laura Adler. From the Job's Worth to the Person's Price: Changes in Pay-Setting Practices since 1950. *Working Paper*, 2020.

George A. Akerlof and Janet L. Yellen. The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*, 105(2):pp. 255–283, 1990.

Patrick Arni. What's in the Blackbox? The Effect of Labor Market Policy on Search Behavior & Beliefs. A Field Experiment. 2013.

⁸Ariel Rubinstein, in his seminal paper "Perfect Equilibrium in a Bargaining Model" (1982) that popularized use of the Nash bargaining solution in labor market models today, remarks: "A critical assumption in the model is that each player has complete information...I hope to deal with this situation in another paper" (p100).

- David Arnold, Simon Quach, and Taska Bledi. The Impact of Pay Transparency in Job Postings on the Labor Market. *Working Paper*, 2022.
- Michael Baker, Yosh Halberstam, Kory Kroft, Alexandre Mas, and Derek Messacar. Pay Transparency and the Gender Gap. *American Economic Journal: Applied Economics (Forthcoming)*, 2022.
- Anna Behrmann and Kathy Osborn. In effort to increase employees' bargaining power, U.S. senators petition Federal Antitrust Agencies to revisit benchmarking guidelines, Jul 2018.
- Michele Belot, Philipp Kircher, and Paul Muller. Providing advice to jobseekers at low cost: An experimental study on online advice. *The Review of Economic Studies*, 86(4): 1411–1447, 2019.
- Morten Bennedsen, Elena Simintzi, Margarita Tsoutsoura, and Daniel Wolfenzon. Do Firms Respond to Gender Pay Gap Transparency? *The Journal of Finance*, 77(4):2051–2091, 2020.
- Morten Bennedsen, Birthe Larsen, and Jiayi Wei. Wage transparency and the gender pay gap: A survey. *Working Paper*, 2022.
- Lance A. Berger and Dorothy Berger. *The Compensation Handbook*. McGraw-Hill, New York, 2008.
- Julian R. Betts. What do students know about wages? Evidence from a survey of undergraduates. *Journal of Human Resources*, pages 27–56, 1996.
- Manudeep Bhuller, Karl Ove Moene, Magne Mogstad, and Ola L Vestad. Facts and fantasies about wage setting and collective bargaining. *Journal of Economic Perspectives*, 36(4): 29–52, 2022.
- Zachary Bleemer and Basit Zafar. Intended college attendance: Evidence from an experiment on college returns and costs. *Journal of Public Economics*, 157:184–211, 2018.
- Jack Blundell. Wage responses to gender pay gap reporting requirements. *Centre for Economic Performance Discussion Paper 1750*, 2021.
- Erlend E. Bø, Joel Slemrod, and Thor O. Thoresen. Taxes on the internet: Deterrence effects of public disclosure. *American Economic Journal: Economic Policy*, 7(1):36–62, 2015.
- René Boheim and Sarah Gust. The Austrian Pay Transparency Law and the Gender Wage Gap. *IZA Discussion Paper 14206*, 2021.
- Emily Breza, Supreet Kaur, and Yogita Shamdasani. The Morale Effects of Pay Inequality. *The Quarterly Journal of Economics*, 133(2):611–663, 2018.
- U.S. Census Bureau. Post-secondary employment outcomes (pseo), April 2020.
- Women's Bureau. Equal pay and pay transparency protections.

Sydnee Caldwell and Nikolaj Harmon. Outside Options, Bargaining and Wages: Evidence from Coworker Networks. *Working Paper*, 2018.

Canada. Pay Equity Act , December 2018.

David Card, Alexandre Mas, Enrico Moretti, and Emmanuel Saez. Inequality at Work: The Effect of Peer Salaries on Job Satisfaction. *American Economic Review*, 102(6):2981–3003, 2012.

Cincinnati. An Ordinance No. 83, Mar 2019.

Greg Clark. New executive pay transparency measures come into force. *Gov.UK*, January 2019.

Guillermo Cruces, Ricardo Perez-Truglia, and Martin Tetaz. Biased perceptions of income distribution and preferences for redistribution: Evidence from a survey experiment. *Journal of Public Economics*, 98:100–112, 2013.

Zoë Cullen and Bobak Pakzad-Hurson. Equilibrium Effects of Pay Transparency. *NBER Working Paper Series 28903*, June 2021.

Zoë Cullen and Ricardo Perez-Truglia. The Salary Taboo: Privacy Norms and the Diffusion of Information. *NBER Working Paper No. 25145*, 2018.

Zoë Cullen and Ricardo Perez-Truglia. How Much Does Your Boss Make? The Effects of Salary Comparisons. *Journal of Political Economy*, 130(3):766–822, 2022.

Zoë Cullen, Shengwu Li, and Ricardo Perez-Truglia. What’s my employee worth? the effects of salary benchmarking. 2022.

Deloitte. Sustainable finance disclosure regulation, 2021.

Erika Deserrano, Gianmarco Leon, and Philipp Kastrau. Promotions and Productivity: The Role of Meritocracy and Pay Progression in the Public Sector. *Working Paper*, 2021.

Mathias Dewatripont, Ian Jewitt, and Jean Tirole. The Economics of Career Concerns, Part I. *The Review of Economic Studies*, 66(1):183–198, 1999.

Peter A Diamond. Wage determination and efficiency in search equilibrium. *The Review of Economic Studies*, 49(2):217–227, 1982.

HR Dive. A running list of states and localities that have outlawed pay history questions, Feb 2022a.

HR Dive. A running list of states and localities that require employers to disclose pay or pay ranges, May 2022b.

DOJ and FTC. Antitrust guidance for human resource professionals, Oct 2016.

Tom Dreisbach. Pay secrecy policies at work: Often illegal, and misunderstood, Apr 2014.

- Arindrajit Dube, Suresh Naidu, and Adam D Reich. Power and Dignity in the Low-wage Labor Market: Theory and Evidence from Wal-Mart Workers. Technical report, NBER Working Paper 30441, 2022.
- Emma Duchini, Stefania Simion, and Arthur Turrell. Pay Transparency and Cracks in the Glass Ceiling. *Mimeo*, May 2020.
- Matthew A. Edwards. The Law and Social Norms of Pay Secrecy. *Berkeley Journal of Employment and Labor Law*, 26:41–63, 2005.
- European Commission. Pay transparency in the EU: A legal analysis of the situation in the EU Member States, Iceland, Liechtenstein and Norway. Technical report, 2017.
- Martin Feldstein and James Poterba. Unemployment insurance and reservation wages. *Journal of Public Economics*, 23(1-2):141–167, 1984.
- James Flynn. Salary disclosure and individual effort: Evidence from the national hockey league. *Journal of Economic Behavior & Organization*, 202:471–497, 2022.
- Valerie Frey. Can pay transparency tools close the gender wage gap? *OECD*, 2021.
- Wolfgang Frimmel, Bernhard Schmidpeter, Rene Wiesinger, and Rudolf Winter-Ebmer. Mandatory Wage Posting, Bargaining and the Gender Wage Gap. *Working Paper*, 2022.
- Andreas Fuster, Ricardo Perez-Truglia, Mirko Wiederholt, and Basit Zafar. Expectations with endogenous information acquisition: An experimental investigation. *Review of Economics and Statistics*, 104(5):1059–1078, 2022.
- Robert Gibbons and Kevin J Murphy. Optimal Incentive Contracts in the Presence of Career Concerns: Theory and Evidence. *Journal of Political Economy*, 100(3):468–505, 1992.
- Robert Gibbons and Michael Waldman. A Theory of Wage and Promotion Dynamics Inside Firms. *Quarterly Journal of Economics*, 114(4):1321–1358, 1999a.
- Robert Gibbons and Michael Waldman. Careers in Organizations: Theory and Evidence. In *Handbook of Labor Economics, Volume 3B*, pages 2373–2437. 1999b.
- Jeff Green, Ella Ceron, and Alexandre Tanzi. NYC Aims to Close Stubborn Gender Pay Gap With Salary Disclosure, Feb 2022.
- Andreas Gulyas, Sebastian Seitz, and Sourav Sinha. Does Pay Transparency Affect the Gender Wage Gap? Evidence from Austria. *American Economic Journal: Economic Policy (Forthcoming)*, 2022.
- Robert Hall and Alan Krueger. Evidence on the Incidence of Wage Posting, Wage Bargaining, and On-the-Job Search. *American Economic Journal: Macroeconomics*, 4(4):56–67, 2012.
- Milton Harris and Bengt Holmstrom. A Theory of Wage Dynamics. *The Review of Economic Studies*, 49(3):pp. 315–333, 1982.

- Oliver P. Hauser and Michael I. Norton. (mis) perceptions of inequality. *Current Opinion in Psychology*, 18:21–25, 2017.
- Bengt Holmstrom. Managerial Incentive Problems: A Dynamic Perspective. *Review of Economic Studies*, 66(1):169–182, 1999.
- Kristoffer B. Hvidberg, Claus Kreiner, and Stefanie Stantcheva. Social Positions and Fairness Views on Inequality. (28099), November 2020.
- Simon Jaeger, Christopher Roth, Nina Roussille, and Benjamin Schoefer. Worker Beliefs About Outside Options. *NBER Working Paper No. 29623*, December 2021.
- Robert Jensen. The (perceived) returns to education and the demand for schooling. *The Quarterly Journal of Economics*, 125(2):515–548, 2010.
- Mark Johanson. Why companies don't post salaries in job adverts. *BBC*, September 2021.
- Sorapop Kiatpongsan and Michael I. Norton. How Much (More) Should CEOs Make? A Universal Desire for More Equal Pay. *Perspectives on Psychological Science*, 9(6):587–593, 2014.
- James Kluegel and Eliot Smith. *Beliefs about Inequality Americans' Views of What Is and What Ought to Be*. Routledge, 1986.
- David M. Kreps and Robert Wilson. Reputation and imperfect information. *Journal of Economic Theory*, 27(2):253–279, 1982.
- Vijay Krishna. *Auction theory*. Academic press, 2009.
- Alan B. Krueger and Andreas I. Mueller. A contribution to the empirics of reservation wages. *American Economic Journal: Economic Policy*, 8(1):142–79, 2016.
- Peter Kuhn and Wulong Gu. A Theory of Holdouts in Wage Bargaining. *American Economic Review*, 88(3):428–449, 1998.
- Peter Kuhn and Wulong Gu. Learning in Sequential Wage Negotiations: Theory and Evidence. *Journal of Labor Economics*, 17(1):109–140, 1999.
- Ilyana Kuziemko, Michael I. Norton, Emmanuel Saez, and Stefanie Stantcheva. How elastic are preferences for redistribution? Evidence from randomized survey experiments. *American Economic Review*, 2015.
- Edward E. Lawler. Managers' Perceptions of their Subordinates' Pay and of Their Superiors' Pay. *Personnel Psychology*, 18(4):413–422, 1965.
- Edward P. Lazear and Sherwin Rosen. Rank-Order Tournaments as Optimum Labor Contracts. *Journal of Political Economy*, 89(5):841–864, 1981.
- Erzo F.P. Luttmer. Neighbors and negatives: Relative earnings and well-being. *Quarterly Journal of Economics*, 2005.

- Alexandre Mas. Does Disclosure affect CEO Pay Setting? Evidence from the Passage of the 1934 Securities and Exchange Act. *Working Paper*, 2016.
- Alexandre Mas. Does Transparency Lead to Pay Compression? *Journal of Political Economy*, 125(5):1683–1721, 2017.
- Yoshie Midorikawa. New Rules Require Japanese Companies to Disclose Their Gender Wage Gap, August 2022.
- Paul Milgrom. Good News and Bad News: Representation Theorems and Applications. *The Bell Journal of Economics*, 12(2):380–391, 1981.
- Paul Milgrom and Robert Weber. A Theory of Auctions and Competitive Bidding. *Econometrica*, 50(5):1089–1122, 1982.
- Takero Minami. Japan to require listed companies to disclose executive pay rules. *Nikkei Asia*, December 2018.
- Dale T. Mortensen. The matching process as a noncooperative bargaining game. In *The economics of information and uncertainty*, pages 233–258. University of Chicago Press, 1982.
- Dale T. Mortensen. *Wage dispersion: why are similar workers paid differently?* MIT press, 2005.
- Andreas I. Mueller, Johannes Spinnewijn, and Giorgio Topa. Job seekers’ perceptions and employment prospects: Heterogeneity, duration dependence, and bias. *American Economic Review*, 111(1):324–63, 2021.
- Katie Nadworny. Israel: Equal pay reporting obligations, May 2022.
- NJDOL. New jersey equal pay act, 2018.
- NLWC. Promoting pay transparency to fight the gender wage gap, Mar 2020.
- Michael I. Norton and Dan Ariely. Building a better America—One wealth quintile at a time. *Perspectives on psychological science*, 6(1):9–12, 2011.
- Barack Obama. Executive order 13665-non-retaliation for disclosure of compensation information, Apr 2014.
- Tomasz Obloj and Todd Zenger. The influence of pay transparency on inequity, inequality, and the performance-basis of pay in organizations. *Nature: Human Behavior*, 6:646–655, 2022.
- International Labour Organization. Pay transparency legislation: Implications for employers’ and workers’ organizations. 2022.
- Uberto Percivalle. Italy: Gender-equality reporting and certification bill passed, Nov 2021.

Ricardo Perez-Truglia. The Effects of Income Transparency on Well-Being: Evidence from a Natural Experiment. *American Economic Review*, 110(4):1019–54, 2020.

Ricardo Perez-Truglia and Ugo Troiano. Shaming Tax Delinquents. *Journal of Public Economics*, 167:120–137, 2018.

Macon Phillips. Now Comes Lilly Ledbetter. 2009.

Christopher A Pissarides. Short-run equilibrium dynamics of unemployment, vacancies, and real wages. *The American Economic Review*, 75(4):676–690, 1985.

Fabien Postel-Vinay and Jean-Marc Robin. The Distribution of Earnings in an Equilibrium Search Model with State-Dependent Offers and Counteroffers. *International Economic Review*, 43(4):989–1016, 2002.

Phillip Reese. See how far union membership has declined in California. *The Sacramento Bee*, 2019.

Joan Robinson. *The Economics of Imperfect Competition*. Macmillan, 1933.

Sherwin Rosen. Prizes and Incentives in Elimination Tournaments. *The American Economic Review*, 76(4):701–715, 1986.

Nina Roussille. The central role of the ask gap in gender pay inequality. *Mimeo*, 2021.

SEC. Sec adopts rule for pay ratio disclosure, August 2015.

SEC. Sec adopts pay versus performance disclosure rules, August 2022.

Leah Shepherd. Ireland requires employers to report pay disparities by gender, May 2022.

Skatteetaten. Search the tax lists.

Samuel Skoda. Directing Job Search in Practice: Mandating Pay Information in Job Ads. *Working Paper*, 2022.

Johannes Spinnewijn. Unemployed but optimistic: Optimal insurance design with biased beliefs. *Journal of the European Economic Association*, 13(1):130–167, 2015.

George J. Stigler. Information in the Labor Market. *Journal of Political Economy*, 70(5): 94–105, 1962.

Shengwei Sun, Jake Rosenfeld, and Patrick Denice. On the Books, Off the Record: Examining the Effectiveness of Pay Secrecy Laws in the U.S. *Institute for Women’s Policy Research*, 2021.

Toledo. O-173-19, Apr 2019.

R. Trachtman. The Money Taboo: Its Effects in Everyday Life and in the Practice of Psychotherapy. *Clinical Social Work Journal*, 27(3):275–288, 1999.

TSX. Guide to security based compensation arrangements, January 2020.

TWSE. Securities and exchange act article 14, January 2021.

UK. The companies (directors' remuneration policy and directors' remuneration report) regulations 2019, May 2019.

Jose Antonio Valdez and Lucianna Polar. Peru: New legislative protection for equal pay, Feb 2018.

Steven R. Williams. Efficient Performance in Two Agent Bargaining. *Journal of Economic Theory*, 41:154–172, 1987.

Matthew Wiswall and Basit Zafar. Determinants of college major choice: Identification using an information experiment. *Review of Economic Studies*, 82(2):791–824, 4 2014.

TABLE II: Partial List of Government Mandates

Intent	Policy	Places Implemented		
		Countries	States/Provinces	Local
Combating pay discrimination	Expected Wages in Job Postings	Latvia, Slovakia, Austria, Lithuania		
Combating pay discrimination	Wage Ranges in Job Postings		CO, CA, WA †, Ontario, Canada †	New York City, NY; Ithaca, NY; Westchester County, NY; Jersey City, NJ
Combating pay discrimination	Wage Ranges for Job Applicants Upon Request		CA, MD, WA, NV, CT, RI	Toledo, OH; Cincinnati, OH
Combating pay discrimination	Wages or Wage Range Disclosure for Employees Upon Request	Germany, Chile	NV, CT, WA, RI	
Combating pay discrimination	Reporting Gender Wage Gap Statistics	UK, Australia, France, Japan, Switzerland, Italy		
Combating pay discrimination	Reporting Gender Wage Gap Statistics by Occupational Group	Austria, Belgium, Iceland, Denmark, Lithuania, Spain, Canada, Israel	NJ*	
Combating pay discrimination	Required Transparent Compensation	Portugal, Peru, Croatia		
Combating pay discrimination	Ad Hoc Gender Pay Audits	Greece, Turkey, Costa Rica, Ireland, the Netherlands		
Combating pay discrimination	Salary History Ban		AL, CA, CO, CT, DE, HI, IL, ME, MD, MA, NV, NJ, NY, OR, PR, RI, VT, WA, NC*, PA*, VA*, Ontario, Canada †	San Francisco, CA; New York City, NY; Albany County, NY; Suffolk County, NY; Westchester County, NY; Cincinnati, OH; Toledo, OH; Philadelphia, PA; Washington D.C.*; Atlanta, GA*; Chicago, IL*; Louisville, KY*; New Orleans, LA*; Columbia, SC*; Jackson, MI*; Kansas City, MO*; St. Louis, MO*; Pittsburgh, PA*; Montgomery County, MD*
Combating pay discrimination	Right of Workers to Talk: Protected Disclosure	U.S.*	CA, CO, CT, DE, DC, IL, LA*, ME, MD, MA, MI, MN, NE, NV, NH, NJ, NY, OR, VT, WA	
Combating pay discrimination	Right of Workers to Talk: Protected Inquiry	U.S.*	CA, CO, CT, DE, DC, IL, LA*, ME, MD, MA, MN, NE, NV, NH, NJ, NY, OR, VT, WA	
Public trust/accountability	Public Salaries	Norway, Sweden, Finland, Iceland		
Public trust/accountability	Public Labor Cost Index	Slovakia		
Public trust/accountability	Government Employee Public Salaries	Estonia	CA, CO, CT, DE, DC, HI, IL, ME, MA, MI, MN, NH, NJ, NV, NY, OR, VA, VT	Córdoba, Argentina
Prohibiting Pay Secrecy	Collective Bargaining	U.S.		
Encouraging competition	Antitrust Safety Zone Permitting Salary Benchmarking	U.S.		
Encouraging competition	Ban on Salary Discussion Among HR Professionals	U.S.		
State policy uniformity	Prohibition of Salary History Bans		MI, WI	

Notes: States or countries marked with * indicate the policy only applies to state employees or federal contractors, † indicates laws passed but not yet effective. Sources: Dive (2022a), NLWC (2020), Organization (2022), Bureau, Frey (2021), European Commission (2017), Dive (2022b), Dreisbach (2014), Obama (2014), Perez-Truglia (2020) NJDOL (2018), Toledo (2019), Cincinnati (2019), Behrmann and Osborn (2018), DOJ and FTC (2016), Arg (2022), Johanson (2021), Green et al. (2022), Midorikawa (2022), Nadworny (2022), Percivalle (2021), Valdez and Polar (2018), Shepherd (2022), Frimmel et al. (2022), Bennedson et al. (2022)

TABLE III: Financial Regulation Policies

Intent	Policy	Where
Shareholder evaluation	Pay Ratio (CEO/median) disclosure	U.S. (SEC)
Shareholder evaluation	“Pay-for-performance” executive compensation disclosure	U.S. (SEC)
Shareholder evaluation	CEO & Board Directors compensation disclosure	UK
Corporate Governance & Accountability	Pay Ratio (CEO/median) disclosure	UK
Shareholder evaluation	Security-Based compensation disclosure	Canada (TSX)
Shareholder evaluation	Executive compensation policies disclosure	Japan
ESG	Pay gap of a fund’s investee companies disclosure	Europe (EU)
ESG	Remuneration policy, employee average salary & director/supervisor remuneration disclosure	Taiwan (TWSE)

Sources: SEC (2015), SEC (2022), UK (2019), Clark (2019), TSX (2020), Minami (2018), Deloitte (2021), TWSE (2021)

TABLE IV: Meta Analysis study details

Study	Setting	Policy	Men's wage effect	Men's wage SE	Women's wage effect	Share men	W:M Pay Ratio (pre policy)	Imputed wage effect
Baker et al. (2022)	Canadian Universities	Posting individual salaries	-0.034	0.007	-0.022	0.725	0.89	-0.031
Bennedsen et al. (2020)	Danish Private Sector	Disclosure of relative earnings by gender	-0.015	0.0037	0.0036	0.7	0.84	-0.010
Blundell (2021)	U.K. Private Sector	Disclosure of relative earnings by gender	-0.014	0.0047	0.002	0.61	0.83	-0.008
Böheim and Gust (2021)	Austrian Private Sector	Disclosure of relative earnings by gender	0.005		-0.008	0.42	0.78	-0.000
Duchini et al. (2020)	U.K. Private Sector	Disclosure of relative earnings by gender	-0.026	0.011	0.001	0.54	0.80	-0.017
Gulyas et al. (2022)	Austrian Private Sector	Disclosure of relative earnings by gender	0.002	0.004	0.001	0.58	0.75	0.002
Mas (2016)	CA Public Sector	Posting individual salaries	-0.014	0.017	-0.07	0.99	2.80	-0.014
Obloj and Zenger (2022)	U.S. Universities	Posting individual salaries	-0.016	0.008	0.005	0.614	0.93	-0.009
Cullen and Pakzad-Hurson (2021)	13 U.S. States	Right of workers to talk	-0.019	0.004	-0.016	0.58	0.74	-0.018

Notes: Largely replicated from Cullen and Pakzad-Hurson (2021). 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. For studies that do not, we report the treatment effect coefficient from the final year of the analysis. Except as noted below, all numbers are drawn from each paper, respectively. Baker et al. (2022): Numbers drawn from Table 4 Col. 4, Table 2. Bennedsen et al. (2020): Numbers drawn from Table 3 Col. 7, Table 1. Duchini et al. (2020): Numbers drawn from Table 5 Col. 1, Table 2. Blundell (2021): Numbers drawn from Figure 1, Table 1, Table 2 Col. 5. 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 to 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. Gulyas et al. (2022): 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 (2016): Numbers drawn from Table 2 Col. 5 Row 3, Table 3 Col. 2 Row 3. Additional numbers drawn from the California municipal pay website at <https://publicpay.ca.gov/Reports> 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 does not report the effect of transparency on men's and women's wages, but rather managers' and non-managers' wages. We abuse terminology and refer to managers as "men" and non-managers as "women." Obloj and Zenger (2022): Numbers drawn from Table 1 Col. 6, page 5. Disclosure of employee salaries is facilitated by newspapers and other organizations who release salary information garnered through Freedom of Information Act requests. Cullen and Pakzad-Hurson (2021): Numbers drawn from Table C.1, Figure D.5.