I Z A Institute of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17385

Job Search, Efficiency Wages and Taxes

Alex Bryson
Harald Dale-Olsen

OCTOBER 2024

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17385

Job Search, Efficiency Wages and Taxes

Alex Bryson
University College London, IZA and NIESR

Harald Dale-Olsen
Institute for Social Research, Oslo and IZA

OCTOBER 2024

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Job Search, Efficiency Wages and Taxes*

Norwegian workers' job mobility decisions are related to firms' wage policies, but also depend on the national tax schedule. By utilising Norwegian population-wide administrative linked employer-employee data on workers and firms between 2010-2019, we study how the job-to-job turnover of employees is affected by marginal taxes and firms' pay policies, enabling inferences to be made about on-the-job search. Paying higher wages is associated with a drop in job-to-job separation rates, but this negative relationship is weakened when income taxes increase. Higher taxes imply strictly reduced search activity, but less so for bonus job-workers than salaried workers.

JEL Classification: H24, J42, J63, M12

Keywords: job search, marginal taxes, monopsony, wages, effort

Corresponding author:
Alex Bryson
Social Research Institute
University College London
27 Woburn Square
London WC1H 0AA
United Kingdom
E-mail: a.bryson@ucl.ac.uk

* We thank participants at COPE 2024 and EALE 2024 for fruitful discussions and helpful suggestions. We thank the Norwegian Research Council for funding (grant numbers No 295914 and No 324358).

1. Introduction

Prices on goods act as signals to equate demand and supply of goods. Wages offered to workers act similarly, but in contrast to prices on goods, wages also reflect how productive labour is or should be. However, firms pay apparently similar workers different wages, as suggested by Richard Lester 80 years ago (Lester, 1946, 1952) and identified using population-wide register data in the last three decades (Abowd et al., 1999; Card et al., 2016, 2018; Goldschmidt and Schmieder, 2017, Schmieder, 2023). One explanation is that firms follow different wage strategies. In contrast to goods, people act on information, and this allows workers to search for jobs (as unemployed) or new better jobs (as employed). Employers may use wages in recruiting and retaining workers, optimising with respect to turnover costs (Salop and Salop, 1976; Salop, 1979). Thus, wage offers can affect job mobility. However, there are multiple profit-maximising strategies with some firms choosing low wage strategies with high worker turnover, while others offer higher wages inducing lower worker turnover and a queue of job seekers. This is the essence of the on-the-job search model of Burdett and Mortensen (1998). The presence of labour market frictions makes this possible. Labour market frictions also provide firms with monopsonistic power allowing them to pay a mark-down on productivity (Manning, 2003; Langella and Manning, 2021). Considerable recent evidence establishes employer market power in the labour market (Dobbelaere and Kyota, 2018; Berger et al., 2022).

These labour market frictions can lead to the dissolution of a job not expressed by an exogenous job destruction rate. Another set of frictions arises from the information flow related to job offers, usually expressed by a job offer arrival rate. Although often taken for granted in analyses, these frictions can be influenced by workers. For instance, expectations of future pecuniary rewards in new employment relationships influence workers in terms of how hard they look for new jobs. Thus, the probability that a worker ends an employment relationship is not only related to wage offers and factors outside the worker's control, but also how intensively they search for new jobs (Christensen et al., 2005). And yet few analyses examine the influence of earnings taxes on search behaviour.

That tax policies might affect search behaviour has theoretically been recognised since the 1970s (Kesselman, 1976) and been addressed by Gentry and Hubbard (2004) empirically. Kesselman (1976) observed that, theoretically, for most tax and transfer policies the slope of the labour-supply schedule affects the direction of search incentives. Recently, however, Berger et al. (2024) show theoretically that progressive income taxes distort hiring and wages when firms have labor market power, i.e., progressive taxes amplify the distortions associated with monopsony, and provide simple quantitative evidence supporting these notions. In their empirical study for the United States Gentry and Hubbard (2004) found that higher tax rates and increased progressivity decrease the probability that a head of household will move to a better job during the coming year. Thus, in practice, job search activity in the U.S. diminishes as tax levels and progressivity increase. To our knowledge, this is the sole empirical study addressing how search is affect by taxes.

We contribute to this literature by establishing whether the results hold twenty years in another country. If it is the case that labour taxes affect the search behaviour of workers, this is likely to provide firms with monopsonistic wage-setting powers with implications for the operation of the labour market and public authorities. Employer monopsony power yields distorted allocation of labour across firms and thus a welfare loss.

In this paper, we study how Norwegian workers' job mobility decisions are related to firms' wage policies under different tax regimes. We draw inspiration from the rich literature on the elasticity of taxable income with respect to marginal tax rates (Gruber and Saez, 2002; Saez et al., 2012; Kleven and Schultz, 2014). This literature highlights the negative association between marginal taxes rates and income due to reduced effort when the returns to work diminish. This literature identifies modest labour income elasticities for wage earners on average, but larger impacts whenever tax changes are large, consistent with the notion that smaller changes are attenuated by optimising frictions (for example, adjustment costs and inattention). Previous studies for Norway also indicate labour income responses following tax reforms (Aarbu and Thoresen, 2001). However, the notion that effort is affected by tax changes could also have implications for firm wage policies and worker turnover.[1] Since performance pay is one strategy to overcome informational deficiencies concerning workers' provision of effort (Lazear, 2000; Lucifora and Origo, 2015), in part of the analyses we differentiate between fixed pay and performance-pay.[2]

We utilise Norwegian administrative register data on the population of workers and firms during the period 2014-2019. Except for 2014, we exploit monthly data on jobs including information on work hours, hourly wages and bonuses. Data comprise roughly 3.65 million men and 3.64 million women, and slightly less than 70 million monthly observations for each gender. To derive measures of firms' wage policies, we apply standard linear fixed effect regressions as they were introduced by Abowd et al. (1999) and which numerous studies have applied (Dale-Olsen, 2006; Barth and Dale-Olsen, 2009) and recently extended (Barth et al., 2021; Engbom et al., 2022; Schmieder, 2023). To avoid complications related to motherhood and family obligations affecting labour supply decisions and job search, we focus our analyses on male private sector employment relationships in firms reporting to the Accounting Register.

During our period of observation, the Norwegian earning tax schedule changed on a yearly basis. The tax schedule is stepped by brackets, and both the brackets and the marginal tax rate within brackets change. Thus, a minor change to a workers' earnings might induce a strong tax change due to moving this worker across brackets. This, together with changing tax rates within brackets, is what we exploit in the empirical analyses. These analyses comprise linear job-to-job separation regressions incorporating fixed worker effects, marginal tax rates and a measure of the predicted probability of receiving a better job offer. To derive a causal interpretation, we utilise instrumental variables (IVs) based on the information on the individual's lagged taxable labour income and lagged total factor productivity of

[1] In one interpretation of efficiency wage models, firms pay wage premiums to avoid shirking workers (Shapiro and Stiglitz, 1984). If taxes on earnings change the effort distribution of workers by shifting the non-shirking wage upward then, if unchanged, workers start shirking and this will induce turnover as is seen in Piyapromdee (2018).

[2] Performance pay is often associated with improved firm performance (Lazear, 2000; Lucifora and Origo, 2015) and although some argue that monetary incentives undermine intrinsic motivation and thus performance, this has been refuted in field tests (Esteves-Sorensen and Broce, 2022).

their employer. As we will return to, we have strong reasons to believe that total factor productivity affects the wage offers of firms.

The remainder of the paper is structured as follows: Section 2 describes the labour tax legislation in Norway during 2014-2019. Section 3 introduces the theoretical background which motivate our empirical analyses. Section 4 presents the data, describes the derivation of main empirical measures, and provides descriptive statistics on these variables. In Section 5, we address our key question by studying how the job-to-job separation rates of Norwegian male workers react to changes in the marginal tax schedule and employers' wage policies. Section 6 briefly concludes.

2. The Norwegian Labour Income Tax Schedule

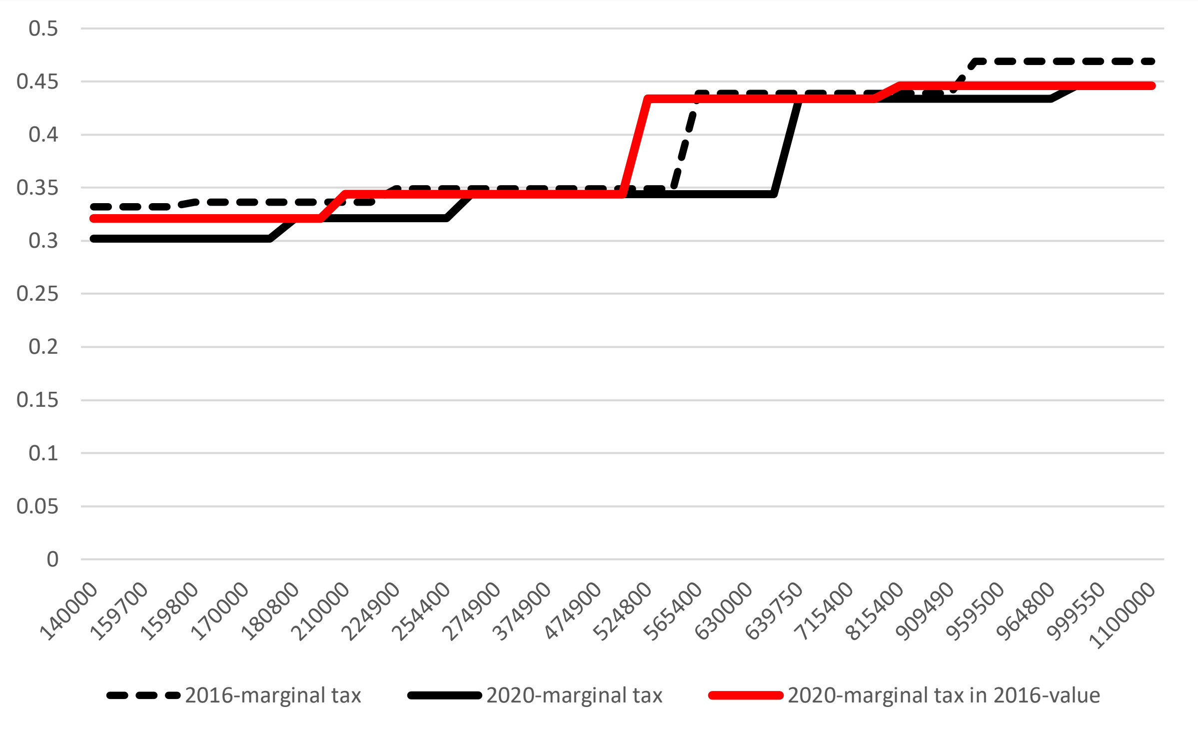
Table 1: Distribution of changes in the marginal tax (in percent). Income above baseline social services threshold (1G)

	2015	**2016**	**2017**	**2018**	**2019**	**2020**
National insurance contributions						
Basic	0.082	0.082	0.082	0.082	0.082	0.082
Lower limit/ deduction (25%)	49650	49650	54650	54650	54650	54650
General income						
Basic	0.270	0.250	0.240	0.230	0.220	0.220
Low	0.235	0.215	0.205	0.195	0.185	0.185
Bracket tax (surtax 2015)						
0	<550550:0	<159800:0	<164100:0	<169000:0	<174500:0	<180800:0
1		<224900:0.0044	<230950:0.0093	<237900:0.014	<245650:0.019	<254500:0.019
2		<565400:0.017	<580650:0.0241	<598050:0.033	<617500:0.042	<639750:0.042
3basic	<885600:0.09	<909500:0.107	<934050:0.1152	<962050:0.124	<964800:0.132	<999550:0.132
3low	<885600:0.07	<909500:0.087	<934050:0.0952	<909500:0.104	<909500:0.112	<999550:0.112
4	Else:0.120	Else:0.137	Else:0.1452	Else:0.154	Else:0.137	Else:0.137

Note: Marginal tax rate comprises national insurance contributions + general income tax + bracket tax/surtax. The low-tax areas comprise workers living in the county of Finnmark and selected municipalities in North-Troms.

Norwegian labour income tax legislation comprises three tax parts which together yield a progressive labour tax schedule. Earnings above a lower threshold are subject to national insurance contributions. However, even above the limit one should never pay contributions or tax exceeding 25 percent of labour income after the deduction. All workers also pay income tax which is independent of the income level, with those living in northern Norway facing a slightly lower general income tax rate (as an incentive to live in the more inhospitable climate). Finally, workers face a bracket tax depending on their income level (called a surtax in 2015 and previous years). This bracket tax means higher tax rates for income in higher brackets. Thus, the marginal tax rate is given by the sum of the national insurance contributions, the general income tax and the bracket tax. The marginal tax rate follows a stepped schedule as labour income increases.   Table 1 describes the different tax components, and how these changed during the period 2015 to 2020.

Figure 1: Changes in the marginal tax rate and the bracket tax over time due to tax schedule changes. 2016 and 2020



Note: See Norwegian Tax Administration (see skatteetaten.no) and own calculations.

During our period of observation, Norwegian workers experience tax rate changes on a yearly basis. First, both the 'basic' general income tax and the 'low' general income tax in the North fall. Second, the bracket defining the bracket tax changes over time. Third, as is seen after the bracket interval, the tax rates within the brackets change over time. Figure 1 reveals the stepped nature of the marginal tax schedule. Since the bracket tax increases slightly, particularly for middle incomes, but not at the top, thus, this implies to a certain degree a less progressive tax schedule. In addition, the general income tax declines, thus actually making the marginal tax rate less progressive. Overall, the marginal tax rates would on average decline over time, but inflation and wage drift cause labour incomes to increase. In the figure, we have added the 2020-marginal tax rates based for 2016-incomes added average wage growth. With this perspective, we see that some workers will face higher marginal taxes and others experience a drop. A minor change to a worker's earnings might induce a strong tax rate change. Between two years (and not 4 as shown here), inflation and realised wage drift might be stronger than the general reduction in marginal taxes as is seen in the tax rates.

3. Theoretical Motivation

We base our theoretical motivation mainly on Christensen et al. (2005) who address the relationship between wage dispersion, mobility and optimising search effort under search frictions. Their model embeds endogenous search intensity or search effort (depending on the expected gain from a wage offer) into the Burdett and Mortensen-model (Burdett and Mortensen, 1998). We have no intention of providing an explicit combination of these two models adding tax schedules, but we argue that it is possible to indicate or derive empirical predictions.

In this model, a firm posts a wage offer w, hires any worker accepting this offer, and pays all its workers this wage. The wage offer distribution is denoted by F(w), where F(w) represents the probability that a randomly selected wage is not greater than w. Workers search randomly for wage offers. Each worker receives job offers at a rate λs, where s is a measure of the worker's search effort. Each worker chooses search effort subject to an increasing convex search cost function $c(s)= c_0s^2$, where c_0 is a positive parameter.[3] Finally, employment relationships are destroyed exogenously at a rate δ. As unemployed, the worker receives b and pays no tax. Let t denote the marginal tax rate. When employed, the worker receives instantaneous utility of (1-t)w. We assume that each worker maximises expected wealth, which can be expressed by:

$$1)\ rV_e(w) = \max_{s \geq 0}((1-t)w - c(s) + \lambda s\left[\int \max\left(V_e(w), V_e(x)\right) dF(x) - V_e(w)\right] + \delta[V_u - V_e(w)]),$$

[3] This squared cost function is a simplification of the cost function of Christensen et al. (2005), however, we are primarily interested in motivating our empirical analyses, and for that purpose, we argue this simplified function is sufficient. More involved search cost functions are also found in Miano (2023).

where V_u is the value of unemployed search. Following the derivation of Christensen et al. (2005) and incorporating the (1-t)-tax element, Equation 1) can be rewritten as

$$V_e(w) = \max_{s \geq 0}\{\frac{(1-t)w-c(s)+\delta V_u+\lambda s[\int \max(V_e(w),V_e(x))dF(x)]}{r+\delta+\lambda s}\}, \text{ where } V_e{}'(w) = \frac{(1-t)}{r+\delta+\lambda s(w)[1-F(w)]}>0.$$

Then, as shown by Christensen et al. (2005), optimal search effort is given by the first order condition:

$$c'(s(w))= \lambda \int_w^{\overline{w}} [V_e(x) - V_e(w)]dF(x) = \lambda \int_w^{\overline{w}} V_e{}'(w)[1 - F(x)]dx= (1 - t)\lambda \int_w^{\overline{w}} \frac{1-F(x)}{r+\delta+\lambda s(x)[1-F(x)]} dx.$$

Since c(s) is positive convex, s(w) is decreasing in w. Christensen et al. (2005) show that since search effort is not observed, one cannot identify λ and s separately, but one can recover one joint parameter comprising the search cost parameter, c_0, and λ. With a squared search cost function, this would yield $\lambda(w) = (1 - t)\frac{\lambda^2}{c_0}\int_w^{\overline{w}} \frac{1-F(x)}{r+\delta+\lambda(x)[1-F(x)]}dx$, which is declining in w and t. For completeness, the expected discounted lifetime income for an unemployed worker can be given by

2) $$rV_u = \max_{s \geq 0}(b - c(s) + \lambda s[\int \max(V_u, V_e(x))\, dF(x) - V_u].$$

The worker's reservation wage, R, is given by the condition $V_e(x)= V_u$, implying that search effort while unemployed equals s0=s(R), and that R=b/(1-t).

From Christensen et al. (2005: Equation 6)), with no taxes, we know that a firm's separation rate can be expressed as:

3) $$Q(w) = \delta + \lambda s(w)[1 - F(w)],$$

where $s'(w)<0$ and F'(w)>0 and Q expresses separation rate from the firm.[4] $\overline{F}(w)$=1-F(w) then expresses the probability of receiving a better job offer, where $\overline{F}'(w)<0$. The better paid you are, the less likely it is that you will receive a better wage offer.

[4] Following Burdett and Mortensen (1998), the wage offer distribution can be expressed as $F(w) = \frac{\delta+\lambda s}{\lambda s}\left(1 - \frac{p-w}{p-b}\right)^{0.5}$.

Given this squared search cost function, we can, as a simplification and approximation acting as motivation for our empirical analyses, express λ(w) as $\lambda(\mathrm{w}) = (1-\mathrm{t})\frac{\lambda^2}{c_0}\int_{w}^{\overline{w}} \frac{1-F(x)}{r+\delta+\lambda(x)[1-F(x)]}dx \approx (1-\mathrm{t})\frac{\lambda^2}{c_0}\left[\gamma_0 - \frac{\gamma_1}{\overline{F}(w)}\right]$, where $\lambda'(\mathrm{w}) < 0$. Incorporating taxes in the search intensity function then yields the separation function:

4) $$\mathrm{Q(w)} = \delta + \lambda(\mathrm{w})\left[\overline{F}(w)\right] \approx \delta + (1-\mathrm{t})\frac{\lambda^2}{c_0}\left[\gamma_0 - \frac{\gamma_1}{\overline{F}(w)}\right]\overline{F}(w) =$$

$$\delta - \frac{\lambda^2}{c_0}\gamma_1 + \frac{\lambda^2}{c_0}\gamma_1 \mathrm{t} + \frac{\lambda^2}{c_0}\gamma_0\overline{F}(w) - \frac{\lambda^2}{c_0}\gamma_0 t\overline{F}(w).$$

In this separation function, firms' pay policies differ only by virtue of frictions and optimising turnover behaviour, and workers optimise on search effort.

Finally, note that in this model the workers have perfect information on the arrival rate of offers, the offer distribution, and job destruction. If imperfect information exists, then beliefs about search costs, returns to search, and outside options will matter, as is seen in the study of Miano (2023).

4. Econometric Model

Based on Equation 4), we can model the probability that worker i employed at workplace f at year t leaves for a new job at another workplace in year t+1 by the simple linear probability model expressed by Equation 5):

5) $$Q_{ift} = \alpha_0 + \alpha_t\tilde{t}_{it+1} + \alpha_F\overline{F}_{ft} + \alpha_{FT}\tilde{t}_{it+1}X\overline{F}_{ft} + \alpha_Z Z_{ift} + \xi_{ift},$$

where ξ_{ift} expresses a standard error term and Z_{ift} expresses time-varying exogeneous control variables. We let the job destruction rate, δ, be expressed by $\delta = \alpha_0 + \alpha_Z Z_{ift} + \xi_{ift}$. Our key variables are the expected marginal tax for the next year ($\tilde{t}_{it+1}$), the probability that the worker receives a better job offer ($\overline{F}_{ft}$) and the interaction between these.

Note from Equation 4), we expect that the estimate of α_{FT} is negative, while the estimate of α_F should be positive. Similarly, the estimate of $\alpha_t$is expected to be positive. We expect [α_F+$\alpha_{FT}\tilde{t}_{it+1}$] to always be positive: a higher probability of a better job offer should always increase the separation probability. However, since higher marginal tax rates potentially cause separations due to contract misalignment and shirking (agency considerations) and affect the job search incentives, the sign of [α_t+$\alpha_{FT}\overline{F}_{ft}$] is ambiguous a priori.

When deriving the theoretical relationship between separations and marginal taxes, we assume that work effort, in contrast to search effort, is given and can be contracted upon. It is not within the scope of this paper to introduce efficiency wages or performance pay into the model above. However, the classical Burdett and Mortensen (1998) model without endogenous search effort has been extended by Piyapromdee (2018), to allow the output of a match between a worker and a firm to depend on a worker's non-contractable effort level and that the work effort provided is being costly for the worker. Firms monitor workers imperfectly, at a cost, and fire shirking workers if found shirking. While this model comprises many of the traits and characteristics of a standard equilibrium search model, it also comprises elements like the classical Shapiro and Stiglitz (1984) model. For example, wages and monitoring are two means employers use to manage shirking. From this, reminiscent of the Shapiro and Stiglitz-model, Piyapromdee (2018) derives an equilibrium non-shirking-wage, which will be the lowest wage offered in the economy, where nobody shirks. No employed worker shirks, but the wage is higher than it would have been, given contractable effort. Adding taxes to this model should imply that, since a tax hike reduces the return to work, a tax hike would increase the non-shirking wage, and some of the workers employed before the tax hike, would start shirking, and a proportion of these would be caught and lose their job.

In the Piyapromdee (2018) search model, effort affects worker output, firms optimize wages and monitoring to achieve profit-maximising labour supply. Firms cannot always contract on output. In a standard textbook performance pay model where the relationship between output and effort is not directly observed, the optimal solution is that the risk-neutral principal offers a constant absolute risk-averse (CARA) agent with convex effort costs, a linear contract comprising a fixed salary and a bonus depending on output. By introducing a labour income tax affecting the agent in the standard principal-agent model, one easily sees that the agent's optimum effort is reduced, and thus the optimum contract is changed.[5] The piece-rate on performance does not change, but the salaried part should increase with increasing marginal taxes. Changing labour taxes affects the participation constraint of the agent and induces separations of workers to better aligned contracts between workers and employers. Thus, from this discussion, both efficiency wage and standard agency considerations imply that separations could increase when marginal taxes increase. If this is the case, this would also contribute positively to α_t.

In Equation 5), the relationship between marginal taxes, the predicted probability of receiving a better wage offer, and their interaction, is given by a simple linear specification. In such a specification, impact will be symmetric, i.e., a similar tax reduction or tax hike yields the same sizeable but differently signed impact. As robustness checks, we explore this in our empirical analyses.

As pointed out in Section 3, firms optimize their wage policy with respect to turnover and monitoring costs, making firms' wage policies endogenous in Equation 5). Similarly, individuals' separation decisions next year could be strongly related to the mechanisms that determine this year's labour income. Since this year's labour income also determines marginal taxes next year, we could face an omitted variable bias or bias arising from endogeneity related to workers' optimizing behaviour. Furthermore, there is a tendency in Norway of employers paying out holiday entitlements and remaining bonuses when workers leave a job. This creates a positive correlation between the amount of pay received the month a worker leaves the firm and the probability that the worker leaves. However, for analyses of separations and pay, this correlation can be considered measurement error. Thus, to avoid these biases

[5] If output is given by $y=e+\varepsilon$, where e is effort and ε a zero-mean random normal-distributed shock with variance σ^2, the offered linear contract is $w=(1-t)(s+\beta y)$, the CARA risk-averse agent's effort is convex $x(e)=0.5ce^2$, the agent's optimum effort will be given by $e^*=(1-t)\beta/c$, while the optimal contract offered by the principal will be $\beta^*=1/(1+cr\sigma^2)$ and $s^*=(U^*/(1-t)r)-0.5(1-t)^2 \beta^{*2}[(1/c)-r\sigma^2]$. Thus, $\partial\beta^*/\partial t=0$ and $\partial s^*/\partial t>0$.

we introduce IVs for the marginal tax rate and the estimated probability that the worker receives a better job offer, and the interactions between these. As IVs, we use firm- and year-specific total factor productivity and a synthetic marginal tax rate (and interaction). These IVs are discussed and described more in detail in Section 5.

5. Data

We utilise Norwegian administrative register data on the population of workers and firms during the period 2014-2019. During these years, we have monthly data on jobs, including information on work hours, hourly wages and bonuses. Data comprise roughly 3.65 million men and 3.64 million women, with nearly 70 million monthly observations for each gender. In total, our data comprise slightly more than 133 million observations. Our main analyses use yearly data since this is the frequency of the tax schedule changes. We focus on male private sector employment relationships in firms reporting to the Accounting Register, where we select employment relationships active on December 5th each year. Thus, except for deriving the workplaces' wage policies, which are based on the monthly data on all employment relationships (both men and women), we utilise information on 1.15 million male workers and 5 million observations. Limiting the data to private sector employment relationships in firms reporting to the Accounting Register gives us information of 2.5 million observations on 664 thousand workers.

The quality of the data is very good, since these data comprise a linking of the Central Population Register and the Tax Authorities' registers of jobs and earnings collected for tax purposes. The wages derived from these data comprise the value of taxable fringe benefits reported to the Tax Authorities. In addition, we know their working hours. This allows us to derive a measure of hourly wages which includes the value of fringe benefits. Furthermore, we know monthly bonuses paid during the year, thus we can differentiate between performance pay (bonus) and fixed salaried pay.[6] Finally, when linking

[6] Our original data is based on monthly observations for each month in the year, thus focussing on December 15th has no impact on the definition of bonus pay jobs versus salaried jobs.

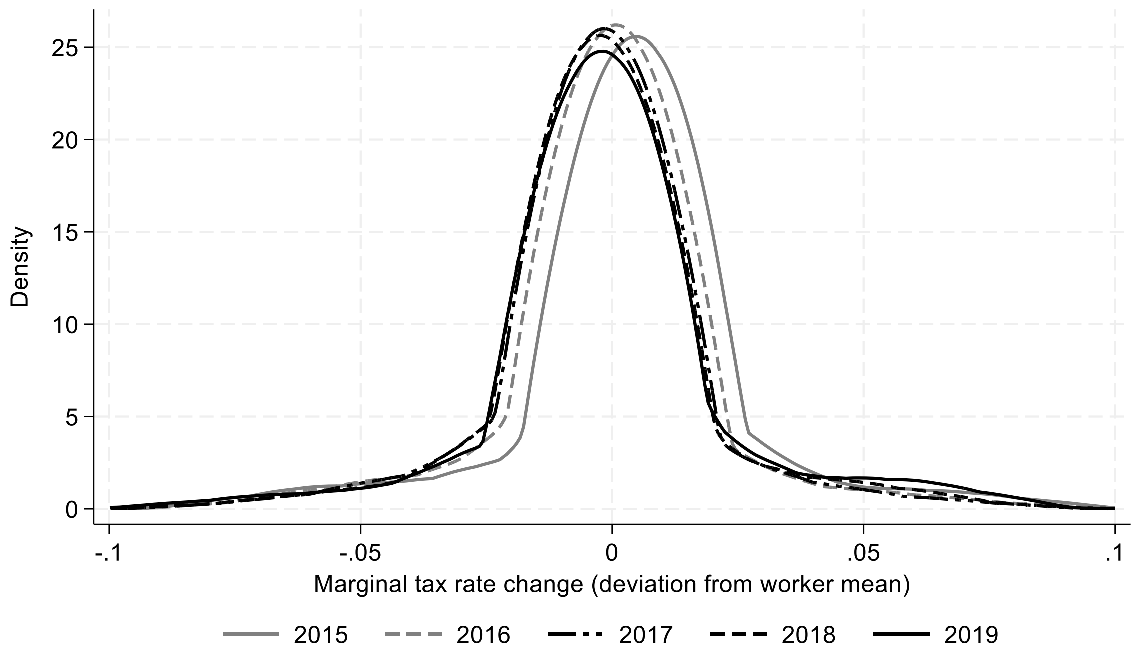
information from the Income Register using the workers' identifying numbers, we also get all taxable labour income, which directly lets us identify the marginal tax. Our data comprise a full panel of firms and their employees, with detailed information on workers and workplaces.

5.1 Key measures and descriptives

Job-to-job separation dummy, Q: Defined as a worker employed at workplace f at the end of year t but moves to another workplace at year t+1.

Expected marginal tax rate for year t+1, $\tilde{t}_{it+1}$: The marginal tax rate is given by the sum of the national insurance contributions, the general income tax and the bracket tax. The rate depends on labour income and the tax schedule. The expected marginal tax for year t+1, $\tilde{t}_{it+1}$, is calculated from the tax schedule of year t+1 based on the labour income for worker i from year t multiplied by the industry and occupation-specific wage growth rate from year t-1 to t.

Figure 2 Changes in the marginal tax rate distribution within worker



Note: Based on male employment relationship active on December 1st each year. Deviation from worker mean.

In Figure 2, we see the development over time in the marginal tax rate within worker. Due to the reduction in the general income tax, the distributions shift downwards. However, we also see a tendency to wider distributions over time, indicating larger dispersion in marginal taxes which follows from the increase in the bracket tax (by moving brackets and changed tax rates within brackets).

Synthetic marginal tax rate for year t+1, $t(\widetilde{I_{it-1}})_{it+1}$: The synthetic marginal tax rate for year t+1, $t(\widetilde{I_{it-1}})_{it+1}$, is calculated from the tax schedule of year t+1 based on the labour income for worker i from year t-1 multiplied by the industry and occupation-specific wage growth rate from year t-2 to t ($\widetilde{I_{it-1}}$).

Wage policy at workplace f at time t: The wage policy at workplace f at time t is estimated based on the population-wide monthly data following Barth and Dale-Olsen (2024). We apply standard linear fixed effect regressions as they were introduced by Abowd et al. (1999) and recently extended e.g. to incorporate time-varying firm effects (Barth et al., 2021; Engbom et al., 2022; Schmieder, 2023). We start by residualizing the log hourly wage, controlling for worker age (age and age squared measured relative to 35 years of age) and education (7 dummies) as seen in Appendix Table A3. Then, having added the intercept to this residualised wage, we estimate the regression given by Equation (6) for worker i employed by firm f in year y and month m:

6) $$lnW_{ifmy}^{r} = \alpha_0 + \theta_i + \Delta_{fy} + \beta_{fy}\ln{(seniority)_{ifmy}} + \varepsilon_{ifmy},$$

where ε_{ifmy} expresses a standard error term and θ_i expresses a worker FE. This equation identifies a standard wage premium or firm FE, Δ_{fy}, as is seen previously in the literature, but adds in firm- and year-specific returns to seniority profile, β_{fy}, i.e., allows for firm heterogeneity also in the seniority wage profile. Measured at the firm yearly average, $\Phi_{fy} = \Delta_{fy} + \beta_{fy}\overline{\ln{(seniority)_{fy}}}$, expresses the standard wage premium. We assume that the distributions of the wage premiums follows a standard logistic distribution, where the mean and scale is defined by the average and standard deviation of the wage premium across firms within a year. Let $F_{fy}(\Phi_{fy}^{k})$, k=newly hired, average seniority, and 15 years, express these distributions. The probability that a worker receives a better job offer is then expressed by $\overline{F_{fy}(\Phi_{fy}^{k})}$=1-$F_{fy}(\Phi_{fy}^{k})$. When analysing separation behaviour, we let time be denoted by t (instead of y), since these are conducted on yearly observations.

Table 2 provides simple descriptive statistics on our key variables over the years. We see that the job-to-job separation rate increases weakly over time. Average seniority, however, also increases over time, indicating compositional changes in employment also occur. Marginal tax rates appear to drop weakly, while no clear pattern over time can be found concerning the predicted probability of receiving a better job offer. However, total factor productivity clearly grows from 2015 to 2019.

Table 2: Descriptive statistics. Workers

	2015	**2016**	**2017**	**2018**	**2019**
Private sector+accounting registers workers					
Job-to-job separation rate	0.111	0.114	0.124	0.129	0.125
	(0.315)	(0.318)	(0.330)	(0.336)	(0.331)
$\tilde{t}_{it+1}$	0.391	0.383	0.381	0.381	0.381
	(0.049)	(0.050)	(0.050)	(0.051)	(0.051)
$t(\widetilde{I_{it-1}})_{it+1}$	0.395	0.388	0.384	0.382	0.381
	(0.049)	(0.050)	(0.051)	(0.053)	(0.054)
Δ^s_{ft}	-0.152	-0.237	-0.266	-0.257	-0.226
	(0.685)	(0.655)	(0.669)	(0.684)	(0.796)
β_{ft}	0.065	0.076	0.080	0.079	0.077
	(0.142)	(0.141)	(0.146)	(0.150)	(0.171)
$\overline{F_{ft}(\Delta^s_{ft})}$	0.443	0.404	0.380	0.377	0.398
	(0.070)	(0.118)	(0.147)	(0.148)	(0.120)
TFP_{ft}	0.055	0.080	0.081	0.092	0.103
	(0.361)	(0.381)	(0.383)	(0.398)	(0.407)
Seniority (months)	81.181	82.955	83.489	83.277	83.574
	(90.531)	(90.528)	(90.673)	(90.808)	(91.106)
Log I_{it-1}	12.983	13.017	13.017	13.027	13.059
	(0.712)	(0.665)	(0.682)	(0.695)	(0.686)
Bonus job$_{if}$	0.367	0.380	0.379	0.367	0.339
	(0.482)	(0.485)	(0.485)	(0.482)	(0.474)

Note: Active jobs per December each year for workers earning at least 1 G (Social Services Baseline Figure).

5.2 On the relationships between the different IVs and the endogenous variables

As pointed out in Section 4, it is not unreasonable to believe that changes in marginal taxes are endogenous in a job-to-job separation regression. Next year's marginal taxes are calculated based on this year's labour income, and this year's labour income can follow from workers' optimizing behaviour. Thus, to avoid the potential bias affecting the marginal tax rate in the job-to-job separation regression, we introduce a synthetic marginal tax rate as an IV. This synthetic tax rate is calculated using the tax schedule of year t+1, but rests on the lagged annual labour income from year t-2. This is less likely to be endogenous with respect to the separation decision in year t+1, since the lagged labour income from year t-2 and the tax schedule of year t did not generate a separation in year t. Still, we expect the synthetic marginal tax rate to be positively correlated with next year's marginal tax rate.

Furthermore, as pointed out in Section 4, the distribution of the predicted probability of receiving a better job offer also follows from firms' optimising decisions on optimal workforce size and monitoring costs. In addition, holiday entitlement and remaining bonuses which are paid out to workers when they leave a job, cause measurement errors correlated with separations. Thus, to avoid bias from this, we follow Barth and Dale-Olsen (2024) and utilise information from the Accounting Register and estimate firm- and time-specific total factor productivity (TFP) based on the control function approach of Ackerman et al. (2016) and Gandi et al. (2020). We apply a Cobb-Douglas value added production function, with capital and labour as factors of production, treat labour as a free factor and utilise intermediates in the control function to avoid the standard endogeneity issues relating to capital and labour in the production function estimation literature. The wage offer distribution of Burdett and Mortensen (1998) is also a function of productivity, so using TFP as an IV is also supported theoretically. Following Burdett and Mortensen (1998), the wage offer distribution can be expressed as $F(w) = \frac{\delta+\lambda s}{\lambda s}\left(1-\frac{p-w}{p-b}\right)^{0.5}$.[7]

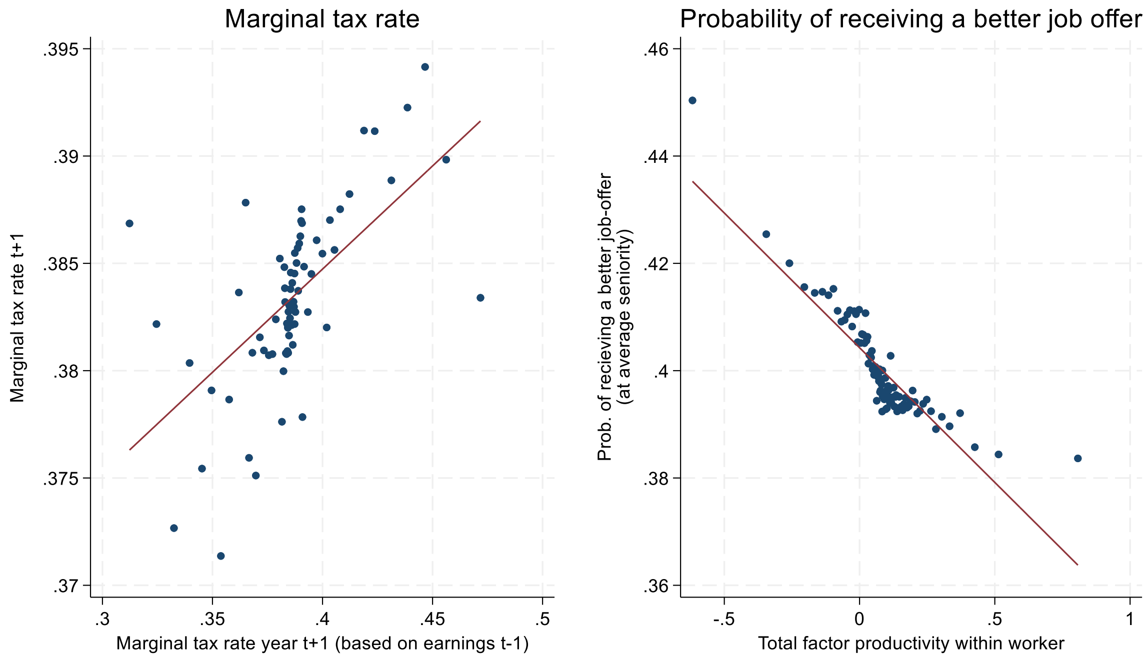
More productive firms are more likely to pay better, and thus total factor productivity should be negatively correlated with the probability of receiving a better job offer. By shifting the labour demand at different productivity levels, we map the labour supply curve.

Figure 3 shows simple bin-scatters of the relationships between the endogenous variables and the instruments measuring these relationships within worker, i.e., they are measured as deviations from worker means. On the left-hand-side of Figure 3, we see, as expected, that the marginal tax rate is

[7] The wage offer distribution can be expressed as $F(w) = \frac{\delta+\lambda s}{\lambda s}\left(1-\frac{p-w}{p-b}\right)^{0.5}$, while $\overline{F}(w) = 1 - F(w)$. Total differentiating $\overline{F}(w) = -0.5\frac{\delta+\lambda s}{\lambda s}\left(\frac{w-b}{p-b}\right)^{-0.5} dw + 0.5\frac{\delta+\lambda s}{\lambda s}\left(\frac{w-b}{p-b}\right)^{-0.5}\left(\frac{w-b}{(p-b)^2}\right) dp$, which implies that for a firm at the profit-maximising level of $\overline{F}(w)$, i.e., when $d\overline{F}(w)$=0 , then $\frac{dw}{dp} = \left(\frac{w-b}{p-b}\right) >$. Thus, firms increase their wages when productivity increases. Across firms, we therefor expect to see a negative relationship between the probability of receiving a better wage offer and total factor productivity.

positively correlated with the synthetic tax rate. On the right-hand-side of Figure 3, we see that total factor productivity is negatively correlated with the predicted probability of getting a better wage offer.

Figure 3 The relationship between endogenous variables and corresponding IVs



6. Results

6.1 General impact

In this section, we examine how sensitive workers' separation decisions are to marginal taxes and firms' wage policies. We model the probability that worker i employed at workplace f at year t leaves for a new job at another workplace in year t+1 by the simple linear probability model expressed by Equation 9), where we add the marginal tax rate, the predicted probability that the worker receives a better job offer, and the interaction between the two. Time dummies and the constant express the contributions to job-to-job transitions not related to job search, taxes and pay. The estimated parameter associated with the interaction yields direct evidence on how labour taxes affect job search behaviour. Note that we have subtracted the global mean from both the tax rate and predicted probability before calculating the interaction term, so the parameters associated with the tax rate and predicted probability directly yield the impacts measured at the global mean.

Table 3 The impact of marginal tax and pay policy changes on yearly job-to-job separations. Men.

Dep: dummy for job-to-job separation t+1	FE			IV-FE				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7 "Positive tax shocks"	Model 8 - "Negative tax shocks"
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\tilde{t}_{it+1}$			**-0.158****			**-0.716****	**-0.769****	**-1.656****
			(0.011)			(0.206)	(0.304)	(0.567)
$\overline{F_{ft}(\Delta^s_{ft})}$	**0.519****	**0.385****	**0.380****	**1.588****	**0.739****	**0.692****	**0.930****	**0.658****
	(0.006)	(0.006)	(0.006)	(0.054)	(0.079)	(0.086)	(0.163)	(0.086)
$\tilde{t}_{it+1}$ X $\overline{F_{ft}(\Delta^s_{ft})}$	**-0.522****	-0.017	-0.115	**-8.424****	**-6.508****	**-7.168****	**-10.006****	**-10.525****
	(0.067)	(0.066)	(0.067)	(1.047)	(1.016)	(1.137)	(1.955)	(2.045)
Strength of instruments								
Kleibergen-Paap F-value				810.42	796.08	426.33	163.98	89.74
Controls								
yearFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Worker FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lagged earnings vignitiles	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry		Yes	Yes		Yes	Yes	Yes	Yes
W	647783	647783	647783	647783	647783	647783	431714	384619
N	2503178	2503178	2503178	2503178	2503178	2503178	1117743	912618

Note: For detail on first stage estimates, see Table A2. *p<0.05, ** p<0.01, (se clustered on workers).

Table 3 presents these regression results. We start in the three first models to estimate Equation 5) on observations from private sectors firms linked to the accounting registers. Model 2 differs from Model 1 by incorporating controls for industry. However, we see that the estimates from the two models are quite similar, although the interaction effect is smaller and insignificant when we consider industry differences. In Model 3 we allow a direct effect of marginal taxes on the separation rate. This tells us that, on average a 10-percentage point higher marginal tax implies a reduction in the job separation rate of around 1.5 percentage points. Similarly, increasing the predicted probability that a worker receives a better job offer by 1 percentage point increases the separation rate by 0.38-0.52 percentage points. Thus, in these private sector firms, workers' job search is hit by labour taxes, and firms' pay policies affect worker turnover.[8]

[8] Our restriction of the analysis to private sector firms linked to the Accounting Registers is that we are to use total factor productivity as an IV for the predicted probability of receiving a better wage offer. If we conduct

However, marginal taxes and the predicted probability that a worker receives a better job offer might be considered endogenous in a separation regression. Thus, in models 4-6 we instrument these variables and their interaction by the total factor productivity and marginal taxes based on lagged labour income (and their interaction). As the Kleibergen-Paap F-values reveal, these instruments perform nicely and are strong. The first stage estimates are presented in Table A2 in the appendix. This IV-strategy has a strong impact on our estimates. From model 6, we see that on average across these workers, increasing the marginal tax by 10 percentage points causes *increased* job separation by 7.1 percentage points. Similarly, increasing the predicted probability that a worker receives a better job offer by 1 percentage point increases the separation rate by 0.069 percentage points. Still, we observe a strongly significant and negative parameter associated with the interaction term. This estimate directly tells us that the search intensity of workers drops as the marginal tax increases. Due to the interaction term, it is difficult to interpret the total effect of marginal tax changes.

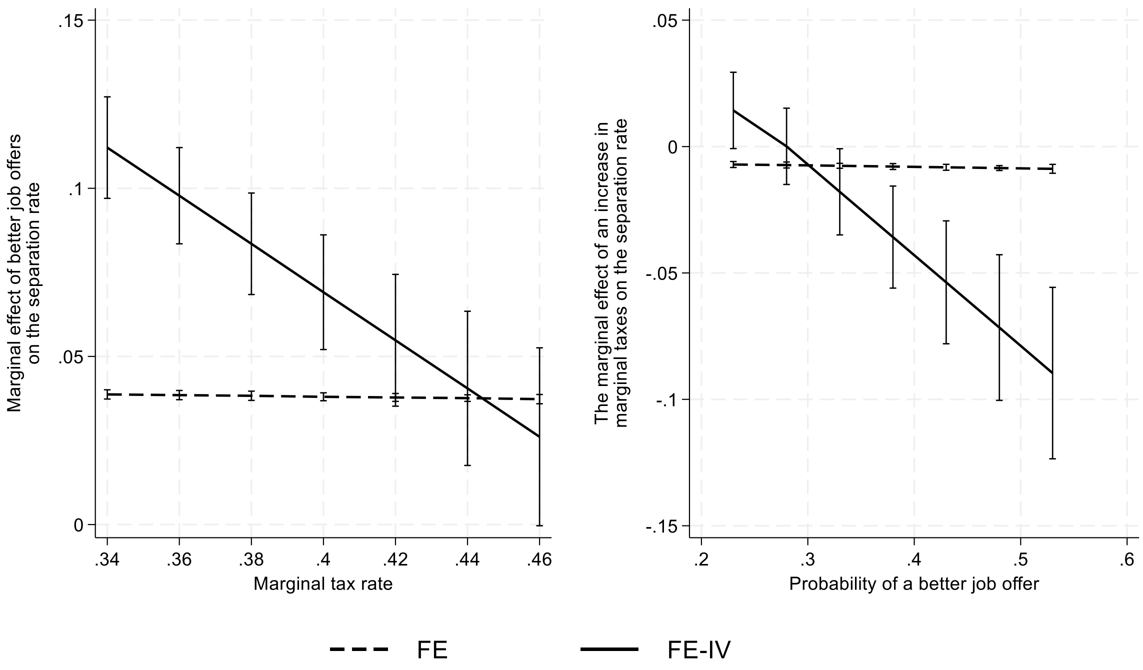
To ease interpretation, Figure 4 depicts the marginal impacts on the job-to-job separation rate for increased marginal taxes and increased better job offer probabilities based on the estimates of Model 6 in Table 3. In the figure to the left, we measure the impact on the separation rate of a 1 standard deviation increase in the probability of a better job offer across the marginal tax distribution. We see that while the FE-estimates indicate that better job offer probabilities matter only marginally, but positively, on the separation rate, the IV-estimates reveal strongly diminishing impacts across the tax distribution.

In the figure to the right, we measure the impact on the separation rate of a 1 standard deviation increase in the marginal tax rate across the probability of receiving a better job offer distribution. We see that while the FE-estimates indicate that higher marginal taxes matter marginally, but negatively, on the

these fixed effects regression on private and public sector observations (the whole economy), w eget rather similar parameter estimate.

separation rate, the IV-estimates reveal strongly diminishing impacts across the distribution of the probability of receiving a better job offer.

Figure 4 The marginal impacts of the marginal tax and higher job offer probability on the job-to-job separation rate



Note: The marginal effects are estimated based on the parameter estimates of Model 6 in Table 3.

This means on one hand that if a worker is located at the bottom of the tax distribution, firm pay policies have a strong impact on his mobility, but as one moves upwards in the tax distribution, firm pay policies nearly always continue to be important, but less so. On the other hand, if a worker is working at firm located at the bottom of the wage offer distribution, the tax policy has a strong detrimental impact on this worker's search efforts and mobility decisions. If the worker is employed at a firm paying top wages, future gains from mobility are limited already and the marginal taxes have limited impact on mobility.

In the last two models in Table 3, we ask whether separations are affected more strongly by tax increases than tax reductions. To shed light on this issue, first we estimate the residuals from a simple linear regression of the marginal tax calculated based on lagged income on year dummies, age group FE, industry FEs, lagged income vigintile FEs, and worker FEs. Models 7 and 8 repeat the analyses of Model 6, but where we study the potential differential impacts related to growing or diminishing marginal taxes as expressed by positive or negative residuals. Positive shocks to the marginal tax (as expressed by the residuals), yield impacts that are twice as strong as those from negative shocks. Better job offers induce separations more strongly given negative tax shocks than under positive tax shocks. The search effort, however, appears quite similar in intensity.

6.2 Pay schemes

Firms apply different strategies to motivate workers and ensure optimum performance of employed workers. One of these strategies is to pay bonuses whenever a performance target is reached. Bonus pay can be interpreted as a method of compensating workers for effort (which they dislike) and to insure them against firm performance variation outside their control, thus eliciting better performance by workers.

In Table 4, we ask whether the presence of performance pay alters our previous findings. We repeat the analyses of Model 4 in Table 3 while adding information on performance pay.

In Models 1 and 2, we just add a dummy on whether the job is salaried or if pay also incorporates bonuses. In Model 3 we also add dummies for industry. Potentially our results in Model 1 could reflect industry only. The occurrences of bonuses are highly related to industries and occupations.

In Model 4, we then interact bonus pay, marginal tax and the predicted probability of receiving a better wage offer, making it possible to study differential impacts depending on pay regime. Models 1 and 2 reveal a similar picture regarding the impact of marginal taxes and the probability that a better job offer is received. More interesting is the finding in both models that separations drop when bonus pay is utilised. These are only correlations but they suggest that workers do not dislike bonus pay. Adding industry controls in Model 3 has little impact. Finally, in Model 4 we see strongly significant results, but qualitatively they appear unchanged from previous findings with one exception: the job search intensity parameter becomes much more negative under fixed pay than under bonus pay.

Table 4 The impact of marginal tax and pay policy changes on yearly job-to-job separations. Men. Different pay regimes.

Dep: dummy for job-to-job separation t+1	Private sector+accounting registers			
	Model 1 -FE-IV	Model 2-FE-IV	Model 3-FE-IV	Model 4-FE-IV
	b/se	b/se	b/se	b/se
Bonus pay job$_{if}$	**-0.080****	**-0.080****	**-0.085****	**-0.075****
	(0.003)	(0.003)	(0.003)	(0.003)
$\tilde{t}_{it+1}$		-0.281	**-0.716****	**-0.860****
		(0.197)	(0.206)	(0.209)
$\overline{F_{ft}(\Delta^s_{ft})}$	**1.547****	**1.531****	**0.679****	**0.618****
	(0.055)	(0.062)	(0.087)	(0.095)
t^{s+3}_{it+1} X $\overline{F_{ft}(\Delta^s_{ft})}$	**-8.245****	**-8.490****	**-7.080****	**-9.459****
	(1.072)	(1.184)	(1.278)	(1.401)
BonusX$\tilde{t}_{it+1}$				**0.293****
				(0.055)
BonusX $\overline{F_{ft}(\Delta^s_{ft})}$				0.094
				(0.062
BonusXt^{s+3}_{it+1} X $\overline{F_{ft}(\Delta^s_{ft})}$				**7.199****
				(1.562)
First stage strength of instruments				
Kleibergen-Paap F-value	811.72	442.75	427.25	200.89
Controls				
In all regressions, yearFEs, Age group Fes, Worker FEs, income vigintile FEs				
Industry			Yes	Yes
W	647783	647783	647783	647783
N	2503178	2503178	2503178	2503178

Note: Details on first stage estimates, available from the authors upon request. *p<0.05, ** p<0.01, *** p<0.001 (se clustered on workers).

To ease interpretation as we did for Table 3, we present in Figure 5 the marginal effects associated with the tax rates and the predicted probabilities that a worker receives a better job offer. The left-hand side of the figure plots the marginal effect on the separation rate of a better job offer across the 10-90 percentiles of the marginal tax distribution. The right-hand side of the figure plots the marginal effect on the separation rate of higher marginal taxes across the 10-90 percentiles of the job offer distribution.

Figure 5: The marginal impacts on the job-to-job separation rate from higher marginal tax and better job offers changes under different pay regimes

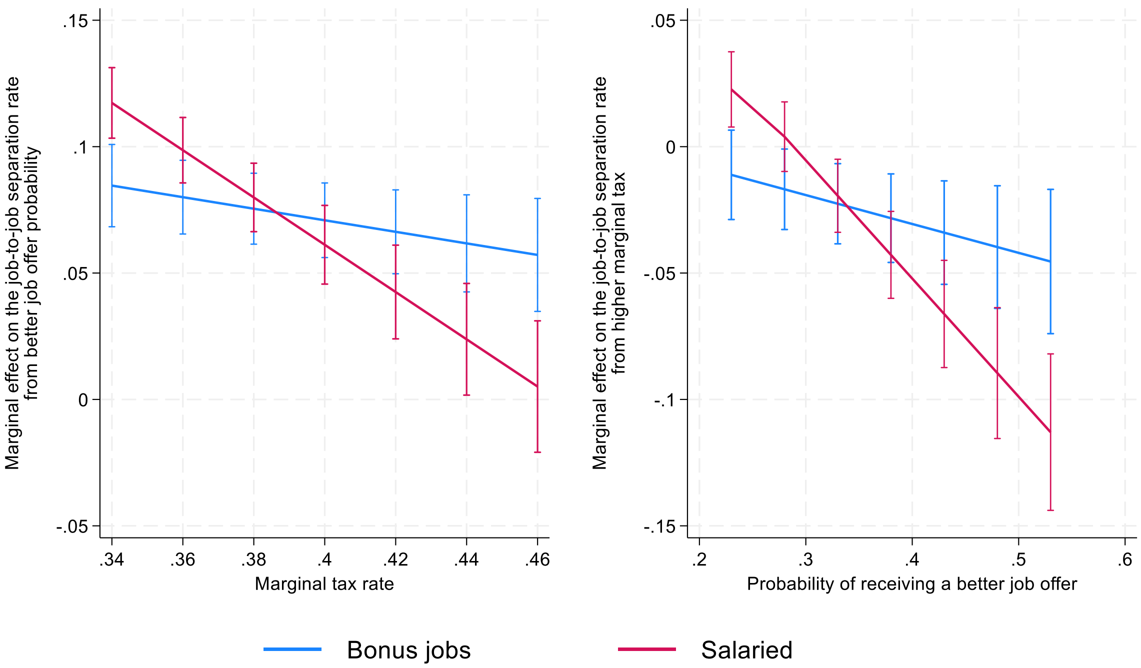


Figure 5 reveals differences between the two pay regimes in how wage policies and labour taxes shape the separation patterns across firms, differences which becomes significant at the very top and the very bottom of the distributions. Employees under salaried contracts behave as seen in the previous tables and figures. If a worker is located at the bottom of the tax distribution, firm pay policies have a strong impact on his mobility, but as one moves upwards in the tax distribution, firm pay policies diminish in importance. On the other hand, for a worker employed by a low-paying firm, the tax policy has a strong impact on this worker's search behaviour and expected gains from search and thereby strong impact on the mobility decision. When employed by a high-wage firm, on the other hand, future gain from mobility is limited which itself should reduce job search intensity. Additional changes in the tax rates should have minor impacts on search, but still induce mobility due to wage contract-effort misalignment.

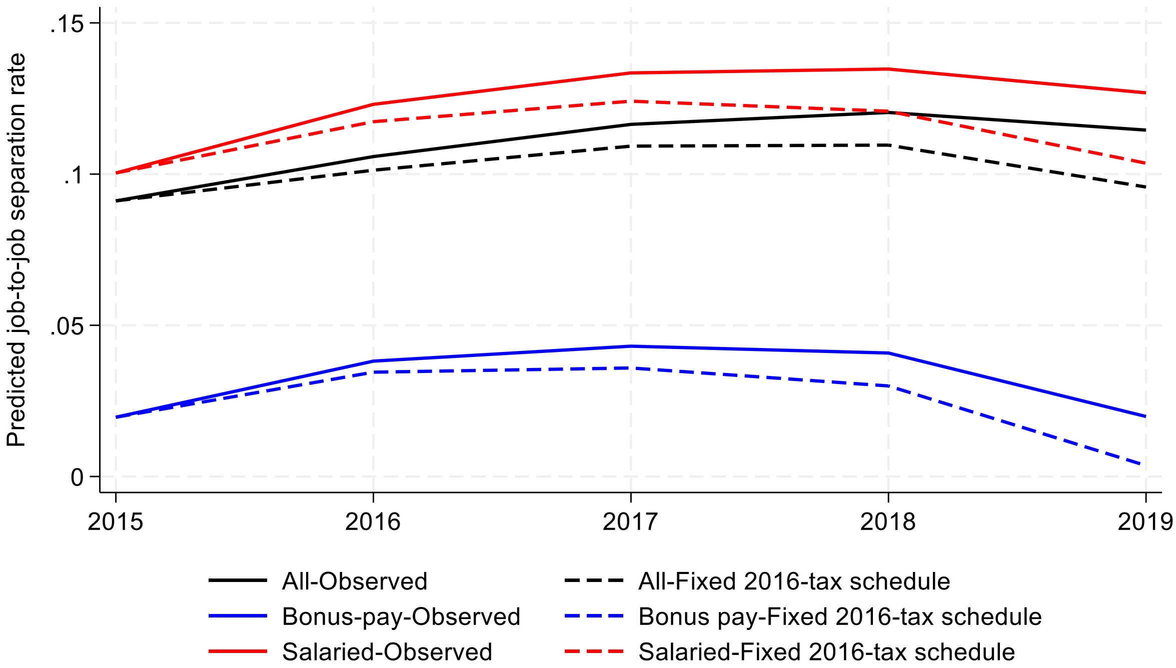
These relationships for the salaried workers appear to be true for bonus-pay workers as well, but they appear much weaker. The mobility decision of bonus-job workers appears to be more sensitive to the wage premiums of firms at high tax-levels but less at low tax-levels, and their search decision is similarly less affected by the taxes. Whether this is true because these workers have less control over their actual pay (the pay of salaried workers is fixed and completely transparent) making it more difficult to evaluate search and mobility cost versus mobility gains, or whether there is another aspect associated with performance pay that influences mobility we do not know.

6.3 Contrafactual development

Finally we consider whether these changes in the tax schedule really matter, when it comes to job-to-job turnover. While the previous analyses clearly document that job-to-job turnover is affected in a statistically significant way, these impacts might not be economically sizeable. To shed light on this question, we undertake a simple contrafactual analysis starting in December 2015 and ending in December 2019. First, we assume that any changes in the tax schedule do not affect the number of jobs, pay and pay structure, work effort, occupational choices or firms, but do impact on job search and job-to-job turnover. These are highly unrealistic assumptions. Second, we fix the tax schedule to what is observed for 2016, i.e., no changes in the tax schedule occurred afterwards, except that we let the bracket intervals be inflation-adjusted by the National Insurance Scheme's Basic Amount (1G). Then we predict a contrafactual development for all workers based on Model 6 in Table 3. Similarly, to highlight the importance of pay schemes, the same strategy is used, but where we apply the estimates from Model 4 in Table 4. For comparison, we use the observed values of the marginal tax to predict the realised job-to-job-turnover-patterns over time given the observed tax-schedule changes.

Figure 6 presents our results. On average, we observe a minor growth in the job-to-job turnover rate over time, although it diminishes slightly in 2019. Similarly, workers under bonus payment schemes experience lower turnover and less steep growth in turnover rates than salaried workers. However, for all these groups, the job-to-job turnover rates decreases considerably when we fix the tax schedule to the level and structure of 2016. The impact is stronger on average in the economy and for those employed under salaried payment schemes than for the bonus-paid workers. This implies that when the government reduced the progressivity of the Norwegian labour taxes and overall reduced the marginal labour tax, they reduced labour market frictions, reduced employer monopsony power, and achieved improved reallocation of workers.

Figure 6 Contrafactual development of job-to-job quits based on no marginal tax changes since 2016



Note: Figure on wage distribution is based on Model 6 in Table 3, while figure on pay schemes are based on Model 4 in Table 4. The graphs Fixed 2016-schedule express the contrafactual development, where we have kept the tax schedule of 2016 fixed for all years, except that we let the labour income brackets be adjusted by the growth in the National Insurance Basic Amount (G). Except for the marginal tax rate, all other variables are measured as observed, and we also assume that the population of workers, employers, industry and occupational choices are unaffected by the tax schedule.

7. Conclusion

The literature on the elasticity of taxable income focuses on how taxable income changes in response to net-of-tax changes. Vattø (2020) estimates an elasticity in Norway around 0.11-0.15. Kleven and Schultz (2014) report values around 0.04-0.06 for wage earners in Denmark. In Finland, Matikka (2016) identifies an elasticity of 0.16. On the other hand, Weber (2014) reports an elasticity as high as 0.86 on U.S. data from Michigan. The meta-study of Neisser (2017) reports average estimates ranging from 0.16-0.40 based on difference-in-difference analyses. Thus, the behavioural responses appear to be modest in the Nordic countries, while they can be considerably larger elsewhere. From this, one might infer that the marginal tax rates in Norway effectively ensure public finances, while contributing to redistribution.

Our starting point is somewhat different, in that our focus is on what other kinds of responses (other than solely income) might follow from tax reforms and marginal tax rates. The presence of labour market frictions provides firms with monopsonistic powers, which allow them to pay a mark-down on productivity (Manning, 2003; Langella and Manning, 2021). Another set of frictions arises from the information flow related to job offers, which can be interpreted as job search intensity. A very scarce U.S. literature indicates that labour taxes affect the search behaviour of workers, thereby affecting the allocation of workers across firms, and they provide firms with monopsonistic power, which is probably an unintended and unknown side-effect for public authorities, since this means that the public authorities contribute to inequality in the labour market.

In this paper, we study how Norwegian workers' job mobility decisions are related to firms' wage policies under different tax regimes. We utilise population-wide Norwegian administrative register data on the population of workers and firms during the period 2014-2019, although the bulk of our analyses pertains to the private sector employment relationships in firms reporting to the accounting register. However, this limitation of the data allows us to draw causal interferences.

By paying higher wages, job-to-job separation rates drop, but this negative relationship is weakened when the marginal tax increases. Higher taxes imply strictly reduced search activity, but less for workers employed in bonus jobs. For these bonus jobs, it does not matter whether the worker is located at the bottom or the top of the tax distribution, firm pay policies always have a strong impact on these workers' mobility. Thus, our findings are quite clear: public authorities' tax policies affect the search intensity of workers and thus they contribute to labour market frictions, thereby inducing misallocation of workers across firms and wage inequality between groups not related to productivity differentials. In Norway, during our observation period, income taxes became less progressive, thus public authorities achieved to reduce the distortion and welfare loss associated with monopsony.

References

Aarbu, K. and T. Thoresen (2001). "Income Responses to Tax Changes – Evidence from the Norwegian Tax Reform", *National Tax Journal*, 54, 319-334

Abowd, J. M., F. Kramarz, and D. N. Margolis (1999). «High-wage workers and high-wage firms»,. *Econometrica*, 67, 251–334.

Ackerberg, D., K. Caves, and G. Frazer (2015). "Identication properties of recent production function estimators", *Econometric*a, 83, 2411-51.

Adam, S., Browne, J., Phillips, D. and B. Roantree. (2017). "Frictions and taxpayer responses: evidence from bunching at personal tax thresholds", Institute for Fiscal Studies Working Paper W17/14

Bandiera, O., I. Barankay, and I Rasul (2011), «Field Experiments with firms,» *Journal of Economic Perspectives*, 25, 63–82

Barth, E. and H. Dale-Olsen (2009). "Monopsonistic Discrimination and the Gender Wage Gap." *Labour Economics,* 16, 589 – 597.

Berger, D., K. Herkenhoff, and S. Mongey (2022=. "Labor market power." *American Economic Review*, 112(4): 1147–93.

Berger, D., K. Herkenhoff, S. Mongey, and N. Mousavi (2024), «Monopsony amplifies distortions from progressive taxes», *American Economic Review*, 114, 555-60.

Dale-Olsen, H. (2006). "Wages, Fringe Benefits and Worker Turnover." *Labour Economics*, 13, 87-106.

Barth, E. A. Bryson and H. Dale-Olsen (2020), "Union density effects on productivity and wages". *Economic Journal,* 130, 1898-1936

Barth, E. S. P. Kerr, and C. Olivetti (2021), «The dynamics of gender earnings differentials: Evidence from establishment data,» *European Economic Review*, 134, DOI: 10.1016/j.euroecorev.2021.103713

Bechter, B., N. Braakmann, and B. Brandl(2021), "Variable pay systems and/or collective wage bargaining? Complement or substitutes?" *Industrial and Labor Relations Review,* 74, 443–469.

Berger, D., K. Herkenhoff, A. R. Kostøl and S. Mongey (2023), An anatomy of monopsony: Search Frictons, Amenities and Bargaining in Concentrated Markets, NBER Working Paper 14848, NBER.

Bhuller, M., K. O. Moene, M. Mogstad, and O. L. Vestad (2022), Facts and fantasies about wage setting and collective bargaining. NBER Working Paper 30437, NBER.

Blandhol, C., M. Mogstad, P. Nilsson, and O.L. Vestad (2021), Do employees benefit from worker representation on corporate boards?, Discussion paper 947, Statistics Norway.

Bryson, A., and R. Freeman (2019), "The role of employee stock purchase plans — Gift and incentive? Evidence from a multinational corporation." *British Journal of Industrial Relations,* 57, 86–106

Burdett, K. and D. T. Mortensen (1998), «Wage differentials, Employer size, and Unemployment,» *International Economic Review*, 39, 257-273.

Card, D., A. R. Cardoso and P. Kline (2016), "Bargaining, sorting, and the gender wage gap: Quantifying the impact of firms on the relative pay of women," *Quarterly Journal of Economics*, 131, 633-686.

Card, D., A. R. Cardoso and P. Kline (2018), "Firms and labor market inequality: Evidence and some theory," *Journal of Labor Economics*, 36, S13-S70.

Christensen, B. J., D. T. Mortensen, G. R. Neumann, and A. Werwatz (2005), «On-the-job-search and the wage distribution,» *Journal of Labor Economics*, 23, 31-57.

Engbom, N., C. Moser and J. Sauermann (2022), Firm Pay Dynamics, IZA DP No. 15014. IZA.

Esteves-Sorensen, C. and R. Broce (2022), «Do monetary incentives undermine performance on intrinsically enjoyable tasks? A field test,» *Review of Economics and Statistics*, 104, 67–84.

Gandhi, A., S. Navarro, and D. Rivers (2020), "On the Identification of Gross Output Production Functions," *Journal of Political Economy*, 128(8), 2973-3016. doi: 10.1086/707736.

Gentry, W. M., and R. G. Hubbard (2004), «The effects of progressive income taxation on job turnover,» *Journal of Public Economics*, 88, 2301-2322

Goldschmidt, D. and J. Schmieder (2017), "The rise pf domestic outsourcing and the evolution of the German wage structure*," Quarterly Journal of Economics*, 132, 1165–1217

Gruber, J. & E. Saez. (2002). "The Elasticity of Taxable Income: Evidence and Implications", *Journal of Public Economics*, 84 , 1-32

Holmstrøm, B. (1979), "Moral hazard and observability," *Bell Journal of Economics,* 10, 74-91.

Kesselman, J. R. (1976), «Tax effects on job search, training and work effort,» *Journal of Public Economics*, 6, 255-272

Kleven, H. and E. Schultz. (2014). "Estimating Taxable Income Responses Using Danish Tax Reforms", *American Economic Journal: Economic Policy*, 6, 217–301.

Manning, A. (2003), *Monopsony in Motion: Imperfect competition in labor markets*. Princeton, NJ: Princeton University Press.

Moen, E. and Å. Rosén (2005), "Performance pay and adverse selection, "*Scandinavian Journal of Economics*, 107, 270- 298.
Moen, E. and Å. Rosén (2006), "Equilibrium Incentive Contracts and Efficiency Wages,» *Journal of the European Economics Association*, 4, 1165-1192
Langella, M. and A. Manning (2021), «The measure of monopsony,» *Journal of the European Economic Association*, 19, 2929–2957.
Lazear, E. "Performance pay and productivity." *American Economic Review* 90:5 (2000): 1346–1361
Lester, R.A (1946), "Wage Diversity and Its Theoretical Implications, " *The Review of Economics & Statistics*, 28, 152-159.
Lester, R.A (1952), "A Range Theory of Wage Differentials," *Industrial & Labor Relation Review*, 5, 480-500.
Lucifora, C., and F. Origo(2015), «Performance-related pay and firm productivity: Evidence from a reform in the structure of collective bargaining», *Industrial and Labor Relations Review*, 68, 603–632.
Mattika, T. (2016) "Elasticity of Taxable Income: Evidence from Changes in Municipal Income Tax Rates in Finland", *Journal of Scandinavian Economics*, 120, 943-973
Neisser, C. (2017). "The Elasticity of Taxable Income: A Meta-Regression Analysis", ZEW Discussion Paper No. 17-032. ZEW - Zentrum für Europäische Wirtschaftsforschung / Center for European Economic Research.
Piyapromdee, S. (2018), «Residual wage dispersion with efficiency wages,» *International Economic Review*, 59, 1315-1343
Saez, E. J. Slemrod and S. H. Giertz (2012), «The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review», *Journal of Economic Literature*, 50, 3–50
Salop, J. and S. Salop (1976), "Self-selection and turnover in the labor market," *Quarterly Journal of Economics*, 90, 619- 627.
Salop, S. (1979), "A natural rate of unemployment," *American Economic Review*, 69, 117-125.
Schmieder, J. F. (2023), "Establishment age and wages," *Journal of Econometrics*, 233, 424-442.
Shapiro, C. and J. E., Stiglitz (1984), «Equilibrium Unemployment as a Worker Discipline Device,» *American Economic Review*, 74, 433-44.
Shearer, Bruce S. (2004), «Piece Rates, Fixed Wages and Incentives: Evidence from a Field Experiment,» *Review of Economic Studies*, 71, 513–34
Strand, J. (1987), «Unemployment as a Discipline Device with Heterogeneous Labor», *American Economic Review*, 77, 489-93.
Vattø, T.E. (2020), Estimating the elasticity of taxable income when earnings responses are sluggish. Discussion Paper No 926. Statistics Norway.
Weber, C. (2014). "Toward obtaining a consistent estimate of the elasticity of taxable income using difference-in-differences", *Journal of Public Economics*, 117, 90–103.

Appendix

Table A1 First stage estimates Table 3-Models 4-8

Dep. Variable:	t_{it+1}	$\overline{F_{ft}(\Delta^{s}_{ft})}$	$\tilde{t}_{it+1}$ X $\overline{F_{ft}(\Delta^{s}_{ft}}$
	b/se	b/se	b/se
Model 4			
$t(\widetilde{I_{it-1}})_{it+1}$			
TFP_{ft}		**-0.037***	**0.001***
		(0.001)	(0.0001)
$t(\widetilde{I_{it-1}})_{it+1}$X TFP_{ft}		**0.227***	**-0.025***
		(0.005)	(0.003)
Kleibergen-Paap F-value		810.42	
Model 5			
$t(\widetilde{I_{it-1}})_{it+1}$			
TFP_{ft}		**-0.022***	**0.001***
		(0.001)	(0.0001)
$t(\widetilde{I_{it-1}})_{it+1}$X TFP_{ft}		**0.103***	**-0.022***
		(0.004)	(0.003)
Kleibergen-Paap F-value		796.80	
Model 6			
$t(\widetilde{I_{it-1}})_{it+1}$	**0.094***	**-0.071***	**-0.006***
	(0.002)	(0.003)	(0.001)
TFP_{ft}	**0.001***	**-0.022***	**0.001***
	(0.0001)	(0.001)	(0.0001)
$t(\widetilde{I_{it-1}})_{it+1}$X TFP_{ft}	-0.001	**0.115***	**-0.021***
	(0.001)	(0.005)	(0.003)
Kleibergen-Paap F-value		426.09	
Model 7			
$t(\widetilde{I_{it-1}})_{it+1}$	**0.178***	**-0.081***	**-0.011***
	(0.006)	(0.008)	(0.001)
TFP_{ft}	**0.001***	**-0.019***	**0.001***
	(0.0001)	(0.001)	(0.0001)
$t(\widetilde{I_{it-1}})_{it+1}$X TFP_{ft}	**0.013***	**0.026***	**-0.024***
	(0.003)	(0.010)	(0.001)
Kleibergen-Paap F-value		163.16	
Model 8			
$t(\widetilde{I_{it-1}})_{it+1}$	**0.066***	**-0.080***	**-0.007***
	(0.003)	(0.004)	(0.001)
TFP_{ft}	**0.002***	**-0.022***	**0.001***
	(0.0001)	(0.001)	(0.0001)
$t(\widetilde{I_{it-1}})_{it+1}$X TFP_{ft}	**-0.017***	**0.131***	**-0.020***
	(0.003)	(0.008)	(0.001)
Kleibergen-Paap F-value		89.74	
Controls: In all models, controls for yearFE, Worker FE, Tax Schedule Step, Log lagged income, and industry dummies (not Model 4)			
W (model 4-6)		664645	
N (model 4-6)		2559640	

*p<0.05, ** p<0.01, *** p<0.001 (se clustered on workers)

Table A2 Wage premium estimation

	Residualising (age and education)	Wage policy
		$\ln W_{ifmy}^{r}$
		b/se
Constant	**5.3454*****	**5.3617*****
	(0.0001)	(0.0001)
Age-35	**0.0156*****	
	(0.0001)	
(Age-35)^2	**-0.0005*****	
	(0.0001)	
Education FE(7)		
Controls		
Worker FE (2961791)		Yes
WorkplaceXyearFE (1068087)		Yes
β_{fy}X ln$Seniority_{ifmy}$ (1068087)		Yes
N	133146893	133146893

*p<0.05, ** p<0.01, *** p<0.001 (se clustered on workers)