Monopsony amplifies distortions from progressive taxes

By David Berger, Kyle Herkenhoff, Simon Mongey, and Negin Mousavi*

Abstract

In this short paper we show that progressive income taxes distort hiring and wages when firms have labor market power. From a firm's perspective, raising pre-tax wages increases employment by less when taxes are progressive as less of the pre-tax wage is paid to workers. Understanding this when setting wages leads to lower wages and employment at all firms. When firms differ in productivity, progressive taxes also distort the allocation of labor across firms. We characterize this novel *monopsony cost* of progressivity in a simple monopsony economy and derive efficiency wedges that depend on progressivity. A simple quantification of these wedges points to the possibility that the monopsony cost may be of similar magnitudes to redistribution and insurance benefits.

I. Introduction

A growing number of studies argue that monopsony is pervasive across countries and industries (Berger, Herkenhoff and Mongey (2022), Brooks et al. (2019), Lamadon, Mogstad and Setzler (2019), Hershbein, Macaluso and Yeh (2022)). These studies typically report that workers' wages are marked down 20 to 30 percent below their marginal revenue product, indicating significant monopsony power. A separate literature on taxation measures income tax progressivity and—in competitive labor market environments—computes optimal tax progressivity (Heathcote, Storesletten and Violante (2017) henceforth HSV, Ferriere et al. (2023), Holter, Stepanchuk and Wang (2023) among many others).[1]

In this paper, we argue that these two literatures interact in a meaningful way. Greater tax progressivity lowers the labor supply elasticities perceived by firms, exacerbating monopsony power and contributing to wider wage markdowns. The intuition is simple. The center of the monopsonist's problem is the labor supply curve. A monopsonist that faces a very inelastic labor supply curve understands that wage cuts will result in much smaller employment losses. They exploit this to lower wages and lower their wage bill without sacrificing much productive output.

In the context of this paper, firms understand that when taxes are progressive, a cut in pre-tax wages reduces post-tax wages by disproportionately less. Thus tax progressivity acts to lower the elasticity of labor input with respect to the pre-tax wage that the firm has to pay. This contributes to wider markdowns.

The source of monopsony power is the imperfect substitutability of jobs from the worker's perspective. When jobs are imperfect substitutes and firm productivity is heterogeneous, another consequence of tax progressivity is labor misallocation. High productivity firms pay higher wages, but the post-tax wages received by workers are disproportionately smaller than the pre-tax wage when wages are higher. Higher paying firms attract fewer workers because tax progressivity flattens the post-tax wage distribution.

* Berger: Duke University. Herkenhoff: University of Minnesota. Mongey: Federal Reserve Bank of Minneapolis. Mousavi: Ernst & Young LLP. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Minneapolis or the Federal Reserve System. This article has been prepared for *AEA Papers & Proceedings, 2024.* This article was supported by NSF Grant - Award 2214431.

[1] A small set of papers studies optimal taxation in non-competitive labor markets. Mousavi (2022) is closest to this paper. See Cahuc and Laroque (2014) (see references therein) and Bagger, Moen and Vejlin (2021) who study optimal taxation in frictional search environments.

We provide a simple theoretical framework for examining these issues. Importantly it contains none of the *benefits* of progressive taxes. Workers are homogeneous, so progressive taxes do not redistribute. Workers face no risk, so progressive taxes do not provide insurance. This allows us to focus on the novel *costs* of progressive taxes. We leave it to future work to put these new costs head-to-head with previously understood benefits.

We first establish these mechanisms in an environment with homogeneous firms. We extend these results to heterogeneous firms where the additional misallocation force is present. We then quantify these forces under standard parameter values. Misallocation and lower labor supply elasticity effects induced by progressive taxes significantly lower output. A change in progressivity from 0.10 to 0.20—which spans various estimates for the U.S.—reduces output by 2 percent.

II. A simple general equilibrium model of market power with progressive taxes

The economy is static and features a unit measure of identical households with a continuum of workers within each, a continuum of firms indexed by $j \in [0,1]$, and a government. Each worker works at a single firm and their labor income is taxed by the government. If a firm pays a pre-tax wage w_j, the household receives $\lambda w_j^{1-\tau}$ in post-tax labor income. Taxes fund government spending G, although our assumptions will imply that we do not need to incorporate the government budget constraint.

Households

A representative household distributes labor across a continuum of firms indexed by $j \in [0,1]$. The pre-tax wage per worker at each firm is taken as given by the household and is denoted w_j. The post-tax wage per worker $\widetilde{w}_j = \lambda w_j^{1-\tau}$, as in HSV. The household also receives income from firm profits, which are rebated lump-sum. The household problem is:

$$\max_{C,n_j} \quad \log\left(C - \frac{1}{\overline{\varphi}^{1/\varphi}}\frac{N^{1+1/\varphi}}{1+1/\varphi}\right)$$

$$N = \left[\int n_j^{\frac{\eta+1}{\eta}}\,dj\right]^{\frac{\eta}{\eta+1}}$$

subject to

$$C = \int \lambda w_j^{1-\tau} n_j\,dj + \Pi.$$

Greenwood, Hercowitz and Huffman (1988) preferences remove wealth effects on labor supply, hence output, wages and employment are determined independent of consumption and the government budget constraint. Consumption goods produced by firms are perfect substitutes and sell at a price $p_j = P$ which we normalize to one. The household faces a convex disutility in total labor N, which is determined by the distribution of labor across firms, n_j. Allocating more workers to firm j incurs more disutility on the margin, requiring higher compensation. Firms experience this as an upward sloping labor supply curve.

Define the aggregate wage index W by the following expression:

$$\lambda W^{1-\tau} N = \int \lambda w_j^{1-\tau} n_j\,dj \tag{1}$$

Under linear taxes ($\tau = 0$), this is a standard wage index. Under $\tau > 0$, W has the interpretation of the aggregate pre-tax wage index. Combining this definition with first order conditions for C and n_j, household optimal labor supply is determined by:

$$n_j = \left(\frac{w_j}{W}\right)^{(1-\tau)\eta} N \tag{2}$$

$$W = \left[\int_j w_j^{(1-\tau)(1+\eta)} dj\right]^{\frac{1}{(1-\tau)(1+\eta)}} \tag{3}$$

$$N = \overline{\varphi}\left(\lambda W^{1-\tau}\right)^{\varphi}. \tag{4}$$

The third equation is a standard optimality condition for labor supply under progressive taxes: higher progressivity distorts labor supply by reducing the after tax wage on the margin.

The equilibrium wage index that enters this expression is also distorted by the presence of progressive taxes. The household optimally allocates labor across firms to equate marginal disutilities of work to *post-tax* wages, hence the wage index is formed using *post-tax* wages. Progressivity causes the gap between pre- and post-tax wages to widen at higher wage firms, which is encoded into the wage index via lower weight on the pre-tax wages of high wage firms. This can also be seen in the first equation, which gives the labor supply curve to firm j. On the margin, higher pre-tax wages increase post-tax wages with an elasticity of $(1-\tau)$, and since the household cares about post-tax wages, raising the pre-tax wage reallocates workers with a lower elasticity.

From equation (2) we can derive the elasticity of labor supply that the firm faces, under the assumption that the firm is monopsonistically competitive (i.e. it is small and hence its effect on W is zero). The elasticity of labor supply to firm j is given by:

$$\varepsilon_j = \frac{\partial \log n_j}{\partial \log w_j} = \eta(1-\tau). \tag{5}$$

Higher progressivity directly lowers the elasticity of the firm's labor supply curve. In an imperfectly competitive labor market, the firm internalizes this effect, and hence tax progressivity will directly shape the distribution of *pre-tax* wages.

Firms

Firms operate a constant returns to scale production technology $y_j = z_j n_j$. They take as given the labor supply curves of households and aggregates W and N, and solve:

$$\pi_j = \max_{w_j} z_j n_j - w_j n_j \tag{6}$$

subject to

$$n_j = \left(\frac{w_j}{W}\right)^{(1-\tau)\eta} N. \tag{7}$$

Firm optimality implies the wage:

$$w_j = \mu z_j \ , \ \mu = \frac{\varepsilon}{\varepsilon+1} \ , \ \varepsilon = (1-\tau)\eta. \tag{8}$$

The firm cares about the *pre-tax* wage, and understands that on the margin, as it increases its wage, the *post-tax* wage that is received by workers increases at the lower rate of $(1-\tau)$. From the perspective of the firm, labor supply is less elastic with respect to pre-tax wages. Progressive taxes make hiring more expensive on the margin, so the firm does less of it in equilibrium, which is achieved with a lower wage.

Figure 1 illustrates the partial-equilibrium effects of increasing tax progressivity to $\tau' > \tau$, holding W and N fixed. Steeper tax progressivity reduces the firm's perceived labor supply elasticity. They pay wages at wider markdowns, and the gap between the competitive (efficient) and monopsonistic allocations widen. The distortionary effects of tax progressivity are internalized and then amplified by the monopsonist.

Equilibrium - Homogenous firms

To derive simple analytical expressions we first assume firms are homogeneous: $z_j = Z$. Under GHH preferences the following conditions characterize labor demand, labor supply and output:[2]

$$\begin{aligned} W &= \mu Z \ , \ \mu = \frac{(1-\tau)\eta}{(1-\tau)\eta+1} && (9)\\ N &= \overline{\varphi}\left(\lambda W^{1-\tau}\right)^{\varphi} , && (10)\\ Y &= ZN. && (11) \end{aligned}$$

In terms of primitives, output is therefore

$$Y = \underbrace{\left[\frac{(1-\tau)\,\eta}{(1-\tau)\,\eta+1}\right]^{\varphi(1-\tau)}}_{\text{Monopsony}} \underbrace{\overline{\varphi}\lambda^{\varphi} Z^{1+\varphi(1-\tau)}}_{\text{Competitive}}$$

[2] The government budget constraint is $G = WN - \lambda W^{1-\tau}N$. Without other fiscal adjustments, changes in taxes change G. Via the resource constraint ($Y = C+G$) this changes C. In the case without GHH preferences, this would shift labor supply via wealth effects. Hence, GHH preferences allow us to solve for output without considering G.

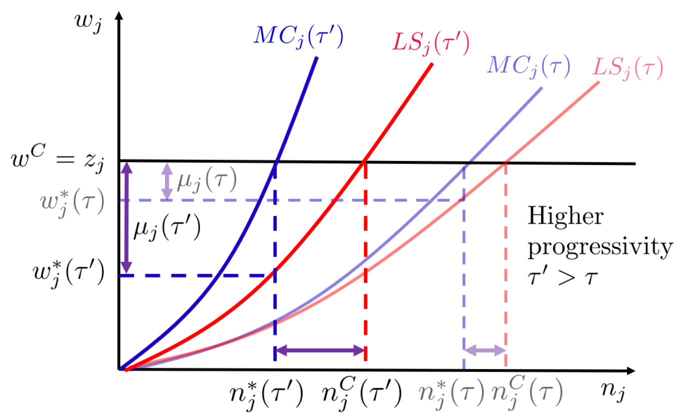

FIGURE 1. EFFECT OF PROGRESSIVE TAXES ON FIRMS' OPTIMAL PRE-TAX WAGE (w_j) AND EMPLOYMENT (n_j).

Note: $MC_j(\tau)$ denotes the marginal cost of labor to the monopsonist when tax progressivity is τ. $LS_j(\tau)$ denotes the labor supply curve when tax progressivity is τ. $n_j^C(\tau)$ denotes the competitive choice of labor, and $n_j^*(\tau)$ denotes the monopsonist choice of labor.

The *Competitive* term is obtained if we solve the above equations under $W = Z$, and hence firms have no wage-setting power. Progressive taxes show up in the competitive term for standard reasons: higher Z produces a higher pre-tax W, but the post-tax wage received by households is distorted downwards, reducing household labor supply.

The *Monopsony* term reduces output due to firms' decisions to restrict demand as they internalize the increasing marginal cost of hiring workers. Part of this comes from preferences via η. Part of this comes from policy via τ. Absent progressive taxes, this term is $[\eta/(\eta+1)]^{\varphi}$. With progressive taxes, labor supply elasticities to firms are lower, markdowns are wider, and this term is smaller, reducing output for any Z.

We draw two symmetric conclusions. First, progressive taxes amplify the inefficiencies associated with labor market power. Under monopsony, increasing τ reduces the monopsony term, reducing output. Second, monopsony amplifies the inefficiencies associated with progressive taxes. Under progressive taxes, wage-setting power introduces an additional wedge between output and what would obtain under linear taxes.

EQUILIBRIUM - HETEROGENEOUS FIRMS

We now add firm heterogeneity. A first result is to show how progressive taxes distort allocations when jobs are imperfect substitutes, even when firms act competitively. This is reminiscent of results in Scheuer and Werning (2017). In our case, however, there is no worker heterogeneity, but the allocation is nonetheless distorted. A second result is to show how the associated loss is amplified under monopsony.

Suppose that firms are heterogeneous in their productivity, $z_j \sim F(z)$. As they are infinitesimal, firms still pay the same markdown μ on their marginal product of labor: $w_j = \mu z_j$.

The same three equations as above determine $\{Y, W, N\}$, with the additional expression for aggregate TFP, Z:

$$(12)\; Z \;=\; \left[\int z_j^{\frac{(1+\eta)(1-\tau)}{1+\eta(1-\tau)}}\, dj\right]^{\frac{1+\eta(1-\tau)}{(1+\eta)(1-\tau)}}.$$

Progressive taxes now have three roles. First, the standard distortion visible in equation (10). Second, the new distortion introduced in the previous section through which progressivity widens markdowns, equation (9). Third, an additional distortion in terms of the allocation of labor across firms. This is absent if jobs are perfect substitutes, as all labor goes to the highest productivity firm. When jobs are imperfect substitutes, and progressivity taxes wages more at high wage, high productivity firms, the allocation of employment is distorted away from these firms. This reduces aggregate total factor productivity Z, equation (12), as higher τ downweights higher z_j's. This is clear from a second order approximation of Z:[3]

$$\log Z = \mathbb{E}\Big[\log z_j\Big] + \underbrace{\frac{(1+\eta)(1-\tau)}{1+\eta(1-\tau)}}_{\text{Decreasing in } \tau} \mathbb{V}\Big[\log z_j\Big].$$

Fixing $\eta < \infty$, more productivity dispersion raises TFP. However, as taxes become more progressive, the gains from greater productivity dispersion are mitigated. In the limit as taxes become fully progressive and $\tau \to 1$, productivity dispersion is irrelevant: after tax wages at productive and unproductive firms are equalized and there are no allocative efficiency gains from productivity dispersion.

Note that this additional distortion occurs with or without wage-setting power of firms. If firms are competitive $\mu = 1$, and Z is unchanged. The result also holds without worker heterogeneity or sorting. Higher productivity workers sorting into higher productivity firms would compound this TFP loss. Scheuer and Werning (2017) study sorting and competitive labor markets from a theoretical perspective. However, in Scheuer and Werning (2017) employment at each firm is limited to one worker—i.e. a one-to-one assignment problem.[4] Here, employment at each firm has an intensive margin, but all workers do not work in one firm due to imperfect substitutability.

III. Simple quantification

We take a simple approach to quantifying the potential of efficiency losses from misallocation and markdowns induced by tax progressivity. Estimates of progressivity of taxes τ range from 0.05 and 0.25 (see Fleck et al., 2021; Holter, Stepanchuk and Wang, 2023).[5] Consider the baseline economy to be one with τ equal to 0.15. Then solving the above equations in log deviations $\widehat{x} = \log(X(\tau)/X(\tau_0))$ we have

$$\widehat{y} = \big(1 + \varphi(1-\overline{\tau})\big)\widehat{z} + \varphi\big(1-\overline{\tau}\big)\widehat{\mu}.$$

Note that $\widehat{\mu}$ captures monopsony distortions, whereas $\widehat{z}$ is independent of monopsony power. In that sense, productivity losses from tax progressivity are not affected by the presence of a monopsonist. However, monopsony power exacerbates the distortions of progressive taxation as evidence by the negative dependence of $\widehat{\mu}$ on tax progressivity.

We keep the direct role of $\overline{\tau}$ in this equation constant at 0.15 and increase τ in the expressions for Z and μ. We keep $\mathbb{E}[\log z_j]$ and $\mathbb{V}[\log z_j]$ fixed. This causes a decline in productivity ($\widehat{z} < 0$) and widening markdown ($\widehat{\mu} < 0$).

Working in log deviations reduces free parameters. We do not have to specify λ, G, $\overline{\varphi}$, or $\mathbb{E}[\log z_j]$. The only inputs are (i) φ, which we set to a standard value for the Frisch elasticity of labor supply of 0.75, (ii) $\mathbb{V}[\log z_j]$ which we set to capture a 40 percent standard deviation of log productivity, consistent with Syverson (2004), and (iii) η for which we consider three values $\eta \in \{3, 5, 7\}$, corresponding to markdowns of $\mu \in \{0.75, 0.83, 0.88\}$. These markdowns are within the range reported by Berger, Herkenhoff and Mongey (2022) and Hershbein, Macaluso and Yeh (2022).

Figure 2A shows that changes in progressivity within the empirical range can move output by up to 6 percent.[6] Effects are larger when labor supply is less elastic

[3] We approximate $\log Z$ and $\log z_j$ around $\mathbb{E}[\log z_j]$.

[4] A missing link is studying optimal taxes in a large firm model of assortative matching as in Eeckhout and Kircher (2018).

[5] The estimated progressivity depends on whether transfers are included and the handling of zeros. It also depends on whether state taxes are included (Fleck et al., 2021). Holter, Stepanchuk and Wang (2023) estimate that across states and time, progressivity lies between 0.08 and 0.18.

[6] The value of $\overline{\tau}$ is not important, with similar results obtained for $\overline{\tau}$ of either 0.05 or 0.25.

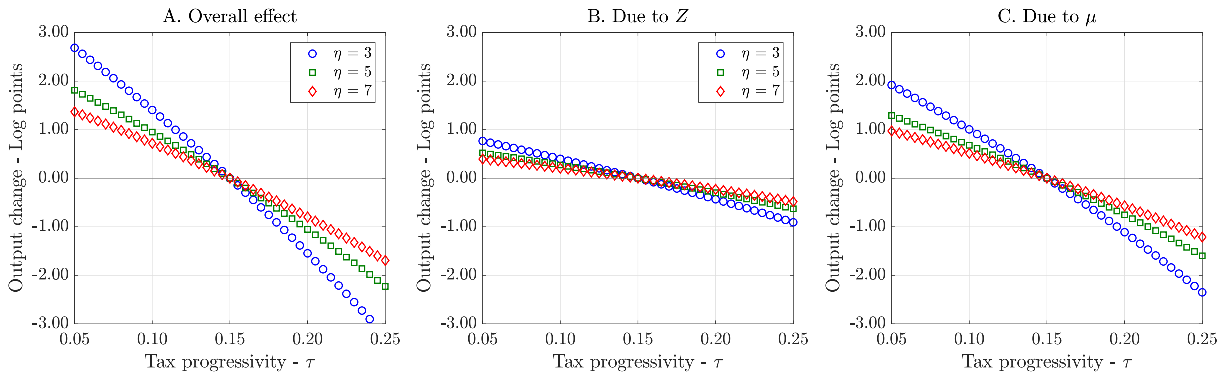

Figure 2. Effect of progressive taxes on output via misallocation and markdowns.

across firms ($\eta = 3$).[7] Not pictured here, it should be clear that effects are increasing in firm productivity dispersion. Doubling the standard deviation of $\log z_j$ under $\eta = 3$ amplifies the decline in output across $\tau = 0.05$ and $\tau' = 0.25$ from 6 percent to around 10 percent.

The markdown effect via μ is larger than the misallocation effect via Z, however both are large relative to the welfare gains that are common in quantitative optimal tax exercises in competitive labor markets. As an example, suppose such an exercise that did not factor in monopsony and firm heterogeneity found that increasing progressivity from 0.15 to 0.20 was optimal and increased welfare by 1 percent. Factoring in firm heterogeneity and monopsony under $\eta = 5$ would reduce output by 1 percent. The negative effects via the allocation of workers across firms and wider markdowns could wipe out most of these gains (Figure 2A).

From this simple exercise we conclude that studying the role of monopsony and firm heterogeneity in mitigating the welfare gains from higher progressivity is an important avenue of future research.

[7]The response of markdowns is smaller when ε is high. Note that $\partial\mu/\partial\varepsilon = 1/(\varepsilon+1)^2$. As $\varepsilon \to \infty$, $\partial\mu/\partial\varepsilon \to 0$. Greater progressivity lowers the labor supply elasticity ε, but markdowns are less responsive when the initial perceived labor supply elasticity is high. Also note that the overall responsiveness of markdowns to taxes is decreasing in the labor supply elasticity η: $\partial\mu/\partial\tau = -\eta/(\eta(1-\tau)+1)^2$ which similarly goes to zero as η approaches ∞.

IV. Conclusion

That progressive taxes may distort labor supply has been studied extensively in economics. This paper introduces distortions via labor demand. We also offer a theory through which the presence of taxes distorts the *pre-tax* wage distribution.

We have show that: (i) when firms are homogeneous, wage-setting firms respond to progressive taxes by distorting downwards their labor demand, (ii) when firms are heterogeneous and behave competitively, labor demand is distorted across firms and generates misallocation that is increasing in the degree of progressivity, and (iii) this is amplified under monopsony.

Standard motives for progressive taxes are redistribution and insurance. Our economy has homogeneous workers in a unitary household, and no idiosyncratic risk. Hence, a government in the model that we have studied would have zero motivation to pursue progressive taxes, but in richer economies where these motives exist, we claim that the economic forces documented in this paper would still be operative.

In continuing work we study this issue in a Bewley economy with consumption, savings, borrowing constraints and individual decisions over which firm to work at and how many hours to work. Workers make individual decisions, and supply labor to a single firm, rather than the 'large household' set-up in this paper. Labor supply curves to firms are rich objects that encode the full distribution of workers' assets and productivity as well as the shape of taxes. On the extensive margin, progressivity increases a firm's marginal cost of hiring a worker away from another firm. On the intensive margin, progressivity increases a firm's marginal cost of getting more hours out of the workers they hire. Wage setting firms internalize these higher marginal costs when setting wages and optimally cut back on employment by offering lower pre-tax wages. Under homogeneous firms and competitive labor markets, this rich economy nests leading frameworks used to quantify optimal tax progressivity (e.g. Heathcote, Storesletten and Violante, 2017). Hence we can quantify the extent to which firm heterogeneity and wage-setting power reduce optimal progressivity in a leading quantitative framework.

REFERENCES

Bagger, Jesper, Espen R Moen, and Rune Vejlin. 2021. "Equilibrium worker-firm allocations and the deadweight losses of taxation."

Berger, David, Kyle Herkenhoff, and Simon Mongey. 2022. "Labor market power." *American Economic Review*, 112(4): 1147–93.

Brooks, Wyatt J., Joseph P. Kaboski, Yao Amber Li, and Wei Qian. 2019. "Exploitation of Labor? Classical Monopsony Power and Labor's Share." National Bureau of Economic Research NBER Working Paper 25660.

Cahuc, Pierre, and Guy Laroque. 2014. "Optimal taxation and monopsonistic labor market: Does monopsony justify the minimum wage?" *Journal of Public Economic Theory*, 16(2): 259–273.

Eeckhout, Jan, and Philipp Kircher. 2018. "Assortative Matching With Large Firms." *Econometrica*, 86(1): 85–132.

Ferriere, Axelle, Philipp Grübener, Gaston Navarro, and Oliko Vardishvili. 2023. "On the Optimal Design of Transfers and Income Tax Progressivity." *Journal of Political Economy Macroeconomics*, 1(2): 000–000.

Fleck, Johannes, Jonathan Heathcote, Kjetil Storesletten, and Giovanni L Violante. 2021. "Tax and transfer progressivity at the us state level." Working paper.

Greenwood, Jeremy, Zvi Hercowitz, and Gregory W Huffman. 1988. "Investment, Capacity Utilization, and the Real Business Cycle." *American Economic Review*, 78(3): 402–417.

Heathcote, Jonathan, Kjetil Storesletten, and Giovanni L Violante. 2017. "Optimal tax progressivity: An analytical framework." *The Quarterly Journal of Economics*, 132(4): 1693–1754.

Hershbein, Brad, Claudia Macaluso, and Chen Yeh. 2022. "Monopsony in the U.S. Labor Market." *American Economic Review (forthcoming).*

Holter, Hans Aasnes, Serhiy Stepanchuk, and Yicheng Wang. 2023. "Taxation and Entrepreneurship in the United States." *Available at SSRN 4341843.*

Lamadon, Thibaut, Magne Mogstad, and Bradley Setzler. 2019. "Imperfect Competition and Rent Sharing in the U.S. Labor Market." National Bureau of Economic Research NBER Working Paper 25954.

Mousavi, Negin Sadat. 2022. "Optimal Labor Income Taxes, Incomplete Markets, and Labor Market Power." PhD diss. The University of Chicago.

Scheuer, Florian, and Iván Werning. 2017. "The taxation of superstars." *The Quarterly Journal of Economics*, 132(1): 211–270.

Syverson, Chad. 2004. "Product substitutability and productivity dispersion." *Review of Economics and Statistics*, 86(2): 534–550.