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On the Incidence Neutrality of Employer and Employees Social Contributions, Again

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Abstract

This paper revisits the belief that the mix of employer and employee social security contributions is neutral for employment and equilibrium wages. We establish the conditions required for neutrality across competitive settings, institutional minimum wages, progressive taxation, and search-and-matching frictions. We show that statutory invariance breaks down due to an asymmetry in the tax wedge operating almost identically across all models. Tax neutrality is restricted to a knife-edge case that does not hold in modern labor markets. Statutory non-neutrality in the labor market is therefore relevant quantitatively because it arises as soon as marginal tax rates are above 20%. This has implications for designing contemporary welfare and workfare policies.

JEL classification

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Keywords

labor taxes, tax incidence, employment, search models

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A recurrent labor policy recommendation in Western economies is to reduce labor costs by decreasing employer social contributions and, if needed, raising transfers for low-wage workers by taking into account the family structure. For instance, the 2021 OECD Employment Survey for France explicitly praised "*welcome reforms [that] have lowered labour costs and increased the in-work bonus for low-paid workers.*[1] The praised policy package amounts to reducing marginal tax rates on employers and raising implicit marginal tax rates on workers, based on the widely believed result that *taxes on workers or on firms are equivalent: the gross wage adjusts, and the statutory taxpayer does not matter*. Such a claim was made early in the prominent textbook by Layard, Nickell and Jackman (1991), page 487: "*Needless to say, it makes no difference whether the tax is levied on firms or workers.*"

This paper revisits this claim and highlights its limitations within modern labor markets where proportional taxes are the norm. On the employer side, total labor costs typically increase with the gross wage w, as $w^{lcost} = b^e + w(1+\tau^e)$ with a lump-sum part that is typically negative in the case of tax cuts targeted to low wage workers. Instead, on the employee side, net disposable income decreases with w as $w^{net} = b^w + w(1-\tau^w)$, where the lump-sum part is typically positive given transfers to low income workers. The $\tau^j, j = e, w$ are the implicit marginal tax rates and the induced wedge as a difference between the labor cost and the net earning is $T^e - T^w = b^e - b^w + (\tau^e + \tau^w)w$. Crucially, while textbook neutrality is traditionally defined around cross-side shifts (buyer to seller or firm to workers) of the lump-sum components, we show that the mere presence of proportional taxes completely invalidates this statutory invariance. In this realistic environment, neither the lump-sum intercept nor the proportional rate satisfies statutory tax neutrality. It follows that the legal side of tax collection is fundamentally non-neutral for real allocations. The neutrality result has recently been challenged in the standard framework (e.g. Pauwels and Schroyen, 2024; Poensgen and Rodrian, 2025), but lump-sum and proportional taxes are evaluated in isolation (Fullerton and Metcalf (2002)) also only focus on proportional taxes. As we discuss in this paper, the classic approach is a subcase of our framework, where non-zero lump-sum and proportional tax schedules coexist on both sides of the labor markets.

We first derive the exact conditions for neutrality. For that, we introduce the concept of the pairwise marginal rate of policy substitution (MRPS), which characterizes the required co-movements among policy instruments necessary to keep real equilibrium allocations unchanged, such as employment and aggregate tax revenue.

In our integrated setting, cross-side variations in lump-sum instruments fail to yield a unitary MRPS, directly violating this classical neutrality theorem. Instead, the MRPS is governed by a structural tax asymmetry wedge $\mathcal{G} \equiv \frac{1+\tau^e}{1-\tau^w}$, which reflects the non-linear combination of proportional taxation across sides. This wedge reveals that labor supply margins exhibit a higher marginal sensitivity to employee-side proportional rates (τ^w) than labor demand margins do to employer-side rates (τ^e) due to their asymmetric compounding effects on net-of-tax returns.

[1] See OECD (2021), page 11: "*Boosting employment and productivity is a priority. Welcome reforms have lowered labour costs and increased the in-work bonus for low-paid workers, while also improving the financing and targeting of education and vocational training. However, too many workers have inadequate skills and their employment rate remains low.*"

In the restricted subcase where proportional tax rates are absent ($\tau^e = \tau^w = 0$), the MRPS simplifies to unity. This recovers the textbook benchmark of statutory tax invariance. In addition, we show that conventional tax invariance holds if and only if the economy is on the knife-edge symmetric case where the baseline proportional tax burden is zero ($\tau^w + \tau^e = 0$, or equivalently $\mathcal{G} = 1$). Once a non-zero proportional tax burden is introduced, this symmetry breaks, and the statutory incidence of a lump-sum transfer alters real allocations. To fix ideas for the reader interested in the relevance and the quantitative implications of the analysis, we present a few simulations at the end of the paper where a discrete jump from 0 to 0.2 of τ^e implies an employment decrease of 6.23%, but the same discrete jump for τ^w reduces employment by 7.58%, that is a $\ln 7.58/6.23 = 19.5\%$ larger decline. And if both $\tau^w = \tau^e$ are already at 0.2, the asymmetric effect of adding percentage points in respective tax rates, as captured by the tax asymmetry wedge $\mathcal{G}$ is as large as 1.5. We also further show that with a minimal amount progressivity defined later, this asymmetry is even larger, the relative difference in employment losses reaching 49% and the tax asymmetry wedge is 2.0.

We will explore a variety of cross-side shifts in proportional tax rates that yield an identical MRPS in absolute terms and derive the locus of neutrality in the four tax parameters $b^j, \tau^j, j = e, w$. In particular, the single structural asymmetry wedge $\mathcal{G}$ determines the scale of all policy distortions in a competitive labor market.

We then explore the robustness of this mechanism. We extend the core framework to incorporate minimum wages, progressive taxation, and a frictional search-and-matching setup with Nash wage bargaining. This non-neutrality result holds across models and their variants: the tax asymmetry wedge continues to affect the equilibrium.

The next question we address is the policy-relevance of the result: how far away are modern welfare states from the symmetric benchmark ($\mathcal{G} = 1$) under realistic parameters for proportional taxes? We show that the tax asymmetry wedge is substantial—reaching approximately 3 in France. Numerical exercises indicate that the symmetry in tax incidence across-sides breaks down.

A policy message is that statutory neutrality may be valid in the goods market with rather low VAT and may have been a reasonable approximation before modern welfare states. However, with the implementation of in-work benefits and targeted cash transfers, as well as large payroll taxes, large marginal tax rates on both sides of the market pushed the tax wedge $\mathcal{G}$ to high values, and the traditional statutory neutrality result is now obsolete for modern labor markets.

Selected literature review. The textbook result, for instance, as stated in Gruber (2005, 2019) as the Second Rule of Tax Incidence, is that "*the side of the market on which the tax is imposed is irrelevant to the distribution of the tax burdens.*" This is typically stated in a competitive long-run equilibrium. The tax introduces a wedge between the buyer's price and the seller's price, and the argument is that shifting demand or supply taxes from one part to the other does not affect the equilibrium buyer and seller price; the 'tax base' price being the one adjusting. In the labor market, a change in employer payroll taxes should affect the equilibrium wage (in the absence of a floor on wages, such as a minimum wage or other nominal rigidities, as well as social norms). Kugler and Kugler (2009) found in Colombia that wages did not reflect increases in payroll taxes due to such wage floors. Saez, Schoefer and Seim (2019) find that the cut on large payroll taxes for young workers did not lead to higher wages and instead found sizable employment effects.

The empirical literature is rather silent on the incidence of the different taxes. An exception is the recent paper by Bozio, Breda and Guillot (2023). While not focused on the divide between the employee and employer portions of payroll contributions, they argue that the perceived contributive value of payroll taxes matters. They indeed find empirically in a panel of OECD countries: i) a full pass-through to workers when payroll taxes lead to well-defined benefits; ii) limited pass-through of non-contributive contributions; iii) that income taxes show nearly full pass-through. In their model, the gross wage w leads to a labor cost $w(1+\tau_k)$ and a perceived wage $w(1+q\tau_k)$ where q is the fraction of perceived equivalent benefits. Their paper also treats the case of two labor inputs but does not introduce income taxes per se.

Cahuc, Carcillo and Zylberberg (2014), pages 156-159, discuss the labor tax incidence effect. They do not refer explicitly to a symmetry or an asymmetry but explain that if a side is charged the tax, it does not imply that the full cost is borne by that side. They conclude that what matters is actually what is transferred to the other side. They focus, in the "Tax Incidence section", on the costs paid by employers, the effect of which is passed on to workers and therefore affects the equilibrium as a function of labor supply and labor demand elasticities. They describe results from the empirical literature that suggest a very low labor supply elasticity, e.g. Gruber (1997) for the 1981 reform in Chile. In the later chapter on Income redistribution, they develop the analysis of asymmetric tax incidence on wages. They argue, p. 761, that for competitive markets, "*the impact of taxes on the net wage is identical, whether it is the employer or the employee who is paying the tax to the fisc. This property, which was stressed in [the Tax Incidence section], is very general.*" This result only applies to the fixed component of firms' taxes and workers' taxes, not the proportional tax. It is also unrelated to perfect competition—it follows solely from the non-proportionality of taxes. The analysis of proportional taxes, earlier in that Section, clearly shows a non-equivalence that is not discussed in the book. The role of frictions is analyzed pp. 762-765. They reintroduce proportional taxes and identify a possible asymmetry, yet they restate that "*... it is worth noting that the model illustrates a classic result of the analysis, according to which a 1 unit tax has the same impact on unemployment whether it is paid by the firm or by the employee.*" This sentence can be interpreted as a neutrality result of the unit tax, derived from the additive separability of their two tax components in the numerator of the job creation condition (12.13) in the book. However, the tax wedge (their ϕ defined on p. 763) that shows up in the denominator of the job creation condition is not linear at all in the two tax components. Hence, their claim of neutrality only applies to a unit tax, both in the search model and in the competitive model, and does not apply to a proportional tax.

The two closest papers, Poensgen and Rodrian (2025) and Pauwels and Schroyen (2024), make the point that for ad valorem taxes, the statutory tax incidence is not neutral, contrary to common wisdom. Pauwels and Schroyen (2024) correctly identifies the role of the convexity of the tax wedge and equilibrium and the resulting asymmetry. Poensgen and Rodrian (2025) further defines strong irrelevance of the statutory incidence when neither the collected revenue nor the equilibrium change, and weak irrelevance if the tax rates can change to preserve the equilibrium but thereby change the revenue collected. Regarding the proportional tax, that paper argues that "*Unlike in the per unit tax case, however, the price adjustment does not neutralize the statutory incidence shift, leading to a change in the real economic allocation, tax incidence, and collected tax revenue.*" This result confirms our observation that labor models should not assume neutrality for proportional (ad valorem) taxes unless a linearization of the tax wedge is a good approximation of its exact value.

To sum up, the prior literature implicitly restricted its invariance claims to an isolated lump-sum tax structure. Poensgen and Rodrian (2025) and Pauwels and Schroyen (2024) studied proportional taxes in isolation. Our generalized framework demonstrates that even cross-side shifts of these flat lump-sum components become fundamentally non-neutral whenever the baseline proportional tax wedge $\mathcal{G}$ is non-unitary.

In addition, the framework we propose bridges with the macroeconomic literature : our concept of MRPS indeed maps directly into the labor wedge in Chari, Kehoe and McGrattan (2007). Indeed, in the absence of lump-sum intercepts ($b^e = b^w = 0$), their labor wedge—defined as the gap between the gross marginal product of labor and the worker's marginal rate of substitution between consumption and leisure—plays a key role in modern macroeconomics and business cycles. Chari, Kehoe and McGrattan (2007) show that the labor wedge functions more broadly to capture any distortionary deviation from frictionless competitive allocations, including the presence of sticky nominal wages. It is also the key statistic for the dynamic properties of equilibrium macro-labor models as developed in Shimer (2009, 2010). The standard macroeconomic models typically condense the entire fiscal schedule into a single, one-sided tax rate levied symmetrically on either workers or firms, proportional to the gross wage. As long as a research question ignores the statutory reallocation of fiscal burdens across sides of the market, a unified, one-sided tax rate is indeed a sufficient statistic. However, our work indicates that analyzes of particular reforms on employer taxes or employee tax and transfers require a closer look at the asymmetric effects.

The rest of this paper is organized as follows. Section I.A develops our benchmark competitive labor market framework the policy locus of neutrality and the marginal rate of policy substitution. It details the pairwise tax reforms that satisfy neutrality in Section I.B. An analysis of the direction and scale of non-neutral tax reforms is developed in Section I.C. We extend the argument to account for regulatory minimum wages in Section I.D, progressive taxation in Section I.E, and search-and-matching frictions with bargained wages in Section II. Section III provides numerical illustrations with tax parameters consistent with Western labor markets. The last Section concludes.

I. Tax incidence in Competitive Labor Markets

A. *Our Benchmark: Lump-Sum Taxes and Proportional Taxes*

We start from a competitive labor market where firms and workers take the gross market wage w as given. We treat the tax and social benefit system as a piecewise linear schedule specified separately for workers and employers:

$$T^w(w) = b^w - \tau^w w \tag{1}$$

$$T^e(w) = b^e + \tau^e w \tag{2}$$

where the parameters $\tau^w \in [0,1]$ and $\tau^e \in [0,\infty)$ govern the statutory proportional tax rates for employees and employers, respectively, while the parameters (b^e, b^w) define the associated lump-sum intercept components of the schedule. Because these tax parameters are independent of the gross wage w, the proportional components (τ^e, τ^w) represent the constant marginal tax rates within a non-progressive schedule. Under this convention, for a given gross wage w, the total labor cost borne by the employer ($w^{lcost} = w + T^e(w)$) and the net disposable income received by the worker ($w^{net} = w + T^w(w)$) are given by:

$$w^{net} = b^w + (1-\tau^w)w \tag{3}$$

$$w^{lcost} = b^e + (1+\tau^e)w \tag{4}$$

where the lump-sum components $b^e \lesseqgtr 0$ and $b^w \geq 0$, respectively, represent a fixed per-worker payroll contribution or in the case of negative b^e, a subsidy to labor costs of low wage workers; while b^w represents a basic income guarantee.

Thus, our benchmark formulation for the labor market generalizes standard configurations in the public finance literature (e.g., Fullerton and Metcalf, 2002; Pauwels and Schroyen, 2024; Poensgen and Rodrian, 2025), which invariably evaluate these tax parameters (b or τ) in isolation to study tax incidence neutrality in, typically, the goods market.

B. *Neutrality Conditions with Competitive Markets*

We begin by analyzing a static competitive labor market baseline where aggregate output is a function of employment, $Y(N)$. Let labor supply (N^s) and labor demand (N^d) be given by the following standard power functional forms:[2]

$$N^s = S_0 \left[b^w + (1-\tau^w)w\right]^{\phi_s} \tag{5}$$

$$N^d = D_0 \left[b^e + (1+\tau^e)w\right]^{-\phi_d} \tag{6}$$

where D_0 and S_0 are positive scale constants, while $\phi_s > 0$ and $\phi_d > 0$ represent the respective structural elasticities. By equating supply and demand to clear the market at a single market-clearing gross wage w, the competitive equilibrium employment level, denoted $N(b^w, b^e, \tau^w, \tau^e)$, implicitly solves:

$$F(N; b^w, b^e, \tau^w, \tau^e) \equiv N - S_0 \left[b^w + \frac{1-\tau^w}{1+\tau^e}\left[\left(\frac{N}{D_0}\right)^{-\frac{1}{\phi_d}} - b^e\right]\right]^{\phi_s} = 0. \tag{7}$$

[2]See Online Online Appendix A for the competitive-labor market model leading to these standard functional forms.

See Online Online Appendix A for the full derivation of this equilibrium condition. Further, the unit cost of labor in equilibrium is $w^{lcost} = w^{lcost}(N) = \left(\frac{N}{D_0}\right)^{-\frac{1}{\phi_d}}$ and net wages $w^{net} = w^{net}(N) = b^w + \frac{1-\tau^w}{1+\tau^e}\left[w^{lcost}(N) - b^e\right]$; hence, the behavior of labor costs and net income in equilibrium is fully determined by the behavior of employment.

Our goal is to examine how the statutory tax parameters affect employment. In doing so, we establish the precise conditions under which structural tax reforms preserve the equilibrium level of employment. Because the equilibrium condition (7) cannot be solved analytically for $N(b^w, b^e, \tau^w, \tau^e)$ when both lump-sum and proportional tax components are present, we apply the implicit function theorem to map out the localized response of equilibrium employment to joint variations in the tax parameters. Fully differentiating the equilibrium condition yields:

$$\left(\frac{w^{net}}{\phi_s N}\right)\left(\mathcal{G} + \frac{\phi_s}{\phi_d}\frac{w^{lcost}}{w^{net}}\right) \cdot dN = \mathcal{G} \cdot db^w - db^e - w\left(d\tau^e + \mathcal{G} \cdot d\tau^w\right) \tag{8}$$

where $\mathcal{G} = \frac{1+\tau^e}{1-\tau^w}$ and $\mathcal{G} + \frac{\phi_s}{\phi_d}\frac{w^{lcost}}{w^{net}} > 0$; see Online Online Appendix A for details.

Definition 1 (**Tax Neutrality**). *A tax reform that shifts the statutory tax burden between workers, $T^w(w; b^w, \tau^w)$, and firms, $T^e(w; b^e, \tau^e)$, is employment-neutral if it leaves the equilibrium level of employment unchanged.*

Letting $\Gamma \in (0, 1)$ represent the share of aggregate output required for government financing, the budget balance satisfies:

$$\left[T^w(w) + T^e(w)\right] N = \Gamma Y(N) \tag{9}$$

where the left-hand side of Equation (9) represents total tax revenue and the right-hand side denotes its public expenditure, both of which are uniquely determined by the equilibrium level of employment. To see this, note that in competitive labor markets, the gross wage equals the marginal product of labor, $w = Y_N(N)$, which is uniquely determined by N under standard regularity assumptions on the production function $Y(N)$. Consequently, neutrality in employment is completely equivalent to neutrality in both aggregate output and total tax revenues.

In this context, the total differential equation (8) traces out the exact four-dimensional boundary condition along which a tax reform remains globally employment-neutral ($dN = 0$), which we formulate in the next proposition:

Proposition 1 (**Neutrality of Tax Reforms**). *A general tax reform adjusting the parameter vectors (τ^e, τ^w) and (b^e, b^w) is employment-neutral ($dN = 0$) if and only if the total variation satisfies:*

$$db^e + w d\tau^e = \mathcal{G}\left(db^w - w d\tau^w\right) \tag{10}$$

Proof: Setting $dN = 0$ in the total differential (8) yields:

$$\mathcal{G} \cdot db^w - db^e - w\left(d\tau^e + \mathcal{G} \cdot d\tau^w\right) = 0$$

Expanding the brackets, isolating the worker-side parameters containing $\mathcal{G}$ on the right-hand side, and factoring out $\mathcal{G}$ directly establishes the boundary condition in (10). □

The formulation in Proposition 1 yields central insights for policy analysis. Crucially, any nominal tax shift originating from the worker's side ($db^w + wd\tau^w$) must be weighted by the factor $\mathcal{G}$ relative to an equivalent adjustment on the firm's side ($db^e + wd\tau^e$) to preserve neutrality. These variations structurally define the *marginal rate of policy substitution* (MRPS)—the implicit shadow price of shifting the statutory tax burden across market sides while maintaining employment neutrality.

Definition 2 (**Marginal Rate of Policy Substitution**). *Let $\mathcal{N}(b^e, b^w, \tau^e, \tau^w) = 0$ represent the employment-neutrality locus defined by equation* (10)*. The marginal rate of policy substitution (MRPS) between worker-side and firm-side tax bundles is the implicit trade-off ratio that satisfies:*

$$MRPS \equiv \left.\frac{db^e + wd\tau^e}{db^w - wd\tau^w}\right|_{dN=0} = \mathcal{G}, \tag{11}$$

As long as $\tau^e + \tau^w > 0$, this marginal rate of policy substitution is non-unitary ($\mathcal{G} > 1$). In this regime, $\mathcal{G}$ acts as a policy exchange rate—a dimensionless ratio scaling nominal adjustments—which dictates how statutory changes must be balanced to leave the marginal incentives of labor market participants unaltered. For example, a \$1 reduction in worker-side tax liabilities must be balanced by a $\mathcal{G}$-dollar increase in employer-side taxes. Notably, the MRPS depends strictly on the proportional tax rates τ^w and τ^e, remaining completely independent of the lump-sum tax levels. The next two lemmas characterize the behavior of $\mathcal{G}$ with respect to these underlying tax rates.

Lemma 1 (**Characterization of $\mathcal{G}$**). *The marginal effect of the worker tax (τ^w) on the marginal rate of policy substitution ($\mathcal{G}$) is strictly positive and strictly convex, whereas that of the employer tax (τ^e) is strictly positive and strictly linear. Furthermore, the cross-derivative between the two statutory tax channels is strictly positive.*

Proof: See Online Online Appendix B. □

Lemma 2 (**Dominant Marginal Effect of τ^w over τ^e on $\mathcal{G}$**). . *The following properties hold for the marginal effects of the worker tax relative to the employer tax:*

(a) (Asymmetric Case) The marginal effect of the worker tax (τ^w) on the Tax Asymmetry Wedge ($\mathcal{G}$) is larger than that of the employer tax,

$$\frac{\partial \mathcal{G}}{\partial \tau^w} > \frac{\partial \mathcal{G}}{\partial \tau^e}, \qquad \textit{and quantitatively} \qquad \frac{\frac{\partial \mathcal{G}}{\partial \tau^w}}{\frac{\partial \mathcal{G}}{\partial \tau^e}} = \mathcal{G} > 1 \tag{12}$$

whenever the baseline proportional tax burden is strictly positive ($\tau^w + \tau^e > 0$)

Table 1—: Quantitative Relevance of the Tax Asymmetry Wedge $\mathcal{G}$

	(a) $\mathcal{G}(\tau^w, \tau^e)$	(b) $\tau_G(\tau^w, \tau^e)$
Expanded	$\dfrac{1+\tau^e}{1-\tau^w}$	$\dfrac{\tau^w+\tau^e}{1+\tau^e}$
Compact	$\mathcal{G}$	$1-\mathcal{G}^{-1}$
$\tau^e = \tau^w = 0.5$	3	0.667
France 2024	2.9/3.9/2.4	0.65/0.74/0.58
Germany 2024	2.2/2.1/1.8	0.54/0.53/0.45
U.S. 2024	1.5/2.3/1.7	0.31/0.57/0.41

Notes: Column (a) presents the marginal rate of policy substitution ($\mathcal{G}$) between worker- and firm-side tax instruments. Column (b) reports the labor tax wedge (τ_G), which is introduced in Section I.B for the special case of an economy with pure proportional taxes. Country examples come from OECD (2025) and are their calculations of the labor wedge rate τ_G for respectively i) a single earner with no children at 67% of the average wage, ii) the same earner but with two children, and iii) a couple of two earners both at the average wage and two children, for the marginal income of the main earner in the household. Source: Table 3.6 @ `https://www.oecd.org/en/publications/2025/04/taxing-wages-2025_20d1a01d/full-report/effective-tax-rates-on-labour-income-in-2024_878e20ff.html`

(b) (Knife-Edge Symmetric Case) The marginal effect of the worker tax (τ^w) on the Tax Asymmetry Wedge ($\mathcal{G}$) is equal to that of the employer tax (τ^e),

$$\frac{\partial \mathcal{G}}{\partial \tau^w} = \frac{\partial \mathcal{G}}{\partial \tau^e}, \qquad \textit{and quantitatively} \qquad \frac{\dfrac{\partial \mathcal{G}}{\partial \tau^w}}{\dfrac{\partial \mathcal{G}}{\partial \tau^e}} = \mathcal{G} = 1 \tag{13}$$

whenever the baseline proportional tax burden is zero ($\tau^w + \tau^e = 0$)

Proof: See Online Online Appendix B. □

To fix ideas, Table 1 illustrates the quantitative behavior of the marginal rate of policy substitution $\mathcal{G}$ in column (a). When both tax rates (τ^e and τ^w) are set at 50%, the value of $\mathcal{G}$ equals $(1 + 0.5)/(1 - 0.5) = 3$, reflecting a strong asymmetry in the scaling of policy shifts. The table presents 2025 data for France, Germany, and the United States across three distinct household profiles: (i) a low-income single earner, (ii) a single earner with children, and (iii) a dual-earner couple. For example, the French case shows that a \$1 reduction in worker-side tax liabilities must be balanced by an employer-side tax increase of up to \$3.90 to preserve employment neutrality. Further, Figure B.1 in Online

Appendix B illustrates the properties established in Lemma 1 and 2, showing that the marginal rate of policy substitution exhibits a fundamental structural asymmetry in response to changes in statutory tax rates.

The economic intuition driving this asymmetry is straightforward: the proportional tax parameters scale only the variable components of labor costs and net income. In the general case, a one-percentage-point increase in τ^e alters labor demand through the marginal gross-up channel. Because this specific channel is amplified by the factor $(1+\tau^e)$, the marginal impact of adjusting τ^e is more diluted relative to the total labor cost base than a corresponding change in τ^w. Conversely, a one-percentage-point increase in τ^w operates through a compressed channel scaled by $(1-\tau^w)$, rendering labor supply highly sensitive to worker-side rate adjustments at the margin. As characterized in Lemma 2, $\mathcal{G}$ represents the exact ratio of these marginal scaling profiles. While non-zero lump-sum components $(b^e, b^w \neq 0)$ introduce flat level shifts to the overall decision bases, $\mathcal{G}$ perfectly isolates the relative pricing wedge of the proportional tax channels, dictating how nominal parameter adjustments must balance across sides to preserve equilibrium employment.

To explore the economic implications of $\mathcal{G}$, we first analyze two restrictive baseline subcases of Proposition 1. The first subcase recovers the classic public finance neutrality result in an economy with solely lump-sum shifters (b^e, b^w), while the second focuses on an economy featuring solely proportional tax rates (τ^e, τ^w). These two subcases are consistent with the recent analysis in Pauwels and Schroyen (2024) and Poensgen and Rodrian (2025). We then return to our general framework where lump-sum and proportional taxes coexist, providing a full characterization of neutral tax reforms. Our general framework demonstrates that the conventional baseline—employment neutrality under a symmetric, one-for-one shift where $db^e = db^w$—holds only in a highly restrictive, knife-edge scenario.

The Subcase of Economies with Pure Lump-Sum Taxes

Consider a scenario that restricts our benchmark statutory tax schedule to consist solely of lump-sum intercept components. That is, we shut down the proportional tax rates by setting the parameters $\tau^w = \tau^e = 0$, which inherently implies $d\tau^w = d\tau^e = 0$. This configuration represents a restrictive subcase of Proposition 1 that not only eliminates variation in the marginal tax rates but also forces the marginal wedge ratio to unity ($\mathcal{G} = 1$). Substituting these parameter restrictions directly into the generalized boundary condition of equation (10) yields the following classical corollary:

Corollary 1 (Tax Neutrality in Economies with Pure Lump-Sum Taxes: Classic Result). *Under a pure lump-sum tax schedule characterized by the absolute absence of proportional tax margins ($\tau^w = \tau^e = 0$), a structural tax reform is employment-neutral ($dN = 0$) if and only if it features a symmetric, one-for-one cross-side nominal shift:*

$$\left.\frac{db^e}{db^w}\right|_{\tau^w=\tau^e=0} = 1 \tag{14}$$

Proof: See Online Online Appendix C □

Corollary 1 recovers the celebrated textbook theorem of statutory tax incidence irrelevance. It confirms that when the labor tax schedule contains no proportional or distortionary marginal tax components, any nominal dollar shifted away from workers b^w onto employers b^e leaves aggregate employment, output, and public revenue completely unchanged. In our generalized benchmark framework (1)-(2) where lump-sum components and proportional rates coexist, this classical neutrality property ($db^e = db^w$) no longer holds—a breakdown that constitutes the central finding of this paper. To isolate the mechanism driving this non-neutrality, we first examine the alternate polar subcase where proportional taxes are strictly present but lump-sum components are entirely absent ($b^w = b^e = 0$).

The Subcase of Economies with Pure Proportional Taxes

Consider now, as in Poensgen and Rodrian (2025), a regime restricted strictly to flat, proportional taxation, such that the lump-sum intercepts are shut down ($b^e = b^w = 0$), which inherently implies $db^w = db^e = 0$. Thus, the net wage received by workers is $(1 - \tau^w)w$ and the labor cost paid by employers is $(1 + \tau^e)w$, with $\tau^w \in [0, 1]$, and $\tau^e \in [0, \infty)$. Substituting these parameter restrictions directly into the generalized boundary condition of equation (10) yields the following corollary:

Corollary 2 (Tax Neutrality in Economies with Pure Proportional Taxes). *Under a pure proportional tax schedule with zero lump-sum taxes ($b^w = b^e = 0$), a structural tax reform is employment-neutral ($dN = 0$) if and only if it features an asymmetric shift scaled by the wedge ratio $\mathcal{G}$:*

$$\left.\frac{d\tau^e}{d\tau^w}\right|_{b^w=b^e=0} = -\mathcal{G} \tag{15}$$

Proof: See Online Online Appendix C □

Thus, in an economy with pure proportional taxes, a tax reform that shifts the legal burden from workers' taxes τ^w to firms' taxes τ^e maintains employment neutrality under the exact scaling condition in (15). Furthermore, this specific baseline ($b^e = b^w = 0$) yields a closed-form solution for the equilibrium employment level. It maps the wedge ratio $\mathcal{G}$ directly to a labor tax wedge analogous to the one in Chari, Kehoe and McGrattan (2007). This wedge takes the functional form $1 - \tau_G = \mathcal{G}^{-1}$, as illustrated in column (b) of Table 1; see Online Online Appendix A.

A Full Characterization of Pairwise Tax Reforms: Coexisting Lump-Sum and Proportional Taxes

We now turn to the general case where lump-sum components and proportional taxes coexist ($b^e, b^w \neq 0$ and $\tau^e, \tau^w \neq 0$). Under this configuration, the condition governing employment-neutral tax reforms is given by the general frontier in equation (10). In what follows, we focus on studying the neutrality conditions within all pairwise tax reforms, where policymakers adjust exactly two tax parameters while holding the remaining two constant. In particular, we show that the coexistence of lump-sum and

Table 2—: Pairwise Marginal Rate of Policy Substitution: Coexisting (Non-Zero) Lump-Sum and Proportional Taxes ($b^e, b^w \neq 0$ and $\tau^e, \tau^w \neq 0$)

$dy \setminus dx$	db^e	db^w	$d\tau^e$	$d\tau^w$
db^e		$\mathcal{G}$ (Corollary 3(b))	$-w$ (Corollary 3(a))	$-w\mathcal{G}$ (Corollary 3(c))
db^w	$\mathcal{G}^{-1}$ (Corollary 3(b))		$w\mathcal{G}^{-1}$ (Corollary 3(c))	w (Corollary 3(a))
$d\tau^e$	$-w^{-1}$ (Corollary 3(a))	$w^{-1}\mathcal{G}$ (Corollary 3(c))		$-\mathcal{G}$ (Corollary 3(b))
$d\tau^w$	$-(w\mathcal{G})^{-1}$ (Corollary 3(c))	w^{-1} (Corollary 3(a))	$-\mathcal{G}^{-1}$ (Corollary 3(b))	

Notes: Each cell displays the partial derivative of the row tax parameter (dy) with respect to the column tax parameter (dx) required to maintain employment neutrality ($dN = 0$). Each cell corresponds to the associated pairwise MRPS derived in Corollary 3.

proportional components in our general framework reveals that standard statutory invariance—namely, the classic neutrality condition $db^w = db^e$—holds only under highly restrictive, knife-edge parameter configurations.

To formalize these localized policy trade-offs within the general framework, we introduce the concept of a pairwise policy replacement rate:

Definition 3 (Pairwise Marginal Rate of Policy Substitution). *Let any pair of tax instruments be $x, y \in \{b^e, b^w, \tau^e, \tau^w\}$ with $x \neq y$. Assuming all remaining tax instruments are held constant, the pairwise marginal rate of policy substitution of instrument y for a unit change in instrument x is the implicit derivative that preserves employment neutrality:*

$$MRPS_{y,x} \equiv \left.\frac{dy}{dx}\right|_{dN=0} \tag{16}$$

where $\frac{dy}{dx}$ is derived directly by applying the implicit function theorem to the neutrality locus $\mathcal{N}(b^e, b^w, \tau^e, \tau^w) = 0$ in equation (10).

To systematically evaluate these joint adjustments, Table 2 maps out the complete set of pairwise neutral tax reforms. The matrix is structured such that each cell entry reports the required marginal response of the row parameter (dy) given a unit variation in the corresponding column parameter (dx). Consequently, these entries explicitly define the pairwise marginal rates of policy substitution necessary to maintain strict employment neutrality ($dN = 0$).

We define a "Within-side reform" as a change in tax policy that affects one side only, either the employer side or the employee/household side. We define an "across-sides reform" as the opposite situation of a change in tax policy parameters that transfers some parameters from the employer side to the employee/household side or vise versa. We also define a "Within-parameter type reform' as a change that affects either the lump-sum components of taxes on each side or the proportional tax component, but not both. Similarly, a "between-parameter type" reform is a shift from the lump-sum to the proportional components (that may be within or across-sides).

The following corollary formalizes this breakdown.

Corollary 3 (**Pairwise Marginal Rate of Policy Substitution**). *In a labor market governed by the statutory tax schedule* (1)–(2)*:*

(a) ***Within-side reforms:*** *An isolated employer-side adjustment* ($db^e, d\tau^e$ *with* $db^w = d\tau^w = 0$) *or an isolated employee-side adjustment* ($db^w, d\tau^w$ *with* $db^e = d\tau^e = 0$) *yields the following marginal rates of substitution:*

$$MRPS_{b^e,\tau^e} \equiv \left.\frac{db^e}{d\tau^e}\right|_{db^w=d\tau^w=0} = -w$$

and

$$MRPS_{b^w,\tau^w} \equiv \left.\frac{db^w}{d\tau^w}\right|_{db^e=d\tau^e=0} = w$$

(b) ***Across-sides reforms, within-parameter types:*** *An isolated lump-sum adjustment* (db^e, db^w *with* $d\tau^e = d\tau^w = 0$) *or an isolated proportional tax adjustment* ($d\tau^e, d\tau^w$ *with* $db^e = db^w = 0$) *yields the following marginal rates of substitution:*

(i) (Asymmetric Case) If the baseline proportional tax burden is strictly positive ($\tau^w + \tau^e > 0$)*, the nominal variation satisfies:*

$$MRPS_{b^e,b^w} \equiv \left.\frac{db^e}{db^w}\right|_{d\tau^w=d\tau^e=0} = \mathcal{G}$$

and

$$MRPS_{\tau^e,\tau^w} \equiv \left.\frac{d\tau^e}{d\tau^w}\right|_{db^w=db^e=0} = -\mathcal{G}$$

(ii) (Knife-Edge Symmetric Case) If the baseline proportional tax burden is zero ($\tau^w + \tau^e = 0$)*, the nominal variation satisfies:*

$$MRPS_{b^e,b^w} \equiv \left.\frac{db^e}{db^w}\right|_{d\tau^w=d\tau^e=0} = 1$$

and

$$MRPS_{\tau^e,\tau^w} \equiv \left.\frac{d\tau^e}{d\tau^w}\right|_{db^w=db^e=0} = -1$$

(c) ***Across-sides reforms, across-parameter types:*** *Any combination of changes of the four parameters that maintains* $\mathcal{G}$ *constant also maintains the MRPS. This general result can be applied to specific cases. Isolated pairwise adjustment in* db^e

and $d\tau^w$ with $db^w = d\tau^e = 0$ or an isolated pairwise adjustment in db^w and $d\tau^e$ with $db^e = d\tau^w = 0$ yields the following marginal rates of substitution:

(i) (Asymmetric Case) If the baseline proportional tax burden is strictly positive ($\tau^w + \tau^e > 0$), the nominal variation satisfies:

$$MRPS_{b^e,\tau^w} \equiv \left.\frac{db^e}{d\tau^w}\right|_{db^w=d\tau^e=0} = -w\mathcal{G}$$

and

$$MRPS_{b^w,\tau^e} \equiv \left.\frac{db^w}{d\tau^e}\right|_{db^e=d\tau^w=0} = w\mathcal{G}^{-1}$$

(ii) (Knife-Edge Symmetric Case) If the baseline proportional tax burden is zero ($\tau^w + \tau^e = 0$), the nominal variation satisfies:

$$MRPS_{b^e,\tau^w} \equiv \left.\frac{db^e}{d\tau^w}\right|_{db^w=d\tau^e=0} = -w$$

and

$$MRPS_{b^w,\tau^e} \equiv \left.\frac{db^w}{d\tau^e}\right|_{db^e=d\tau^w=0} = w$$

Proof: See Online Online Appendix D □

C. Direction and Scale of Non-Neutral Tax Reforms

Any policy change that deviates from the condition established in Proposition 1 necessarily affects the labor market, either in an expansionary or contractionary way. Given that the coefficient scaling dN in equation (8) is strictly positive, the sign of the change in equilibrium employment is driven by the right hand side of that equation.

Proposition 2 (**Direction of Non-Neutral Tax Reforms**). *A joint policy adjustment expands equilibrium employment ($dN > 0$) if and only if worker-side nominal variations dominate employer-side nominal variations when scaled by the wedge:*

$$\mathcal{G}\left(db^w - wd\tau^w\right) > db^e + wd\tau^e \tag{17}$$

Conversely, a policy adjustment where the inequality is reversed ($\mathcal{G}(db^w - wd\tau^w) < db^e + wd\tau^e$) results in a contractionary distortion ($dN < 0$).

Proof: See Online Online Appendix E □

To discuss the scale of these responses we isolate the transmission channels through which non-neutralities operate. First, we define the baseline scaling parameters $\Omega_1 \equiv \left[\mathcal{G} + \frac{\phi_s}{\phi_d}\frac{w^{lcost}}{w^{net}}\right] > 0$ and $\Omega_2 \equiv \left[\frac{\phi_d}{\phi_s}\frac{w^{net}}{w^{lcost}} + \mathcal{G}^{-1}\right] > 0$. Second, applying the implicit function theorem directly to the market-clearing condition yields the localized marginal sensitivities of the entire labor allocation to individual instrument shocks:

$$\frac{\partial N}{\partial \tau^w} = -\frac{w\mathcal{G}}{\Omega_1} \cdot \frac{\phi_s N}{w^{net}} < 0, \qquad \frac{\partial N}{\partial \tau^e} = -\frac{w}{\Omega_1} \cdot \frac{\phi_s N}{w^{net}} = \mathcal{G}^{-1}\frac{\partial N}{\partial \tau^w} < 0 \tag{18}$$

$$\frac{\partial w^{net}}{\partial \tau^w} = -\frac{w\mathcal{G}}{\Omega_1}, \qquad \frac{\partial w^{net}}{\partial \tau^e} = -\frac{w}{\Omega_1} = \mathcal{G}^{-1}\frac{\partial w^{net}}{\partial \tau^w} \tag{19}$$

$$\frac{\partial w^{lcost}}{\partial \tau^w} = \frac{w}{\Omega_2}, \qquad \frac{\partial w^{lcost}}{\partial \tau^e} = \frac{w}{\Omega_2}\mathcal{G}^{-1} = \mathcal{G}^{-1}\frac{\partial w^{lcost}}{\partial \tau^w} \tag{20}$$

Equations (18)–(20) highlight that employment is uniquely vulnerable to worker-side rate distortions relative to the total cost base. This asymmetry leads directly to the following real economic consequences.

Corollary 4 (**Scale of Non-Neutral Across-Sides Tax Reforms**). *In any economy featuring a pre-existing proportional tax burden ($\tau^e + \tau^w > 0 \implies \mathcal{G} > 1$), an ex-ante budget-neutral tax shift from the employee side to the employer side yields the following real economic reallocations:*

(a) ***Across-Sides Proportional Tax Reforms:*** *A revenue-neutral shift from worker to firm proportional tax margins ($d\tau^e = -d\tau^w > 0$) at constant unit levels ($db^e = db^w = 0$) causes worker net disposable income to rise, total firm labor costs to fall, and equilibrium employment to expand ($dN > 0$):*

$$\left.\frac{dw^{net}}{d\tau^e}\right|_{d\tau^e=-d\tau^w} = \frac{w}{\Omega_1}(\mathcal{G}-1) > 0 \tag{21}$$

$$\left.\frac{dw^{lcost}}{d\tau^e}\right|_{d\tau^e=-d\tau^w} = \frac{w}{\Omega_2}(\mathcal{G}^{-1}-1) < 0 \tag{22}$$

(b) ***Across-Sides Lump-Sum Tax Reforms:*** *A one-for-one nominal shift of fixed liabilities from worker transfers to firm payroll contributions ($db^e = db^w > 0$) at constant marginal rates ($d\tau^e = d\tau^w = 0$) causes net disposable income to rise, total labor costs to fall, and aggregate employment to expand ($dN > 0$):*

$$\left.\frac{dw^{net}}{db^e}\right|_{db^e=db^w} = \frac{1}{\Omega_1}(\mathcal{G}-1) > 0 \tag{23}$$

$$\left.\frac{dw^{lcost}}{db^e}\right|_{db^e=db^w} = \frac{1}{\Omega_2}(\mathcal{G}^{-1}-1) < 0 \tag{24}$$

Proof: See Online Online Appendix E □

While Corollary 4 shows that shifting statutory liabilities toward the firm side acts as an expansionary macroeconomic lever, our global numerical simulations in Section III reveal that this does not constitute a fiscal free lunch. Because the equilibrium adjustment triggers a decline in the gross wage base ($dw < 0$), these shifts compress the total income tax base. This erosion renders ex-ante revenue-balanced statutory reforms inherently non-neutral ex-post within a complete general equilibrium framework.

D. Minimum Wage

We can also analyze the configuration where a binding minimum wage pins employment down on the labor demand curve. Denoting this statutory minimum wage by $\bar{w}$, and keeping the remaining structural environment unchanged, the allocations are given by:

$$N^* = N^d = D_0\left[\bar{w}(1+\tau^e)+b^e\right]^{-\phi_d} \tag{25}$$

$$N^s = S_0\left[\bar{w}(1-\tau^w)+b^w\right]^{\phi_s} \tag{26}$$

$$U \equiv N^s - N^d = S_0\left[\bar{w}(1-\tau^w)+b^w\right]^{\phi_s} - D_0\left[\bar{w}(1+\tau^e)+b^e\right]^{-\phi_d} \tag{27}$$

Under a binding minimum wage, equilibrium employment is determined strictly by labor demand. Consequently, the labor wedge at the minimum wage is simply the ratio of total labor costs to the gross minimum wage and does not contain τ^w. While employment depends exclusively on firm-side parameters (b^e, τ^e), labor supply depends on the worker's net disposable income. As a result, aggregate unemployment depends symmetrically on both tax schedules. Interestingly, in this regime, an increase in the employee-side transfer b^w expands labor supply and pushes up unemployment, failing to stimulate employment as it did under alternative wage-setting regimes.

Proposition 3 (**Minimum Wages and Tax Neutrality**). *The relative marginal impact of proportional tax rates on equilibrium unemployment depends on an ex-post total tax wedge ratio ($\tilde{\mathcal{G}}$) that incorporates both proportional tax rates and lump-sum transfers:*

$$\tilde{\mathcal{G}} \equiv \frac{\bar{w}(1+\tau^e)+b^e}{\bar{w}(1-\tau^w)+b^w} \tag{28}$$

The relative marginal effect of proportional taxes on unemployment is governed by the ratio of supply and demand elasticities, the ex-post wedge, and the aggregate employment rate:

$$\frac{\frac{\partial U}{\partial \tau^w}}{\frac{\partial U}{\partial \tau^e}} = -\frac{\phi_s}{\phi_d}\left(\frac{N^s}{N^*}\right)\tilde{\mathcal{G}} = -\frac{\phi_s}{\phi_d}\left(\frac{1}{1-u}\right)\tilde{\mathcal{G}} \tag{29}$$

where $u \equiv 1 - N^*/N^s$ denotes the equilibrium unemployment rate.

Proof: It is shown in the Online Online Appendix F that

$$dU = K \times \left\{db^w - \bar{w}d\tau^w + \left(db^e + \bar{w}d\tau^e\right)\frac{\phi_d}{\phi_s}\frac{N^*}{N^s}\tilde{\mathcal{G}}^{-1}\right\}$$

giving the relative impact of each tax on unemployment. □

E. Progressive Taxation

We now extend our analysis to allow for progressive taxation using a power-function specification for the tax schedule (Feldstein, 1969; Heathcote, Storesletten and Violante, 2017). We focus on the subcase without lump-sum transfers ($b^e, b^w = 0$ and $\tau^e, \tau^w \neq 0$). For our purposes, the degree of tax progressivity is allowed to differ between the employee and employer sides of the labor market. Following standard notation, the net wage and labor cost are $\lambda^w w^{1-\psi^w}$ and $\lambda^e w^{1+\psi^e}$ respectively, where $\psi^w, \psi^e \geq 0$ govern the degree of progressivity; a value of zero implies a flat-rate tax (no progressivity, and $\lambda^e = 1+\tau^e, \lambda^w = 1-\tau^w$. Note by $\hat{\mathcal{G}} = \lambda^e/\lambda^w$ the equivalent of $\mathcal{G}$ in the absence of progressivity. In the next proposition, we establish the tax neutrality condition that applies to this context. In the general case, the tax rates vary with w. With progressivity, a positive marginal change of λ^e corresponds to an increase in the marginal tax rate on employers, whereas a positive marginal change of λ^w corresponds to a *decrease* in the marginal tax rate on employees, therefore flipping the signs of the condition for tax neutrality.

Proposition 4 (**Tax progressivity and Tax Neutrality**). *Under progressive taxation with parameters $\psi^w, \psi^e \geq 0$, a structural tax reform scaling up the tax profile through a marginal change of the parameters $\lambda^j, j = e, w$ is employment-neutral ($dN = 0$) if and only if:*

$$\left.\frac{d\lambda^e}{-d\lambda^w}\right|_{b^w=b^e=0} = -\frac{1+\psi^e}{1-\psi^w}\hat{\mathcal{G}} \tag{30}$$

Proof: See Online Online Appendix G □

That is, with progressivity, the pairwise MRPS between λ^e and $-\lambda^w$ is scaled by the ratio of employer-employee progressivity $\frac{1+\psi^e}{1-\psi^w}$. This implies that tax progressivity on either side of the market amplifies the required asymmetry: a larger increase in τ^e is needed to offset a given reduction in τ^w due to the scaling factor $\frac{1+\psi^e}{1-\psi^w} \geq 1$. This amplification effect is mutually reinforcing when progressivity is present on both sides simultaneously. Quantitatively, for France, over the period 2006 to 2024, average $\psi^w = 0.16$, while $\psi^e = 0.11$[3], making the scaling factor equal 1.32. Based on column (a) in Table 1, the resulting tax asymmetry wedge for France amounts to: (i) 3.828 for a single earner with no children at 67% of the average wage; (ii) 5.148 for the same earner with two children; and (iii) 3.168 for a two-earner couple both earning the average wage with two children.

Corollary 5 (**Subcase with $\psi^w = \psi^e = 0$**). *In the absence of progressive taxation $\psi^w = \psi^e = 0$ the tax incidence neutrality condition (30) simplifies back to Corollary 2.*

Proof: See Online Online Appendix G □

II. A Search Economy with Bargained Wages

We now introduce search frictions into a canonical matching framework featuring the same tax configuration as our baseline model. The details and derivations are provided in

[3]We estimate ψ^w, ψ^e from actual tax schedules by adjusting the notation as follows: $\ln w^{lcost} = \ln \lambda^e + (1+\psi^e)\ln w$ and $\ln[w^{net}] = \ln \lambda^w + (1-\psi^w)\ln w$ directly estimable by OLS, with $\lambda^w = 1-\tau^w$ and $\lambda^e = 1+\tau^e$.

Online Online Appendix H. Under a standard free-entry condition, firms post vacancies until the expected capitalized value of a vacancy is driven to zero. This relates the expected recruitment cost to the discounted stream of corporate profits, denoted by Π:

$$\frac{\gamma}{q(\theta)} = \frac{A - w(1+\tau^e) - b^e}{r+s} = \Pi \tag{31}$$

where A represents labor productivity, r is the risk-free discount rate, s is the exogenous job separation rate, and γ is the flow vacancy posting cost. The labor market tightness, θ, is defined as the vacancy-to-unemployment ratio, dictating the firm's job-filling rate $q(\theta)$, where $q'(\theta) < 0$, with parameters $q(\theta) = \mu\theta^{-\eta}$ for the calibration of the model in Section III.B.

Workers and firms split the economic surplus via Nash bargaining over the gross wage w, where $0 \le \alpha < 1$ denotes the worker's bargaining weight. As shown in the Online Appendix, the equilibrium wage vector—expressed in labor-cost terms (w^{lcost}), gross contract terms (w), and net-of-tax terms (w^{net})—is given by:

$$\begin{aligned} w^{lcost} &\equiv w(1+\tau^e) + b^e = \alpha(A + \theta\gamma) + (1-\alpha)\left[(z - b^w)\,\mathcal{G} + b^e\right] \\ w &= \alpha\frac{A + \theta\gamma - b^e}{1+\tau^e} + \frac{(z-b^w)(1-\alpha)}{1-\tau^w} \\ w^{net} &\equiv w(1-\tau^w) + b^w = \mathcal{G}^{-1}\alpha(A + \theta\gamma - b^e) + (1-\alpha)z + \alpha b^w \end{aligned}$$

where z captures the worker's flow utility of leisure, and $\mathcal{G} \equiv \frac{1+\tau^e}{1-\tau^w}$ is the structural tax asymmetry wedge. Substituting the wage equation into the free-entry condition (31) yields the fundamental equilibrium locus determining market tightness:

$$\frac{\gamma}{q(\theta)} = \frac{(1-\alpha)\left[A - (z-b^w)\,\mathcal{G} - b^e\right] - \alpha\gamma\theta}{r+s} \tag{32}$$

From (32), we can implicitly define the master policy locus $\mathcal{M}(\theta; \tau^e, \tau^w, b^e, b^w) = 0$. By taking the total differential with respect to the policy instruments while holding market tightness constant ($d\theta = 0$), we characterize the structural tax neutrality frontier in the frictional economy.

Proposition 5 (**Search Economy with Bargained Wages and Tax Neutrality**). *Let $\mathcal{G} \equiv \frac{1+\tau^e}{1-\tau^w}$ define the structural tax asymmetry wedge. The pairwise marginal rates of policy substitution (MRPS) preserving a constant equilibrium labor market tightness θ satisfy:*

(a) ***Across-Sides Proportional Tax Reform:*** *The trade-off between employer and employee proportional tax rates depends strictly on the baseline asymmetry wedge $\mathcal{G}$:*

$$MRPS_{\tau^e,\tau^w} \equiv \left.\frac{d\tau^e}{d\tau^w}\right|_{d\theta = db^e = db^w = 0} = -\mathcal{G} \tag{33}$$

(b) ***Across-Sides Lump-Sum Tax Reform:*** *The trade-off between employer and*

employee lump-sum instruments is perfectly symmetric if and only if $\mathcal{G} = 1$:

$$MRPS_{b^e,b^w} \equiv \left.\frac{db^e}{db^w}\right|_{d\theta=d\tau^e=d\tau^w=0} = \mathcal{G} \tag{34}$$

Consequently, b^e and b^w are perfect substitutes ($MRPS_{b^e,b^w} = 1$) exclusively in the knife-edge baseline where proportional taxes are absent ($\tau^e = \tau^w = 0$).

Proof: See Online Online Appendix H □

A difference with the competitive economy is the presence of a fixed part in wages due to the utility of leisure that cannot be compensated by an infinite marginal return to labor at zero employment. This implies that for the first vacancy to be created, a viability condition is needed in the Online Appendix, that, again, involves the ratio $\mathcal{G}$:

$$A - b^e > (z - b^w)\,\frac{1+\tau^e}{1-\tau^w} \tag{35}$$

This condition will reduce the range of taxes, in particular the marginal tax rates on the worker's side τ^w as illustrated next, in Section III.

III. Numerical illustrations

A. *Competitive markets*

We can illustrate our results with a set of simulations.[4] A first way of illustrating the asymmetry in marginal tax rates is to raise their values from zero, comparing their effects and when they diverge. This is done in Figure 1. It is very clear that the two curves corresponding to increasing marginal tax rates (darker blue for τ^e on employers contributions and lighter pink for τ^w for employees contributions) are close to each other until a threshold of 20%, and the curves then widely diverge.

Figure 1a captures the asymmetry in tax effects discussed in introduction in the case of linear tax schedules, where we claimed that a discrete jump from 0 to 0.2 of τ^w implied a drop in employment larger by 19.5% than the same discrete jump in τ^e. In addition, with the modest progressivity parameters $\psi^e, w = 0.15$ discussed in the above section, a discrete jump from 0 to 0.2 of τ^w implied a drop in employment larger by 49% than the same discrete jump in τ^e, and the corresponding tax asymmetry wedge $\mathcal{G}$ is as large as 2.0. In the OECD labor markets where both rates τ^e, w are typically above 25%, the asymmetry cannot be ignored.

We next show in Figure 2 the role of marginal tax rates τ^e, τ^w on employment changes relative to a benchmark at which both tax rates are equal to 0.5. The top panel shows the role of changing each tax rate (employers on the horizontal axis, employee taxes on the vertical axis) from this starting point. The black, dashed line is the 45-degree line that preserves the budget in the partial equilibrium sense defined in the previous section. This line, which is the locus of one-to-one transfers in taxes does not coincide with the

[4]We choose the parameters as follows: $\phi_s = 0.5$, $\phi_d = 1.2 > 1$. Results are rather robust to a wide range of parameters, e.g. as for $\phi_s = 1.5$, $\phi_d = 1.5$, see related charts in the Online Appendix.

iso-employment curve of Proposition 1 (the 0-contour plot, which is a less steep straight line). The fact that this 0-contour plot is flatter means that a rise in τ^w is much more distortive than a rise in τ^e, arising from the higher slope of the labor wedge $\mathcal{G}$ with respect to employee contributions. Interestingly, for the starting parameter values, in line with the labor market experience of many Western economies, a 10 percentage-point increase in the implicit tax rate of employee contributions τ^w is associated with a 10% decline in employment; it would require a prohibitively large increase of employer contributions τ^e to achieve a similar 10% decline in employment. The impact of component τ^e is much smaller because it is better absorbed in employment decisions. Another way to see this is that the tax revenue from workers' taxes has an inverted-U shape pattern, coming from the collapse of net wages - despite the increase in gross wages - when τ^w becomes prohibitive.

The two plots (2 (b), 2 (c)) in the second column show that the initial point matters. In the bottom left panel, which starts from $\tau^w = 0.1, \tau^e = 0.5$, one needs to increase τ^w by more than 30 percentage points to achieve a 10% decline in employment. And in the right bottom panel, starting from $\tau^w = 0.5, \tau^e = 0.1$, it shows that to reach a 10% decline in employment, it is now necessary to increase τ^w by 20 percentage-points. Starting from higher taxes makes them both more distortive and more asymmetric, but this effect is naturally stronger if one starts from a higher implicit tax rate τ^w.

Last, we simulate the effects of a substitution between taxes: In Figure 3, top panel, we show the impact of increasing τ^e and simultaneously reducing τ^w: this leads to an increase in employment, because the reduction in τ^w helps reducing gross wages, which reduces labor costs, despite the rise in employer taxes. The net disposable income of workers increases. Yet, this happens while reducing the total tax revenues (bottom panel); this is even due to the decreasing tax revenue that employment goes up: the tax wedge decreases.

B. Search market

A search economy, based on Online Appendix, can also be simulated. We choose a productivity parameter $A = 2$, the cost of posting vacancies of $\gamma = 0.6$, and otherwise standard values of parameters: $r = 4\%, s = 5\%, z = 0.3A, \alpha = .3, \eta = 0.6, \mu = .8$ where the matching rate for firms is $q(\theta) = \mu\theta^{-\eta}$.

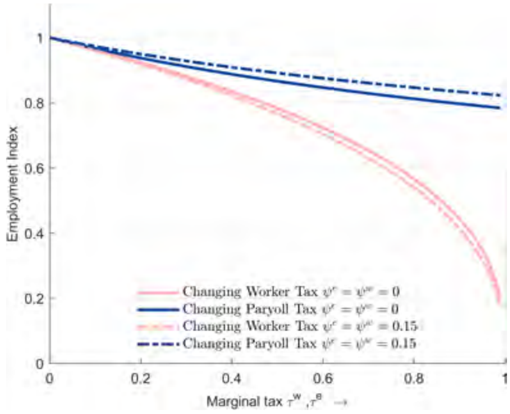
A difference with the previous simulations is that not all taxes are admissible. Indeed the economy must be viable, that is, there must be a positive profit for the first vacancy, featured by the viability condition (35). For instance with $\tau^e = 0$, a value of $\tau^w > 0.7$ is enough to make the economy no longer viable.

When raising the marginal tax rates from zero, in Figure 1, the darker blue curve for τ^e on employers contributions and lighter pink for τ^w for employees contributions again diverge. The divergence between the two tax schedules starts at $\tau^w = 0.45$ and the collapse in employment after $\tau^w > 0.6$, a value commonly found in some Western European countries such as France.

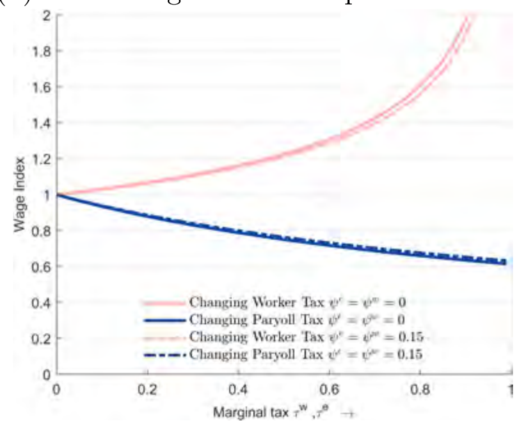
We also reproduce in Online Appendix the exercise of Figure 2 on the role of the asymmetry in the starting point : starting from either a situation in which both tax rates are equal to 0.5, or alternatively (0.1 and 0.5).

Figure 1. : Effect on employment and gross wages of varying marginal tax rates

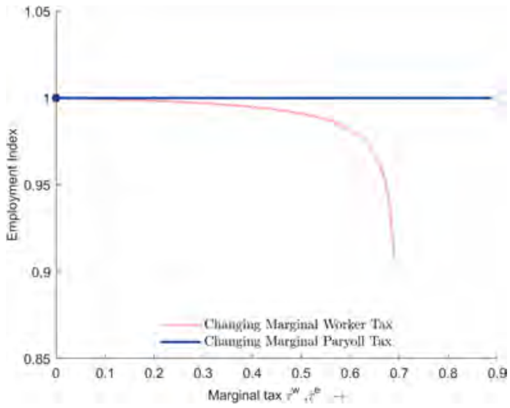
(a) Employment Index Competitive Model



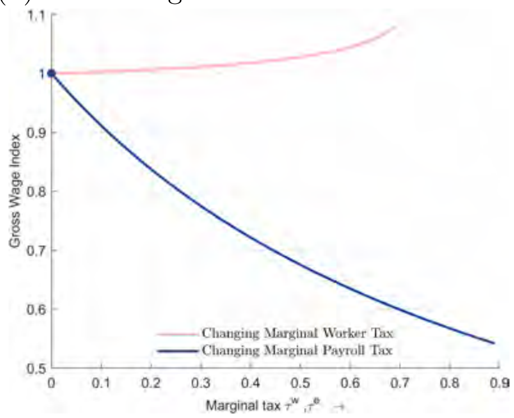
(b) Gross Wage Index Competitive Model



(c) Employment Index Search & Matching

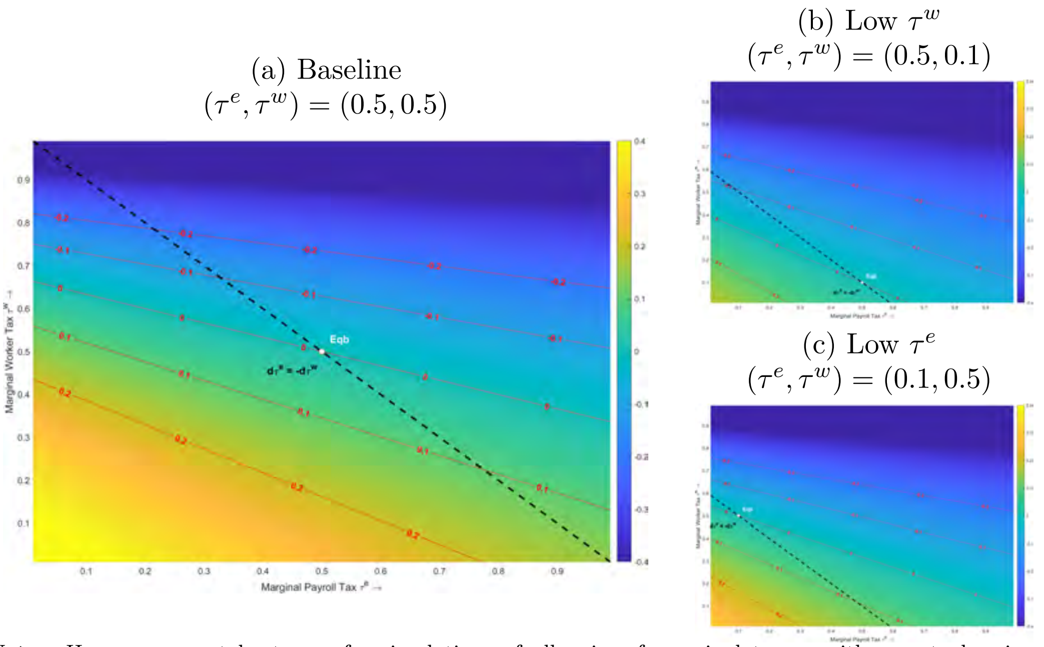


(d) Gross Wage Index Search & Matching



Notes: In this Figure, we show the effect of changing marginal taxes while keeping other parameters fixed. Sub-figure (a) and (b) are for the competitive labor supply and labor demand model with and without progressive taxation.The progressivity was kept at 0.15 symmetrically for both sides. Here, the fixed part of tax (or the unit taxes) $b^e = b^w = 0$; labor supply elasticity $\phi_s = 0.5$ and labor demand elasticity $\phi_d = 1.2$. As can be seen, for low values of the marginal tax, the effect on employment (top-left panel) is similar for both the marginal tax on either party, however, after a value of 0.2, the impact of marginal tax on worker diverges substantially from the blue line depicting impact of marginal tax on employer. Sub-figure (c) and (d) are for the search and matching model with Nash bargaining with workers' bargaining power as 0.3.

Figure 2. : Asymmetric Tax Incidence in the Labor Market



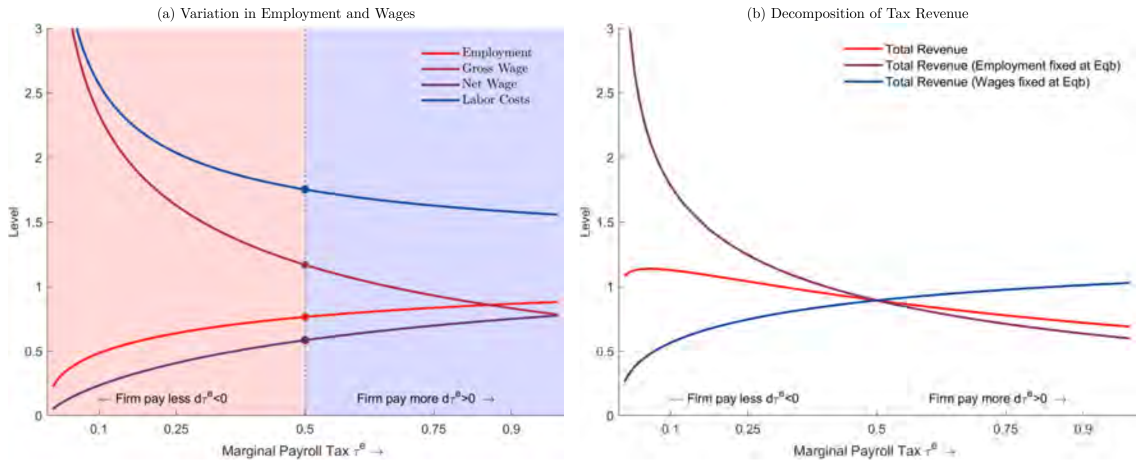
(a) Baseline
$(\tau^e, \tau^w) = (0.5, 0.5)$

(b) Low τ^w
$(\tau^e, \tau^w) = (0.5, 0.1)$

(c) Low τ^e
$(\tau^e, \tau^w) = (0.1, 0.5)$

Notes: Here, we report heatmaps for simulations of all pairs of marginal tax on either party keeping other parameters fixed for the competitive labor supply and labor demand model. The fixed part of tax (or the unit taxes) are set to $b^e = b^w = 0$. The panels a, b and c represent 3 different starting values of the marginal taxes. Panel (a) has both $\tau^e = \tau^w = 0.5$, while panel (b) and (c) have variations where the marginal tax is higher on the worker (panel (c)) or the employer (panel (b)). The red contour lines in each of the figures are iso-quant lines showing the loci of all pairs of (τ^e, τ^w) such that the employment is constant at the level of the value of the contour line.

Figure 3. : One to one conversion of tax rates



Notes: In the figure, we show how employment, gross wages, tax revenue changes when the marginal tax rate is changed. Here, the starting equilibrium shown with a vertical line in the middle of both figures is the point $\tau^e = \tau^w = 0.5$ with the fixed part of tax (or the unit taxes) $b^e = b^w = 0$. As one moves towards the right from the equilibrium line, the marginal tax on employer increases accompanied with a simultaneous decrease in the marginal tax on the worker with $d\tau^e = -d\tau^w$. As one moves towards the left from the equilibrium line the marginal tax on employer decreases accompanied with a simultaneous increase in the marginal tax on the worker with $d\tau^e = -d\tau^w$. All other parameters are fixed with the figure showing the competitive labor supply and labor demand model. Here, the top panels shows how employment increases when the tax incidence shifts towards the employer driven primarily by the decrease in gross wages. The decrease in gross wages results in the tax base being lower resulting in lower total tax revenue as shown in the bottom panel.

IV. Conclusion

This paper revisits the standard public finance result regarding statutory tax incidence. The incidence of payroll taxation is non-neutral in most cases when both lump-sum and proportional taxes coexist, except in a knife-edge case that is unlikely to occur in the labor market. This non-neutrality is quantitatively relevant when the baseline fiscal parameters reflect the high marginal tax rates—a pervasive characteristic of modern Western labor markets. Specifically, once historical proportional tax rates passed the 20 percent threshold established between the 1970s and early 1990s, linear approximations routinely utilized in standard textbooks are no longer valid and are actually quite misleading. Given the influence that this conventional wisdom has had on the design of targeted low-wage workfare policies, a re-evaluation of the tax-and-transfer architecture with this optic is in order.

It is, however, important to emphasize that the statutory non-neutrality of employment allocations does not imply a free-lunch situation where, by shifting statutory burdens by increasing proportional employer contributions while reducing employee rates, equilibrium gross wages are suppressed. One would increase equilibrium employment without a decrease in net tax revenues. In fact, the opposite is true: it is only when net tax revenues decrease that employment expands. Tax reforms that are considered revenue-balanced on an ex-ante basis (without taking general equilibrium effects into account) fail to maintain budget neutrality ex-post. Across-sides shifts expand employment precisely because they compress the comprehensive tax wedge, which simultaneously reduces aggregate tax collections.

Last, our analysis does not imply that targeted workfare subsidies are ineffective instruments for expanding aggregate labor supply. Rather, it highlights that such interventions require raising proportional taxes (since higher lump-sum components require reaching a certain threshold of gross wages). To fully evaluate these dynamics, the optimal joint configuration of coexisting lump-sum and proportional instruments must be modeled explicitly through the lens of the structural marginal rate of policy substitution—the tax asymmetry wedge $\mathcal{G}$, established in our framework. Extending these mechanisms to heterogeneous labor markets to fully assess the optimal design of modern fiscal policies is an ongoing research agenda (e.g. Alemán-Pericón et al. (2026) for France's successive reforms since the mid-1990s to the present).

:AI statement AI/LLM tools were used for copyediting (including this AI statement), generating visualization code, and preliminary mathematical checking. All final proofs, code, mathematical developments, and manuscript contents were independently verified by the authors, who assume full joint responsibility for the work.

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Online Appendix A: Benchmark Tax Schedule in Competitive Labor Markets: Derivation Details

Here we provide the details of the derivation of employment equilibirum and the full differentiation of employment and tax parameters.

A1. Employment Equilibrium Condition

Here, we lay out in detail the competitive labor markets model used in Section I.B, and the employment equilibrium condition. Let a representative agent have a standard CRRA utility function, additively separable in consumption and labor, $U(C,N)=\frac{C^{1-\sigma}}{1-\sigma}-\kappa\frac{N^{1+\frac{1}{\nu}}}{1+\frac{1}{\nu}}$ where C is consumption and N is aggregate labor input. Households choose C, N to maximize utility subject to net income and $\nu>0$ the standard labor disutility parameter.

The static household budget constraint includes the basic income guarantee b^w and a proportional tax τ^w:

$$C=[b^w+(1-\tau^w)w]N \tag{A.1}$$

Evaluating the household's marginal trade-off at full-time equivalent market returns yields the modified first-order condition:[5]

$$U_C\,[b^w+(1-\tau^w)w]=U_N \tag{A.2}$$

Solving this optimization problem delivers the structural labor supply function:

$$N^s=S_0\,[b^w+(1-\tau^w)w]^{\phi_s} \tag{A.3}$$

with an elasticity of labor supply $\phi_s=\frac{\nu(1-\sigma)}{1+\nu\sigma}>0$ and a proportional labor supply constant $S_0=\kappa^{-\frac{\nu}{1+\nu\sigma}}$.[6]

On the labor demand side, firms face a fixed per-worker payroll contribution b^e alongside the marginal tax rate τ^e. The firm's total net liability per worker is given by $b^e+(1+\tau^e)w$. Under decreasing returns to scale, the firm solves $\max_N Y(N)-[b^e+(1+\tau^e)w]N$. The corresponding first-order condition delivers the structural labor demand schedule:

$$N^d=D_0\,[b^e+(1+\tau^e)w]^{-\phi_d} \tag{A.4}$$

with $\phi_d=-\left(\frac{1}{\zeta-1}\right)>1$ under the standard decreasing returns condition $\zeta\in(0,1)$, and a baseline labor demand constant $D_0=(A\zeta)^{\phi_d}$.

Equilibrium To characterize the competitive labor market equilibrium, we equate supply and demand ($N=N^s=N^d$) to determine the unique market-clearing gross wage w. Inverting the labor demand function isolates the gross market wage:

$$\begin{aligned}\left(\frac{N}{D_0}\right)^{-\frac{1}{\phi_d}}&=b^e+(1+\tau^e)w\\ w&=\frac{1}{1+\tau^e}\left[\left(\frac{N}{D_0}\right)^{-\frac{1}{\phi_d}}-b^e\right]\end{aligned} \tag{A.5}$$

Substituting this equilibrium wage expression (A.5) directly into the labor supply function yields:

$$N=S_0\left[b^w+\frac{1-\tau^w}{1+\tau^e}\left[\left(\frac{N}{D_0}\right)^{-\frac{1}{\phi_d}}-b^e\right]\right]^{\phi_s} \tag{A.6}$$

[5]Where U_X stands for the marginal effect of $X=\{C,N\}$ on $U(C,N)$.

[6]A special case is that of linear consumption, where $\sigma\to 0$ and $N^s=\kappa^{-\nu}\left(b^w+(1-\tau^w)w\right)^{\nu}$. If $\sigma\to 1$, we approach the log-utility scenario in which income and substitution effects offset each other, yielding a constant labor supply $N^s=\kappa^{-\frac{\nu}{1+\nu}}$.

Rearranging terms establishes our targeted implicit equilibrium condition, $F(N; b^w, b^e, \tau^w, \tau^e) = 0$:

$$F(N; b^w, b^e, \tau^w, \tau^e) \equiv N - S_0 \left[b^w + \frac{1-\tau^w}{1+\tau^e} \left[\left(\frac{N}{D_0} \right)^{-\frac{1}{\phi_d}} - b^e \right] \right]^{\phi_s} = 0, \tag{A.7}$$

which recovers the equilibrium condition Equation (7).

Net Income and Labor Costs. Using the equilibrium wage condition, we can map out the structural outcomes for the total labor cost borne by the employer (w^{lcost}) and the net disposable income bundle of the worker (w^{net}) at the margin:

$$w^{lcost} = b^e + (1+\tau^e)w = \left(\frac{N}{D_0} \right)^{-\frac{1}{\phi_d}} \tag{A.8}$$

$$w^{net} = b^w + (1-\tau^w)w = b^w + \frac{1-\tau^w}{1+\tau^e} \left[\left(\frac{N}{D_0} \right)^{-\frac{1}{\phi_d}} - b^e \right] \tag{A.9}$$

Government Budget Balance. Let the government require a total fiscal financing target denoted by $\Gamma Y(N)$ where Γ is the share of total income spent by the government. The government budget balance condition incorporates revenue collected from both the proportional tax rates (τ^w, τ^e) and the net lump-sum adjustments ($b^e - b^w$) across total employment N and balances total revenue and total expenditure:

$$\left[(\tau^w + \tau^e)w + b^e - b^w \right] N = \Gamma Y(N) \tag{A.10}$$

where $\Gamma \in [0, 1]$ is an exogenous proportion of output devoted to government expenditure.

Subcase with Pure Proportional Taxes When there are no lump-sum components in the tax and transfer system ($b^w = 0$ and $b^e = 0$), the competitive labor market model collapses to a framework with pure proportional taxes. Under this parameterization, the implicit equilibrium mapping simplifies considerably:

$$N = S_0 \left[\frac{1-\tau^w}{1+\tau^e} \left(\frac{N}{D_0} \right)^{-\frac{1}{\phi_d}} \right]^{\phi_s} \tag{A.11}$$

Let the labor tax wedge $\tau_G \equiv \tau_G(\tau^w, \tau^e) = \frac{\tau^w + \tau^e}{1+\tau^e}$, that is,

$$1 - \tau_G = \frac{1-\tau^w}{1+\tau^e} \tag{A.12}$$

and substituting into the simplified equilibrium condition, we can analytically isolate the equilibrium employment level N on the left-hand side, yielding:

$$N = \left(S_0 D_0^{\frac{\phi_s}{\phi_d}} \right)^{\frac{\phi_d}{\phi_d + \phi_s}} (1 - \tau_G)^{\frac{\phi_s \phi_d}{\phi_d + \phi_s}} \tag{A.13}$$

Distributing the exponent across the scale parameters allows us to define the structural elasticity composite $\varepsilon \equiv \frac{\phi_s \phi_d}{\phi_d + \phi_s}$, which yields the final closed-form analytical solution for employment:

$$N = N_0 (1 - \tau_G)^{\varepsilon} \tag{A.14}$$

where $N_0 \equiv S_0^{\frac{\phi_d}{\phi_d + \phi_s}} D_0^{\frac{\phi_s}{\phi_d + \phi_s}}$ is the baseline competitive employment scale constant under zero taxation. Note that in this manner τ_G captures the labor wedge in Chari, Kehoe and McGrattan (2007). Further note that $1 - \tau_G = \mathcal{G}^{-1}$ is the inverse of the marginal rate of policy substitution (the asymmetric tax wedge) defined in Equation 11.

A2. Full Differentiation of Employment and Tax Parameters

This Appendix provides the step-by-step derivation of the localized response mapping presented in Equation (8), in Section I.B. Recall from Equation (7) that the competitive labor market equilibrium is defined implicitly by:

$$F(N; b^w, b^e, \tau^w, \tau^e) \equiv N - S_0 \left[b^w + \frac{1-\tau^w}{1+\tau^e} \left[\left(\frac{N}{D_0} \right)^{-\frac{1}{\phi_d}} - b^e \right] \right]^{\phi_s} = 0 \tag{A.15}$$

To simplify notation throughout the chain rule expansions, we define the employer total labor cost (w^{lcost}) and worker net disposable income (w^{net}) terms directly from their market clearing identities:

$$w^{lcost} = \left(\frac{N}{D_0} \right)^{-\frac{1}{\phi_d}} = b^e + (1+\tau^e) w \tag{A.16}$$

$$w^{net} = b^w + \frac{1-\tau^w}{1+\tau^e} \left[w^{lcost} - b^e \right] = b^w + (1-\tau^w) w \tag{A.17}$$

Note that from the structural labor supply equation, we have $N = S_0 (w^{net})^{\phi_s}$, which implies the marginal supply scale satisfies:

$$\phi_s S_0 (w^{net})^{\phi_s - 1} = \frac{\phi_s N}{w^{net}} \tag{A.18}$$

Applying the Implicit Function Theorem requires taking the partial derivatives of $F(N; \cdot)$ with respect to the endogenous variable N and each of the four statutory policy parameters.

First, we take the partial derivative with respect to employment (N):

$$\begin{aligned} \frac{\partial F}{\partial N} &= 1 - \left[\frac{\phi_s N}{w^{net}} \right] \left(\frac{1-\tau^w}{1+\tau^e} \right) \left[-\frac{1}{\phi_d} \left(\frac{N}{D_0} \right)^{-\frac{1}{\phi_d}-1} \frac{1}{D_0} \right] \\ &= 1 + \left[\frac{\phi_s N}{w^{net}} \right] \left(\frac{1-\tau^w}{1+\tau^e} \right) \left[\frac{1}{\phi_d N} w^{lcost} \right] \end{aligned} \tag{A.19}$$

Utilizing the definition of the statutory marginal tax wedge ratio, $\mathcal{G} \equiv \frac{1+\tau^e}{1-\tau^w}$, this simplifies compactly to:

$$\frac{\partial F}{\partial N} = 1 + \frac{1}{\mathcal{G}} \frac{\phi_s}{\phi_d} \frac{w^{lcost}}{w^{net}} \tag{A.20}$$

Second, the partial derivatives with respect to Lump-Sum Components (b^w, b^e):

$$\frac{\partial F}{\partial b^w} = - \left[\frac{\phi_s N}{w^{net}} \right] \cdot 1 = - \frac{\phi_s N}{w^{net}} \tag{A.21}$$

$$\frac{\partial F}{\partial b^e} = - \left[\frac{\phi_s N}{w^{net}} \right] \left(- \frac{1-\tau^w}{1+\tau^e} \right) = \frac{\phi_s N}{w^{net}} \frac{1}{\mathcal{G}} \tag{A.22}$$

Third, the partial derivatives with respect to proportional rates (τ^w, τ^e):

$$\frac{\partial F}{\partial \tau^w} = - \left[\frac{\phi_s N}{w^{net}} \right] \left(- \frac{1}{1+\tau^e} \right) \left[w^{lcost} - b^e \right] = \frac{\phi_s N}{w^{net}} w \tag{A.23}$$

$$\frac{\partial F}{\partial \tau^e} = - \left[\frac{\phi_s N}{w^{net}} \right] \left(- \frac{1-\tau^w}{(1+\tau^e)^2} \right) \left[w^{lcost} - b^e \right] = \frac{\phi_s N}{w^{net}} \frac{w}{\mathcal{G}} \tag{A.24}$$

Finally, setting the total differential $dF = 0$ yields the equilibrium variation condition:

$$\frac{\partial F}{\partial N} dN + \frac{\partial F}{\partial b^w} db^w + \frac{\partial F}{\partial b^e} db^e + \frac{\partial F}{\partial \tau^w} d\tau^w + \frac{\partial F}{\partial \tau^e} d\tau^e = 0 \tag{A.25}$$

Substituting our calculated partial derivatives directly into the total differential system gives:

$$\left(1 + \frac{1}{\mathcal{G}} \frac{\phi_s}{\phi_d} \frac{w^{lcost}}{w^{net}}\right) dN = \frac{\phi_s N}{w^{net}} \left[db^w - \frac{1}{\mathcal{G}} db^e - w d\tau^w - \frac{w}{\mathcal{G}} d\tau^e\right] \tag{A.26}$$

To cleanly isolate the policy parameters and map this expression directly onto the system's structural denominator, we multiply both sides of the equation by the scaling variable block $\mathcal{G} \cdot \left(\frac{w^{net}}{\phi_s N}\right)$:

$$\mathcal{G}\left(1 + \frac{1}{\mathcal{G}} \frac{\phi_s}{\phi_d} \frac{w^{lcost}}{w^{net}}\right) \left(\frac{w^{net}}{\phi_s N}\right) dN = \mathcal{G} db^w - db^e - \mathcal{G} w d\tau^w - w d\tau^e \tag{A.27}$$

which recovers the total variation equation in (8).

Online Appendix B: Properties of $\mathcal{G}$

Here we provide the proofs for Lemma 1 and Lemma 2 characterizing the tax asymmetry wedge $\mathcal{G} \equiv \frac{1+\tau^e}{1-\tau^w}$.

B1. Characterization of $\mathcal{G}$

Proof for Lemma 1:

Proof: Differentiating the tax asymmetry wedge $\mathcal{G}$ with respect to the employee tax rate τ^w yields:

$$\frac{\partial \mathcal{G}}{\partial \tau^w} = \frac{1+\tau^e}{(1-\tau^w)^2} > 0, \qquad \frac{\partial^2 \mathcal{G}}{\partial \tau^{w2}} = \frac{2(1+\tau^e)}{(1-\tau^w)^3} > 0 \tag{B.1}$$

Differentiating $\mathcal{G}$ with respect to the employer tax rate τ^e yields:

$$\frac{\partial \mathcal{G}}{\partial \tau^e} = \frac{1}{1-\tau^w} > 0, \qquad \frac{\partial^2 \mathcal{G}}{\partial \tau^{e2}} = 0 \tag{B.2}$$

The cross-derivatives are symmetric and equal to:

$$\frac{\partial^2 \mathcal{G}}{\partial \tau^w \partial \tau^e} = \frac{\partial^2 \mathcal{G}}{\partial \tau^e \partial \tau^w} = \frac{1}{(1-\tau^w)^2} > 0 \tag{B.3}$$

□

B2. Dominant Marginal Effect of τ^w over τ^e on $\mathcal{G}$

Proof for Lemma 2:

Proof: To establish the conditions for the dominant marginal effect of the employee tax rate, we compare the first partial derivatives derived in Lemma 1. Setting the inequality $\frac{\partial \mathcal{G}}{\partial \tau^w} > \frac{\partial \mathcal{G}}{\partial \tau^e}$ yields:

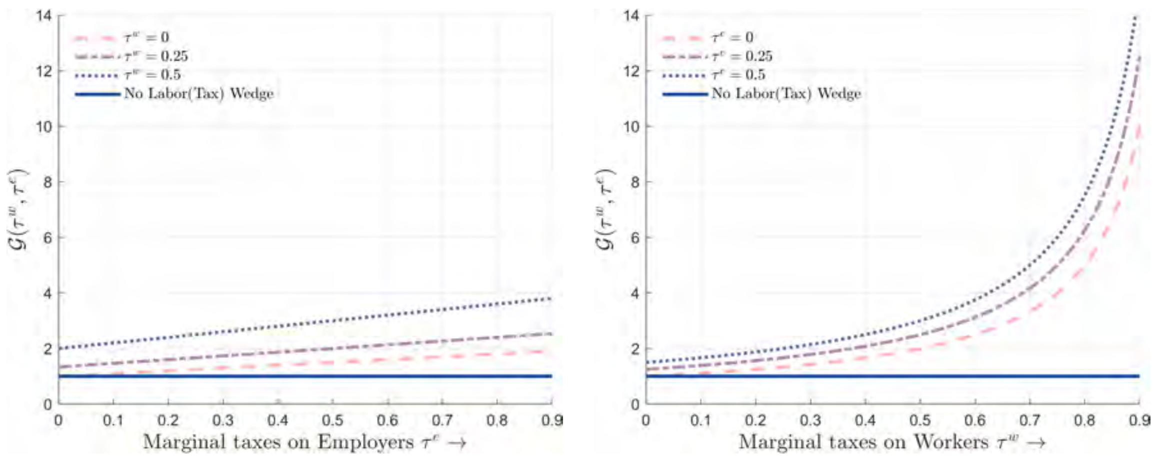
$$\frac{1+\tau^e}{(1-\tau^w)^2} > \frac{1}{1-\tau^w}$$

Multiplying both sides by the strictly positive term $(1-\tau^w)$ and rearranging simplifies the expression directly to:

$$\frac{1+\tau^e}{1-\tau^w} > 1 \qquad \text{or} \qquad \mathcal{G} > 1$$

Figure B.1. : Illustration of the Tax Asymmetry Wedge: Marginal Effects on $\mathcal{G}$

(a) Marginal Effects of τ^e: $\mathcal{G}(\overline{\tau}^w, \tau_e)$ (b) Marginal Effects of τ^w: $\mathcal{G}(\tau^w, \overline{\tau}_e)$



Notes: Let $\mathcal{G} = \frac{1+\tau^e}{1-\tau^w}$. This Figure illustrates the characterization of $\mathcal{G}$. We focus on the case $\tau^w + \tau^e > 0$. The left panel shows the effect of changing marginal taxes on employees, τ^w, while the right panel has the effect of changing marginal taxes on employers τ^e.

Under our benchmark structural parameter conventions ($\tau^w \in [0, 1)$ and $\tau^e \in [0, \infty)$), this condition is strictly equivalent to a strictly positive baseline statutory tax burden:

$$\tau^w + \tau^e > 0$$

We proceed analogously to evaluate the knife-edge case where marginal policy effects are symmetric. The condition $\dfrac{\partial \mathcal{G}}{\partial \tau^w} = \dfrac{\partial \mathcal{G}}{\partial \tau^e}$ is satisfied if and only if:

$$\frac{1+\tau^e}{(1-\tau^w)^2} = \frac{1}{1-\tau^w} \implies \frac{1+\tau^e}{1-\tau^w} = 1 \qquad \text{or} \qquad \mathcal{G} = 1$$

which holds true if and only if all tax distortions vanish entirely from both sides of the market:

$$\tau^w + \tau^e = 0$$

□

B3. Illustration of the Tax Asymmetry Wedge: Marginal Effects on $\mathcal{G}$

Figure B.1 illustrates the properties established in Lemma 1 and 2, showing that the marginal rate of policy substitution exhibits a fundamental structural asymmetry in response to changes in statutory tax rates. Panel (a) depicts the strictly positive and convex relationship between τ^w and $\mathcal{G}$. The curvature illustrates that the marginal impact of τ^w accelerates rapidly at higher baseline tax levels, emphasizing the dominant role of worker-side tax distortions. Conversely, The effect of τ^e on $\mathcal{G}$ is strictly linear, represented by straight lines with constant slopes. Crucially, the upward shifting and steepening of these lines as τ^w increases visually confirms the strictly positive cross-derivative, demonstrating that a higher employee tax rate compounds and intensifies the marginal impact of the employer tax.

Online Appendix C: Subcases

Here, we present the proof for the tax incidence neutrality conditions under both the subcase with pure lump-sum taxes (stated in Corollary 1), which represents the classic result of tax incidence invariance, and the subcase with pure proportional taxes (stated in Corollary 2).

C1. The Subcase of Economies with Pure Lump-Sum Taxes

Here, we detail the proof of Corollary 1 presented in Section I.B, which corresponds to the classic result of tax invariance (e.g. Fullerton and Metcalf, 2002) that our framework captures as a subcase with pure lump-sum taxes (i.e., with $\tau^w = \tau^e = 0$).

Proof: The result follows immediately by applying the parameter restrictions to the generalized boundary condition (10) established in Proposition 1. Setting the baseline proportional tax rates to zero ($\tau^w = \tau^e = 0$) collapses the marginal rate of policy substitution to unity, $\mathcal{G} = 1$. Furthermore, because the proportional tax rates are fixed at zero always, there is no variation along the marginal tax channels ($d\tau^w = d\tau^e = 0$). Substituting $\mathcal{G} = 1$ and $d\tau^w = d\tau^e = 0$ directly into the master neutrality locus of equation (10) yields (14). □

C2. The Subcase of Economies with Pure Proportional Taxes

Here, we detail the proof of Corollary 2 presented in Section I.B, which corresponds to the specific case recently studied in Pauwels and Schroyen (2024) and Poensgen and Rodrian (2025) that our framework captures as a subcase with pure proportional taxes (i.e., with $b^w = b^e = 0$).

Proof: Under pure proportional taxes, the lump-sum tax components are zero ($b^e = b^w = 0$), which eliminates any variation along the lump-sum channel ($db^w = db^e = 0$). Substituting $db^w = db^e = 0$ directly into the neutrality locus in equation (10) yields (15). □

Online Appendix D: Full Characterization of Pairwise Tax Reforms

This section provides the details for the proof of Corollary 3 presented in Section I.B, which fully characterizes the conditions for the neutrality of pairwise tax reforms.

Proof: The results follow directly from the master locus equation established in Proposition 1. By imposing the specific zero-variation conditions for each policy experiment, the total differential of the locus collapses into a bivariate relationship:

(a) Evaluating the master locus under $db^w = d\tau^w = 0$ yields the employer-side relation $db^e + wd\tau^e = 0$, implying $MRPS_{b^e,\tau^e} = -w$. Similarly, under $db^e = d\tau^e = 0$ yields the employee-side relation $db^w - wd\tau^w = 0$, implying $MRPS_{b^w,\tau^w} = w$.

(b) Setting $d\tau^e = d\tau^w = 0$ in the master locus isolates the lump-sum instruments, reducing the equation to $db^e - \mathcal{G}db^w = 0$, which yields $MRPS_{b^e,b^w} = \mathcal{G}$. Conversely, setting $db^e = db^w = 0$ isolates the proportional tax instruments, reducing the expression to $d\tau^e + \mathcal{G}d\tau^w = 0$, which yields $MRPS_{\tau^e,\tau^w} = -\mathcal{G}$. When the baseline proportional tax burden is zero ($\tau^w + \tau^e = 0$), then $\mathcal{G} = 1$, generating the knife-edge symmetric benchmark.

(c) Setting $db^w = d\tau^e = 0$ reduces the master locus to $db^e + w\mathcal{G}d\tau^w = 0$, yielding $MRPS_{b^e,\tau^w} = -w\mathcal{G}$. Setting $db^e = d\tau^w = 0$ reduces the locus to $\mathcal{G}db^w - wd\tau^e = 0$, yielding $MRPS_{b^w,\tau^e} = w\mathcal{G}^{-1}$. In the knife-edge case where $\tau^w + \tau^e = 0$, setting $\mathcal{G} = 1$ simplifies these expressions to $-w$ and w, respectively.

□

Online Appendix E: Direction and Scale of Non-Neutral Tax Reforms

This section presents two proofs. First, we provide the formal proof of Proposition 2 (presented in Section I.C), which establishes the direction of non-neutral tax reforms. Second, we present the proof of Corollary 4 (presented in Section I.C), which quantifies the scale of non-neutral across-sides tax reforms.

Proof: Consider the total differential of the master policy locus derived in equation (8), which isolates the structural co-movements of employment and policy instruments:

$$\Lambda \cdot dN = \mathcal{G}\left(db^w - wd\tau^w\right) - \left(db^e + wd\tau^e\right) \tag{E.1}$$

where $\Lambda \equiv \left(\frac{w^{net}}{\phi_s N}\right)\left(\mathcal{G} + \frac{\phi_s}{\phi_d}\frac{w^{lcost}}{w^{net}}\right) = \left[\frac{\mathcal{G}}{\phi_s}\frac{w^{net}}{N} + \frac{1}{\phi_d}\frac{w^{lcost}}{N}\right]$ aggregates the structural elasticities and base parameters of both sides of the market. Because labor supply and demand elasticities are strictly positive ($\phi_s, \phi_d > 0$), and equilibrium allocations and prices are strictly positive ($N, w^{net}, w^{lcost} > 0$), them the composite scaling coefficient is strictly positive ($\Lambda > 0$). It follows immediately from (E.1) that the sign of dN is identical to the sign of the right-hand side policy allocation vector. Imposing $dN > 0$ yields $\mathcal{G}\left(db^w - wd\tau^w\right) - \left(db^e + wd\tau^e\right) > 0$. Rearranging this inequality yields the expansionary threshold in (17). Inverting the inequality strictly delivers $dN < 0$. □

Proof: The proof follows immediately from evaluating the fully differentiated system under the respective cross-side linear constraints. For part (a), imposing $d\tau^e = -d\tau^w > 0$ and $db^e = db^w = 0$ into the system yields equations (21) and (22). Because $\mathcal{G} > 1$, the right-hand expressions settle into strictly positive and negative bounds, respectively ($\mathcal{G} - 1 > 0$ and $\mathcal{G}^{-1} - 1 < 0$). Via the iso-elastic labor demand curve N^d, a compression in total labor costs ($dw^{lcost} < 0$) requires an expansion in equilibrium employment ($dN > 0$). For part (b), imposing the constraint $db^e = db^w > 0$ and fixing marginal rates ($d\tau^e = d\tau^w = 0$) recovers identical directional signs for equations (23) and (24), ensuring $dw^{net} > 0$, $dw^{lcost} < 0$, and $dN > 0$. □

Online Appendix F: Minimum Wage Model

This section presents the formal proof of Proposition 3 (presented in Section I.D), which establishes the conditions for tax neutrality in the context of minimum wages.

Proof: The full differentiation of the text equation (27) leads to:

$$\begin{aligned}
dU &= d\{S_0\left[\bar{w}(1-\tau^w) + b^w\right]^{\phi_s}\} - d\{D_0\left[\bar{w}(1+\tau^e) + b^e\right]^{-\phi_d}\} \\
&= S_0\frac{(db^w - \bar{w}d\tau^w)}{\bar{w}(1-\tau^w) + b^w}\phi_s\left[\bar{w}(1-\tau^w) + b^w\right]^{\phi_s} + D_0\phi_d\frac{(db^e + \bar{w}d\tau^e)}{\bar{w}(1+\tau^e) + b^e}\left[\bar{w}(1+\tau^e) + b^e\right]^{-\phi_d} \\
&= \frac{db^w - \bar{w}d\tau^w}{\bar{w}(1-\tau^w) + b^w}\phi_s N^s + \phi_d\frac{(db^e + \bar{w}d\tau^e)}{\bar{w}(1+\tau^e) + b^e}N^* \\
&= \frac{\phi_s N^s}{\bar{w}(1-\tau^w) + b^w} \times \left\{db^w - \bar{w}d\tau^w + (db^e + \bar{w}d\tau^e)\frac{\phi_d}{\phi_s}\frac{\bar{w}(1-\tau^w) + b^w}{\bar{w}(1+\tau^e) + b^e}\frac{N^*}{N^s}\right\} \\
&= K \times \left\{db^w - \bar{w}d\tau^w + (db^e + \bar{w}d\tau^e)\frac{\phi_d}{\phi_s}\frac{N^*}{N^s}\tilde{\mathcal{G}}^{-1}\right\}
\end{aligned}$$

where $\tilde{\mathcal{G}} = \frac{\bar{w}(1+\tau^e)+b^e}{\bar{w}(1-\tau^w)+b^w}$. □

Online Appendix G: Progressive Taxation Model

Here, we extend the competitive labor market model to include progressive taxation and provide the formal proof of Proposition 4 (presented in Section I.E). We introduce progressive schedules via a power-tax function à la Heathcote, Storesletten and Violante (2017). For our purposes, the degree of tax progressivity is allowed to differ between the employee and employer sides of the labor market.

With progressive taxation and no lump-sum taxes ($b^e = b^w = 0$), labor demand N^d and labor supply N^s are respectively $N^s = S_0\left[\lambda^w w^{(1-\psi^w)}\right]^{\phi_s}$ and $N^d = D_0\left[\lambda^e w^{(1+\psi^e)}\right]^{-\phi_d}$. Equating $N^s = N^d$ and taking logs yields

$\ln S_0 + \phi_s \ln \lambda^w + (1-\psi^w)\phi_s \ln w = \ln D_0 - \phi_d \ln \lambda^e - (1+\psi^e)\phi_d \ln w$. Solving for equilibrium wages $\ln w$ yields

$$\ln w = \left[\ln D_0 - \ln S_0 - \phi_d \ln \lambda^e - \phi_s \ln \lambda^w\right] \Phi(\psi^w, \psi^e)^{-1} \tag{G.1}$$

with $\Phi(\psi^w, \psi^e) = (1-\psi^w)\phi_s + (1+\psi^e)\phi_d$.

Plug in $\ln w$ and solve for equilibrium employment $\ln N$

$$\ln N = \frac{1}{\alpha_1}\left(\ln \lambda^w - \frac{1-\psi^w}{1+\psi^e} \ln \lambda^e + \alpha_0\right) \tag{G.2}$$

with $\alpha_1 = \frac{1}{\phi_s} + \frac{1-\psi^w}{(1+\psi^e)\phi_d}$ and $\alpha_0 = \frac{1}{\phi_s}\ln S_0 + \frac{1-\psi^w}{(1+\psi^e)\phi_d} \ln D_0$.

A positive marginal change of λ^w corresponds to a *decrease* in the marginal tax rate on employees. Proposition 4 precisely establishes the conditions for tax neutrality under tax progressivity.

Proof: Employment-neutrality requires $d \ln N = 0$, which implies from equation (G.2):

$$\frac{-d\lambda^w}{\lambda^w} + \frac{1-\psi^w}{1+\psi^e} \cdot \frac{d\lambda^e}{\lambda^e} = 0$$

Then, isolating $d\lambda^e/d\lambda^w$ delivers (30):

$$\frac{d\lambda^e}{-d\lambda^w} = -\frac{1+\psi^e}{1-\psi^w} \cdot \frac{\lambda^e}{\lambda^w} = -\frac{1+\psi^e}{1-\psi^w} \cdot \hat{\mathcal{G}}$$

□

where $\hat{\mathcal{G}} = \frac{\lambda^e}{\lambda^w}$ and equals $\mathcal{G}$ in the absence of progressivity.

Further, Corollary 5 states that if $\psi^w = \psi^e = 0$ then we return to the subcase in Corollary 2. The formal proof is here.

Proof: After imposing $\psi^w = \psi^e = 0$ on condition (30) or the Appendix equation right above, it collapses to $-\mathcal{G}$, recovering Corollary 2. □

Online Appendix H: Labor Search

H1. Labor Search Model

In a search model with labor taxes and N, labor demand is determined by a free-entry condition: firms post vacancies up to the point at which the value of a vacancy is zero. The demand for goods is summarized by parameter A reflecting the firm revenue. The classical condition follows: it equalizes the expected search costs paid by firms and the discounted profits denoted by Π:

$$\frac{\gamma}{q(\theta)} = \frac{A - w(1+\tau^e) - b^e}{r+s} = \Pi$$

Workers's values are given by:

$$\begin{aligned} rW_u &= z + \theta q(\theta)\left[W_n - W_u\right] \\ rW_n &= w(1-\tau^w) + b^w + s\left[W_u - W_n\right] \end{aligned}$$

and the surplus of the worker S_w is determined by

$$S_w(w) = W_n - W_u = \frac{w(1-\tau^w) + b^w - rW_u}{r+s}$$

We have the Nash solution as follows:

$$\max_w S_w^\alpha \Pi^{1-\alpha}$$

leading to the first order conditions, reintroducing the labor wedge $\mathcal{G} = \frac{1+\tau^e}{1-\tau^w}$:

$$
\begin{aligned}
\alpha \frac{\frac{\partial S_w}{\partial w}}{S_w} &= (1-\alpha)\frac{-\frac{\partial \Pi}{\partial w}}{\Pi} \\
\alpha \frac{1-\tau^w}{S_w} &= (1-\alpha)\frac{1+\tau^e}{\Pi} \\
\alpha \Pi &= S_w(1-\alpha)\mathcal{G} \\
\alpha\left(A - w(1+\tau^e) - b^e\right) &= \left(w(1-\tau^w) + b^w - rW_u\right)(1-\alpha)\mathcal{G}
\end{aligned}
$$

Replacing rW_u as usual by

$$
rW_u = z + \theta q(\theta)\Pi\mathcal{G}^{-1}\frac{\alpha}{1-\alpha} = z + \theta q(\theta)\frac{\gamma}{q(\theta)}\mathcal{G}^{-1}\frac{\alpha}{1-\alpha} = z + \theta\gamma\mathcal{G}^{-1}\frac{\alpha}{1-\alpha}
$$

we obtain

$$
\begin{aligned}
rW_u = z + \theta q(\theta)\Pi\mathcal{G}^{-1}\frac{\alpha}{1-\alpha} &= z + \theta\gamma\mathcal{G}^{-1}\frac{\alpha}{1-\alpha} \\
\alpha\left(A - w(1+\tau^e) - b^e\right) &= \left(w(1-\tau^w) + b^w - z - \theta\gamma\mathcal{G}^{-1}\frac{\alpha}{1-\alpha}\right)(1-\alpha)\mathcal{G} \\
w\left[(1-\alpha)\mathcal{G}(1-\tau^w) + \alpha(1+\tau^e)\right] &= \alpha\left(A - b^e\right) + \left(z - b^w\right)(1-\alpha)\mathcal{G} + \alpha\theta\gamma \\
w(1+\tau^e) &= \alpha\left(A + \theta\gamma - b^e\right) + \left(z - b^w\right)(1-\alpha)\mathcal{G} \\
w^{lcost} &= \alpha\left(A + \theta\gamma - b^e\right) + \left(z - b^w\right)(1-\alpha)\mathcal{G} + b^e \\
&= \alpha(A+\theta\gamma) + (1-\alpha)\left[\left(z - b^w\right)\mathcal{G} + b^e\right] \\
w &= \alpha\left(\frac{A + \theta\gamma - b^e}{1+\tau^e}\right) + \frac{\left(z - b^w\right)(1-\alpha)}{1-\tau^w} \\
w^{net} - b^w &= \mathcal{G}^{-1}\alpha(A + \theta\gamma - b^e) + \left(z - b^w\right)(1-\alpha) \\
w^{net} &= \mathcal{G}^{-1}\alpha(A + \theta\gamma - b^e) + (1-\alpha)z + \alpha b^w
\end{aligned}
$$

Employment is given by

$$
N = 1 - U = \frac{\theta^* q(\theta^*)}{s + \theta^* q(\theta^*)}
$$

where equilibrium market tightness uses the free entry condition and the equilibrium value of the wage.

$$
\begin{aligned}
\frac{\gamma}{q(\theta)} &= \frac{A - w^{lcost}}{r+s} \\
&= \frac{(1-\alpha)\left[A - \left(z - b^w\right)\mathcal{G} - b^e\right] - \alpha\gamma\theta}{r+s}
\end{aligned}
$$

Assuming Cobb-Douglas matching technology with matching efficiency μ and elasticity η

$$
\theta = \left(\frac{\mu\left[A - w(1+\tau^e) - b^e\right]}{\gamma(r+s)}\right)^{\frac{1}{\eta}}
$$

Not all tax ranges are acceptable: viability requires that the right hand side is positive for all positive values of θ and therefore:

$$
(1-\alpha)\left[A - \left(z - b^w\right)\mathcal{G} - b^e\right] > 0
$$

implying:

$$
A - b^e > \left(z - b^w\right)\frac{1+\tau^e}{1-\tau^w} \tag{H.1}
$$

H2. Search and Tax Neutrality

Here, we establish the conditions for tax neutrality in the labor search model, as presented in Proposition 5 (Section II).

Proof: To isolate policy configurations that leave the equilibrium market tightness θ invariant, we impose $d\theta = 0$ and take the total differential of the fundamental equilibrium matching locus (32):

$$-(1-\alpha)\left[(z-b^w)d\mathcal{G} - \mathcal{G}db^w + db^e\right] = 0 \tag{H.2}$$

Since $1-\alpha \neq 0$, the bracketed expression must equal zero. Expanding the total differential of the tax wedge yields $d\mathcal{G} = \frac{1}{1-\tau^w}d\tau^e + \frac{1+\tau^e}{(1-\tau^w)^2}d\tau^w$. Substituting this back into (H.2) yields the master policy locus under search frictions:

$$db^e - \mathcal{G}db^w + \left(\frac{z-b^w}{1-\tau^w}\right)d\tau^e + \mathcal{G}\left(\frac{z-b^w}{1-\tau^w}\right)d\tau^w = 0 \tag{H.3}$$

(a) To analyze the proportional tax mix, we hold the lump-sum instruments fixed ($db^e = db^w = 0$). The master equation (H.3) reduces directly to:

$$\left(\frac{z-b^w}{1-\tau^w}\right)d\tau^e = -\mathcal{G}\left(\frac{z-b^w}{1-\tau^w}\right)d\tau^w$$

Under the assumption that the worker's net value of leisure is non-trivial ($z \neq b^w$), the common scaling terms cancel perfectly from both sides. This yields:

$$\left.\frac{d\tau^e}{d\tau^w}\right|_{d\theta=0} = -\mathcal{G}$$

which establishes that the asymmetric incidence of proportional taxes operates identically through $\mathcal{G}$ in the frictional economy.

(b) To isolate the lump-sum tax trade-off, we hold the proportional tax components constant ($d\tau^e = d\tau^w = 0$). Equation (H.3) simplifies immediately to:

$$db^e - \mathcal{G}db^w = 0 \implies \left.\frac{db^e}{db^w}\right|_{d\theta=0} = \mathcal{G}$$

Again, perfect policy substitution between sides of the market requires an MRPS of exactly 1. This condition holds if and only if $\mathcal{G} = 1$. In any economy with pre-existing proportional taxes ($\tau^e + \tau^w > 0$), we have $\mathcal{G} \neq 1$, generating an inherent policy asymmetry for statutory lump-sum transfers.

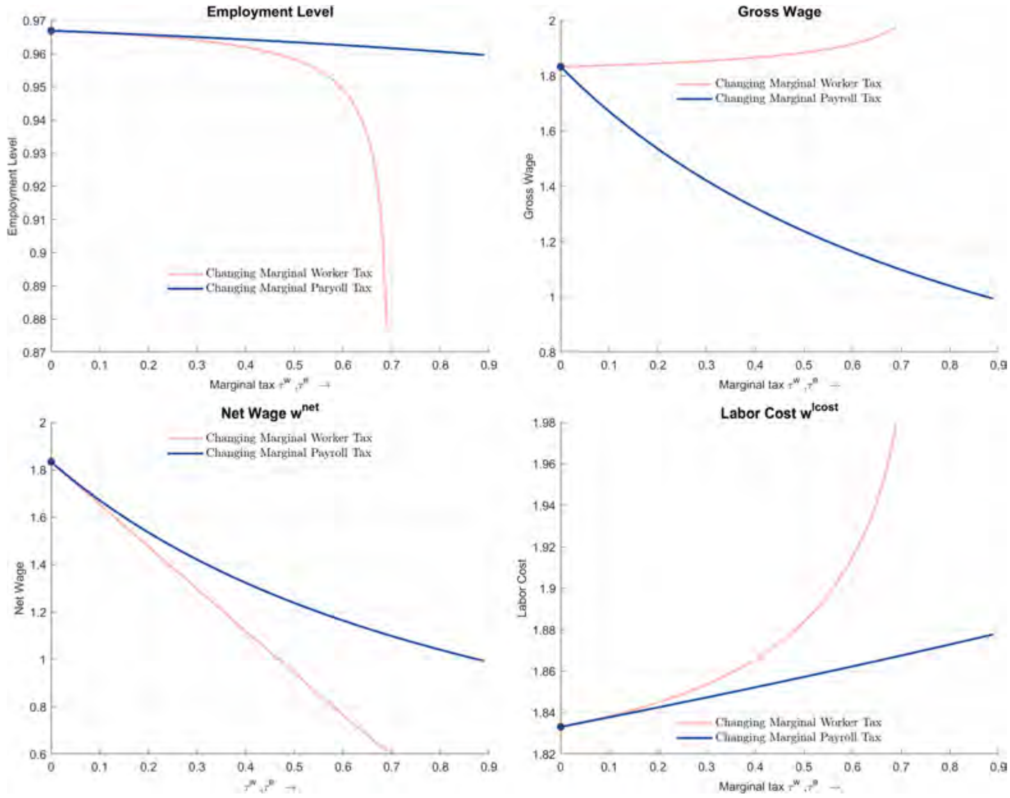
□

Online Appendix I: Online Appendix: Additional Figures

Increasing Labor Supply and Labor Demand Elasticities

In the main text we showed the effect of changing marginal taxes on employment and gross wages. Here, we increase the labor supply elasticity from $\phi_s = 0.5$ to $\phi_s = 1.5$ and increase the labor demand elasticity from $\phi_d = 1.2$ to $\phi_d = 1.5$. The results shown in figure I.1 are similar in nature to figure 1. We also increase the bargaining power of the worker to showcase the effects for the search and matching model in figure I.1 part c and d.

Figure H.1. : Search Model: Effect on employment, wages, labor costs and tax revenue of varying marginal tax rates

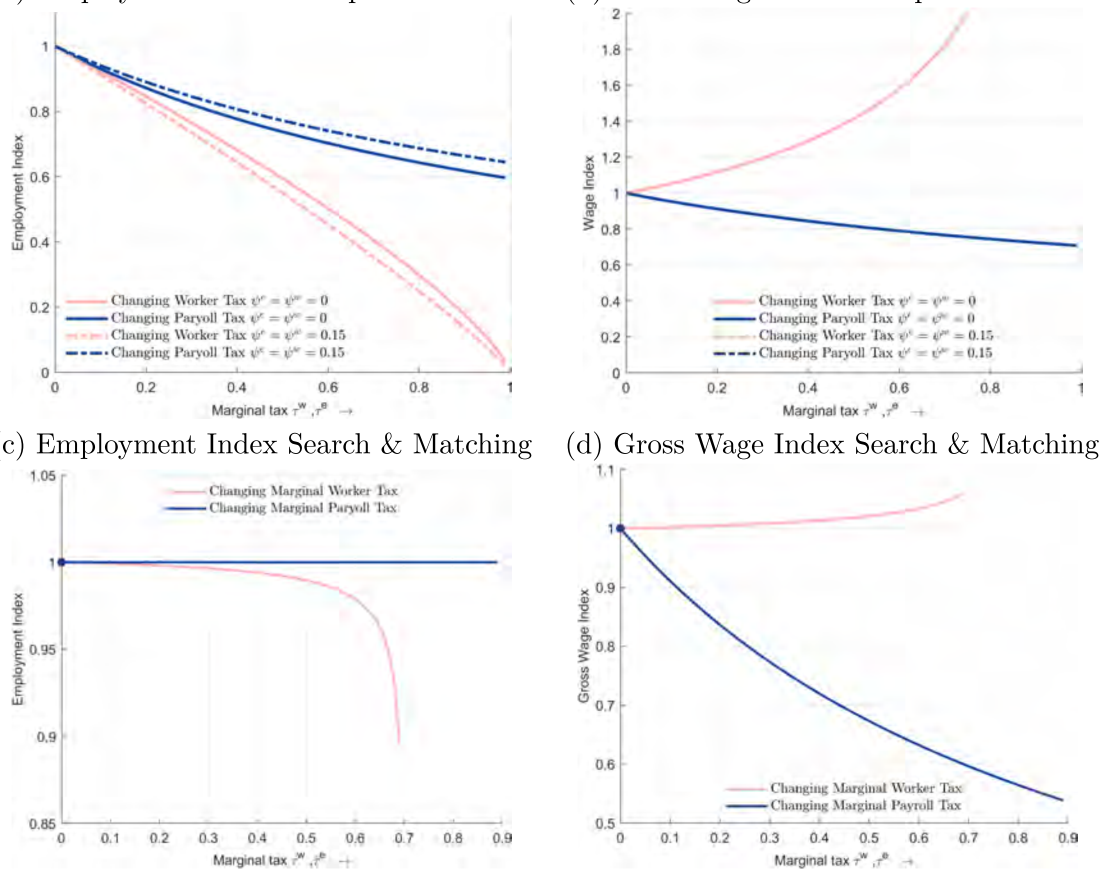


Notes: In this Figure, we show the effect of changing marginal taxes while keeping other parameters fixed for the search and matching model with wages determined by Nash Bargaining. Here, the fixed part of tax (or the unit taxes) $b^e = b^w = 0$. The effect on employment (top-left panel) is similar for both the marginal tax on either party for low values of the marginal tax but diverges rapidly after a value of 0.4. As the marginal tax on worker increases, firms do not create any vacancy in the search model as the gross wage increases rapidly at higher values of τ^w.

Figure I.1. : Effect on employment and gross wages of varying marginal tax rates

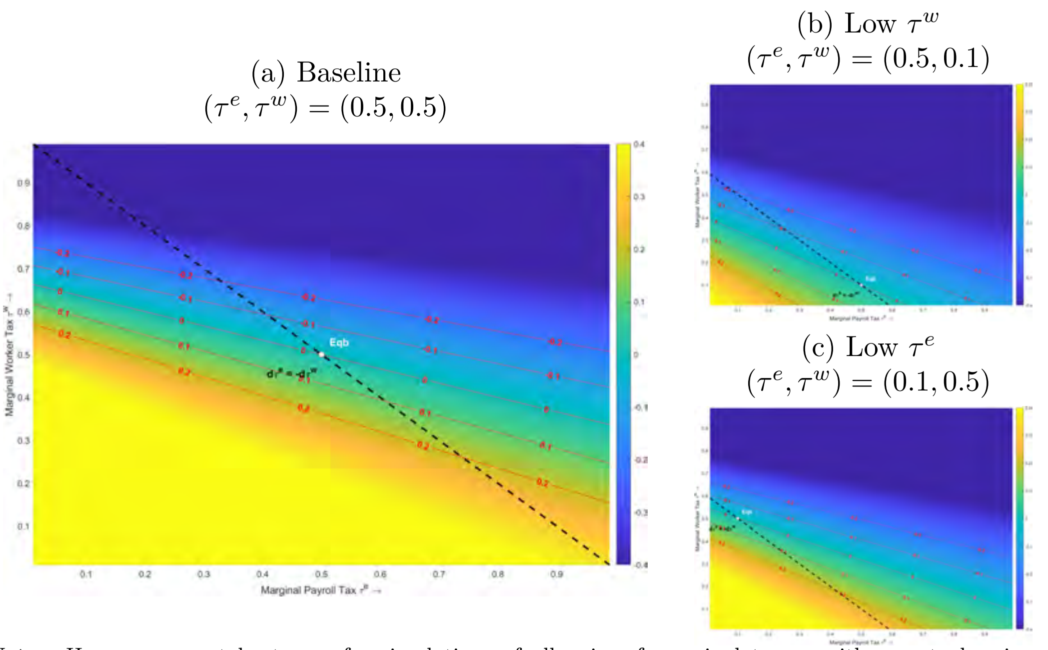
(a) Employment Index Competitive Model (b) Gross Wage Index Competitive Model

(c) Employment Index Search & Matching (d) Gross Wage Index Search & Matching



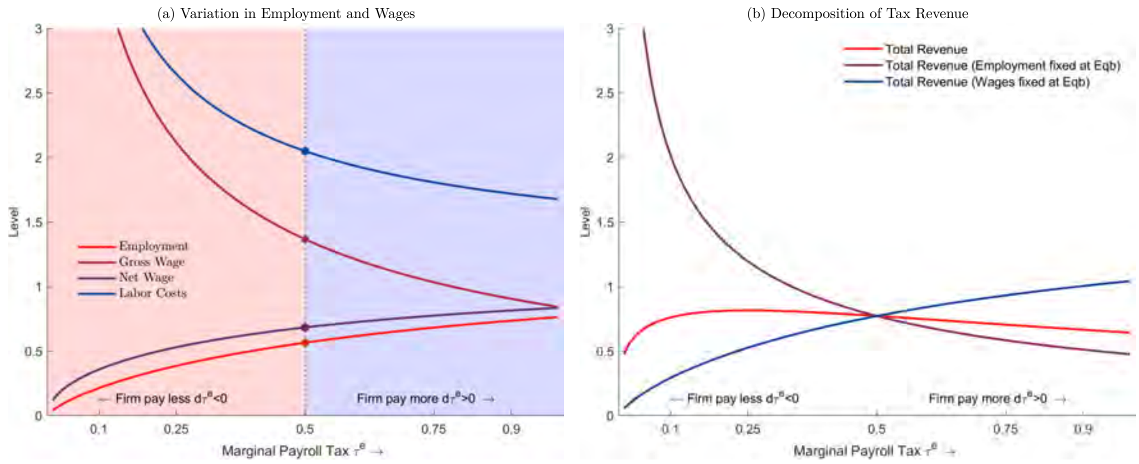
Notes: In this Figure, we show the effect of changing marginal taxes while keeping other parameters fixed. Sub-figure (a) and (b) are for the competitive labor supply and labor demand model with and without progressive taxation.The progressivity was kept at 0.15 symmetrically for both sides. Here, the fixed part of tax (or the unit taxes) $b^e = b^w = 0$; labor supply elasticity $\phi_s = 1.5$ and labor demand elasticity $\phi_d = 1.5$. As can be seen, for low values of the marginal tax, the effect on employment (top-left panel) is similar for both the marginal tax on either party, however, after a value of 0.2, the impact of marginal tax on worker diverges substantially from the blue line depicting impact of marginal tax on employer. Sub-figure (c) and (d) are for the search and matching model with Nash bargaining with workers' bargaining power as 0.4.

Figure I.2. : Asymmetric Tax Incidence in the Labor Market with increased labor supply and demand elasticities



Notes: Here, we report heatmaps for simulations of all pairs of marginal tax on either party keeping other parameters fixed for the competitive labor supply and labor demand model with $\phi_d = \phi_s = 1.5$. Here, the fixed part of tax (or the unit taxes) $b^e = b^w = 0$. The panels a, b and c represent 3 different starting values of the marginal taxes. Panel (a) has both $\tau^e = \tau^w = 0.5$, while panel (b) and (c) have variations where the marginal tax is higher on the worker (panel (c)) or the employer (panel (b)). The red contour lines in each of the figures are iso-quant lines showing the loci of all pairs of (τ^e, τ^w) such that the employment is constant at the level of the value of the contour line.

Figure I.3. : One to one conversion of tax rates with increased labor supply and demand elasticities



Notes: In the figure, we show how employment, gross wages, tax revenue changes when the marginal tax rate is changed for the competitive labor supply and labor demand model with $\phi_d = \phi_s = 1.5$. Here, the starting equilibrium shown with a vertical line in the middle of both figures is the point $\tau^e = \tau^w = 0.5$ with the fixed part of tax (or the unit taxes) $b^e = b^w = 0$. As one moves towards the right from the equilibrium line, the marginal tax on employer increases accompanied with a simultaneous decrease in the marginal tax on the worker with $d\tau^e = -d\tau^w$. As one moves towards the left from the equilibrium line the marginal tax on employer decreases accompanied with a simultaneous increase in the marginal tax on the worker with $d\tau^e = -d\tau^w$. All other parameters are fixed with the figure showing the competitive labor supply and labor demand model. Here, the top panels shows how employment increases when the tax incidence shifts towards the employer driven primarily by the decrease in gross wages. The decrease in gross wages results in the tax base being lower resulting in lower total tax revenue as shown in the bottom panel.

Online Appendix J: Online Appendix: Effect of changing tax parameters on the equilibrium

J1. Effect of changing unit tax (b^e) on employers

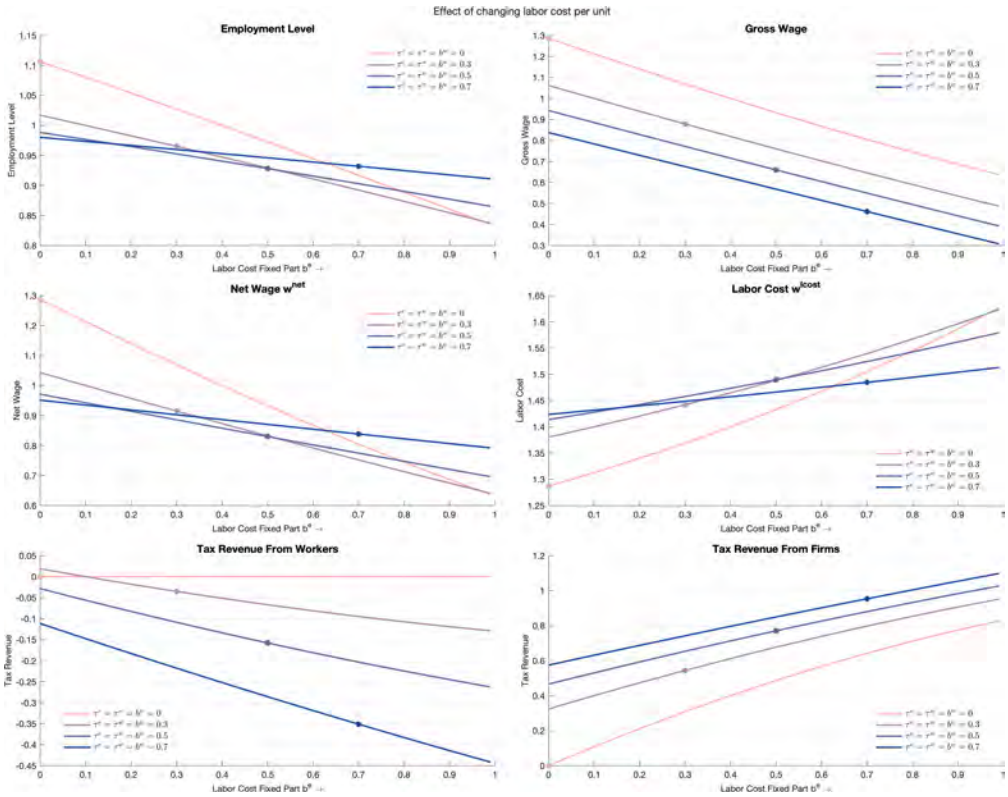


Figure J.1. : Effect on employment, wages, labor costs and tax revenue of varying employer unit tax rates (b^e)

Notes: In this Figure, we show the effect of changing unit tax on employer b^e while keeping other parameters fixed for the competitive labor supply and labor demand model. Moving from left to right on the horizontal axis for each plot, the unit tax on employer increases making the labor costs higher. The starting point for each plot is the situation where the unit tax $b^e = 0$ and gradually the employers pays a higher value. The four different lines in each plot represent 4 combinations of tax parameters which are kept constant as the unit tax on employer is changed. As b^e increases, the employment, net wages, gross wages fall, while the labor costs and tax revenue from employers increases.

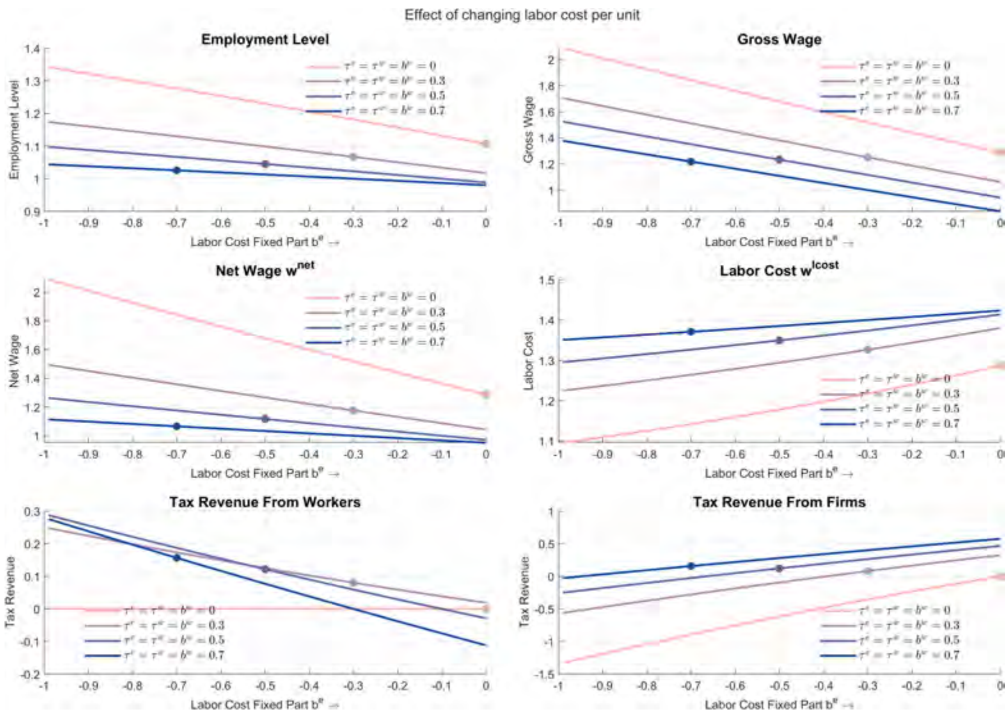


Figure J.2. : Effect on employment, wages, labor costs and tax revenue of varying employer unit tax rates (b^e)

Notes: In this Figure, we show the effect of changing unit tax on employer b^e while keeping other parameters fixed for the competitive labor supply and labor demand model. Moving from left to right on the horizontal axis for each plot, the unit tax on employer increases making the labor costs higher. The starting point for each plot is the situation where the unit tax $b^e = -1$, i.e., the employer receives a subsidy and moving left to right the subsidy is reduced to 0. The four different lines in each plot represent 4 combinations of tax parameters which are kept constant as the unit tax on employer is changed. As b^e increases, the employment, net wages, gross wages fall, while the labor costs and tax revenue from employers increases.

J2. *Effect of changing unit tax (b^w) on workers*

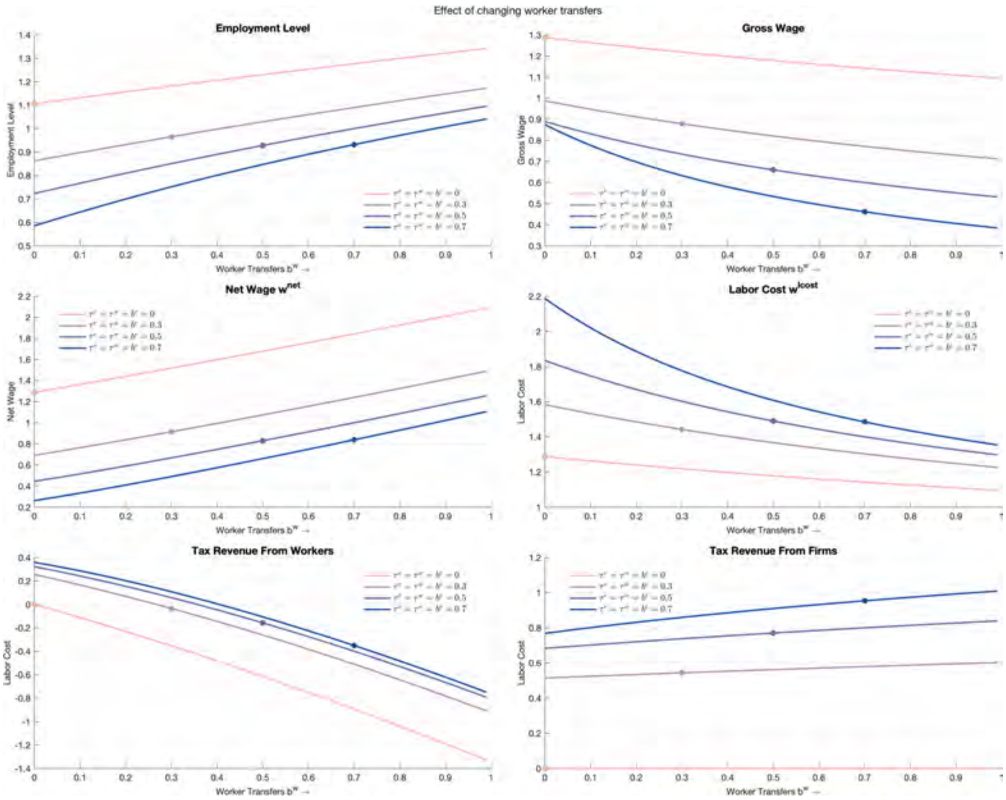


Figure J.3. : Effect on employment, wages, labor costs and tax revenue of varying worker unit tax rates (b^w)

Notes: In this Figure, we show the effect of changing unit transfer on worker b^w while keeping other parameters fixed for the competitive labor supply and labor demand model. Moving from left to right on the horizontal axis for each plot, the unit tax on worker increases making the net wage higher. The starting point for each plot is the situation where the unit tax $b^w = 0$ and moving horizontally left to right the worker receives a higher transfer. The four different lines in each plot represent 4 combinations of tax parameters which are kept constant as the unit tax on worker is changed. As b^w increases, employment and net wages rise, while the labor costs, gross wage and tax revenue from workers decreases.

J3. Effect of changing marginal tax (τ^w) on workers

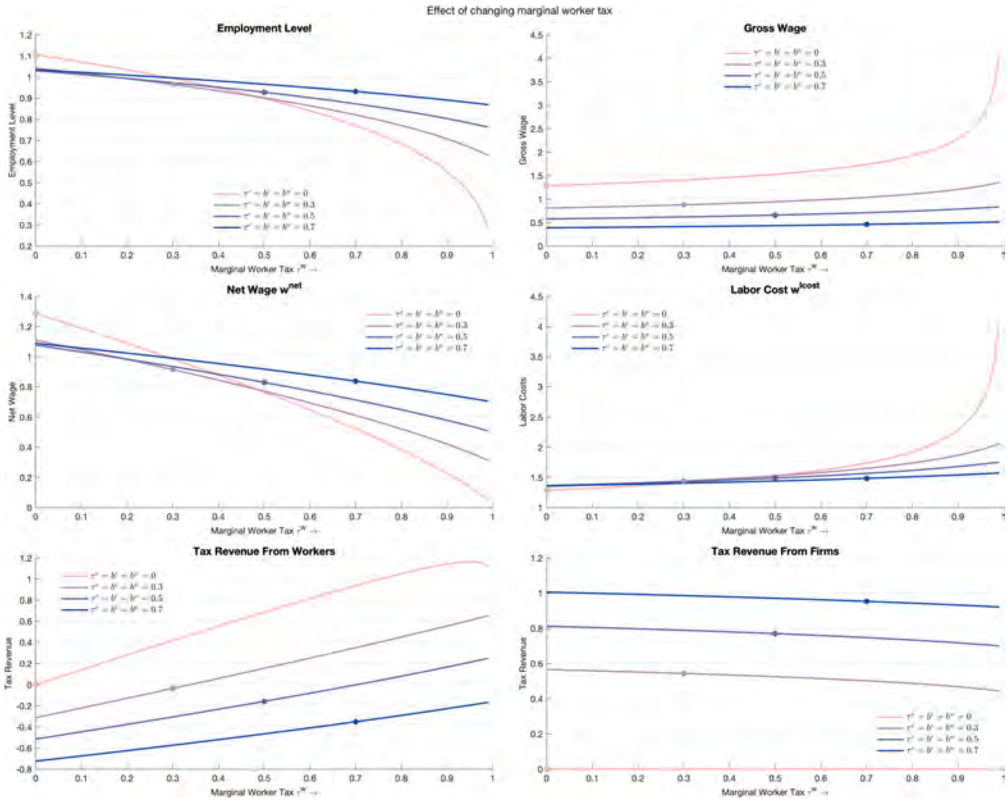


Figure J.4. : Effect on employment, wages, labor costs and tax revenue of varying worker marginal tax rates (τ^w)

Notes: In this Figure, we show the effect of changing marginal tax on worker τ^w while keeping other parameters fixed for the competitive labor supply and labor demand model. Moving from left to right on the horizontal axis for each plot, the marginal tax on worker increases making the net wage lower. The starting point for each plot is the situation where the marginal tax $\tau^w = 0$ and moving horizontally left to right the worker pays a higher proportion of gross wage as tax. The four different lines in each plot represent 4 combinations of tax parameters which are kept constant as the marginal tax on worker is changed. As τ^w increases, employment and net wages fall, while the labor costs, gross wage and tax revenue from workers increases.

J4. Effect of changing marginal tax (τ^e) on employers

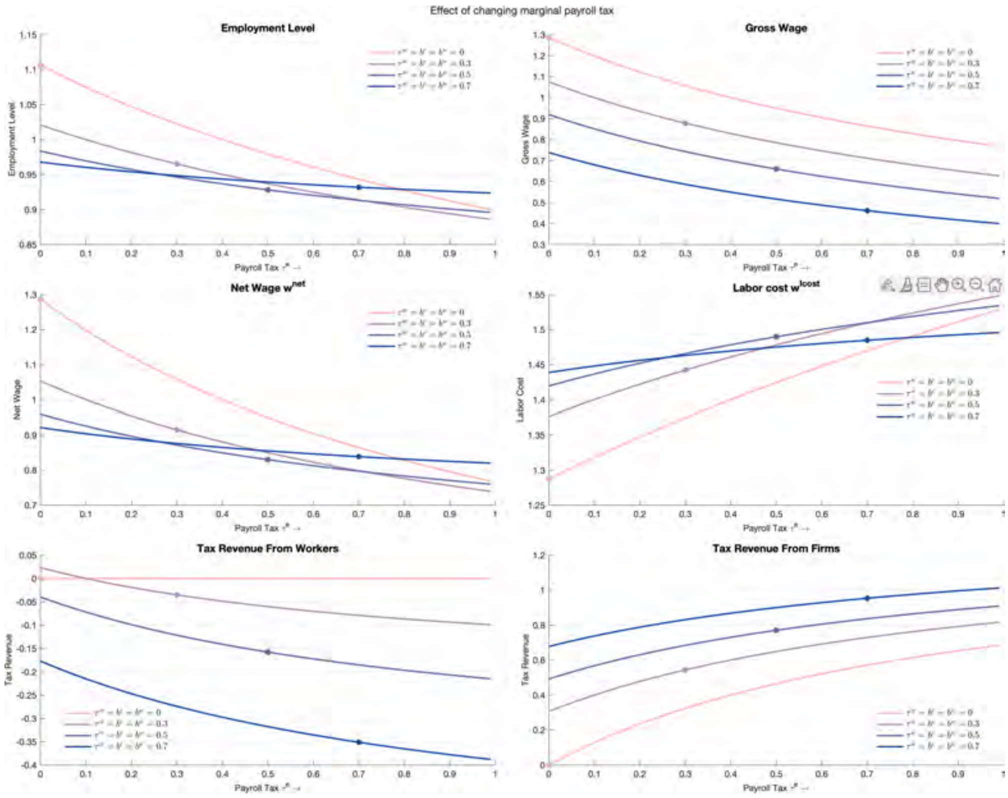


Figure J.5. : Effect on employment, wages, labor costs and tax revenue of varying employer marginal tax rates (τ^e)

Notes: In this Figure, we show the effect of changing marginal tax on employer τ^e while keeping other parameters fixed for the competitive labor supply and labor demand model. Moving from left to right on the horizontal axis for each plot, the marginal tax on employer increases. The starting point for each plot is the situation where the marginal tax $\tau^e = 0$ and moving horizontally left to right the employer pays a higher proportion of gross wage as tax. The four different lines in each plot represent 4 combinations of tax parameters which are kept constant as the marginal tax on employer is changed. As τ^e increases, employment, gross wages and net wages fall, while the labor costs and tax revenue from employers increases.