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Basic income and employment

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Abstract

We analyse the general equilibrium implications of introducing a universal basic income (UBI) for employment and income in an economy characterized by involuntary unemployment. Our framework allows tax revenues and workers' reservation wages to adjust endogenously with employment to satisfy the government's budget constraint. We show that multiple equilibria may emerge and that a UBI can support higher employment when the initial equilibrium is characterized by high taxes. However, in this setting, replacing unemployment benefit schemes with UBI proves less effective at fostering employment, ultimately requiring higher taxes and yielding more limited welfare gains.

Keywords: Unemployment benefits; universal basic income; taxes; unions; employment

JEL classification: *E24*; *H20*; *I38*; *J65*

1. Introduction

The institutions underpinning the welfare state are facing significant challenges in the context of the so-called Fourth Industrial Revolution, particularly due to profound transformations in the labor market that disproportionately affect low-skilled workers. Structural changes – driven in part by automation, digitalization, and platform-based work – have contributed to increasing wage polarization and growing job insecurity among this segment of the workforce. A further noteworthy trend is the marked increase in leisure time among low-skilled, low-paid individuals, raising concerns about diminishing incentives to engage in paid employment (Aguiar and Hurst, 2016; Gimenez-Nadal and Sevilla, 2012). These developments signal a fundamental shift in employment patterns and prompt critical questions regarding the adequacy and long-term sustainability of traditional welfare arrangements, particularly those centered on unemployment insurance (UI) and means-tested benefits.[1]

[1]Welfare systems combine insurance-based elements (e.g., unemployment benefits) and redistributive elements (e.g., means-tested support), with the balance varying across countries.

In response to these structural labor market shifts, the concept of an unconditional income subsidy has gained increasing support. The emerging consensus suggests that replacing traditional unemployment and means-tested benefits with such a subsidy could alleviate the disincentive effects often associated with conditional welfare schemes, while continuing to provide essential income support – particularly to workers at the lower end of the income distribution. Within this context, the proposal to replace unemployment benefits with a guaranteed basic income has become a prominent and widely discussed policy option.[2]

In this paper, we examine the implications of this policy shift and pose the following questions. Can a basic income effectively reduce unemployment levels? And in economies marked by involuntary unemployment, might replacing UI with a basic income positively affect employment levels?

To address these questions, we develop a simple general equilibrium model with two core elements: a basic income scheme funded through a proportional tax on labor income; and an endogenous level of involuntary unemployment. Heterogeneity among households arises solely from their employment status. Consistent with much of the literature, we focus on individual responses along the extensive margin – an approach well suited to analyzing endogenously determined involuntary unemployment. The interaction between labor market outcomes and the government's balanced-budget requirement implies that, in general equilibrium, labor market conditions directly influence the equilibrium tax rate. This relationship generates a Laffer curve type mechanism, under which two distinct tax rates may satisfy the budget constraint: a lower rate on the upward-sloping segment of the Laffer curve, and a higher rate on the downward-sloping segment. As a result, the model admits the possibility of multiple equilibria, arising from the interplay between the balanced budget constraint and the disincentive effects of higher tax rates on labor supply. We solve the model analytically and show that the answers to our research questions differ across equilibria. Furthermore, we derive explicit conditions on the underlying economic fundamentals that determine which equilibrium is more likely to prevail.

Our analysis yields three main findings. First, an increase in the basic income can support higher employment in economies operating at the high-tax

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Denmark, for instance, emphasizes generous UI alongside limited means-tested support (Parsons et al., 2015), whereas the United Kingdom relies more heavily on means-tested aid and provides relatively modest unemployment benefits.

[2]Proponents contend that a flat, unconditional basic income would eliminate poverty traps by providing consistent support without phase-out thresholds, thereby preserving incentives to seek additional income or work hours (see, e.g., Atkinson, 1996). Interestingly, the neo-liberal right also embraces this idea as an opportunity to roll back on the bureaucracy of the welfare state and encourage people to take responsibility for their own lives (see, e.g., Murray, 2006)

equilibrium. In such contexts, the economy lies on the downward-sloping segment of the Laffer curve, where a reduction in tax rates increases tax revenues. A fully funded expansion of the basic income can therefore coincide with a lower equilibrium tax rate, boosting employment. The opposite occurs in economies at the low-tax equilibrium on the upward-sloping segment of the Laffer curve: here, an increase in the basic income requires a higher tax rate to maintain budget balance, reducing employment. Thus, the employment effects of introducing or expanding a basic income depend critically on the economy's initial tax equilibrium.

Second, in our framework – where the wage is set above the reservation wage due to union bargaining power – an expansion of the UI scheme produces, in absolute terms, a larger change in employment than an equivalent increase in the basic income. This difference stems from the wage wedge – the gap between the negotiated wage and the reservation wage net of taxes – on which unemployment benefits exert a stronger influence. Consequently, in high-tax economies, increasing unemployment benefits is more effective than expanding a basic income in supporting both employment and the net income of employed workers. Conversely, in low-tax economies, raising unemployment benefits has a more negative effect on employment – though not necessarily on overall income – than increasing the basic income. In such contexts, the main advantage of adopting a basic income lies in its potential to mitigate market distortions and work disincentives while ensuring a minimum standard of living. It may also facilitate better job matches by allowing individuals to seek employment that aligns more closely with their preferences.[3] Taken together these findings lead to a paradox: a basic income appears least appropriate in high-tax contexts – where it is most effective at supporting employment – while potentially offering improvements over existing systems in low-tax environments, where it may, paradoxically, lead to higher unemployment.

Third, economies characterized by strong worker bargaining power, low disutility of labor, and high productivity tend to converge to a unique equilibrium – specifically, the high-tax equilibrium located on the downward-sloping segment of the Laffer curve. This configuration is far from unrealistic. Consider, for example, the disutility of labor: it reflects the opportunity cost of foregoing non-market activities. When the government provides public services that act as substitutes for such activities (e.g., childcare), individuals' disutility of labor falls, reservation wages become lower, and higher tax rates are, in principle, more easily sustained. This is

[3]The basic income scheme likewise facilitates a more balanced allocation of time between paid work and non-market or caring activities. For a discussion of the advantages of basic income, see, for example, Van Parijs and Vanderborght (2017) and Hanna and Olken (2018).

particularly evident in Scandinavian countries.[4] These economies are also among the most productive and unionized in Europe. In such settings, we show that increasing unemployment benefits generates a Pareto improvement, and that the associated welfare gains exceed those obtained from an equivalent increase in basic income.

Our study contributes to the growing body of literature on universal basic income (UBI) schemes. Recent theoretical work includes contributions by Rauh and Santos (2022), Conesa et al. (2023), Guner et al. (2023), Daruich and Fernández (2024), Jaimovich et al. (2024), and Luduvice (2024). In contrast to our approach, these studies typically use simulated method of moments techniques to evaluate the macroeconomic and welfare impacts of a UBI, focusing on a single equilibrium. Moreover, they generally analyze welfare policies in the context of frictional or voluntary unemployment, often overlooking the role of involuntary unemployment or treating it as exogenous.

Among these recent contributions, Luduvice (2024) shows that UBI schemes funded through consumption taxes yield positive long-run welfare gains. By comparison, Daruich and Fernández (2024) find that while UBI improves welfare for older cohorts, it may harm younger generations due to intergenerational linkages related to parental altruism and decisions regarding children's education. Guner et al. (2023), evaluating various transfer mechanisms in the United States, conclude that a UBI is dominated by a negative income tax, although both policies are found to be less effective than existing transfer programs. Conesa et al. (2023), assuming that human capital is exogenously determined by household education levels and that productivity grows through learning-by-doing, find substantial welfare losses when replacing existing means-tested transfers and UI with a UBI. In contrast, within search-and-matching labor market models, Rauh and Santos (2022) and Jaimovich et al. (2024) show that introducing a moderate UBI in place of existing programs can yield welfare gains by reducing inefficiencies linked to conditional benefits.

Direct comparisons between basic income and UI are explored in Fabre et al. (2014) who investigate the socially optimal level of transfers in a model with voluntary unemployment arising from shirking behavior. Their findings highlight the policy trade-offs involved in designing socially optimal transfer schemes that balance work incentives with social protection. Specifically, they

[4]These countries exhibit some of the highest tax rates in the world and are more likely to operate on the downward-sloping side of the Laffer curve. Empirical estimates and calibrations by Trabandt and Uhlig (2011) identify Sweden and Denmark as lying on this portion of the curve. More recent estimates by Ferreira-Lopes et al. (2020) corroborate these findings, adding Belgium and Finland to the group.

show that, when monitoring costs are low, UI outperforms UBI according to a utilitarian social welfare function. Our analysis differs in several important respects. We compare UBI and UI primarily through their employment effects, focusing on whether the labor market exhibits unique or multiple equilibria. We also emphasize how structural factors, such as heterogeneity in labor disutility, shape labor market dynamics by generating endogenous involuntary unemployment responses to changes in UBI and UI.[5] Our findings complement this literature by identifying the conditions under which an increase in unemployment benefits either induces a trade-off between employment and income for certain agents, or produces a Pareto improvement relative to an equivalent increase in basic income.

Turning to the empirical literature, recent studies by Jones and Marinescu (2022) and Banerjee et al. (2023), among others, use evidence from cash transfer programs to assess the potential effects of UBI. Jones and Marinescu (2022), analyzing the unconditional annual dividend paid to Alaska residents from the state's sovereign wealth fund, find no significant impact on aggregate employment. Banerjee et al. (2023), drawing on evidence from large cash transfer programs in Kenya, highlight UBI's potential for poverty alleviation: they document substantial positive effects on economic activity and poverty reduction, with no detectable reduction in labor supply. Verho et al. (2022) study the Finnish government's experiment, in which 2,000 randomly selected unemployed adults had their unemployment benefits replaced with a guaranteed cash payment that continued even if they started working; this intervention similarly produced no measurable employment effects. While informative, these studies do not consider how such policies affect tax rates and therefore do not capture the general equilibrium feedback mechanisms that are central to our analysis.

The paper is structured as follows. In Section 2, we present the model and examine both partial and general equilibrium outcomes. In Section 3, we solve the model analytically and discuss its properties. In Section 4, we evaluate the effect of a basic income on employment, income, and welfare. In Section 5, we compare the impacts of basic income and UI. In Section 6, we extend the analysis to other types of social welfare policies, such as means-tested transfers, and to alternative bargaining models. We also demonstrate that our findings are robust and complementary to the existing literature comparing a UBI with current social assistance programs. We conclude in Section 7.

[5] As in Fabre et al. (2014), we exclude capital accumulation from our static model, while their analysis centers on the stationary equilibrium of a model featuring intertemporal consumption and saving.

2. The model

We consider an economic environment characterized by two main elements: (i) a welfare system featuring an unconditional income subsidy (basic income), financed through a proportional tax on labor income; and (ii) involuntary unemployment arising from efficient bargaining between firms and labor unions. The economy consists of N identical workers, each endowed with one unit of labor that can be either employed or unemployed, and M identical firms, each producing output using employed labor. Due to unemployment, only a fraction of workers – denoted $L < N$ – are employed. We define $n \equiv N/M$ and $l \equiv L/M$ as the average number of workers per firm and the average number of employed workers per firm, respectively.

2.1. Government

There exists a basic income scheme under which every worker – employed or unemployed – receives a lump-sum real transfer $b > 0$ from the government. This transfer is financed by a proportional tax on labor income at rate $\tau \in (0, 1)$. Firms, workers, and unions take the tax rate τ as given; hence, in the partial equilibrium analysis of the labor market, τ is taken as exogenous. In general equilibrium, however, τ becomes endogenous, as it must satisfy the government budget constraint for the basic income scheme $\tau wl = bn$. Solving for the equilibrium tax rate yields

$$\tau = \frac{bn}{wl} \equiv \tau(l, w), \tag{1}$$

where w denotes the gross real wage paid by firms.

2.2. Technology and the marginal product of labor

A single good, taken as the numéraire, is produced under perfect competition with constant returns to scale. Each representative firm uses capital k and labor l according to the production technology,

$$F(k, l) = Ak^s l^{1-s}, \qquad A > 0 \quad \text{and} \quad 0 < s < 1, \tag{2}$$

$$\text{with } APL = A(k/l)^s \quad \text{and} \quad MPL = (1 - s)A(k/l)^s, \tag{3}$$

where APL and MPL denote the average product of labor and the marginal product of labor, respectively. The parameter s thus corresponds to the elasticity of both APL and MPL with respect to the capital–labor ratio, and A denotes total factor productivity.

2.3. Preferences and the reservation wage

The preferences of a representative worker are described by the utility function,

$$U(c) - \theta e \qquad \text{and} \qquad \theta > 0. \tag{4}$$

Here, θ denotes the marginal disutility of labor (or cost of effort) and $e \in \{0, 1\}$ represents the number of labor units worked, where $e = 1$ if employed and $e = 0$ if unemployed. Consumption is denoted by $c \geq 0$ and the utility from consumption, $U(c)$, is a well-behaved increasing function such that $U'(c) > 0$ for $c > 0$. The function may be strictly concave ($U''(c) < 0$) in the case of risk aversion, or linear ($U''(c) = 0$) under risk neutrality.

The income of a worker is given by $w(1 - \tau) + b$ if employed ($e = 1$), and by b if unemployed ($e = 0$). Accordingly, the consumption level of an employed worker is $c = w(1 - \tau) + b$. The indirect utility of an employed worker can therefore be written as

$$V_E = U(w(1 - \tau) + b) - \theta \equiv U(\tilde{w}) - \theta, \tag{5}$$

where $\tilde{w} = w(1 - \tau) + b$ denotes net real income. For an unemployed worker, the indirect utility is simply $V_U = U(b)$. The reservation wage $\underline{w}$ is the wage at which a worker is indifferent between employment and unemployment, satisfying $U(\underline{w}) - \theta = U(b)$. Because $U'(c) > 0$, if $U(\tilde{w}) - \theta > U(b)$, then $w > \underline{w}$ and individuals prefer to work rather than remain unemployed. In equilibrium, as shown below, the bargained wage exceeds the reservation wage; however, not all workers are able to obtain employment. The model thus gives rise to involuntary unemployment.[6]

2.4. Labor market and efficient bargaining

Our modeling closely follows the efficient bargaining framework used in Coimbra et al. (2005). In the labor market, there are M firm-specific unions (i.e., one union per firm). Workers are exogenously and uniformly distributed across these unions and cannot move between them. Each union therefore represents $n \equiv N/M$ workers. As is standard in this class of models, workers are treated anonymously, so the unemployment (employment) rate corresponds to the probability of being unemployed (employed) in a symmetric equilibrium. Unions aim to maximize the expected utility of their members – both employed

[6]We assume that each worker either supplies one unit of labor (if employed) or none (if unemployed). Hence, labor decisions occur exclusively along the extensive margin – an approach commonly adopted in the literature on endogenous involuntary unemployment. Empirical evidence supports the relevance of extensive-margin labor supply elasticities, particularly among low-income earners (see Saez, 2002, and references therein).

and unemployed – while firms seek to maximize profits. We model the interaction as a two-stage game. In the first stage, firms pre-commit to renting a given level of capital k, at the perfectly competitive rental rate r per unit of capital. When choosing k, firms anticipate that wages and employment will be determined later. In the second stage, wages and employment levels are negotiated via efficient bargaining. To solve for the equilibrium wage w and employment l, we formulate and solve the generalized Nash bargaining problem, taking the capital level k as fixed. Firm profits and union expected utility are considered net of their respective fall-back; that is, net of the level of their returns should no agreement be reached and production not occur.

Accordingly, w and l are the solutions of the following problem,

$$\max_{(w,l)\in\Re_{++}} \{Ak^s l^{1-s} - wl\}^{\alpha}\{[U(\tilde{w}) - \theta - U(b)](l/n)\}^{1-\alpha}$$

$$\text{s.t. } l \leq n,$$

where $1 > 1 - \alpha > 0$ denotes the union bargaining power. The term $Ak^s l^{1-s} - wl$ represents the firm's profits net of its fall-back (i.e., net of the hiring cost of capital rk), and the term $[U(\tilde{w}) - \theta - U(b)](l/n)$ denotes the expected utility of union members net of their fall-back (i.e., net of $U(b)$). Assuming $l < n$, the solution to this problem is given by

$$MPL - w = -\frac{U(\tilde{w}) - \theta - U(b)}{(1-\tau)U'(\tilde{w})}, \tag{6}$$

and

$$w = \mu MPL, \qquad \mu \equiv \frac{1-\alpha s}{1-s} > 1. \tag{7}$$

Due to union bargaining power ($\alpha < 1$), the factor $\mu > 1$ represents a wage mark-up over the competitive level. The MPL is given by (3), implying that the total wage bill $wl = \mu l MPL = \mu(1-s)Al^{1-s}k^s$ is increasing in employment l.

Anticipating this bargaining outcome, the profit-maximizing representative firm determines the demand of capital according to

$$r_t = \alpha s A(k/l)^{s-1}.$$

The above, together with expressions (7)–(3), imply that profits are zero in equilibrium. The level of capital rented by each firm in a symmetric equilibrium is $k = \overline{K}/M$, where $\overline{K}$ is the fixed level of capital in the economy. From now on, it is assumed that capital is fixed at this level.

2.5. Partial equilibrium

Expression (6) represents the contract curve at the partial equilibrium level (i.e., for a given tax rate) and defines the locus of (l, w) pairs where the slopes of the firm's isoprofit curve and the union's indifference curve coincide. Equation (7) represents the rent division condition, which – using expression (3) – can be derived as the locus of (l, w) pairs where the weighted average of the marginal and average product of labor equals the wage. The respective weights correspond to the bargaining power of firms and unions. The equilibrium wage and employment levels must simultaneously satisfy both equations (6) and (7). Because of union power $\mu > 1$, the equilibrium wage determined by equation (7) exceeds the marginal product of labor (MPL), so that $w > MPL$.[7] Hence, from equation (6), the utility gain from employment, $U(\tilde{w}) - \theta - U(b)$, is strictly positive in equilibrium:

$$U(\tilde{w}) - \theta - U(b) > 0. \tag{8}$$

This inequality implies that the equilibrium wage also exceeds the reservation wage. Therefore, combining equations (6) and (7), at the equilibrium wage all workers strictly prefer employment to unemployment. Consequently, any unemployment level $n - l > 0$ must be involuntary.

Figure 1 depicts the partial equilibrium levels of employment and wages (l_{PE}, w_{PE}). As the MPL is decreasing in l, the rent division curve (RDC) is a downward-sloping function in the (l, w) plane. In contrast, for equilibrium wages satisfying $w > MPL$, the contract curve – defined by equation (6) – is increasing in l under risk aversion, and vertical under risk neutrality. This behavior is characterized by the derivative of the wage with respect to employment along the contract curve:

$$\frac{dw}{dl} = \frac{\partial MPL/\partial l}{1 + (\partial \Omega/\partial w)} > 0. \tag{9}$$

Here, the function $\Omega(w, \tau)$ is defined as

$$\Omega(w, \tau) \equiv -\frac{U(\tilde{w}) - \theta - U(b)}{(1 - \tau)U'(\tilde{w})}.$$

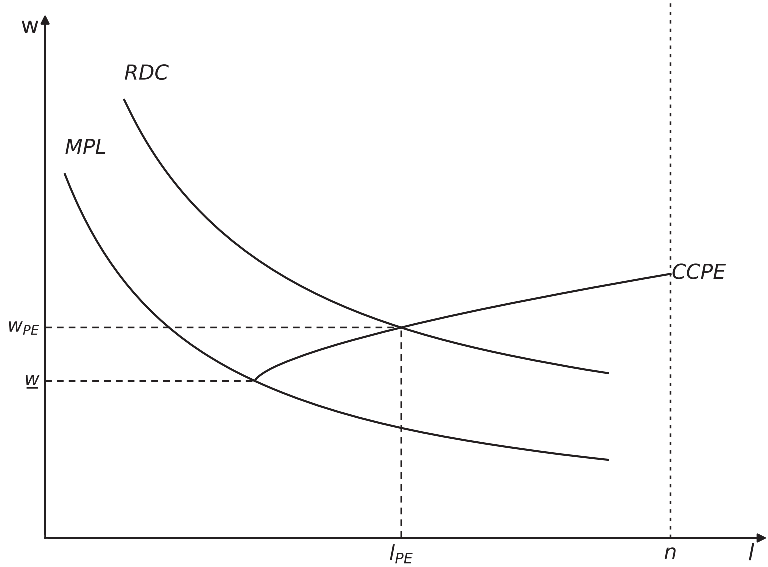
The denominator in the expression for dw/dl captures the curvature of the worker's utility function. Specifically, we have

$$1 + \frac{\partial \Omega}{\partial w} = \left(\frac{U(\tilde{w}) - \theta - U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})} \leq 0, \tag{10}$$

where the inequality follows from equation (8) and the assumption of risk aversion ($U''(\tilde{w}) < 0$). Thus, under risk aversion, this term is non-positive,

[7] As is standard in this class of models, the equilibrium real wage exceeds the marginal product of labor. This implies that the firm is induced – presumably by a none-or-all offer – to employ more workers than it would choose at the given negotiated wage (McDonald and Solow, 1981).

Figure 1. The partial equilibrium outcome



implying that the contract curve is upward-sloping in the (l, w) space. Graphically, the partial equilibrium contract curve ($CCPE$) originates on the labor demand curve (MPL) at the level $\underline{w}$ corresponding to the reservation wage; that is, where the utility from employment equals the utility from unemployment ($\Omega = 0$). Under risk aversion, the contract curve is positively sloped for all higher wage and employment levels up to $l = n$, reflecting increasing wage demands as employment expands.

For a given tax rate, the equilibrium wage and employment levels are determined by the intersection of contract curve and the rent division curve. From equations (7) and (6), and noting that under union power $\mu/(\mu - 1) > 1$, it follows that the equilibrium wage satisfies

$$w = \frac{\mu}{\mu - 1} \frac{U(\tilde{w}) - \theta - U(b)}{(1 - \tau)U'(\tilde{w})}, \quad \text{with} \quad w > \frac{U(\tilde{w}) - \theta - U(b)}{(1 - \tau)U'(\tilde{w})} > 0. \tag{11}$$

Expression (11) defines the equilibrium wage implicitly. Substituting the equilibrium wage into the rent division curve (7) – and using expression (3) – implicitly determines the corresponding equilibrium level of employment. The partial equilibrium wage and employment levels depend on the tax rate τ, and together determine government revenues τwl. As shown in Appendix A, government revenues follow a Laffer curve type relationship, $LC(\tau) = \tau wl$, where w and l are determined by equations (11) and (7).

Differentiating total tax revenue with respect to the tax rate yields

$$\frac{dLC(\tau)}{d\tau} = wl\frac{s-\tau}{(1-\tau)s}.$$

From this, we have the following lemma.

Lemma 1. *The Laffer curve $LC(\tau) = \tau wl$, where w and l are determined by (11), (7), and (3), exhibits a hump-shaped relationship between tax revenue and the tax rate $\tau \in (0, 1)$. Specifically, tax rates satisfying $\tau < s$ lie on the upward-sloping segment of the Laffer curve, while tax rates $\tau > s$ lie on the downward-sloping segment, reaching a maximum at $\tau = s$.*

2.6. General equilibrium

In general equilibrium, the slope of the contract curve differs from its partial equilibrium counterpart given in equation (6), because the tax rate τ, which finances the basic income as specified in (1), depends endogenously on both employment l and the wage w. In contrast to the contract curve, the slope of the rent division curve remains unchanged, as the tax rate τ does not appear in the rent division condition (7).

Differentiating (6), while accounting for the relationship in (1), the derivative of the wage with respect to employment along the general equilibrium contract curve is given by

$$\left.\frac{dw}{dl}\right|_{GE} = \frac{(\partial MPL/\partial l) - (\partial\Omega/\partial\tau)(\partial\tau/\partial l)}{1 + (\partial\Omega/\partial w) + (\partial\Omega/\partial\tau)(\partial\tau/\partial w)}, \tag{12}$$

where $1 + (\partial\Omega/\partial w)$ is given in equation (10). Using equations (1), (8), and (11), we obtain

$$\frac{\partial\Omega}{\partial\tau}\frac{\partial\tau}{\partial l} = -\frac{w}{1-\tau} \times\left[1 - \frac{U(\tilde{w}) - \theta - U(b)}{(1-\tau)wU'(\tilde{w})} - \left(\frac{U(\tilde{w}) - \theta - U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right]\frac{\tau}{l} < 0$$

and

$$\frac{\partial\Omega}{\partial\tau}\frac{\partial\tau}{\partial w} = -\frac{w}{1-\tau} \times\left[1 - \frac{U(\tilde{w}) - \theta - U(b)}{(1-\tau)wU'(\tilde{w})} - \left(\frac{U(\tilde{w}) - \theta - U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right]\frac{\tau}{w} < 0.$$

Therefore, the denominator of (12) is always negative, while the numerator may be either positive or negative. Specifically, the contract curve becomes downward-sloping if the following inequality holds

$$-\frac{\partial MPL}{\partial l}\frac{l}{MPL} < \frac{w}{MPL}\frac{\tau}{(1-\tau)} \times \left[1 - \frac{U(\tilde{w}) - \theta - U(b)}{(1-\tau)wU'(\tilde{w})} - \left(\frac{U(\tilde{w}) - \theta - U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right].$$

This inequality is more likely to hold when risk aversion is high, as reflected by the term $U''(\tilde{w})/U'(\tilde{w})$. The left-hand side corresponds to the absolute value of the elasticity of the rent division curve, denoted by s. When the contract curve is downward-sloping, whether it is steeper than the rent division curve at equilibrium depends on the relative magnitude of the tax rate τ and the labor demand elasticity s. Specifically, as shown in Appendix B, the following lemma holds.

Lemma 2. *If the contract curve is downward-sloping, it is steeper than the rent division curve in equilibrium if and only if the labor demand elasticity s is less than the tax rate τ (i.e., $s < \tau$). Otherwise, if the contract curve is downward-sloping but less steep than the rent division curve, or if it is upward-sloping, the tax rate is lower than the labor demand elasticity (i.e., $s > \tau$).*

This relative slope condition is closely connected to the Laffer curve. More precisely, under Lemma 1 and Lemma 2, when the contract curve is negatively sloped in general equilibrium, it becomes steeper than the rent division curve if and only if the tax rate lies on the downward-sloping segment of the Laffer curve.

Without specifying the functional form of $U(c)$, it is not possible to determine the sign of the slope of the general equilibrium contract curve or to assess its slope relative to the rent division curve. Likewise, we cannot establish whether this slope changes sign across equilibria. Endogenous variations in the slope of the contract curve – whether in magnitude, sign, or relative steepness – can generate multiple equilibria in unemployment, wages, and tax rates.[8] Crucially, firms and unions do not internalize the government's balanced-budget tax rate when making wage and employment decisions. The tax rate τ, however, is endogenously determined by the government budget constraint (1). This endogeneity implies that, in general equilibrium, multiple tax rates may support the same level of basic income expenditure.

[8]Inspection of Figure 1 shows that, in partial equilibrium, the contract curve is positively sloped, yielding a unique equilibrium. Multiple equilibria may arise, however, if the contract curve becomes negatively sloped for some employment levels, or if it is everywhere negatively sloped but alternates between being steeper and flatter than the rent division curve.

In particular, due to the presence of a Laffer curve, some equilibria may be associated with a low tax rate $\tau < s$, while others may coexist at a higher tax rate $\tau > s$, all yielding the same level of government revenue bn. To gain further analytical insight, in Section 3 we examine the limiting case of linear utility, which permits a closed-form solution of the model and represents a more conservative benchmark.[9]

3. Analytical solution

In this section, assuming linear utility, we derive the implicit equation that defines the general equilibrium levels of employment, and we show that the model can yield either a unique or multiple unemployment equilibria. We then characterize how these equilibrium outcomes differ based on key factors such as the magnitude of the direct utility loss from working and the strength of union bargaining power. In Section 4, we analyze the effects of an increase in the basic income, conditional on the equilibrium configuration identified.

3.1. Employment determination

Under linear utility, $U(c) = c$, the reservation wage becomes identical to $\underline{w} = \theta/(1-\tau)$, and the rent division curve and the contract curve for a given τ, respectively, are written as

$$w = \mu MPL \quad \text{with} \quad MPL = (1-s)Ak^s l^{-s} \text{ and } \mu \equiv \frac{1-\alpha s}{1-s} > 1 \tag{13}$$

and

$$w = MPL + \frac{(1-\tau)w - \theta}{1-\tau} \Leftrightarrow MPL = \frac{\theta}{1-\tau}. \tag{14}$$

Equation (14) shows that in equilibrium the MPL is equal to the reservation wage. Together with equation (13), this implies that the wage is set as mark-up over the reservation wage, $w = \mu[\theta/(1-\tau)]$. Therefore, in partial equilibrium, an increase in the tax rate τ raises both the reservation wage and the wage, which leads to an increase in MPL (see equation (14)) and, consequently, to a decrease in the employment l. However, the wage bill wl decreases, which implies that tax revenues τwl may either decrease or

[9] Recall that the slope restriction for a downward-sloping general equilibrium contract curve

$$-\frac{\partial MPL}{\partial l} < \frac{\tau w}{(1-\tau)l}\left[1 - \frac{U(\tilde{w}) - \theta - U(b)}{(1-\tau)wU'(\tilde{w})} - \left(\frac{U(\tilde{w}) - \theta - U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right],$$

is more restrictive under linear utility (i.e., when $U(\tilde{w})'' = 0$) than under risk aversion.

increase. This means that the same level of basic income can be financed with a combination of high wages, high tax rates, and relatively low employment, or alternatively with lower wages, lower taxes, and higher employment. This trade-off gives rise to a Laffer curve type relationship, as stated in Lemma 2.

In general equilibrium, the tax rate depends on both wages and employment through the basic income scheme's budget constraint. Substituting (1) into (14) and re-arranging terms, the contract curve in general equilibrium can be written as

$$w = \frac{(1-s)Ak^s l^{-s}}{[(1-s)Ak^s l^{-s} - \theta]\, l} bn. \tag{15}$$

Next, by equating (15) with (13), we implicitly derive the general equilibrium employment level, which must satisfy $(1-s)Ak^s l^{-s} = \theta + (b/\mu)(n/l)$. Re-arranging the latter expression, we obtain

$$G(l) \equiv \mu[(1-s)Ak^s l^{1-s} - \theta l] = bn. \tag{16}$$

The right-hand side of equation (16) is a constant, while the left-hand side defines a nonlinear function $G(l)$ in employment l. Specifically, $G(l)$ is an inverted U-shaped function with the following properties.

Lemma 3. *The function $G(l)$ is increasing in l if and only if $0 < l < l^* \equiv [(1-s)^{2/s} A^{1/s} k]/\theta^{1/s}$, and attains its maximum value at $l = l^*$ given by*

$$G(l^*) = \frac{s\mu(1-s)^{(2-s)/s} A^{(1/s)} k}{\theta^{(1-s)/s}}.$$

Furthermore, $G(l) = 0$ if $l = 0$ or

$$l = l^{**} \equiv \frac{(1-s)^{1/s} A^{1/s} k}{\theta^{1/s}}.$$

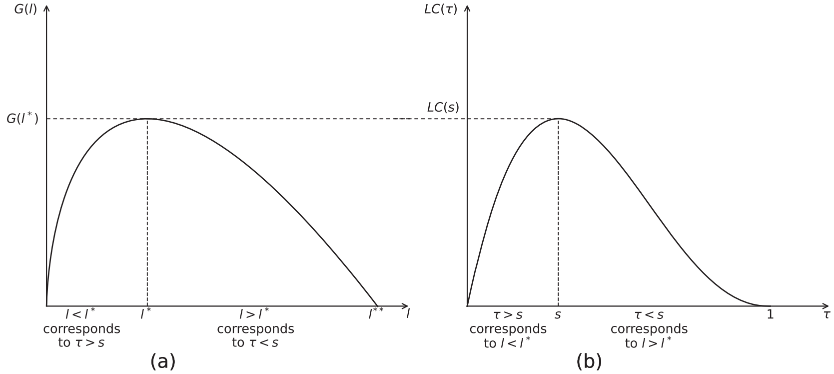
Finally, $G(l) < 0$ if and only if $l > l^{**}$.

As $bn > 0$, any equilibrium employment levels l satisfying (16) must satisfy $G(l) > 0$, which implies $l < l^{**}$. This condition is equivalent to requiring the marginal product of labor to exceed the marginal disutility of work $MPL > \theta$, as specified in equation (14). Furthermore, the wage determined by (13) is strictly greater than the reservation wage, $w > \underline{w}$, and decreases as l increases.

Notably, there exists a direct correspondence between the function $G(l)$ and the Laffer curve defined by

$$LC(\tau) = \tau\mu k \left[\frac{(1-\tau)^{1-s}(1-s)A}{\theta^{1-s}}\right]^{1/s},$$

Figure 2. Representation of (a) Lemma 3 and (b) Lemma 4



Notes: This figure illustrates the functions $G(\ell)$ and $LC(\tau)$ under the following parametrization: $A = 1$, $k = 1$, $s = 0.3$, $\mu = 1.2$, and $\theta = 0.6$. The corresponding critical values are $\ell^{**} \approx 1.67169$, $\ell^{*} \approx 0.50911$, and $LC(s) = G(\ell^{*}) \approx 0.1571$.

as demonstrated in Appendix C and summarized in Lemma 4. This relationship holds irrespective of the presence of bargaining power by firms or workers (i.e., even when $\mu = 1$).

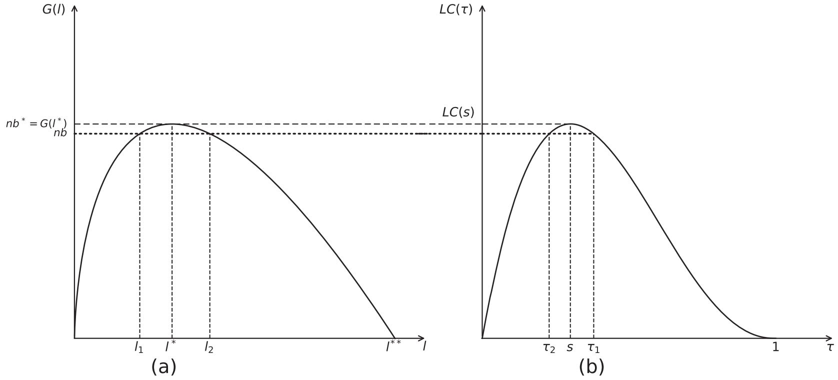
Lemma 4. *Under Lemma 2 and Lemma 3, we have the equality $LC(s) = G(l^*)$. In an (unemployment) equilibrium where $l < n$, the following conditions hold: (i) the tax rate τ lies on the upward-sloping segment of the Laffer curve (i.e., $\tau < s$) if and only if $G(l)$ is a decreasing function of l with $l > l^*$; (ii) the tax rate τ lies on the downward-sloping segment of the Laffer curve (i.e., $\tau > s$) if and only if $G(l)$ is an increasing function of l with $l < l^*$.*

Figure 2 illlustrates Lemmas 3 and 4.

3.2. Equilibrium analysis

To analyze whether the model generates a unique employment equilibrium or multiple equilibria, it is helpful to visualize the equilibrium conditions graphically. According to the equilibrium condition (16), employment equilibria correspond to the points at which the curve $G(l)$ intersects a horizontal line at height nb, for given parameters b and n. In the example illustrated in Figure 3(a), the line nb intersects $G(l)$ twice – at l_1 and l_2 – on opposite sides of the threshold l^*, with $l_1 < l^* < l_2$. Whenever these intersections satisfy $l < n$, they represent valid (unemployment) equilibria. The corresponding equilibrium tax rates are then obtained by applying the government budget constraint: for any equilibrium employment level l, the required tax rate is the value of τ such that revenues equal nb. Graphically,

Figure 3. Equilibrium analysis



Notes: The parameter values are the same as in Figure 2, with $n = 1$ and $b = 0.15 < b^* \approx 0.1571$. The corresponding equilibrium values are $\ell_1 = 0.3406$, $\ell_2 = 0.7061$, $\tau_1 = 0.3795$, and $\tau_2 = 0.2278$.

this is represented in Figure 3(b) by the intersection points between the same horizontal line at height nb and the Laffer curve. These intersection points therefore yield the equilibrium tax rates associated with l_1 and l_2.

Inspection of Figure 3 shows that the existence of at least one equilibrium requires that $bn \leq G(l^*)$, where l^* and $G(l^*)$ are defined in Lemma 3. In the special case where $b = b^* \equiv G(l^*)/n$, the model admits exactly one unemployment equilibrium at $l = l^*$, provided that $n > l^*$.

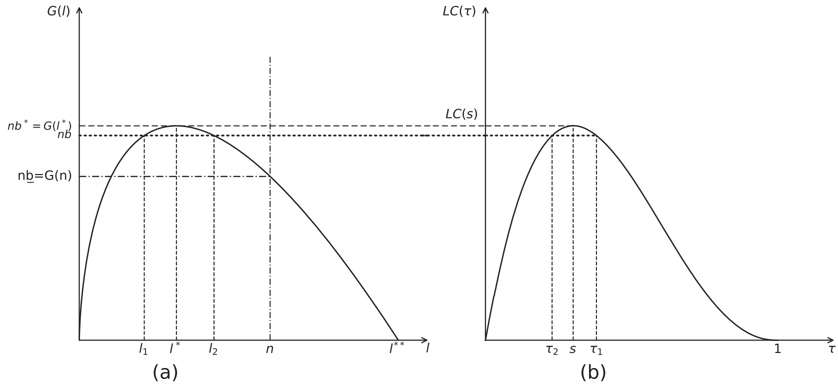
Consider now the generic case where $0 < b < b^* \equiv G(l^*)/n$. When $n > l^{**}$, the model admits two equilibria, l_1 and l_2 satisfying $l_1 < l^* < l_2 < l^{**}$. By contrast, when $b < b^*$ and $n < l^*$, the model may exhibit either no equilibrium (if $n < l_1 < l^*$) or at most one equilibrium (if $l_1 < n < l^*$); see Appendix D. We now turn to the intermediate region $n \in (l^*, l^{**})$ and examine whether the model admits a unique or multiple equilibria when $0 < b < b^*$. Accordingly, we impose the following.

Assumption 1. $l^{**} > n > l^*$ and $0 < b < b^* \equiv G(l^*)/n$, where l^{**}, l^*, and $G(l^*)$ are defined in Lemma 3.

Under Assumption 1, at least one equilibrium $l_1 < l^*$ necessarily esists (see Appendix D and Figure 3). For given values of k, n, s, and other structural parameters θ, μ, A, the number of equilibria depends on the values of b. Using the expression for $G(l)$ given in (16), define a second critical value $\underline{b} > 0$ such that $n\underline{b} \equiv G(n) = \mu n[(1-s)Ak^s n^{-s} - \theta]$.[10] Figure 4(a) shows that two (unemployment) equilibria – one below l^* and one above – exist

[10]Note that $\underline{b} > 0$ as $n < l^{**}$ under Assumption 1.

Figure 4. Multiple equilibria



Notes: The parameter values are the same as in Figure 3, with $n\underline{b} = G(n) = 0.12$.

if and only if $b > \underline{b}$. Specifically, $l_1 < l^* < l_2 < n$. In equilibrium, the wage is given by $w = \mu MPL$, which is decreasing in l. Hence, the wage at the low-employment equilibrium, w_1, exceeds that at the high-employment equilibrium, w_2. Because the wage bill $\mu MPL.l$ increases with l, the tax rate required to balance the government's budget for a given b falls as employment rises. Thus, the low-employment equilibrium (l_1, τ_1) features a higher tax rate, while the high-employment equilibrium (l_2, τ_2) features a lower tax rate. By Lemma 4, the latter lies on the upward-sloping segment of the Laffer curve ($\tau_2 < s$), whereas the former lies on the downward-sloping segment ($\tau_1 > s$), as illustrated in Figure 4(b). If instead $nb < n\underline{b}$, the model admits a unique unemployment equilibrium at $l_1 < n$. By Lemma 4, this equilibrium always lies on the downward-sloping side of the Laffer curve. Understanding how an economy's fundamental characteristics – such as the disutility of labor, total factor productivity, and union mark-up – shape the emergence of unique versus multiple equilibria is particularly relevant when we fix the level of basic income within the interval $0 < b < b^*$. To investigate this, we compare economies that differ in their labor-disutility parameter θ under the condition that Assumption 1 holds. We further assume that b is fixed and satisfies $0 < b < A\mu s(1-s)^{1/s}k^s n^{-s}$. For convenience, define $\underline{\theta} \equiv (1-s)Ak^s n^{-s} - b/\mu > 0$. Recalling that $n\underline{b} \equiv G(n) = \mu n[(1-s)Ak^s n^{-s} - \theta]$, we obtain the equivalence $b < \underline{b}$ $(b > \underline{b}) \iff \theta < \underline{\theta}$ $(\theta > \underline{\theta})$. Appendix E provides the detailed proof of the results stated below.

Proposition 1. (Multiplicity versus uniqueness of equilibrium). *Consider levels of* b *such that* $b < \mu s(1-s)^{1/s}Ak^s n^{-s}$ *and define* $\underline{\theta} \equiv (1-s)Ak^s n^{-s} - b/\mu$. *Furthermore, restrict attention to values of* $\theta > 0$ *that satisfy Assumption 1. Then, the following hold.*

(*i*) *There exist two equilibria, l_1 and l_2, with $l_1 < l^* < l_2 < n$, if and only if $\theta > \underline{\theta}$.*

- *The low-employment equilibrium l_1 is associated with a wage $w_1 = \mu MPL(l_1)$ and a tax rate $\tau_1 = (nb)/(w_1 l_1) > s$ belonging to the downward-sloping segment of the Laffer curve.*

- *The high-employment equilibrium l_2 is associated with a wage $w_2 = \mu MPL(l_2) < w_1$ and a tax rate $\tau_2 = (nb)/(w_2 l_2) < s$ belonging to the upward-sloping segment of the Laffer curve.*

(*ii*) *A unique equilibrium $l_1 < l^*$ (with $l_1 < n$) exists if and only if $\theta < \underline{\theta}$. The associated wage is $w_1 = \mu MPL(l_1)$ and the tax rate $\tau_1 = (nb)/(w_1 l_1) > s$ belongs to the downward-sloping segment of the Laffer curve.*

Multiple equilibria may arise because, in general equilibrium, the wage bill and the basic income tax are endogenous and mutually interdependent. Specifically, the level of employment determines the level of tax through the balanced-budget condition, while the tax rate simultaneously influences employment via the labor market equilibrium. As a result, the equilibrium with relatively low employment and high tax rate (l_1, τ_1) balances the budget in the same way as the equilibrium with relatively high employment and low tax rate (l_2, τ_2). Both equilibria lie on different sides of the same Laffer curve and of the $G(l)$ curve.[11]

The existence of multiple equilibria can also be understood by considering the partial equilibrium set-up, where the equilibrium outcome is determined by the contract curve. Recall that under partial equilibrium and linear utility, the contract curve satisfies $(1 - \tau)MPL(l) = \theta$, which implies that higher tax rates lead to higher MPL and consequently to lower employment rates. This relationship captures two possible scenarios. When unions or workers face a low tax, they accept a lower wage and firms employ more workers. In this case, unions are willing to moderate their wage demands, and the economy settles at the high employment equilibrium. Conversely, when unions or workers face a high tax rate, they demand higher wages, leading firms to hire fewer workers. This results in a low employment equilibrium. Importantly, net wages (wage after tax) are the same in both equilibria and given by $w(1 - \tau) = \theta\mu$. Similarly, the net income of those employed is $\theta\mu + b$, and their utility

[11]It is worth noting that Coimbra et al. (2005) do not find multiple equilibria under a Cobb–Douglas production function similar to the one considered here, as their model excludes government transfers and related taxation.

$\theta(\mu - 1) + b$.[12] Meanwhile, the income and utility of the unemployed is b in both equilibria.

Because unions exist in the economy, the high-employment equilibrium is Pareto superior: employed workers are strictly better off than unemployed workers. Because each worker faces the same probability of becoming employed, l/n, workers are *ex ante* better off when employment level l is higher. Nevertheless, the economy may remain trapped in the low-employment–high-tax equilibrium due to a mechanism akin to a coordination failure driven by a fiscal externality. Specifically, workers (or unions) and firms do not internalize the positive fiscal externality associated with higher employment – namely, the increase in government tax revenues that would allow a lower tax rate while financing a given level of basic income. Notably, if the government were to fix the tax rate at the level corresponding to the high-employment equilibrium and allow the basic income b to adjust endogenously to satisfy the balanced-budget constraint, this fiscal externality would be neutralized and equilibrium multiplicity would vanish.[13] This feature aligns with Rocheteau (1999), among others, who identifies a similar coordination failure arising from an unemployment benefit system combined with labor market frictions based on search and matching. It is worth emphasizing that multiple equilibria would also arise under perfectly competitive labor markets.[14] The source of multiplicity is associated with endogenous taxes that adjust to balance the government budget constraint.[15]

The uniqueness of equilibria arises under the condition $\theta < \underline{\theta}$, as established in Proposition 1(ii), and is more likely to be satisfied in economies characterized by low labor disutility (θ), high total factor productivity (A), and strong union bargaining power (μ). Such economies are therefore more

[12]By use of (13) and (14), it follows that $(1-\tau)w = (1-\tau)\mu MPL(l) = \theta\mu$. Thus, in equilibrium, the net wage is constant and equal to $\theta\mu$, regardless of the equilibrium employment level.

[13]Fixing the tax rate τ, the partial equilibrium equations (13)–(14) determine the equilibrium wage and employment levels. For example, if τ is fixed at the level τ_2, the equilibrium levels of l_2 satisfy $MPL(l_2) = \theta/(1-\tau_2)$, and the wage is $w_2 = \mu MPL(l_2)$. The corresponding level of the basic income b, consistent with the balanced budget, is $bn = \tau_2 \mu MPL(l_2).l_2$, in line with Proposition 1.

[14]In the context of perfectly competitive dynamic models, multiple equilibria may arise under balanced-budget rules with fixed government spending or countercyclical tax rates (see, e.g., Schmitt-Grohe and Uribe, 1997; Abad et al., 2020).

[15]The existence of two unemployment equilibria is linked to the presence of a Laffer curve: as the tax rate rises, the tax base (employment and wages) contracts, creating a non-monotonic relationship. Appendix C shows that this mechanism, and its mapping into the $G(l)$ curve that governs equilibrium employment, continues to hold even in the absence of union wage-setting power ($\mu = 1$).

prone to exhibit the low-employment, high-tax equilibrium (l_1, τ_1). This leads to the following corollary.

Corollary 1. *Under Proposition 1(ii), economies with low labor disutility θ, high productivity A, and strong union bargaining power μ are more likely to be associated with a high-tax equilibrium τ_1, located on the downward-sloping segment of the Laffer curve (i.e., where $\tau_1 > s$).*

Intuitively, when the disutility of labor is low, workers are more willing to accept lower after-tax wages, which makes it easier to sustain a high-tax equilibrium. However, in this context, financing a given level of basic income b becomes more challenging. Because the gross wage is increasing in θ, a lower θ implies a lower pre-tax wage, which in turn reduces the tax base. As a result, a higher tax rate is required to generate sufficient revenue to fund the basic income. This renders the low-tax equilibrium unfeasible, thereby reinforcing the uniqueness of equilibrium under the condition $\theta < \underline{\theta}$. Additionally, to sustain a high-tax equilibrium, gross wages must be sufficiently high. This is more easily achieved when either union bargaining power μ is strong, or productivity A is high – both of which increase the marginal product of labor and the negotiated wage. In summary, economies with low labor disutility, high productivity, and strong unions are more prone to exhibit equilibrium uniqueness due to the interplay between higher required taxation and the wage-setting process.

4. Basic income

We now turn to comparative statics to analyze the conditions under which an increase in basic income positively affects the level of employment. Differentiating the equilibrium level of employment condition (16) with respect to basic income b and employment l, yields

$$\frac{dl}{db} = \frac{n}{\mu\{Ak^s l^{-s}(1-s)^2 - \theta\}}. \tag{17}$$

Similarly, differentiating the negotiated wage condition (7) with respect to b we obtain

$$\frac{dw}{db} = \mu \frac{\partial MPL}{\partial l} \frac{dl}{db}.$$

Using the expression for the equilibrium employment level l^* from Lemma 3, we find that $dl/db > 0$ and $dw/db < 0$ for $l < l^*$, whereas $dl/db < 0$ and $dw/db > 0$ for $l > l^*$. Hence, an increase in basic income leads to higher employment and lower wages when the employment level is below l^*, while it causes employment to decrease and wages to rise when employment is above l^*. According to Proposition 1, the two equilibrium points l_1 and l_2

satisfy $l_1 < l^* < l_2$, so the effect of raising basic income at l_1 is to increase employment and reduce wages, whereas at l_2, employment falls and wages increase.

Overall, the effect of an increase in b on employment and wages in equilibrium depends critically on the slope of the Laffer curve. Two opposing forces are at play. On the one hand, because higher basic income requires additional tax revenues in general equilibrium, workers must be compensated with a higher wage (see equation (15)). On the other hand, for a given level of employment, a higher negotiated wage may reduce the balanced-budget tax rate, lowering the tax burden per worker and making employment more attractive. This tension is captured by the Laffer curve, and which force dominates ultimately depends on the initial tax rate τ. For a given increase in wages, tax revenues rise more when τ is initially high, when starting from a high-tax equilibrium. From Figure 4, it is clear that, beginning at the equilibrium employment level l_1 and tax rate τ_1 on the downward-sloping segment of the Laffer curve, an increase in b raises employment and lowers the tax rate τ (and vice versa). The opposite occurs in economies with multiple equilibria that start from the lower-tax equilibrium τ_2 and higher employment level l_2.

Conversely, in economies characterized by a unique equilibrium (l_1, τ_1), an increase in basic income unambiguously leads to higher employment and lower wages. The tax rate falls as well, because rising employment expands the tax base – the total wage bill wl. Consequently, government revenue can be sustained, or even increased, despite the lower tax rate.

Turning to net income, unemployed workers receive b, while those employed receive $\mu\theta + b$ (i.e., $\mu\theta$ from net wages plus the basic income b). Thus, for workers who remain employed, net income increases by the same amount (the added basic income), regardless of the employment level.[16] In contrast, when starting from the (l_1, τ_1) equilibrium on the downward-sloping segment of the Laffer curve, some previously unemployed workers become employed following the increase in b. For these newly employed workers, the rise in net income is even larger, as they gain both the basic income and the net wage. These observations lead to the following propositions.

Proposition 2. *In economies with involuntary unemployment located on the downward-sloping segment of the Laffer curve ($\tau > s$), increasing basic income raises employment and increases net income for both employed and unemployed workers, resulting in a Pareto superior equilibrium.*

[16]Although wages fall when increasing b starting from l_1, the tax rate τ also falls resulting in a constant net wage: $w(1 - \tau) = \theta\mu$. Conversely, when increasing b starting from l_2, wages rise but so does the tax rate, again yielding the same net wage $w(1 - \tau) = \theta\mu$.

In contrast, starting from the (l_2, τ_2) equilibrium on the upward-sloping segment of the Laffer curve, an increase in b causes some workers to lose their job, which may reduce their net income.

Proposition 3. *In economies with involuntary unemployment located on the upward-sloping segment of the Laffer curve* $(\tau < s)$*, increasing basic income creates a trade-off: net income rises for those who remain employed and for those who remain unemployed, but overall employment falls.*

Proposition 3 applies to economies that are at a relatively high employment equilibrium l_2, thus featuring a relatively large wage bill. In this environment, increasing benefits may not be too costly to sustain given the substantial tax base. However, being on the upward-sloping side of the Laffer curve implies that raising revenues requires a higher tax rate, which leads to higher wages but lower employment in equilibrium.

Two key insights follow from this analysis. Corollary 1 and Proposition 2 suggest that economies with low disutility of labor and a high tax rate face no trade-off and unambiguously benefit from implementing a basic income. By contrast, Proposition 1(i) indicates that economies with relatively high labor disutility may experience coordination failures, as seen in the previous section. Policymakers can address this problem by fixing the basic income tax rate at the level corresponding to the high employment equilibrium. In such cases, increasing b is detrimental to employment and poses the trade off described in Proposition 3. This trade-off, however, is not necessarily viewed as a drawback by some advocates of UBI schemes, as it can provide support for workers displaced by technological change or those engaged in unpaid socially valuable activities (Standing, 2012; Van Parijs and Vanderborght, 2017).

Given these results, a natural question arises: how does a policy relying on a basic income compare to one relying on unemployment benefits? In Section 5, we extend the model to incorporate unemployment benefits and show that when a basic income effectively supports employment, unemployment benefits outperform it; conversely, when basic income is detrimental to employment, it performs better than unemployment benefits.

5. Basic income versus unemployment benefit

In the presence of a fixed unemployment benefit z, the generalized Nash bargaining problem with linear utility becomes

$$\max_{(w,l<n)\in\Re_{++}} \{Alf(x) - wl\}^{\alpha}\{[w(1-\tau) - (\theta + z)](l/n)\}^{1-\alpha}.$$

The rent division curve $w = \mu MPL$ (where MPL is given by (3)) is not affected by z and the wage remains decreasing in the employment level. Meanwhile, the contract curve now reads as $MPL = (\theta + z)/(1 - \tau)$, where $(\theta + z)/(1 - \tau)$ represents the reservation wage. Using the rent division curve and the contract curve, the wage can be expressed as a mark-up over the reservation wage, $w = \mu[(\theta + z)/(1 - \tau)]$. Noticeably, in partial equilibrium (i.e., for a given tax rate τ) both the wage and the reservation wage are unaffected by b. Therefore, the basic income has no influence on the employment level, while any increase in the unemployment benefit z raises the reservation wage and decreases employment. This effect can be related to the moral hazard problems associated with unemployment benefits.

Furthermore, net incomes do not depend on the employment level or the tax rate and are identical whether considering partial or general equilibrium. Specifically, the net income of the unemployed is $b + z$, which increases equally with respect to z or b, while net income of those employed, $\mu(\theta + z) + b$, increases more with an increase in the unemployment benefit.[17] This outcome is closely linked to the presence of unions ($\mu > 1$), which enables workers to secure higher net wages through bargaining when the reservation wage rises with an increase in z. With unions, wages are set above the reservation wage, meaning there is a private cost to unemployment (unemployment is involuntary). This cost decreases as z increases, implying that employers must pay more to make employment attractive as z rises. In contrast, an increase in b does not affect this cost because it does not alter the reservation wage. Without unions, wages equal the reservation wage under both policies, so there is no private cost to unemployment in either case.

Turning to the general equilibrium, the government budget constraint implies that the tax rate satisfies $\tau = [bn + z(n - l)]/wl$. Following the same procedure as in Section 4, the general equilibrium employment level is implicitly defined by

$$Z(l) \equiv \mu\left[(1 - s)Ak^s l^{1-s} - \theta l - z\frac{\mu - 1}{\mu}l\right] = (b + z)n. \tag{18}$$

As shown in Appendix F, when the disutility of labor is sufficiently high – that is, $\theta > \underline{\theta}_z \equiv (1 - s)Ak^s n^{-s} - z - (b/\mu)$ – the model admits two possible equilibria: a low employment equilibrium $l_1 < l_z^*$, where

$$l_z^* \equiv \frac{(1 - s)^{2/s} A^{1/s} k}{[\theta + z((\mu - 1)/\mu)]^{1/s}}$$

[17] Using the rent division curve, the net income of employed workers, $w(1 - \tau) + b$, can be expressed as $\mu MPL(1 - \tau) + b$. By applying the contract curve, this is equivalent to $\mu(\theta + z) + b$.

with associated wage $w_1 = \mu MPL(l_1)$ and tax rate

$$\tau_1 = \frac{bn + z(n - l_1)}{\mu MPL(l_1)l_1},$$

and a high employment equilibrium $l_2 > l_z^*$, characterized by a lower wage $w_2 < w_1$ and a lower tax rate $\tau_2 < \tau_1$.

By differentiating the equilibrium condition (18), the effects of changes in the basic income b and of changes in the unemployment benefit z on employment are

$$\frac{dl}{db} = \frac{n}{\mu\{(1-s)^2 Ak^s l^{-s} - \theta - z[(\mu-1)/\mu]\}}, \tag{19}$$

and

$$\frac{dl}{dz} = \frac{n + (\mu - 1)l}{\mu\{(1-s)^2 Ak^s l^{-s} - \theta - z[(\mu-1)/\mu]\}}. \tag{20}$$

Note that the numerators of both expressions are positive. The denominator is positive at the low-employment equilibrium l_1 (as $l_1 < l_z^*$) and negative at the high-employment equilibrium l_2. Therefore, the qualitative effect on employment of an increase in unemployment benefits mirrors that of an increase in basic income: employment rises when starting from l_1, and falls when starting from l_2.

Quantitatively, however, the effects of increasing b and z differ. Because of union bargaining power ($\mu > 1$), the positive numerator in the expression for dl/db is smaller than that in dl/dz. This implies that, due to the wage mark-up above the reservation wage, employment responds more strongly (in absolute value) to an increase in unemployment benefits than to an identical increase in basic income. The underlying reason lies in the existence of a wage wedge when $\mu > 1$ – that is, a positive difference between the negotiated wage and the reservation wage in net terms, $(\mu - 1)MPL(1 - \tau)$ – whose change, for a given variation in employment, is amplified under changes in z compared with b. To see this, consider a decrease in employment (as when moving from l_2) and suppose this reduction is the same for a given increase in either z or b. Because the endogenous tax rate is defined as $\tau = [bn + z(n - l)]/\mu lMPL$, a fall in employment reduces the wage bill ($\mu lMPL$), which by itself raises the tax rate and thereby shrinks the wage wedge. However, because unemployment benefits z depend on the number of unemployed $(n - l)$, a decrease in employment simultaneously raises total transfers, further increasing τ. This magnifies the contraction of the wage wedge and produces a stronger reduction in employment than an equivalent increase in b. Conversely, when employment increases (as when moving from l_1), the wage bill rises, reducing the tax rate and widening the wage wedge. When transfers are linked to z, the shrinking pool of unemployed further reinforces this effect, leading to a larger increase in employment than under an equivalent rise in basic income b. Hence, an increase in unemployment benefits z causes employment to respond more strongly – in either direction – than an equivalent increase in basic income b.

These results have important implications. In economies with relatively low tax rates (τ_2), increasing unemployment benefits tends to reduce employment more than a comparable increase in basic income – though both support income levels. This outcome corresponds to the higher-employment equilibrium l_2. By contrast, in economies with high tax rates (τ_1), while basic income schemes perform well, increases in unemployment benefits tend to be more effective, as they raise net income, employment, and the overall wage bill, thereby alleviating the tax burden. The following proposition summarizes these results.

Proposition 4. *In the presence of union bargaining power* ($\mu > 1$)*:*

(i) *The employment response to a small increase in unemployment benefits z is stronger than to an equivalent in increase in basic income b. Formally, $dl/dz > dl/db > 0$ for economies starting from a low-employment and high-tax equilibrium (l_1, τ_1) and $dl/dz < dl/db < 0$ for economies starting from a high-employment and low-tax equilibrium (l_2, τ_2).*

(ii) *In economies with relatively low tax rates* (τ_2)*, increases in unemployment benefits reduce employment more than equivalent increases in basic income.*

(iii) *Conversely, in high-tax economies* (τ_1)*, increases in unemployment benefits lead to higher employment and net income, and to a lower tax rate, than equivalent increases in basic income, while providing the same level of support to unemployed workers.*

In summary, unemployment benefits tend to reduce employment more than basic income in low-tax economies, but are more effective at raising both employment and wages in high-tax economies. As shown in Appendix F, when $0 < \theta < \underline{\theta}_z \equiv (1-s)Ak^s n^{-s} - z - (b/\mu)$, a unique equilibrium $l_1 < l_z^*$ with the corresponding tax rate τ_1 exists. This condition is more likely to be satisfied in economies characterized by low labor disutility, high productivity and strong unions. This leads to the following corollary.

Corollary 2. *Given Proposition 4*(iii)*, in economies characterized by low labor disutility, high productivity, and strong unions, a small increase in unemployment benefits is Pareto superior to an equivalent increase in basic income. It yields higher employment and net income for employed workers while maintaining the same support for the unemployed.*

This framework effectively reflects the institutional context of Nordic countries, where generous UI coexists with strong collective bargaining institutions. These economies typically achieve better employment outcomes and higher worker incomes – consistent with our model's prediction that, under the right structural conditions, unemployment benefits can outperform basic income.

We are not the first to compare basic income with UI. As mentioned in the introduction, several studies analyze the effects of replacing targeted income assistance programs with UBI. In the following section, we extend our analysis to include means-tested programs. Direct comparisons of basic income and UI can be found in Fabre et al. (2014) and Rauh and Santos (2022). Fabre et al. (2014) focus on the social optimal level of transfers in a model featuring voluntary unemployment (i.e., shirkers), while Rauh and Santos (2022) consider a search model with agents with heterogeneous ability. Both find that increasing UI or UBI reduces employment, consistent with our results for economies operating under relatively low tax rates – arguably the context considered in those papers.

6. Extensions

In what follows, we extend our analysis to other types of social welfare policies (i.e., means-tested transfers and in-work income support) as well as to alternative models of wage bargaining. Maintaining the assumptions of linear utility and a fixed unemployment benefit, we show that the employment effects of means-tested transfers lie between those of a UBI and an unemployment benefit. Furthermore, we show that our core findings are robust across a variety of widely used union bargaining frameworks.

6.1. Means-tested benefits

Here, we analyze the effect of incorporating means-tested transfers into the model. Specifically, workers are also entitled to a welfare transfer m when unemployed and a welfare transfer δm, with $\delta \in (0, 1)$, when employed. The latter effectively acts as an employment subsidy and mimics in work income transfers, such as earned income tax credit.[18] Accordingly, the income of an employed worker is now given by $w(1-\tau)+b+\delta m$, while an unemployed worker's income becomes $b+z+m$.

[18] See Ghatak and Maniquet (2019) for an in-depth theoretical review comparing unconditional basic income schemes with in-kind, conditional, and targeted transfer programs.

The generalized Nash bargaining solution is given by

$$\max_{(w,l)\in\Re_{++}} \{Ak^s l^{1-s} - wl\}^{\alpha}\{[w(1-\tau) - z - (1-\delta)m - \theta](l/n)\}^{1-\alpha}.$$

The labor market equilibrium (for a given τ) yields the solutions for wages and employment as $w = \mu MPL$ and

$$w - MPL = \frac{w(1-\tau) - z - (1-\delta)m - \theta}{(1-\tau)},$$

where the latter corresponds to

$$MPL = \frac{z + \theta + (1-\delta)m}{1-\tau}.$$

The government budget constraint becomes $\tau wl = bn + (z+m)(n-l) + \delta ml$, which implies the tax rate $\tau = \{(b+z+m)n - [z + (1-\delta)m]l\}/wl$.

Hence, in general equilibrium, we obtain

$$M(l) \equiv \mu\left\{(1-s)Ak^s l^{1-s} - \theta l - [z + (1-\delta)m]\frac{\mu-1}{\mu}l\right\} = (b+z+m)n.$$

The slope of the function $M(l)$ is given by

$$M'(l) = (1-s)^2 Ak^s l^{-s} - \theta - [z + (1-\delta)m]\frac{\mu-1}{\mu}.$$

This function is hump-shaped, implying two equilibrium levels of employment: a low-employment equilibrium l_1, where

$$(1-s)^2 Ak^s l_1^{-s} > \theta + [z + (1-\delta)m]\frac{\mu-1}{\mu},$$

so $M(l)$ is positively sloped; and a high-employment equilibrium l_2, where

$$(1-s)^2 Ak^s l_2^{-s} < \theta + [z + (1-\delta)m]\frac{\mu-1}{\mu},$$

so $M(l)$ is negatively sloped. Totally differentiating $M(l)$ yields

$$\frac{dl}{db} = \frac{n}{\mu\{(1-s)^2 Ak^s l^{-s} - \theta - [z + (1-\delta)m][(\mu-1)/\mu]\}},$$

$$\frac{dl}{dz} = \frac{n + (\mu-1)l}{\mu\{(1-s)^2 Ak^s l^{-s} - \theta - [z + (1-\delta)m][(\mu-1)/\mu]\}},$$

$$\frac{dl}{dm} = \frac{n + (1-\delta)(\mu-1)l}{\mu\{(1-s)^2 Ak^s l^{-s} - \theta - [z + (1-\delta)m][(\mu-1)/\mu]\}}.$$

These expressions show that the employment effects of means-tested programs lie between those generated by unemployment benefits and those generated by basic income. In the low-employment equilibrium l_1, an increase in the unemployment benefit z raises employment more than an equivalent increase in the welfare transfer m. Conversely, in the high-employment equilibrium l_2, an increase in the basic income b results in a smaller reduction in employment than an equivalent increase in either m or z. This latter finding aligns with Rauh and Santos (2022) and Jaimovich et al. (2024), who show that replacing existing social assistance programs with UBI can mitigate the negative effects on labor supply. Both studies argue that unconditional income benefits raise total government transfers to employed workers, reducing job exits and thereby softening the adverse impact on labor supply. As a result, the tax increase required to finance a UBI is smaller – provided the UBI is not set excessively high. However, our framework highlights that this result is not universal. In high-tax economies, a basic income program is not necessarily superior: employment gains tends to be smaller, and the tax increase required to fund the program larger, than under existing assistance schemes.[19]

6.2. Right-to-manage

Below, we consider the right-to-manage union model, where the wage is determined through bargaining between unions and firms. Given the negotiated wage, firms unilaterally choose the amount of labor to employ. Accordingly, labor demand is given by $w = MPL(l)$, that is, $w = (1-s)Ak^s l^{-s}$. Rearranging this expression to solve for l gives

$$l = \left[\frac{A(1-s)k^s}{w}\right]^{1/s}. \tag{21}$$

We can now write the generalized Nash bargaining solution, taking into account the labor demand function $w = MPL(l)$, as

$$\max_{w \in \Re_+} \quad \{Ak^s l^{1-s} - wl\}^{\alpha}\{[w(1-\tau) - \theta - z](l/n)\}^{1-\alpha}$$
$$\text{s.t.} \quad \text{equation (21).}$$

From the first-order condition for a maximum, we obtain

$$-\frac{\alpha l}{Ak^s l^{1-s} - wl} + \frac{(1-\alpha)(1-\tau)}{w(1-\tau) - \theta - z} - (1-\alpha)l\frac{\partial l}{\partial w} = 0,$$

[19]Indeed, in this case the tax rate $\tau = \{(b+z+m)n - [z + (1-\delta)m]l\}/wl$ is higher following an increase in the basic income than after an increase in m or z: total transfers rise more, and employment and the associated wage bill rise less.

where $\partial l/\partial w$ is the derivative of the labor demand with respect to the wage (from equation (21)). Using this derivative, and re-arranging terms, the expression above simplifies to

$$\frac{(1-\alpha)(1-\tau)w}{w(1-\tau)-\theta-z}=\frac{(1-\alpha)}{s}+\frac{\alpha(1-s)}{s},$$

which implies

$$w=\mu\left(\frac{\theta+z}{1-\tau}\right), \tag{22}$$

where $\mu\equiv(1-\alpha s)/(1-s)$. In equilibrium, the wage satisfies

$$w=(1-s)Ak^{s}l^{-s}\Longleftrightarrow MPL(l)=\mu\frac{\theta+z}{1-\tau}.$$

Accordingly, the partial equilibrium level of employment is

$$l^{rtm}=\left[\frac{(1-\tau)(1-s)Ak^{s}}{\mu(\theta+z)}\right]^{1/s}.$$

Not surprisingly, l^{rtm} is lower than the partial equilibrium level of employment under efficient bargaining.[20] Under efficient bargaining, the marginal productivity of labor is lower, namely $MPL(l)=(\theta+z)/(1-\tau)$. However, the wage still corresponds to a mark-up over the reservation wage; as in the efficient bargaining scenario discussed in Section 4.

To solve for the general equilibrium, we substitute τ from the government budget constraint, $\tau wl=(n-l)z+bn$, into the wage mark-up condition (22) and obtain $wl-\mu\theta l-z(\mu-1)l=(b+z)n$. After substituting the wage w by the marginal productivity of labor, the expression simplifies to

$$\tilde{Z}(l)\equiv\mu\left[(1-s)\frac{A}{\mu}k^{s}l^{1-s}-\theta l-z\frac{\mu-1}{\mu}l\right]=n(z+b).$$

This function $\tilde{Z}(l)$ is identical to that derived under the efficient bargaining model in Section 5, except for the presence of the term A/μ. Therefore, all results and comparative statics obtained previously still apply, once we replace

[20]The difference is captured by the extra term μ in the denominator: under efficient bargaining, from the contract curve under partial equilibrium $MPL=(\theta+z)/(1-\tau)$ and using the productivity condition (3),

$$l=\left[\frac{(1-\tau)(1-s)Ak^{s}}{\theta+z}\right]^{1/s}$$

(see Section 5).

A with $\tilde{A} \equiv A/\mu$, where relevant. Finally, a special case of the right-to-manage model is the monopoly union model, where unions have full bargaining power (i.e., $\alpha = 1$) implying $\mu = 1/(1 - s)$. In conclusion, the outcomes under the right-to-manage and efficient bargaining models are qualitatively similar, except that the right-to-manage model is inefficient in the sense that at least one party to the bargain could be made better off by bargaining jointly over both employment and wages.

7. Conclusion

In many countries, governments are reconsidering the role of welfare provision and exploring potential reforms to existing systems. A central motivation behind these reforms is the concern that some welfare benefits may generate undesirable incentive effects, particularly by discouraging labor supply. For example, in the United Kingdom, successive reforms have shifted policy toward greater reliance on income assistance and a reduced role for traditional UI. More broadly, advocates of replacing UI with a guaranteed minimum income argue that because such a benefit does not phase out with earnings, it avoids the work disincentives typically associated with means-tested programs.

In this paper, we argue that basic income schemes can have positive effects on labor supply in high-tax economies. However, replacing unemployment benefits or means-tested transfers with a basic income is generally less effective at increasing employment, resulting in a higher tax burden and smaller welfare gains. In low-tax economies, by contrast, although a basic income scheme may reduce employment, it does so to a lesser extent than unemployment benefits or means-tested transfers. Whether a basic income is therefore counterproductive depends crucially on the fiscal and institutional environment. An important avenue for future research is to assess whether these results extend to dynamic settings in which unemployment benefits expire after a finite duration.

Appendix A. Proof of Lemma 1

The Laffer curve represents tax revenues as a function of the tax rate, formally: $LC(\tau) = \tau w l$, where w and l are implicitly given by equations (7) and (11), where MPL is given by (3) and $\tilde{w} \equiv (1 - \tau)w + b$. To characterize the shape of the Laffer curve, we obtain its derivative $dLC(\tau)/d\tau = wl + \tau l$

$$\frac{dLC(\tau)}{d\tau} = wl + \tau l \frac{dw}{d\tau} + \tau w \frac{dl}{d\tau}. \tag{A1}$$

Totally differentiating equations (7) and (11) with respect to τ, w, and l we obtain $dw/d\tau$ and $dl/d\tau$ as follows. After substituting $\mu MPL = w$ (from equation (7)) and $dMPL/dl = -s(MPL/l)$ (differential of equation (3)) in the differential of equation (7), we have

$$\frac{dl}{d\tau} = -\frac{l}{ws}\frac{dw}{d\tau}. \tag{A2}$$

Differentiating equation (11), we have

$$\frac{dw}{d\tau}\left[1 - \frac{\mu}{\mu-1} + \frac{\mu}{\mu-1}\frac{U''(\tilde{w})}{U'(\tilde{w})}\frac{U(\tilde{w}) - \theta - U(b)}{U'(\tilde{w})}\right]$$
$$= \frac{U(\tilde{w}) - \theta - U(b)}{(1-\tau)U'(\tilde{w})}\frac{\mu}{(\mu-1)}\frac{1}{(1-\tau)}$$
$$+ \frac{\mu w}{\mu-1}\frac{U''(\tilde{w})}{U'(\tilde{w})}\frac{U(\tilde{w}) - \theta - U(b)}{(1-\tau)U'(\tilde{w})} - \frac{\mu w}{(\mu-1)}\frac{1}{(1-\tau)}. \tag{A3}$$

After using

$$\frac{U(\tilde{w}) - \theta - U(b)}{U'(\tilde{w})} = \frac{\mu-1}{\mu}(1-\tau)w$$

(from equation (11)), this can be written as

$$\frac{dw}{d\tau}\frac{\tau}{w} = \frac{\tau}{(1-\tau)}. \tag{A4}$$

Substituting equations (A2) and (A4) in equation (A1), we can obtain the following expression

$$\frac{dLC(\tau)}{d\tau} = wl\frac{s-\tau}{s(1-\tau)}.$$

It follows that the Laffer curve is hump-shaped, as

$$\frac{d\tau wl}{d\tau} = \frac{wl(s-\tau)}{(1-\tau)s} > (<)0$$

for $\tau < (>)s$, reaching a maximum at $\tau = s$.

Appendix B. Proof of Lemma 2

Using equations (7) and (12), a contract curve that is negatively sloped becomes steeper than the rent division curve when the following inequality holds:

$$-\mu\frac{\partial MPL}{\partial l} < \left(\frac{\partial MPL}{\partial l} - \frac{\partial\Omega}{\partial\tau}\frac{\partial\tau}{\partial l}\right)\left(-1 - \frac{\partial\Omega}{\partial w} - \frac{\partial\Omega}{\partial\tau}\frac{\partial\tau}{\partial w}\right)^{-1};$$

$$\begin{aligned}-\mu\frac{\partial MPL}{\partial l} < &\left\{\frac{\partial MPL}{\partial l} + \frac{\tau w}{(1-\tau)l}\left[\frac{1}{w}\left(w - \frac{U(\tilde{w})-\theta-U(b)}{(1-\tau)U'(\tilde{w})}\right)\right.\right.\\ &\left.\left. - \left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right]\right\}\\ &\times\left\{\frac{1}{1-\tau}\left[-\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right.\right.\\ &\left.\left. + \frac{\tau}{w}\left(w - \frac{U(\tilde{w})-\theta-U(b)}{(1-\tau)U'(\tilde{w})}\right)\right]\right\}^{-1}. \end{aligned} \quad \text{(B1)}$$

In equilibrium, conditions (6) and (7) must hold simultaneously, implying

$$-\frac{U(\tilde{w})-\theta-U(b)}{(1-\tau)U'(\tilde{w})} = MPL(1-\mu)$$

and $w = \mu MPL$. Substituting these into the inequality above, gives

$$\begin{aligned}-\mu\frac{\partial MPL}{\partial l} < &\left\{(1-\tau)\frac{\partial MPL}{\partial l} + \frac{\tau\mu MPL}{l}\left[\frac{1}{\mu MPL}(\mu MPL + MPL(1-\mu))\right.\right.\\ &\left.\left. - \left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right]\right\}\\ &\times\left\{\left[-\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right.\right.\\ &\left.\left. \frac{\tau}{\mu MPL}(\mu MPL + MPL(1-\mu))\right]\right\}^{-1};\end{aligned}$$

$$\begin{aligned}-\mu\frac{\partial MPL}{\partial l} < &\left\{(1-\tau)\frac{\partial MPL}{\partial l} + \frac{\tau\mu MPL}{l}\left[\frac{1}{\mu} - \left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right]\right\}\\ &\times\left\{-\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})} + \frac{\tau}{\mu}\right\}^{-1};\end{aligned}$$

$$
\begin{aligned}
&-\mu\frac{\partial MPL}{\partial l} \\
&\quad < \left\{(1-\tau)\frac{\partial MPL}{\partial l} + \tau\frac{MPL}{l} - \tau\mu\frac{MPL}{l}\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right\} \\
&\quad\quad \times\left\{-\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}+\frac{\tau}{\mu}\right\}^{-1}.
\end{aligned}
$$

Multiplying both sides by $l/(MPL)$, gives

$$
\begin{aligned}
&-\mu\frac{l}{MPL}\frac{\partial MPL}{\partial l}\left[-\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}+\frac{\tau}{\mu}\right] \\
&\quad < (1-\tau)\frac{l}{MPL}\frac{\partial MPL}{\partial l} + \tau - \tau\mu\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\cdot\frac{U''(\tilde{w})}{U'(\tilde{w})}.
\end{aligned}
$$

Collecting all terms in

$$\frac{l}{MPL}\frac{\partial MPL}{\partial l}$$

and simplifying, we obtain

$$
\begin{aligned}
&-\mu\frac{l}{MPL}\frac{\partial MPL}{\partial l}\left[-\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}+\frac{\tau}{\mu}+\frac{1-\tau}{\mu}\right] \\
&\quad < \tau\mu\left[\frac{1}{\mu}-\left(\frac{U(\tilde{w})-\theta-U(b)}{U'(\tilde{w})}\right)\frac{U''(\tilde{w})}{U'(\tilde{w})}\right]; \\
&\quad -\frac{l}{MPL}\frac{\partial MPL}{\partial l} = s < \tau
\end{aligned}
$$

Finally, by analogous reasoning, if the contract curve is positively sloped, or if it is negatively sloped but flatter than the rent-division curve, the inequality opposite to equation (B1) holds, implying the condition $s > \tau$.

Appendix C. The $G(l)$ and the Laffer curve

As shown in Appendix A, the inequality $d\tau wl/d\tau > 0$ iff $s > \tau$, holds – a result that also applies under linear utility. We now demonstrate that when the function $G(l)$ is increasing in l, that is, when the equilibrium employment level satisfies

$$l < l^* \equiv \frac{(1-s)^{2/s}A^{1/s}k}{\theta^{1/s}}$$

(from Lemma 3), this implies $s < \tau$; and, conversely, when $s > \tau$ we have $l > l^*$. Using equations (13) and (15), the equilibrium employment level for a given τ is

$$l = \left[\frac{(1-\tau)(1-s)Ak^s}{\theta}\right]^{1/s}.$$

Comparing this expression to l^*, the condition $l < l^*$ is equivalent to

$$\left[\frac{(1-\tau)(1-s)Ak^s}{\theta}\right]^{1/s} < \left[\frac{(1-s)^2 Ak^s}{\theta}\right]^{1/s},$$

which simplifies to $(1-\tau)(1-s) < (1-s)^2 \Rightarrow s < \tau$.

Next we show that $G(l^*) = LC(s)$, where $LC(\tau)$ is the Laffer curve defined in Appendix A for the linear utility case

$$LC(\tau) = \frac{\tau(1-\tau)^{(1-s)/s}(1-s)^{1/s}\mu A^{1/s}k}{\theta^{(1-s)/s}}.$$

Evaluating this at $\tau = s$ yields

$$LC(s) = \frac{s\mu(1-s)^{(2-s)/s}A^{1/s}k}{\theta^{(1-s)/s}}.$$

From Lemma 3, the expression $G(l^*)$ is given by

$$G(l^*) = \frac{s\mu(1-s)^{(2-s)/s}A^{1/s}k}{\theta^{(1-s)/s}},$$

implying the equality $LC(s) = G(l^*)$. Importantly, the hump-shaped nature of the $G(l)$ function and the expression for l^* holds for any $\mu \geq 1$. Therefore, the correspondence between the $G(l)$ and $LC(\tau)$ remains valid even when unions have no bargaining power (i.e., when $\mu = 1$).

Appendix D. Necessary and sufficient conditions for existence of equilibria

Unemployment equilibria are values of employment $l < n$ such that $G(l) = bn$. In Figure 3(a), this corresponds to the intersection between the curve $G(l)$ and the horizontal line bn. The existence of at least one equilibrium requires $bn \leq G(l^*)$ – that is, $b \leq b^* \equiv G(l^*)/n$ – where $l^*$and $G(l^*)$ are given in Lemma 3. Moreover, in the non-generic case $b = b^*$, there is exactly one unemployment equilibrium $l = l^*$, provided that $n > l^*$. From this point on, we focus on the generic case $b < b^*$.

When $n > l^{**}$, the equation $G(l) = bn$ has two distinct solutions $l_1 < l^*$ and $l_2 > l^*$ (see Figure 3(a)). Because $l^{**} < n$, both l_1 and l_2 satisfy $l < n$, meaning that both are valid unemployment equilibria. Thus, in this case there are always two equilibria located on either side of l^*.

When $n < l^*$, two outcomes are possible. If $l_1 > n$, the line bn does not intersect $G(l)$ for $l < n$, and no equilibrium exists. If $l_1 < n < l^*$, then there is one valid equilibrium at l.

Finally, note that the conditions $b < b^*$ and $n > l^*$ are sufficient to ensure the existence of at least one equilibrium ($l_1 < l^* < n$) and at most two unemployment equilibria ($l_1 < l^*$ and $l_2 > l^*$, provided $n > l_2$). Because two equilibria always exist when $n > l^{**}$, the main analysis focuses on the intermediate case $l^* < n < l^{**}$, in which additional conditions determine whether one or two equilibria arise.

Appendix E. Proof of Proposition 1

The proof proceeds in several steps.

1. Express conditions in Assumption 1 in terms of $\theta > 0$, that is,

$$n < l^{**} \equiv \frac{(1-s)^{1/s} A^{1/s} k}{\theta^{1/s}} \Leftrightarrow \theta < (1-s)Ak^s n^{-s} \equiv \theta^{**} \Leftrightarrow \underline{b} > 0,$$

$$n > l^* \equiv \frac{(1-s)^{2/s} A^{1/s} k}{\theta^{1/s}} \Leftrightarrow \theta > (1-s)^2 Ak^s n^{-s} \equiv \theta^* > 0$$
$$(\text{with } \theta^* < \theta^{**}),$$

and

$$b < b^* \Leftrightarrow 0 < \theta < \left[(1-s)^{2-s}(sk)^s A\right]^{1/(1-s)} \left(\frac{\mu}{nb}\right)^{s/(1-s)} \equiv \theta_{b^*}.$$

Assumption 1 is verified if and only if

$$\theta < \theta^{**}, \quad \theta > \theta^*, \quad \theta < \theta_{b^*}, \quad \text{and } b > 0. \tag{E1}$$

2. Recall $n\underline{b} \equiv G(n) = \mu n[(1-s)Ak^s n^{-s} - \theta]$ and note that $\underline{b} > 0$, as $n < l^{**}$. Thus, the condition $b \gtrless \underline{b}$ translates to

$$b \gtrless \underline{b} \Leftrightarrow 0 < \theta \gtrless (1-s)Ak^s n^{-s} - b/\mu \equiv \underline{\theta} < \theta^{**}. \tag{E2}$$

3. Using these expressions, and the discussion in the main text for existence of one ($b < \underline{b}$) or two equilibria ($b > \underline{b}$) under Assumption 1, we have that:

(i) two equilibria exist, l_1 and l_2, with $l_1 < l^* < l_2$, if and only if $\max\{\theta^*, \underline{\theta}\} < \theta < Min\,\{\theta_{b^*}\theta^{**}\}$

(ii) one equilibrium exists, l_1 with $l_1 < l^*$, if and only if $\theta^* < \theta < \min\{\underline{\theta}, \theta_{b^*}, \theta^{**}\}$.

4. To ensure that these sets for $\theta > 0$ are non-empty, we assume

$$\theta_{b^*} > \theta^{**},$$

and note that $\theta_{b^*} > \theta^{**} \Longrightarrow \underline{\theta} > \theta^*$. In fact, these inequalities satisfy

$$\theta_{b^*} > \theta^{**} \Leftrightarrow b < A\mu(1-s)^{1/s} sk^s n^{-s}$$

$$\underline{\theta} > \theta^* \Leftrightarrow b < A\mu(1-s)k^s n^{-s} s.$$

And because $0 < s < 1$, we have $(1-s) > (1-s)^{1/s}$, so that

$$\theta_{b^*} > \theta^{**} \quad \Leftrightarrow b < A\mu(1-s)^{1/s} sk^s n^{-s}, \Longrightarrow \underline{\theta} > \theta^*. \tag{E3}$$

5. Under the condition $\theta_{b^*} > \theta^{**}$ as stated in equation (E3), and using the fact that $\underline{\theta} < \theta^{**}$ from equation (E2), we obtain the following ranking of the critical values of θ

$$\theta_{b^*} > \theta^{**} > \underline{\theta} > \theta^* > 0.$$

Hence, invoking equations (E3) and (E1), the following lemma applies.

Lemma E1. *Define the following thresholds:* $\theta^{**} \equiv (1-s)Ak^s n^{-s}$, $\theta^* \equiv (1-s)^2 Ak^s n^{-s}$, *and* $\underline{\theta} \equiv (1-s)Ak^s n^{-s} - b/\mu$. *Assume a given level of* $b > 0$ *such that* $b < A\mu(1-s)^{1/s} sk^s n^{-s}$, *then Assumption 1 is satisfied if and only if*

$$\theta^{**} > \theta > \theta^*, \qquad \text{while } \theta^{**} > \underline{\theta} > \theta^*.$$

Given this lemma, the equilibrium structure depends on the value of θ as follows: one equilibrium exists when $\theta^* < \theta < \underline{\theta}$, and two equilibria exist when $\underline{\theta} < \theta < \theta^{**}$. Accordingly, Proposition 1 holds under the conditions specified in Assumption 1, provided that $b < A\mu(1-s)^{1/s} sk^s n^{-s}$.

Note that using the parameter values in Figures 2–4 ($n = 1 = k = A$, $s = 0.3$, $\mu = 1.2$, and $b = 0.15$), we obtain $\underline{\theta} = 0.575$, $\theta^{**} = 0.7$, and $\theta^* = 0.49$ Hence, if $\theta = 0.6$ (as in Figure 4) two equilibria exist; while if $\theta = 0.55$, only one equilibrium exists.

Appendix F. Basic income versus unemployment benefits: equilibrium

The generalized Nash bargaining problem is

$$\max_{(w, l<n) \in \Re_{++}} \{Alf(x) - wl\}^{\alpha} \{[w(1-\tau) - (\theta + z)](l/n)\}^{1-\alpha}.$$

The solution for employment and wages, obtained from the labor market equilibrium for a given τ, is characterized by the rent division curve $w = \mu MPL$ and the contract curve

$$w - MPL = \frac{w(1-\tau) - (z+\theta)}{(1-\tau)},$$

which simplifies to $MPL = (z+\theta)/(1-\tau)$. Combining these, the wage can be expressed as

$$w = \mu \frac{z+\theta}{1-\tau}.$$

The government budget constraint is $\tau wl = bn + (z)(n-l)$ implying a tax rate $\tau = [bn + z(n-l)]/wl$. Accordingly, the general equilibrium employment level is implicitly defined by

$$(\theta + z)\left[1 - \frac{bn + z(n-l)}{\mu l MPL}\right]^{-1} = MPL.$$

Using the function $MPL = (1-s)Ak^s l^{-s}$ from equation (3), this equilibrium condition can be rearranged as $Z(l) = (b+z)n$, where

$$Z(l) \equiv \mu \left[(1-s)Ak^s l^{1-s} - \theta l - z\frac{\mu - 1}{\mu} l\right].$$

The slope of $Z(l)$ is

$$Z'(l) = \mu \left[(1-s)^2 Ak^s l^{-s} - \theta - z\frac{\mu - 1}{\mu}\right].$$

This implies that $Z(l)$ is increasing in l if and only if

$$l < l_z^* \equiv \frac{(1-s)^{2/s} A^{1/s} k}{\left[\theta + z\frac{\mu-1}{\mu}\right]^{1/s}}.$$

The maximum value of $Z(l)$ is

$$Z(l_z^*) = \frac{s\mu(1-s)^{(2-s)/s} A^{1/s} k}{\left[\theta + z\frac{\mu-1}{\mu}\right]^{(1-s)/s}},$$

while $Z(l) = 0$ at $l = 0$ and at

$$l = l_z^{**} \equiv \frac{(1-s)^{1/s} A^{1/s} k}{[\theta + z((\mu - 1)/\mu)]^{1/s}}.$$

Following the same reasoning as in Section 4, Proposition 1 continues to hold provided Assumption 1 is reformulated as $l_z^{**} > n > l_z^*$ and $(b + z)n < Z(l_z^*)$. In Proposition 1, we now consider given values of b and z such that $(b + z) < A\mu(1 - s)^{1/s} sk^s n^{-s}$, instead of the earlier condition $b < A\mu(1 - s)^{1/s} sk^s n^{-s}$. Moreover, the positivity condition on $\underline{\theta}$ becomes $\underline{\theta}_z \equiv (1 - s)Ak^s n^{-s} - z - (b/\mu) > 0$. Two equilibria arise when $(b + z)n > Z(n)$, which is equivalent to $\theta > \underline{\theta}_z$. These equilibria are associated with two distinct employment levels. The first is a low-employment level $l_1 < l_z^*$, with wage $w_1 = \mu MPL(l_1)$ and tax rate

$$\tau_1 = \frac{bn + z(n - l_1)}{\mu MPL(l_1)l_1}.$$

The second is a high-employment equilibrium level $l_2 > l_z^*$, with wage w_2 and tax τ_2 satisfying $w_2 < w_1$ and $\tau_2 < \tau_1$. By contrast, if $(b + z)n < Z(n)$, or equivalently if $0 < \theta < \underline{\theta}_z \equiv (1 - s)Ak^s n^{-s} - z - (b/\mu)$, there exists a unique equilibrium characterized by a low employment level $l_1 < l^*$. This case corresponds to economies with relatively low labor disutility θ, high total factor productivity A, and a strong union bargaining power μ.

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