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A "Managerial" Trade Union and Economic Growth

Juin-jen Chang, Ming-fu Shaw and Ching-chong Lai

Institute of Economics
Academia Sinica
Taipei 115, TAIWAN
http://www.sinica.edu.tw/econ/

中央研究院　經濟研究所

INSTITUTE OF ECONOMICS, ACADEMIA SINICA

TAIWAN

A "Managerial" Trade Union and Economic Growth

Juin-jen Chang

Institute of Economics, Academia Sinica

Department of Economics, Fu-Jen Catholic University, Taiwan

Ming-fu Shaw

Department of Industrial Economics, Tamkang University, Taiwan

Ching-chong Lai

Institute of Economics, Academia Sinica

Department of Economics, National Taiwan University, Taiwan

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ABSTRACT

By setting up a simple Romer-type (1989) endogenous growth model embodying a *political trade union* (rather than the traditional *economic* labor union), this paper explores the effects of unionization on unemployment, growth and welfare by highlighting the essence of *internal conflict* within the union. It is shown that the conflicting interests between the leadership and membership within the union play a decisive role in the unemployment, growth and welfare effects of unionization. Given the fact that taxation, besides unions, is another potential candidate in explaining the poor performance of employment and economic growth, we re-examine the taxation effects within the growth model with equilibrium unemployment caused by the presence of the trade union and compare our findings with those for the traditional full-employment growth model. In addition, the dynamic properties of the unionized economy are also examined, with particular emphasis being placed on the role of the trade union in the formation of equilibrium indeterminacy.

Address for Correspondence: Juin-jen Chang, *Institute of Economics, Academia Sinica, Nankang,* Taipei 115, Taiwan, R.O.C.; *Fax: 886-2-27853946; E-mail: jjchang@econ.sinica.edu.tw*

A "Managerial" Trade Union and Economic Growth

1. Introduction

While unemployment and economic growth are two central issues in macroeconomics, and a large number of studies have been devoted to each of them, few papers have jointly studied them, and most have discussed them independently of each other. The main reason for this dichotomy is that unemployment is usually viewed as a pure business cycle phenomenon that will disappear in the long run, whereas economic growth is definitely seen as a long-term trend. In recent years, economists have increasingly suggested that this dichotomy between unemployment and growth may be too sharp. As stressed by Bean (1994) and Daveri and Tabellini (2000), a large part of the existing unemployment, particularly in Europe, may be attributed to equilibrium unemployment. With this understanding, Bean and Pissarides (1993), Aghion and Howitt (1994), and Bräuninger (2000), among others, have investigated the relationship between unemployment and growth in a growing economy with equilibrium unemployment.

A popular explanation for equilibrium unemployment is that it arises due to the collective bargaining that takes place between unions and employers. Indeed, in practice, labor markets in most economies are far from being perfectly competitive. There is no doubt that trade unions play an important role in many countries and union wage bargaining is the common means of determining wages, especially in continental Europe. In this paper, we therefore build a simple *endogenous growth* model in which the labor market is dominated by an economy-wide trade union. Since the trade union is able to capture rents and bargain over a wage that exceeds the market-clearing level, the growth model that we will set up is characterized by equilibrium unemployment.

The objectives of this study are very simple and can be roughly divided into two parts: (i) given a *managerial* trade union, we explore the effects of unionization (namely, increasing the bargaining power of the labor union) on unemployment, economic growth, and social welfare; and (ii) within the endogenous growth model characterized by equilibrium unemployment, we re-examine the effects of taxation, fully comparing them with those in the traditional full-employment growth model. The first objective is similar to that in several other papers, e.g., Palokangas (1996), Irmen and Wigger (2000), Lingens (2002), and Ramos-Parreño and Sánchez-Losada (2002). However, our emphasis is distinctive. Palokangas (1996) and Lingens (2002) shed light on the role of intersectoral interaction and labor mobility in the growth effect of unionization, while Irmen and Wigger (2000) and Ramos-Parreño and Sánchez-Losada (2002) develop an OLG model that focuses on the role of intergenerational

resource allocation and *altruism* in relation to that same effect. In departing from their analysis, this paper sets up a simple Romer-type (1989) endogenous growth model and uses it to explore the effects of unionization on unemployment, growth and welfare by highlighting the essence of *internal conflict within a political union*.

There was a famous debate between Dunlop and Ross. Dunlop (1944) argued (as in most of the economic literature) that a trade union aimed to rationally maximize "something," say, either a *utilitarian objective function* or an *expected utility function*. This viewpoint, which may have been standard in economics, was challenged by Ross (1948). He claimed that trade unions were *political institutions* in their own right, and that economists' use of such a maximization approach ignored their vital political dimension. In the Ross sense, the behavior of a political trade union should have reflected internal conflicts between different factions, especially the leadership and membership, rather than a simple maximization of choice. Pemberton (1988) side-stepped Ross's point and developed a *managerial* model which could, on the one hand, identify the so-called "something" that Dunlop argued unions maximized, as well as, on the other hand, capture the essence of internal conflicts within trade unions. By following Pemberton (1988), the present paper specifies that in a growing economy there is a "managerial" trade union, whose policy is influenced by both leadership (management) and membership preferences. Specifically, the leadership desires to strengthen the union by building up membership and hence employment (we are easily convinced that the leadership is interested in union size, on the basis of the common notion that bureaucrats prefer large organizations). Under such a situation, we can refer to the union's policy as "employment-oriented." However, the membership has a conflicting interest in light of this and desires to extract higher excess wages from employers. The "wage-oriented" policy implies that the union is more *democratic* or *populist*.

Given such a political trade union, we find that the conflicting interests between the leadership and membership within the union play a decisive role in the unemployment, growth and welfare effects of unionization. To be specific, the higher relative bargaining power of the union will result in a lower (higher) unemployment rate and a higher (lower) balanced-growth rate if the union is employment-oriented (wage-oriented), i.e. the leadership (membership) within the union has the dominant power. If the union is neutral, unionization will have no impact on either unemployment or economic growth. As a consequence, we also conclude that a higher degree of unionization will have a positive (negative) effect on social welfare if the union is employment-oriented (wage-oriented). This implies that, somewhat surprisingly, when the union is more *democratic* and more aggressively extracts

higher *wages* from firms, unionization will instead give rise to a negative effect on welfare.

Besides unions, taxation is another potential candidate for explaining the poor performance of employment and economic growth (see, for example, Nickell and Layard, 1999, and Daveri and Tabellini, 2000). Perhaps due to the dichotomy we mentioned earlier, so far the growth effect of taxation has been explored mostly in the context of competitive labor markets that are characterized by full employment. Therefore, the second aim of this paper is to re-examine the taxation effects within the growth model with equilibrium unemployment (caused by the presence of the trade union) and compare our findings with those related to the traditional full-employment growth model. This work is important because many empirical studies mention that taxes give rise to a distorting effect in terms of affecting not only unemployment in the short run but also growth in the long run.

In the existing literature, endogenous growth models with exogenous labor supply predict that a consumption tax does not affect an individual's incentive to accumulate capital and therefore leaves growth unaffected (see, e.g., Rebelo, 1991, for the consumption tax neutrality). However, income taxes are harmful to economic growth. In our endogenous growth model with equilibrium unemployment, we show that while income tax is harmful to unemployment and economic growth (which is not surprising), in a way that departs from the common viewpoint, a consumption tax also gives rise to a negative effect on the employment level and the balanced-growth rate. Of more interest, the negatively distorting effects of taxation, including income and consumption taxes, on the balanced-growth rate are more pronounced in an economy that is dominated by a powerful trade union, provided that it is employment-oriented. In addition, we find that, in conformity with empirical evidence (see Daveri and Tabellini, 2000, and Widmalm, 2001), income taxes will generate more of a distorting effect, in terms of unemployment and economic growth, than consumption taxes.

Recently, many studies, including Benhabib and Farmer (1994, 1996), Benhabib and Perli (1994), Bond, et al. (1996) and Benhabib and Nishimura (1998), have emphasized the role of goods market imperfections in the formation of indeterminate equilibrium paths. In this paper, we instead focus on the role of labor market imperfections caused by trade unions in terms of generating indeterminacy. We show that equilibrium unemployment and distortionary taxes jointly create a mechanism that gives rise to equilibrium indeterminacy. Bond, et al. (1996) have suggested that the economy could become indeterminate when distortionary taxes are imposed on manufacturing entities. This paper takes a further step to point out that the trade union also plays a significant role: Given that the union is wage-oriented, the equilibrium of the unionized economy is more likely to become locally

indeterminate when the economy is highly unionized.

The remainder of this paper proceeds as follows. In Section 2, we set up a simple endogenous growth model with a managerial trade union in which we lay particular emphasis on the essence of internal conflicts between the leadership and membership within the union. In Section 3, the dynamic properties of the unionized economy are analyzed. In Section 4, we investigate the effect of unionization on unemployment, growth and welfare, and re-examine the effect of taxation within an endogenous growth model characterized by equilibrium unemployment. Finally, concluding remarks are provided in Section 5.

2. The Model

Consider a unionized economy consisting of four types of agents: households, firms, a (national) trade union and a government. To shed light on the role of the trade union in the labor market, we assume, for simplicity, that the product market is perfectly competitive. The firms produce goods from labor and physical capital through Cobb-Douglas technology. An economy-wide trade union engages in centralized bargaining with one economy-wide federation, which represents employers. In contrast to the common "economic" (i.e. utilitarian) models of trade unions, we adopt a Ross-type approach in which a union is a "political" organization in the sense that its behavior reflects the internal conflict between its leadership (or management) and its membership, rather than simply involving a rational maximization of choice. Accordingly, as we will make clearer later, there exists a political conflict within the union: the leadership is interested in employment (and hence union size) and the membership is more concerned with the excess wage. Households derive utility from consumption and (if employed) provide their labor inelastically to firms. As in the common growth models, the population growth rate is normalized to zero. Finally, the government levies taxes, including an income tax and a consumption tax, to finance the expending of unemployment benefits b and, accordingly, balances its budget each period.

2.1 Firms, the trade union, and collective bargaining
Firms

Firms hire physical capital k and labor l to produce a single good y which can be consumed or invested. In line with Romer (1989), production is subject to the following technology:

$$y = f(k, \bar{k}, l) = A(\bar{k})k^\alpha l^\beta, \ 0 < \alpha < 1, \ 0 < \beta < 1, \tag{1}$$

where $\bar{k}$ is the average economy-wide stock of capital. As indicated by Wu and Zhang

(1998), the production function (1) exhibits constant returns to scale and is subject to a productivity externality, which is captured by $A(\bar{k})$. The external effect refers to the spillovers of knowledge that operate at the average level of the overall economy and generate perpetual growth. To sustain a growth rate, we further specify that $A(\bar{k}) = A \cdot \bar{k}^{1-\alpha}$ for convenience.

Given the production technology (1), the representative firm attempts to maximize its profit π as follows:

$$\pi = y - wl - rk \,, \tag{2}$$

where w and r are the wage rate and the rental rate of capital, respectively.

Trade union

Following Pemberton (1988), we assume that the trade union is a "managerial" one whose policies are influenced by both leadership (management) and membership preferences. The leadership desires to strengthen the union by building up its membership. We are easily convinced that the leadership is interested in union size (the number of members), based on the common notion that bureaucrats prefer large organizations. Given the assumption of a *closed shop union*, the desire for a higher membership is equivalent to the desire for a higher level of employment.[1] However, this conflicts with the membership preference: the median worker is interested in the excess wage. Given the conflict between leadership and membership preferences, we specify, in line with Pemberton (1988), that the managerial trade union's objective function has the following Stone-Geary form:[2]

$$U = (\hat{w} - \hat{b})^{\delta} l^{v} \,. \tag{3}$$

In (3), defining τ as the income tax rate and τ_c as the consumption tax rate, $\hat{w} \equiv (1-\tau)w/(1+\tau_c)$ and $\hat{b} \equiv b/(1+\tau_c)$ are the after-tax wage rate and unemployment benefits in terms of the real variables, respectively. The parameters $\delta \geq 0$ and $v \geq 0$ correspond to the excess wage $(\hat{w} - \hat{b})$ and to the employment level l elasticities of the union's objective U. Following our earlier discussion, v and δ can be thought of as the distribution of the internal power of leadership and membership, respectively. The larger the difference $(\delta - v)$, the more the union approaches the extreme of a "democratic" (or

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[1] In the closed shop union, only union members are eligible for employment; hence the level of membership is equivalent to the level of employment.

[2] See Pemberton (1988) for detailed derivations. Such a Stone-Geary utility function of the trade union is also supported by the empirical studies of Dertouzos and Pencavel (1981).

"populist") union. When $\delta = v$, these two parties have an identical discretionary power in formulating policies. In a strategic trade model, Mezzetti and Dinopoulos (1991) state that the union is "wage oriented" if $\delta > v$, while it is "employment oriented" if $\delta < v$.

Collective bargaining

The efficient bargaining model as proposed by McDonald and Solow (1981) has been an important framework in the trade union literature. The central feature of such a model is the requirement that the negotiated wage-employment contract should be *efficient* for both the employer and the union. With this feature, we follow Clark (1990) and assume, without loss of generality, that both the union and the employers' federation bargain over nominal wages and employment through the *generalized Nash bargaining solution*, subject to the firms' demand for capital. Given that the bargaining disagreement point results in a zero employment level, this optimization problem can be expressed as:

$$\max_{w,l} \Omega \equiv [(\hat{w} - \hat{b})^\delta l^v]^\theta \cdot [A(\bar{k}) k^\alpha l^\beta - wl - rk]^{1-\theta},$$

$$\text{s.t. } k = \arg\max_k \pi,$$

where $\theta \in (0,1)$ is a parameter that denotes the relative bargaining strength of the union.

By some simple manipulations, the optimal conditions for the wage and employment are given by:

$$\frac{\hat{w} - \hat{b}}{\hat{w}} = \frac{\delta}{v} \frac{w - \beta A(\bar{k}) k^\alpha l^{\beta-1}}{w}, \tag{4}$$

$$w = \left[\beta + \frac{\theta v(1 - \alpha - \beta)}{1 - \theta + \theta v}\right] A(\bar{k}) k^\alpha l^{\beta-1}, \tag{5}$$

and the firm's capital demand function:

$$r = \alpha A(\bar{k}) k^{\alpha-1} l^\beta. \tag{6}$$

As in the traditional theory of union bargaining, (4) describes the *contract curve* in the (w, l) space and (5) depicts the *rent division curve* (see Booth, 1995, for details). The contract curve is upward (downward) sloping if and only if the union is employment (wage) oriented $\delta < v$ ($\delta > v$).[3] This result obviously differs from the traditional union bargaining theory which predicts that if the union is risk-averse (i.e. its preference is characterized by a concave utility of income function), the slope of the contract curve is positive; while if it is risk-loving, the contract curve turns out to be negatively sloped. This distinction, as we will see in

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[3] From (4), we have $\dfrac{\partial w}{\partial l} = \dfrac{\delta(1 - \beta)\beta A(\bar{k}) k^\alpha l^{\beta-2}}{v - \delta} \gtreqless 0$, iff $v \gtreqless \delta$.

Section 4, will play a prominent role in our analysis.

Equation (5) represents the *division curve*, which is in conformity with the common characteristics of the traditional efficient bargaining models. It follows from (5) that, given a particular level of employment, as the union's bargaining power θ increases, the negotiated wage rate will be raised. Equation (6) is a standard $r = MPK$ condition. To simplify the analysis and also conform to the standard trade union models, we do not incorporate the union's preference concerning physical capital into its utility function as reported in (3).[4] Given this simplicity, we can easily realize that the level of *k* satisfying (6) will be the same as that under an efficient wage-employment–capital contract (under which the wage, employment, and capital are simultaneously determined from the negotiation between the employers' federation and the trade union). Clark (1990) and Ulph and Ulph (1990, p. 109) obtain similar results. This allows us to avoid the consequence of inefficiency whereby unionization leads to underinvestment.[5]

Because the labor market is characterized by unionization, market imperfection will result in a positive profit for firms. By substituting (4)-(6) into (2), the representative firm's profit function is given by:

$$\pi = \frac{(1-\theta)(1-\alpha-\beta)}{1-\theta+\theta v} A(\bar{k}) k^\alpha l^\beta \geq 0 . \tag{7}$$

Equation (7) indicates that the firm's profit is positive when (i) the individual firm's production technology exhibits decreasing returns to scale in its *internal* capital and labor factors, i.e. $0 < \alpha + \beta < 1$, and (ii) the employers' federation has a positive bargaining power, i.e. $0 < \theta < 1$. In the extreme case where $\theta = 1$, the profit is reduced to zero.

2.2 Households

The economy is populated by a unit measure of identical, infinitely-lived households. Each household is endowed with one unit of time and has an instantaneous CRRA utility function with respect to consumption *c*.[6] Accordingly, the individual household chooses *c* so

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[4] Some researchers, e.g., Clark (1990), introduce the so-called "manning ratio" (by which is meant the capital-labor or output-labor ratio) into the negotiation between unions and employers. See Booth (1995, pp. 121-122) for details.

[5] Grout (1984) shows that, given that the firm is a monopoly, under "the non-binding contracts" the presence of a union will lead to underinvestment if the resale price of capital is less than its purchase price. Van der Ploeg (1987) incorporates the adjustment costs of investment into a dynamic model and finds that unionization may also be associated with lower investment.

[6] The case of log-linear utility is excluded to maintain the homogeneity of the preferences.

as to maximize the discounted sum of future instantaneous utilities. Specifically, with an intertemporal elasticity of substitution $1/\sigma$, the household's optimization problem is:

$$\max \int_0^\infty \frac{c^{1-\sigma}-1}{1-\sigma} \cdot e^{-\rho t} dt \, ,\tag{8}$$

subject to the following flow budget constraint:

$$\dot{k} = (1-\tau)(rk + \pi + wl) + b(1-l) - (1+\tau_c)c \, ,\tag{9}$$

and a positive capital endowment $k_0 > 0$. The sources of income of a representative individual, as shown by (9), consist of capital income rk, labor income wl, and the profits π transferred from firms.   For simplicity and to focus our point, the same income tax rate τ is imposed on all types of income.   It is worth noting that in a unionized economy, the labor market may be characterized by an equilibrium unemployment rate, say, $1-l$.   When the worker is unemployed, he will receive unemployment benefits b from the government. However, to avoid an unnecessarily complicated derivation, we follow van der Ploeg (1987), Palokangas (1996), and Lingens (2002) and assume that the number of households is continuous and infinite.   Therefore, $wl + b(1-l)$ can be thought of as the "average" labor income of an individual household.

From (8) and (9), a simple manipulation yields the standard Keynes-Ramsey rule:

$$\frac{\dot{c}}{c} = \frac{1}{\sigma}[(1-\tau)r - \rho].\tag{10}$$

Let $\gamma_c^{\max}$ be the maximum sustainable rate of consumption growth. To ensure that the lifetime utility is bounded, we impose the Brock-Gale condition as follows:

Condition B: $\rho > (1-\sigma)\gamma_c^{\max}$.

2.3 The government and the resource constraint

The government collects taxes, including income taxes $\tau(rk + \pi + wl)$ and consumption taxes $\tau_c c$, to finance the expending of unemployment benefits $b(1-l)$.   Accordingly, at any instant of time, the government budget constraint can be expressed as:

$$b(1-l) = \tau(rk + \pi + wl) + \tau_c c \, ,\tag{11}$$

By adjusting b, the government balances its budget (11) each period.

Putting the government's budget constraint (11), the household's budget constraint (9), the firm's production function (1) and the profit function (4) together yields the aggregate resource constraint of the economy:

$$\dot{k} = A(\bar{k})k^{\alpha}l^{\beta} - c = y - c. \tag{12}$$

2.4 Equilibrium

In equilibrium, all firms make the same choices, so that $k = \bar{k}$ applies. Equipped with this, we rewrite (4)-(6), (10), (11) and (12) and, accordingly, summarize the equilibrium conditions of the economy as follows:

$$\frac{\hat{w} - \hat{b}}{\hat{w}} = \frac{\delta}{v} \frac{w - \beta Akl^{\beta-1}}{w}, \tag{4a}$$

$$w = \frac{\theta v(1-\alpha) + (1-\theta)\beta}{1-\theta+\theta v} Akl^{\beta-1}, \tag{5a}$$

$$r = \alpha Al^{\beta}, \tag{6a}$$

$$\frac{b}{k}(1-l) = \tau Al^{\beta} + \tau_{c}\frac{c}{k}, \tag{11a}$$

$$\dot{k} = Akl^{\beta} - c, \tag{12a}$$

and the Keynes-Ramsey rule

$$\frac{\dot{c}}{c} = \frac{1}{\sigma}[(1-\tau)r - \rho]. \tag{10}$$

3. Stability Analysis

For ease of derivation, we combine (4a) with (5a) and, as a result, obtain the unemployment benefit-wage ratio:

$$\frac{b}{w} = (1-\tau)\psi, \tag{13}$$

where $\psi \equiv 1 - \dfrac{\delta\theta(1-\alpha-\beta)}{v\theta(1-\alpha)+(1-\theta)\beta}$. Defining $x \equiv \dfrac{c}{k}$, we next substitute (5a) and (13) into

(11a) to solve employment l for the instantaneous relationship as follows:

$$l = l(\underset{-}{x}; \underset{?}{\theta}, \underset{-}{\tau}, \underset{-}{\tau_{c}}), \tag{14}$$

Letting $\Delta \equiv \tau\beta + (1-\tau)\eta\dfrac{[1-\beta(1-l)]}{l} > 0$ and $\eta \equiv 1-\alpha-(1-\alpha-\beta)\dfrac{1-\theta+\delta\theta}{1-\theta+v\theta}$, the exact

comparative statics in (14) are $l_{x} = \dfrac{-\tau_{c}}{\Delta Al^{\beta-1}} < 0$, and $l_{\theta} = \dfrac{(v-\delta)(1-\alpha-\beta)(1-\tau)(1-l)}{(1-\theta+v\theta)^{2}\Delta} \gtreqless 0$;

iff $v \gtreqless \delta$, $l_{\tau} = \dfrac{-[\eta(1-l)+l]}{\Delta} < 0$, and $l_{\tau_{c}} = \dfrac{-x}{\Delta Al^{\beta-1}} < 0$.

Substituting (6a) and (14) into the Keynes-Ramsey rule (10) and the aggregate resource

constraint (12a), the dynamic system of the macro model is constituted:

$$\frac{\dot{c}}{c} = \frac{1}{\sigma}[(1-\tau)\alpha A l^\beta - \rho],\tag{15}$$

$$\frac{\dot{k}}{k} = A l^\beta - x,\tag{16}$$

To obtain an endogenous growth rate, we should further use (15) and (16) to transform the dynamic system in terms of the variable x as follows:

$$\frac{\dot{x}}{x} = \frac{\dot{c}}{c} - \frac{\dot{k}}{k} = \frac{(1-\tau)\alpha - \sigma}{\sigma} A l^\beta + x - \frac{\rho}{\sigma},\tag{17}$$

where $l = l(x;\theta,\tau,\tau_c)$ reported in (14).

We now in turn deal with the problem of the existence and uniqueness of the balanced-growth-path equilibrium. Based on (17), we establish the following lemma:

Lemma 1. *There exists a unique balanced growth equilibrium in the unionized economy.*
Proof: At the steady-growth equilibrium, the economy is characterized by $\dot{x}=0$ and x is at its stationary value, namely, $\tilde{x}$. It follows from (17) that the steady-state consumption-capital ratio is:

$$\tilde{x} = \frac{\rho}{\sigma} - \frac{(1-\tau)\alpha - \sigma}{\sigma} A \tilde{l}^\beta(\tilde{x};\theta,\tau,\tau_c).\tag{18}$$

Figure 1 provides a geometric illustration for the identification of equilibrium. Define the RHS of (18) as a function $g(\tilde{x})$. As shown in Figure 1, $g(\tilde{x})$ is a monotonic function in $\tilde{x}$ due to $\beta \in (0,1)$, though it may be either upward or downward sloping. Given that, the fixed point theorem immediately leads to a stationary $\tilde{x}$ that exists and is unique.

Based on (18), we can further solve the steady state employment $\tilde{l}$ and the common balanced-growth rate $\tilde{\gamma}$ from (14) and (15):

$$\tilde{l} = l(\tilde{x}(\theta,\tau,\tau_c);\theta,\tau,\tau_c) = \tilde{l}(\theta,\tau,\tau_c)\tag{19}$$

$$\tilde{\gamma} = \tilde{\gamma}_c = \tilde{\gamma}_k = \tilde{\gamma}_y = \frac{1-\tau}{\sigma}\alpha A \tilde{l}^\beta - \frac{\rho}{\sigma},\tag{20}$$

that are also unique. ∎

Recently, many studies, including Benhabib and Farmer (1994, 1996), Benhabib and Perli (1994), Bond, et al. (1996), and Benhabib and Nishimura (1998), have emphasized the role of goods market imperfections in the formation of the indeterminacy of equilibrium paths. This issue is important since, as argued by Boldrin and Rustichini (1994, p. 324), "if the indeterminacy is present, the interpretation of many simple estimations, obtained by polling

together data from a variety of different countries, can be questioned as there is no reason to believe that these countries should be moving along the same equilibrium path." Accordingly, it also gives an implication for the generation of business fluctuations (Benhabib and Farmer, 1994).

Following this line of research, we turn to the discussion of the local stability property of this macro equilibrium, particularly the effect of unionization upon it. Such a study lets us understand whether the trade union generates multiple transitional paths so that it would amplify business fluctuation. According to (17), we have the following proposition:

Proposition 1. *Define* $D = \dfrac{(1-\tau)\alpha - \sigma}{\sigma}\beta A\tilde{l}^{\beta-1}l_x + 1$. *If* $D > 0$, *the equilibrium is locally determinate. However, if* $D < 0$, *then local indeterminacy emerges in the unionized economy.*

Proof: Linearizing (17) around the steady state $\tilde{x}$ gives:

$$\frac{\dot{x}}{x} = D(x - \tilde{x}),$$

where $D \equiv \dfrac{(1-\tau)\alpha - \sigma}{\sigma}\beta A\tilde{l}^{\beta-1}l_x + 1 \gtrless 0$, with $l_x = \dfrac{-\tau_c}{\Delta A\tilde{l}^{\beta-1}} < 0$. Given that x is a jump variable, the dynamic equilibrium will be locally determinate if $D > 0$. However, if $D < 0$, there exists a continuum of equilibrium trajectories that converges to the steady state and, accordingly, local indeterminacy emerges in the economy. ∎

To make the result more specific and for ease of illustration, we substitute l_x into D and rewrite the resulting equation as:

$$D \equiv \frac{\beta}{\Delta\tilde{l}}\left\{\left[\tau + \tau_c\frac{\sigma - (1-\tau)\alpha}{\sigma} + (1-\tau)\eta\right]\tilde{l} + (1-\tau)\eta\frac{1-\beta}{\beta}\right\} \gtrless 0.$$

Based on the above equation, Proposition 1 contributes new insights to the existing literature on equilibrium indeterminacy. First, if the economy is characterized by full employment, i.e. $\tilde{l} = 1$ (and hence $l_x = 0$), and if distortionary taxes are abstracted from the analysis, i.e. $\tau = \tau_c = 0$, $D > 0$ then holds. This implies that the dynamic equilibrium is locally determinate. However, when equilibrium unemployment ($\tilde{l} < 1$) and distortionary taxes play roles, the property of the economy's equilibrium becomes more complicated and there may be local indeterminacy. From the above equation, we learn that local indeterminacy emerges iff:

$$\frac{1}{\sigma} > \frac{1}{(1-\tau)\alpha\tau_c}\left\{\tau + \tau_c + (1-\tau)\eta\left[1 + \frac{1-\beta}{\beta}\frac{1}{\tilde{l}(\theta,\tau,\tau_c)}\right]\right\} \equiv \phi,$$

implying, similar to Benhabib and Perli (1994), that a higher intertemporal elasticity of substitution ($1/\sigma$) may lead the equilibrium to become indeterminate. However, from the above condition we find that the strength of the union's bargaining power also plays a significant role in generating indeterminacy. Differentiating ϕ with respect to θ, we have:

$$\frac{\partial \phi}{\partial \theta} = \frac{\eta_\theta}{(1-\tau)\alpha\tau_c}\left[1+\frac{1-\beta}{\beta\tilde{l}}\left(1-\frac{\tilde{l}_\theta\eta}{\tilde{l}\eta_\theta}\right)\right] \gtreqless 0 \; ; \; \text{iff } v \gtreqless \delta \, ,$$

where $\eta_\theta = \dfrac{(v-\delta)(1-\alpha-\beta)}{(1-\theta+v\theta)^2} \gtreqless 0 \; ; \;$ iff $v \gtreqless \delta$ and $1-(\tilde{l}_\theta\eta/\tilde{l}\eta_\theta) = \{[1-(1-\tau)\alpha/\sigma]\beta\tau_c + \tau\beta +$

$(1-\tau)\eta(1+\beta-\beta/\tilde{l})\}/D\Delta > 0$. This indicates that the equilibrium of the unionized economy is more likely to become locally indeterminate when the union is powerful (i.e. $\partial\phi/\partial\theta < 0$) provided that it is wage oriented, i.e. $\delta > v$. A straightforward (though possibly rough) reason for this is that, as we will see in Proposition 2, when the union is wage oriented, unionization will give rise to a bigger distorting effect in terms of the reduction in employment, which will result in a slowdown of growth.[7] This will highlight the roles of unemployment and taxes in the formation of local indeterminacy.[8]

4. Unemployment, Growth and Welfare Effects

We are now ready to explore the employment, growth, and welfare effects of unionization, namely, an increase in the union's bargaining power θ. Under Lemma 1 and the local determinacy condition $D > 0$, we begin our analysis by rewriting the steady-state consumption-capital ratio (stated in (18)) in terms of a reduced form as follows:

$$\tilde{x}(\underset{?}{\theta},\underset{?}{\tau},\underset{-}{\tau_c}) \, , \tag{21}$$

where $\tilde{x}_\theta = -\dfrac{(1-\tau)\alpha-\sigma}{\sigma D}\beta A\tilde{l}^{\beta-1}l_\theta \gtreqless 0 \; ; \;$ iff $v \gtreqless \delta$, $\tilde{x}_\tau = \dfrac{\alpha}{\sigma D}A\tilde{l}^\beta - \dfrac{(1-\tau)\alpha-\sigma}{\sigma D}\beta A\tilde{l}^{\beta-1}l_\tau \gtreqless 0$,

$\tilde{x}_{\tau_c} = -\dfrac{(1-\tau)\alpha-\sigma}{\sigma D}\beta A\tilde{l}^{\beta-1}l_{\tau_c} < 0$, and $l_\theta = \dfrac{(v-\delta)(1-\alpha-\beta)(1-\tau)(1-\tilde{l})}{(1-\theta+\theta v)^2\Delta} \gtreqless 0$; iff $v \gtreqless \delta$.

4.1 The unemployment and growth effects of union power

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[7] In a labor matching model, Rocheteau (1999) shows how balanced budgets can render the equilibrium rate of unemployment indeterminate.

[8] Benhabib and Perli (1994), Mino (1999), and Itaya and Mino (2003) show that by allowing for endogenous labor choice, indeterminacy is easily produced. See Benhabib and Farmer (1999) for excellent and detailed discussions.

Based on (21), the following interesting proposition can be established:

Proposition 2. *Under Lemma 1 and given that the equilibrium is locally determinate* $D > 0$, *a higher relative bargaining power* θ *will result in a lower (higher) unemployment rate and a higher (lower) balanced-growth rate if the union is employment oriented* $v > \delta$ *(wage oriented* $v < \delta$ *), i.e. the leadership (membership) within the union has dominant power. When the union is neutral* $v = \delta$, *unionization has no impact on either unemployment or economic growth.*

Proof: By substituting (21) into (14) and (20), we immediately have:

$$\frac{\partial(1-\tilde{l})}{\partial\theta} = -\tilde{l}_\theta = -\frac{(v-\delta)(1-\alpha-\beta)(1-\tau)(1-\tilde{l})}{(1-\theta+\theta v)^2 D\Delta} \lesseqqgtr 0 \text{, iff } v \gtreqqless \delta \qquad (22)$$

$$\frac{\partial\tilde{\gamma}}{\partial\theta} = \frac{(1-\tau)\alpha}{\sigma}\beta A\tilde{l}^{\beta-1}\tilde{l}_\theta \gtreqqless 0 \text{, iff } v \gtreqqless \delta. \qquad (23) \blacksquare$$

Proposition 2 provides intuitive but interesting comparative statics.   When the union is employment oriented, an increase in its bargaining power will result in not only a higher negotiated wage rate but also a higher level of employment (recalling that, when the union is employment oriented, an upward-sloping contract curve guarantees a positive relationship between wages and the employment level).   As a result, the unemployment rate $(1-l)$ will fall.   The main reason for this is that an employment-oriented union will more aggressively force the firms to hire more workers.   Given that under the Cobb-Douglas production technology labor and capital are technical complements, (6a) indicates that a higher level of employment will increase the productivity of capital and hence the interest rate.   Therefore, the economic growth rate will increase in response to a higher bargaining power of the union.   On the contrary, a wage-oriented union will be more aggressive in extracting the excess wage for its members.   In exchange for a higher bargained wage, it will be willing to incur a loss in terms of the reduction in employment (note that the wage is negatively correlated with employment when the union is wage oriented).   Once the unemployment rate rises, the rate of economic growth will also fall in response.   In other words, when the union is more *democratic*, unionization is more likely to result in an increase in unemployment and a slowdown in growth.

Proposition 2 contributes to an important macro implication: Unionization will not necessarily be bad for unemployment and growth, but rather, when contrasted with the common notion, may not only alleviate the short-run (or medium-term) problem of unemployment, but may also speed up the long-run economic growth.   In the endogenous

growth context where there are two goods markets (the final and R&D sectors) and two labor sectors (the skilled and unskilled sectors), Palokangas (1996) also provides an example to propound the possibly positive relationship between unionization and economic growth. He shows that, given that skilled and unskilled workers are *complements* in the final-goods sector and that the R&D sector employs only skilled labor, unionization in the unskilled labor market will increase the wages of unskilled labor and decrease their employment, and this will in turn decrease the demand for skilled workers (due to the complementary relationship between skilled and unskilled workers). This fall in the demand for skilled labor will decrease the wage for skilled labor and, consequently, will reduce the firm's R&D costs. Accordingly, the production of new designs will speed up the rate of economic growth.

Irmen and Wigger (2000) develop an OLG model with a trade union, in which they demonstrate that if a union formed by the working young succeeds in raising the aggregate wage bill and effectively transfers resources from the dissaving old to the saving young, unionization may lead to higher aggregate savings and per capita income growth. A similar result is found by Ramos-Parreño and Sánchez-Losada (2000) who use a two-sector OLG model with intergenerational altruism and unions. In a way that differs from theirs, we abstract the interaction between sectors and the allocation of resources between generations from our analysis and show that the nature of internal conflict within a political union is sufficient to create a mechanism resulting in a positive relationship between unionization and economic growth.

Endogenous growth models with exogenous labor supply predict that a consumption tax does not affect an individual's incentives to accumulate capital and therefore leaves growth unaffected (see, e.g., Rebelo, 1991, for the consumption tax neutrality). Income taxes, on the other hand, are harmful to economic growth. However, so far, the growth effect of taxation has only been investigated in the context of a competitive labor market. Therefore, it is also interesting to re-examine the effects of taxation on both unemployment and economic growth in the unionized economy with equilibrium unemployment.

Proposition 3. *Under Lemma 1 and the local determinacy condition* $D > 0$,

   (i) *A higher income tax rate is harmful to unemployment and economic growth;*

   (ii) *An increase in the consumption tax rate increases unemployment and decreases the balanced-growth rate.*

Proof: Substituting (21) into (14) and (20) immediately yields:

$$\frac{\partial(1-\tilde{l})}{\partial\tau} = -\tilde{l}_\tau = \frac{\alpha\tau_c\tilde{l}}{\sigma D\Delta} + \frac{[\eta(1-\tilde{l})+\tilde{l}]}{D\Delta} > 0,$$

$$\frac{\partial\tilde{\gamma}}{\partial\tau} = \frac{(1-\tau)\alpha}{\sigma}\beta A\tilde{l}^{\beta-1}\tilde{l}_\tau - \frac{\alpha}{\sigma}A\tilde{l}^\beta < 0,$$

$$\frac{\partial(1-\tilde{l})}{\partial\tau_c} = -\tilde{l}_{\tau_c} = \frac{\tilde{x}}{D\Delta A\tilde{l}^{\beta-1}} > 0,$$

$$\frac{\partial\tilde{\gamma}}{\partial\tau_c} = \frac{(1-\tau)\alpha}{\sigma}\beta A\tilde{l}^{\beta-1}\tilde{l}_{\tau_c} < 0. \blacksquare$$

Even though the labor market is characterized by equilibrium unemployment, result (i) of Proposition 3 is still consistent with the common argument in endogenous growth models with full employment. Result (ii) of Proposition 3, however, is different from the traditional viewpoint whereby the consumption tax has no impact on the balanced-growth rate. As is evident from Proposition 3, if we ignore the unemployment effect (hence $l_\tau = l_{\tau_c} = 0$), Proposition 3 will be reduced to the traditional results, i.e. $\partial\tilde{\gamma}/\partial\tau < 0$ and $\partial\tilde{\gamma}/\partial\tau_c = 0$. However, if the unemployment effect is taken into account, increasing the consumption tax will give rise to an additionally negative effect on the employment level and this will deteriorate the marginal productivity of capital. Consequently, the economic growth rate will fall.[9]

It follows from Proposition 3 that we have two interesting corollaries. First of all, comparing the relative effect between the income tax and the consumption tax on both unemployment and economic growth leads to:

Corollary 1. *Income taxes give rise to a more distorting effect, in terms of unemployment and economic growth, than consumption taxes.*

Proof: From Proposition 3, the following comparisons are immediately obtained:

$$\frac{\partial(1-\tilde{l})}{\partial\tau} - \frac{\partial(1-\tilde{l})}{\partial\tau_c} = \tilde{l}_{\tau_c} - \tilde{l}_\tau = \frac{\eta A\tilde{l}^{\beta-1}(1-\tilde{l})+\tilde{\gamma}}{D\Delta A\tilde{l}^{\beta-1}} + \frac{\alpha\tau_c\tilde{l}}{\sigma D\Delta} > 0,$$

$$\left|\frac{\partial\tilde{\gamma}}{\partial\tau}\right| - \left|\frac{\partial\tilde{\gamma}}{\partial\tau_c}\right| = \frac{(1-\tau)\alpha}{\sigma}\beta A\tilde{l}^{\beta-1}(\tilde{l}_{\tau_c} - \tilde{l}_\tau) + \frac{\alpha}{\sigma}A\tilde{l}^\beta > 0. \blacksquare$$

The finding in Corollary 1 is supported by the observation of Daveri and Tabellini (2000) for continental Europe. Intuitively, given that no tax is imposed on the unemployment benefit b, a higher wage income tax will drive a wedge between income if employed and income if

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[9] Brief discussions concerning the effects of taxation in models of endogenous labor supply are provided by Devereux and Love (1994), Stocky and Rebelo (1995), Milesi-Ferretti and Roubini (1998), and Turnovsky (2000). They conclude that an increase in the tax on consumption leads to a decrease in the supply of labor, resulting in a substitution of leisure for labor, and further leads to a reduction in the growth rate.

unemployed, as indicated by (3). This distortion leads the trade union to become more concerned about the negotiated wage rate and induces it to accept a lower level of employment in exchange for a higher excess wage. As a result, unemployment follows and economic growth slows down. However, by referring to (3), we learn that taxes on consumption generate an overall impact on consumers regardless of whether they are employed or unemployed workers. Consequently, the distorting effect caused by the consumption taxes becomes smaller. Due to the distinction between income and consumption taxes, income taxes have a greater negative impact effect on unemployment and growth. This result potentially suggests that there may be benefits in reforming the tax structure by shifting the burden of taxation away from labor income onto consumption.

Another interesting question is whether the distorting effects of taxation on economic growth are more pronounced in a labor market that is dominated by a powerful trade union. Corollary 2 that follows is established in order to answer this question:

Corollary 2. *The negatively distorting effects of income taxation, including income and consumption taxes, on the balanced-growth rate are more pronounced in an economy that is dominated by a powerful trade union when it is employment-oriented.*

Proof: Differentiating $(\partial \tilde{\gamma} / \partial \tau)$ and $(\partial \tilde{\gamma} / \partial \tau_c)$ with respect to θ, we have:

$$\frac{\partial}{\partial \theta}\left(\frac{\partial \tilde{\gamma}}{\partial \tau}\right) = -\beta A \tilde{l}^{\beta-1}\left[\frac{(1-\tau)\alpha(1-\beta)}{\sigma}\frac{\tilde{l}_\tau}{\tilde{l}}\tilde{l}_\theta - \frac{(1-\tau)\alpha}{\sigma D}\frac{\partial l_\tau}{\partial \theta} + \frac{\alpha}{\sigma}\tilde{l}_\theta\right] \lesseqgtr 0; \text{ iff } v \gtreqless \delta,$$

$$\frac{\partial}{\partial \theta}\left(\frac{\partial \tilde{\gamma}}{\partial \tau_c}\right) = -\frac{\alpha\beta(1-\alpha/\sigma)\beta\tau_c\tilde{x}_\theta + \alpha\beta[\Delta\tilde{x}_\theta - \tilde{x}\Delta_\theta]}{[(1-\alpha/\sigma)\beta\tau_c + \Delta]^2} \lesseqgtr 0; \text{ iff } v \gtreqless \delta,$$

where $\frac{\partial l_\tau}{\partial \theta} = -\frac{[\eta_\theta(1-\tilde{l})+\tilde{l}_\theta(1-\eta)]\Delta - [\eta+\tilde{l}(1-\eta)]\Delta_\theta}{\Delta^2} \lesseqgtr 0$; iff $v \gtreqless \delta$ and $\Delta_\theta \equiv \frac{\partial \Delta}{\partial \theta} = -\frac{1-\tau}{\tilde{l}}\cdot$

$\{(1-\beta)\eta l_\theta/\tilde{l} + [\tilde{l} - (1-\beta)/\beta]\beta\eta_\theta\} \lesseqgtr 0$; iff $v \gtreqless \delta$. Note that, to isolate the effects, when we derive the impact of unionization on the distorting effect of income tax, i.e. $\partial(\partial\tilde{\gamma}/\partial\tau)/\theta$, the analysis is assumed to start with a zero consumption tax (i.e. $\tau_c = 0$ initially). By analogy, the assumption that $\tau = 0$ is initially made when we derive $\partial(\partial\tilde{\gamma}/\partial\tau_c)/\theta$. ∎

We can bluntly provide the intuition behind Corollary 2 though it is somewhat complex. Proposition 3 indicates that taxation (income and consumption taxes) gives rise to a negatively distorting effect on the reduction in employment and, thus, the balanced-growth rate follows. On the other hand, as shown in Proposition 2, when the union is employment-oriented $v > \delta$, unionization (a higher θ) will result in a higher employment level. Given the higher level of

employment, the balanced-growth rate becomes more sensitive to taxes. In other words, under $v > \delta$, a stronger bargaining power of the union has a greater marginal effect in terms of affecting the tax distortion. Thus, the distorting effect of taxation on economic growth is reinforced by unionization and, as a result, becomes more pronounced in an economy that is dominated by a powerful trade union. A similar type of logic applies to the case where $v < \delta$.

4.2 Welfare analysis

In this sub-section, we attempt to study the impact of unionization on social welfare. In line with the common approach, an appropriate level of welfare is the utility obtained by the representative household. Given the balanced-growth rate $\tilde{\gamma}$, we have: $\tilde{k}(t) = k_0 e^{\tilde{\gamma}t}$, $\tilde{c}(t) = c_0 e^{\tilde{\gamma}t}$, and $c_0 = \tilde{x} \cdot k_0$ (due to $x = c/k$). With this information, computing the utility obtained by means of the integral in (6) is straightforward, and yields the following (aside from a constant):

$$\tilde{W} = \frac{k_0^{1-\sigma}}{1-\sigma} \frac{\tilde{x}^{1-\sigma}}{\rho - (1-\sigma)\tilde{\gamma}}. \tag{24}$$

Based on condition B, the condition $(1-\sigma)\tilde{\gamma} < \rho$ guarantees that the social welfare is bounded.

Given the welfare function (24), we establish Proposition 4 as follows:

Proposition 4. *Given that the equilibrium is locally determinate, i.e. $D > 0$, a higher bargaining power θ has a positive (negative) effect on the social welfare if the union is employment-oriented $v > \delta$ (wage-oriented $v < \delta$). That is, if the union is more democratic, unionization will more likely harm the social welfare.*

Proof: Differentiating (24) with respect to θ, we have:

$$\frac{\partial \tilde{W}}{\partial \theta} = \frac{k_0^{1-\sigma} \tilde{x}^{1-\sigma}}{\rho - (1-\sigma)\tilde{\gamma}} \left[\frac{1}{\tilde{x}} \frac{\partial \tilde{x}}{\partial \theta} + \frac{1}{\rho - (1-\sigma)\tilde{\gamma}} \frac{\partial \tilde{\gamma}}{\partial \theta} \right]. \tag{25}$$

Recall that $\dfrac{\partial \tilde{x}}{\partial \theta} = -\dfrac{(1-\tau)\alpha - \sigma}{\sigma} \beta A \tilde{l}^{\beta-1} \dfrac{l_\theta}{D} \gtreqless 0$ in (21) and $\dfrac{\partial \tilde{\gamma}}{\partial \theta} = \dfrac{(1-\tau)\alpha}{\sigma} \beta A \tilde{l}^{\beta-1} \dfrac{l_\theta}{D} \gtreqless 0$ in

(23). Since $\mathrm{sgn}(l_\theta) = \mathrm{sgn}(v - \delta)$ is true, (25) can thus be re-expressed as:

$$\frac{\partial \tilde{W}}{\partial \theta} = \frac{k_0^{1-\sigma} \tilde{x}^{-\sigma}}{\rho - (1-\sigma)\tilde{\gamma}} \frac{\beta A \tilde{l}^{\beta-1}}{\sigma} \left\{ \frac{(1-\tau)\alpha[1-(1-\tau)\alpha]Al^\beta}{\rho - (1-\sigma)\tilde{\gamma}} + \sigma \right\} \frac{l_\theta}{D} \gtreqless 0 \text{; iff } v \gtreqless \delta. \ \blacksquare$$

As noted earlier, when the trade union is wage-oriented, its stronger bargaining power will

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result in a lower consumption-capital ratio and rate of growth. As a result, the social welfare will be reduced as well. Although the reasoning behind this result is straightforward, somewhat surprisingly, *if the union is more democratic and more aggressively extracts higher wages from firms, unionization will have a negative effect on welfare.*

5. Concluding Remarks

In most of the economics literature, the function of a trade union, in line with the argument of Dunlop (1994), is to rationally maximize "something," say, either a utilitarian objective function or an expected utility function. In this paper, we instead follow Ross (1948) and incorporate a so-called political trade union into the endogenous growth model. By borrowing from Pemberton's (1988) managerial model, we show that the conflicting interests between the leadership and membership within the union play a decisive role in the unemployment, growth and welfare effects of unionization. A higher degree of unionization will result in a lower unemployment rate and a higher balanced-growth rate if the union is employment-oriented. However, when the union is wage-oriented, an opposite result emerges: unionization becomes harmful to both unemployment and growth. These results also lead us to conclude that a higher degree of unionization has a positive (negative) effect on the social welfare if the union is employment-oriented (wage-oriented). This implies that, somewhat surprisingly, when the union is more *democratic* and more aggressively extracts higher *wages* from firms, unionization instead gives rise to a negative effect on welfare.

Since taxation, besides unions, is another potential candidate in terms of explaining the poor performance of employment and economic growth, we also re-examine the taxation effects within a growth model with equilibrium unemployment. It is found that the results of incorporating taxation into our unemployment growth model are somewhat different from those for the traditional full-employment growth model. In addition, this paper also shows that equilibrium unemployment and distortionary taxes jointly create a mechanism that results in equilibrium indeterminacy, in which the union's internal conflicting interests regarding employment and wages play a significant role.

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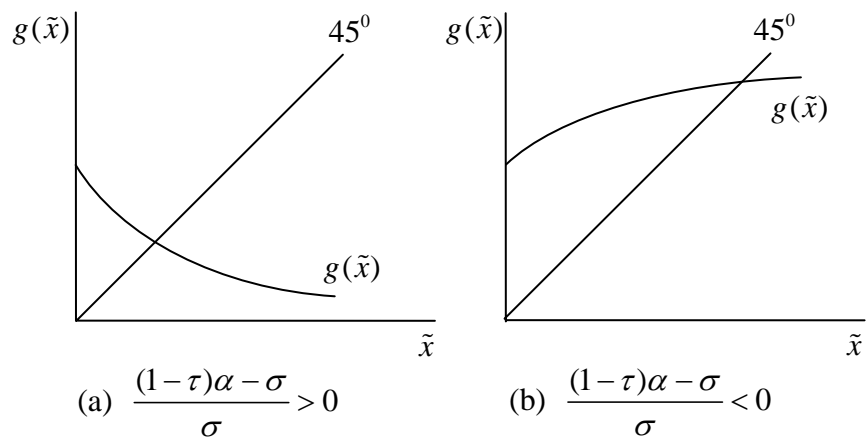
Figure 1: The Existence of the Balanced-Growth Path

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