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LABOR MARKET COMPETITIVENESS AND POVERTY

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Abstract

How does labor market competitiveness frame the impact of greater labor productivity and lower inequality on poverty? Specifically, does greater competitiveness increase the impact of higher labor productivity and lower inequality on poverty reduction? In a simple model, we show that there is complementarity between competitiveness and productivity – the greater is one, the larger is the impact of the other. This suggests that improving labor market competitiveness is worthwhile not only for its own sake, but because it improves the transmission mechanism from productivity increases to poverty reduction. We also derive precise conditions under which there is a similar complementarity between equality and competitiveness in poverty reduction.

Key words: inequality, labor productivity, market competitiveness, poverty.

JEL Classification: D6, I32, J2, J64.

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1. Introduction

This paper explores the implications of employer power for poverty, and in particular, for the impact of productivity growth on poverty. We show that there can be complementarity in poverty reduction between labor market competitiveness, viewed in this way, and productivity. The greater is one, the larger is the impact of an improvement in the other. This suggests that reducing employer power in labor markets is worthwhile not only for its own sake, but also because it improves the transmission mechanism from productivity increases to poverty reduction. We also derive precise conditions under which there is a similar complementarity between equality and competitiveness in poverty reduction.

There exist two strands of literature that are related to our paper. On the one hand, there is an extensive literature on the linkage between growth, inequality and poverty in the context of globalization.[3] Although whether or not globalization helps reduce inequality and/or poverty is one of the hottest issues among economists and the debate seems to remain unsettled, there should be no denying that globalization affects several aspects simultaneously, including labor productivity, inequality, and market competitiveness. Since all of these affect the lives of the poor, it is important to consider within a framework how these factors interact with one another in determining the extent of poverty in an economy. What make our analysis unique are twofold. First, when the effects of globalization are considered, it is almost always the case that labor markets are assumed to be perfect. We investigate the impact of productivity and inequality on poverty in a wide range of labor market competitiveness. Second, in addition to the direct effect of each factor on poverty, we also explore the interactions between them. For example, we ask "how is the marginal change in poverty with an increase in competitiveness affected by increases in labor productivity?"

On the other hand, there is an ongoing active debate on the plausibility of perfect labor market. Most labor economists seem to hold the view that labor markets (at least in the U.S.) can be well approximated by the model of perfectly competitive markets. However, given the growing evidence, direct or indirect, on the existence of labor markets in which employers have non-negligible market power over their workers, studies on imperfect labor

[3] For recent work, see, for example, Aisbett (2003); Dollar and Kraay (2004); Basu (2006); Dollar (2005); Nissanke and Thorbecke (2006); Harrison (2006).

markets have grown rapidly in recent years.[4] In particular, in developing countries, it is often the case that workers live far from firms and so transportation costs are very high. In such a case, it is more likely that firms exert market power. Therefore it seems to be quite plausible to allow a wide range of competitiveness in the analysis of labor markets. The paper attempts this. The contribution of the paper in terms of labor market competitiveness is as follows. Past studies on imperfect labor markets explore wage dispersion, the market provision of general training, and minimum wages and their effects on unemployment, among others.[5] This paper investigates the effects of productivity and inequality on poverty for different degrees of labor market competitiveness.

The plan of the paper is as follows. Section 2 sets out the basic model. Section 3 shows complementarity between labor productivity and labor market competitiveness, while Section 4 investigates complementarity between inequality and competitiveness in poverty reduction. Section 5 concludes the paper. An Appendix provides some generalizations to the results of the paper.

2. The Model

We will develop a specialized, tractable model that allows us to address the questions posed. Let us suppose that individuals are distributed uniformly along a line segment on the x-axis, $[m-k, m+k]$, as depicted in Figure 1. Firms are located at $x=0$. So m is the average distance, or lack of access, to the firms and $k(\leq m)$ is a parameter describing the extent of inequality in terms of access to the labor market. Without loss of generality, population size is normalized to unity. Thus the density function of the distribution of individuals is given by $f(x)=1/2k$. If the firms offer some wage rate w, and if an individual at $x \in [m-k, m+k]$ works for a firm, her net income is given by $y(w,x)=w-tx$. The parameter $t(\geq 0)$ could be interpreted simply as the cost of mobility or, more generally, as transaction costs that are associated with finding and working for a

[4] For the evidence on the imperfectness of labor markets, see Sullivan (1989), Staiger, Spetz and Phibbs (1999), and the papers listed in the next footnote. Bhaskar, Manning and To (2002) and Manning (2003) provide surveys.

[5] For wage dispersion and oligopsonistic labor markets, see, for example, Bhaskar and To (2003). For the market provision of general training, see Stevens (1994) and Acemoglu and Pischke (1999). The literature on minimum wages and labor market competitiveness is large. See, for example, Stigler (1946); Card and Krueger (1994, 1995, 2000); Bhaskar and To (1999); Neumark and Wascher (2000).

firm. We assume that individuals have no earnings opportunity outside the economy.[6] Hence given w, the individuals in $[m-k, w/t]$ work for the firms, while the individuals in $(w/t, m+k]$ do not.[7] Thus the labor supply function and the inverse labor supply function are respectively given by

$$S(w) = \frac{1}{2k}[\frac{w}{t} - (m-k)] \tag{1}$$

and

$$w = 2ktl + (m-k)t \tag{2}$$

For the demand side of the labor market, let us suppose that there exist n firms at $x = 0$. We consider the effects of productivity and inequality on poverty for different degrees of market competitiveness, wherein market competitiveness is measured by the number of firms. So n is treated as a parameter to be varied. All firms have the same revenue function, $R(l_i, a) = al_i - bl_i^2 / 2$, where l_i denotes the number of workers employed, and $a > 0$ and $b > 0$ are technological parameters describing labor productivity and diminishing marginal product, respectively. In what follows, productivity growth is captured by increases in a. Given the revenue function and a wage rate w, the firm's profit function is given by $\pi(l_i) = R(l_i, a) - wl_i$. Each firm maximizes profit given the labor supply and the other firms' labor demand. Since the firms' technology is identical, we restrict ourselves to symmetric Nash equilibria in terms of employment.

The equilibrium employment and wage are calculated as follows. Given (2) and the other firms' labor demand, l_{-i}, firm i's profit function is of the form

$$\pi(l_i; l_{-i}, a, m, k, t) = al_i - \frac{b}{2}l_i^2 - [2kt(l_i + l_{-i}) + (m-k)t]l_i$$

By differentiating π with respect to l_i, and then substituting $(n-1)l_i$ for l_{-i}, the equilibrium labor demand of each firm when there exist n firms in the market is given by

$$l_i^* = \frac{a - (m-k)t}{b + 2kt(n+1)} \tag{3}$$

Thus the equilibrium (total) employment and wage are, respectively,

[6] A positive reservation wage does not affect the basic results of this paper.
[7] In this paper, we focus on the case in which labor productivity is not high enough to ensure full employment. So we suppose that $w/t < m+k$ always holds.

$$l^* = nl_i^* = \frac{n[a-(m-k)t]}{b+2kt(n+1)} \tag{4}$$

and

$$w^* = \frac{t[2akn+(b+2kt)(m-k)]}{b+2kt(n+1)} \tag{5}$$

Note that letting $n \to \infty$ offers the competitive employment and wage:[8]

$$l_c = \frac{a-(m-k)t}{2kt}$$

$$w_c = a$$

Throughout our analysis, poverty is measured using the poverty measure which has been developed by Foster, Greer and Thorbecke (1984):

$$P_\alpha = \int_0^z (\frac{z-y}{z})^\alpha g(y)dy,$$

where z is the (fixed) poverty line and g is the density function of income distribution. α is a parameter, increases in which make the measure more sensitive to the gaps between the poverty line and income levels below it. We consider $\alpha = 0$ and $\alpha \geq 1$.
By changing the variables, the poverty measure is also expressed as

$$P_\alpha = \int_{\frac{w-z}{t}}^{\frac{w}{t}} [\frac{z-(w-tx)}{z}]^\alpha f(x)dx + \int_{\frac{w}{t}}^{m+k} f(x)dx$$

if $y(w, m-k) > z$, and

$$P_\alpha = \int_{m-k}^{\frac{w}{t}} [\frac{z-(w-tx)}{z}]^\alpha f(x)dx + \int_{\frac{w}{t}}^{m+k} f(x)dx$$

if $y(w, m-k) \leq z$. In the case of a uniform distribution, $f(x) = 1/2k$ for all $x \in [m-k, m+k]$, so the above expressions are simplified as:

[8] The numerator of l_c is the income of the richest individual when the market is competitive.

$$P_\alpha = \begin{cases} \frac{1}{2k}[\frac{z}{(1+\alpha)t} + (m+k) - \frac{w}{t}] & \text{if} \quad y(w,m-k) > z(6) \\ \frac{1}{2k}\{\frac{z}{(1+\alpha)t}[1-(\frac{z-[w-t(m-k)]}{z})^{1+\alpha}] + (m+k) - \frac{w}{t}\} & \text{if} \quad 0 < y(w,m-k) \le z(7) \end{cases} \quad (8)$$

In this paper, we consider the case where the richest individuals in the economy are not poor: $y(w,m-k) > z$. In this case, by (2) and (8), the poverty measure is further simplified as follows:

$$P_\alpha = \frac{z}{2kt(1+\alpha)} + (1-l^*) \quad (9)$$

The above expression tells us that, given k and t, the poverty measure solely depends on the amount of employment.

3. Labor Productivity, Competitiveness and Poverty

As shown in (9), in our model, poverty depends on productivity, a, and the number of firms, n, solely through the impact on employment. By differentiating (4), we get

$$\frac{\partial l^*}{\partial n} = \frac{[a-(m-k)t](b+2kt)}{[b+2kt(n+1)]^2} > 0 \quad (10)$$

$$\frac{\partial l^*}{\partial a} = \frac{n}{b+2kt(n+1)} > 0 \quad (11)$$

$$\frac{\partial}{\partial a}(\frac{\partial l^*}{\partial n}) = \frac{\partial}{\partial n}(\frac{\partial l^*}{\partial a}) = \frac{b+2kt}{[b+2kt(n+1)]^2} > 0 \quad (12)$$

Thus, an increase in competitiveness (larger number of firms) increases employment, as does an increase in productivity, as is to be expected. But (12) gives a result that is less obvious – there is complementarity between productivity and competitiveness in enhancing employment and thus in reducing poverty.

The complementarity result can be understood as follows. Since $l^* = nl_i^*$, differentiating the total demand gives

$$\frac{\partial l^*}{\partial n} = l_i^* + n\frac{\partial l_i^*}{\partial n} \quad (>0),$$

where the first term in the right side is the increase in employment due to the entry of a new firm, and the second one is n times the decrease in each firm's employment because of increased competitiveness. By differentiating the derivative with respect to a, we have

$$\frac{\partial}{\partial a}\left(\frac{\partial l^*}{\partial n}\right) = \frac{\partial l_i^*}{\partial a} + n\frac{\partial}{\partial a}\left(\frac{\partial l_i^*}{\partial n}\right)$$

The first and second terms of the right side of the above expression are the effects of an increase in productivity on each firm's employment, and on the marginal change in each firm's employment with an increase in competitiveness pre-multiplied by the number of firms, respectively (Figure 2). As is easily seen in Figure 2, the higher labor productivity, the greater the decrease in each firm's employment that is caused by an increase in competitiveness. So the second term is negative. However, (12) shows that this negative effect is dominated by the increase in employment due to higher productivity.

For poverty, what this says is that (i) an increase in labor market competitiveness has a bigger impact on poverty reduction the higher is firms' productivity, and (ii) an increase in labor productivity has a bigger impact on poverty reduction the more competitive is the labor market. Thus competitiveness policy is pro-poor in the following two ways. First, it directly reduces poverty by inducing higher levels of employment. Second, it enhances the beneficial effect of productivity growth on poverty.

4. Inequality, Competitiveness and Poverty

In the previous section, we have seen how the changes in the demand side of the labor market affect poverty. In this section, we consider the cases in which the conditions of individuals, in addition to the degree of market competitiveness, change. In particular, to examine how different types of changes in individuals' access to the labor market affect poverty among them, we study the effects on poverty of distributional shifts, measured by changes in k, and increases in transaction/transportation cost, t.

Clearly, as k increases, the distribution of individuals becomes more unequal. For the sake of simplicity, let us consider the case of a linear revenue function $(b=0)$. Then by differentiating (4) with respect to k, we have

$$\frac{\partial l^*}{\partial k}=\frac{(mt-a)n}{2k^2t(n+1)}, \tag{13}$$

where a is the competitive wage, w_c (see Section 2). Intuitively, (13) is understood as follows. If m is large, individuals have little access to the labor market. So most of them are unemployed. As the distribution becomes more unequal, more individuals are placed nearer the firms and thus get employed (see Figure 3 – note that since the equilibrium wage is increasing in the number of firms, $w^* \le a$ always holds.) Put differently, the marginal cost that each firm faces (in equilibrium) is $MC_i(l_i)=2kt(n+1)l_i+(m-k)t$. As k increases, more individuals are located nearer the firm, which reduces the term $(m-k)t$. Besides, with a greater k, the value of the density function ($f(x)=1/2k$) is smaller. So the firm must pay more to employ any amounts of labor, which increases the marginal cost through the term $2kt(n+1)l_i$. The original marginal cost curve crosses with the curve for a greater k at $l_i=1/2(n+1)$ (Figure 4). Thus each firm's employment increases iff $1/2(n+1)>l_i(k,n)$, which reduces to $mt-a>0$. Since total employment increases iff each firm's employment increases, total employment increases iff $1/2(n+1)>l_i(k,n)$.

For the effect on poverty, differentiating (9) with respect to k gives

$$\frac{\partial P_\alpha}{\partial k}=-\frac{z}{2k^2t(1+\alpha)}-\frac{\partial l^*}{\partial k} \tag{14}$$

As k increases, the extent of poverty among workers decreases because the number of individuals with any levels of income $(1/2k)$ decreases. This is expressed as the first term of the right side. Clearly, if employment increases with an increase in inequality, poverty decreases. The point here is that as long as

$$\frac{n}{n+1}\left(\frac{a}{t}-m\right)<\frac{z}{(1+\alpha)t}$$

holds, even when employment decreases, poverty decreases. On the other hand, if the opposite inequality holds, employment decreases and poverty increases as the degree of inequality increases.

It is worth noting that

$$\frac{\partial^2 P_\alpha}{\partial n \partial k} = -\frac{\partial}{\partial n}\left(\frac{\partial l^*}{\partial k}\right) = \frac{1}{2k^2(n+1)^2}\left(\frac{a}{t} - m\right) \tag{15}$$

holds. Therefore if m is greater than w_c / t, poverty decreases more with an increase in inequality the more competitive is the labor market. In addition, the impact of increased competitiveness on poverty reduction is greater the more unequal are individuals.

Furthermore, we have

$$\frac{\partial^2 P_\alpha}{\partial a \partial k} = -\frac{\partial}{\partial a}\left(\frac{\partial l^*}{\partial k}\right) = \frac{n}{2k^2 t(n+1)} > 0 \tag{16}$$

So increases in k increase poverty more (or decrease poverty less) the higher is firms' productivity. Also, the impact of productivity growth on poverty reduction is less the more unequal are the individuals.

5. Conclusion

How does the extent of poverty in an economy change if labor market competitiveness, firms' productivity and inequality in terms of individuals' access to labor markets change? This paper shows that increases in market competitiveness and labor productivity reduce poverty. The effect of inequality on poverty is ambiguous. However, in the case of a linear revenue function for example, poverty *decreases* as inequality increases if individuals have little access to the market. In addition, we also investigate the effects of each pair of the factors on poverty. First, it is established that, under certain conditions, the impact of productivity growth on poverty reduction is bigger the more competitive is the labor market. It is worth noting that this result, combined with the effect of competitiveness on poverty, gives two reasons why market competitiveness is desirable: (i) it contributes to poverty alleviation directly by inducing higher employment, and (ii) the more competitive the market, the bigger the impact of productivity growth on poverty reduction. Second, it is also shown that the impact of productivity growth on poverty reduction is smaller the more unequal is the economy. Third, in the case of a linear revenue function, the analysis shows that if individuals have little access to the labor market, the impact of increased competitiveness on poverty reduction is bigger the more *unequal* are individuals.

Appendix: The Case of a General Revenue Function

In this appendix, we explore the case of a general revenue function to see if the results in the main text are robust against changes in functional form. In general, the results in terms of the first-order derivatives of employment and poverty persist for any functional forms which satisfy $\partial R(l,a)/\partial l > 0$, $\partial^2 R(l,a)/\partial l^2 \leq 0$ and $\partial^2 R(l,a)/\partial a \partial l > 0$. On the other hand, the complementarity between competitiveness and productivity, for example, holds under certain conditions.

For example, let us consider the effects of competitiveness and productivity on employment and poverty. Suppose that the firms' revenue function is of the form $R(l_i, a)$, where l_i is employment and a is a technological parameter. As stated above, we assume $\partial R/\partial l \equiv R_1 > 0$, $\partial^2 R/\partial l^2 \equiv R_{11} \leq 0$, and $\partial^2 R/\partial a \partial l \equiv R_{12} > 0$. So as a increases, the marginal revenue of employment increases. Given the revenue function and a wage rate w, the firm's profit function is given by $\pi(l) = R(l,a) - wl$. The inverse labor supply function is the same as in the main text ((2)).

Given (2) and the total labor demand of the other firms, l_{-i}, firm i's profit function is of the form

$$\pi(l_i; l_{-i}, n, a, m, k, t) = R(l_i, a) - [2kt(l_i + l_{-i}) + (m-k)t]l_i$$

By the first-order condition (and $l_{-i} = (n-1)l_i$), the equilibrium labor demand of each firm is given implicitly by the following condition:

$$R_1(l_i^*, a) = 2kt(n+1)l_i^* + (m-k)t \qquad \text{(A−1)}$$

The equilibrium total employment and wage are, respectively,

$$l^* = nl_i^* \qquad \text{(A−2)}$$

and

$$w^* = 2ktl^* + (m-k)t \qquad \text{(A−3)}$$

By differentiating (A-1) with respect to n, we have

$$\frac{\partial l_i^*}{\partial n} = -\frac{2ktl_i^*}{2kt(n+1) - R_{11}(l_i^*, a)} < 0$$

So the effect of increased competitiveness on the equilibrium employment is given by

$$\frac{\partial l^*}{\partial n} = l_i^* + n\frac{\partial l_i^*}{\partial n} = \frac{(2kt - R_{11}(l_i^*, a))l_i^*}{2kt(n+1) - R_{11}(l_i^*, a)} > 0$$

Besides, by differentiating (A-1) with respect to a, we get

$$\frac{\partial l_i^*}{\partial a} = \frac{R_{12}(l_i^*, a)}{2kt(n+1) - R_{11}(l_i^*, a)} > 0$$

So we have

$$\frac{\partial l^*}{\partial a} = n\frac{\partial l_i^*}{\partial a} > 0$$

Therefore, (10) and (11) hold true for any functional forms.

The second derivative of the equilibrium employment with respect to market competitiveness and labor productivity is given by

$$\frac{\partial}{\partial a}\left(\frac{\partial l^*}{\partial n}\right) = \frac{R_{12}(l_i^*, a)(2kt - R_{11}(l_i^*, a)) - 2kntl_i^*(R_{111}(l_i^*, a)\frac{\partial l_i^*}{\partial a} + R_{112}(l_i^*, a))}{[2kt(n+1) - R_{11}(l_i^*, a)]^2} \qquad (A-4)$$

The above expression is positive iff

$$[(2kt - R_{11})R_{12} - 2kntR_{112}l_i^*][2kt(n+1) - R_{11}] - 2kntR_{12}R_{111}l_i^* \geq 0 \qquad (A-5)$$

Hence if, say, (a) $R_{111} \leq 0$ and $R_{112} \leq 0$ hold, (A-4) is positive. The intuition behind this is given in Figure 5. As n increases, the marginal cost curve becomes steeper. Since $R_{12} > 0$, the marginal revenue curve shifts upwards as a increases. Besides, if $R_{112} \leq 0$, the marginal revenue curve also becomes steeper. As a result, the ratio of the decrease in each firm's demand to the original demand is smaller for greater a. Thus, the increase in total demand with an increase in the number of firms, $l_i^* + n\partial l_i^* / \partial n$, is greater for larger a.

On the other hand,

$$\frac{\partial}{\partial n}\left(\frac{\partial l^*}{\partial a}\right) \geq 0 \qquad (A-6)$$

holds iff

$$[(2kt - R_{11})R_{12} - 2kntR_{121}l_i^*][2kt(n+1) - R_{11}] - 2kntR_{12}R_{111}l_i^* \geq 0 \qquad (A-7)$$

The above condition is satisfied with strict inequality if, for example, (b) $R_{111} \leq 0$ and $R_{121} \leq 0$.

Thus (12) holds iff (A-5) and (A-7) are satisfied. Both conditions are satisfied by, among others, quadratic functions and a class of separable functions $R(l_i, a) = r(a)h(l_i)$, where $r' \geq 0$, $h' > 0$, $h'' < 0$, and $h''' \leq 0$.

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Figure 1. "Distance" to the Firms and Individual Incomes

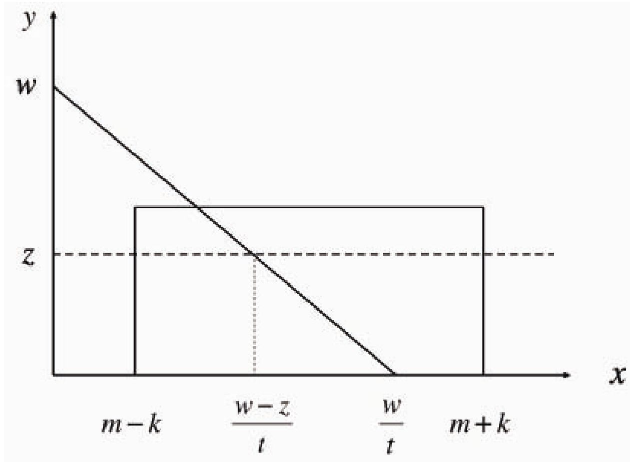


Figure 2. Competitiveness, Productivity and Employment $(a < a', n < n')$

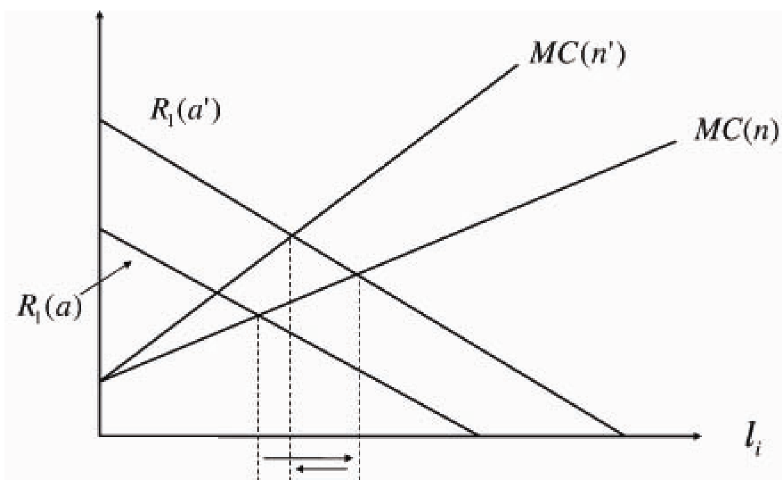


Figure 3. Inequality and Employment

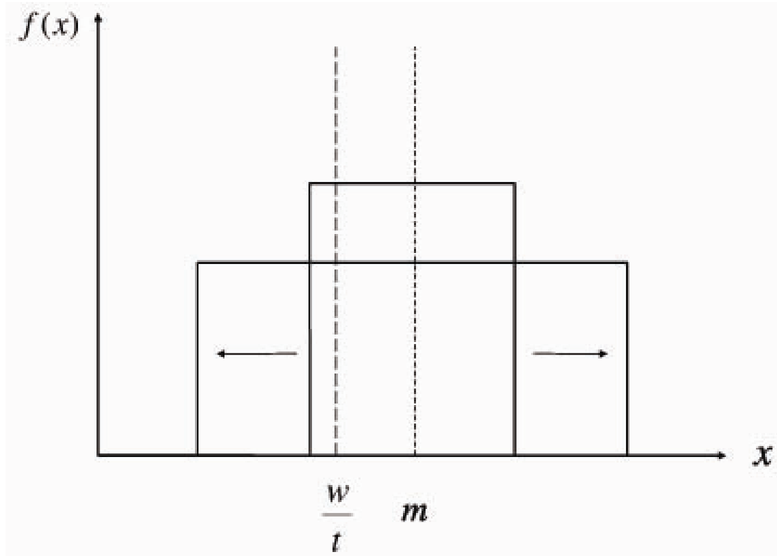


Figure 4. Inequality and the Marginal Cost of Labor $(k < k')$

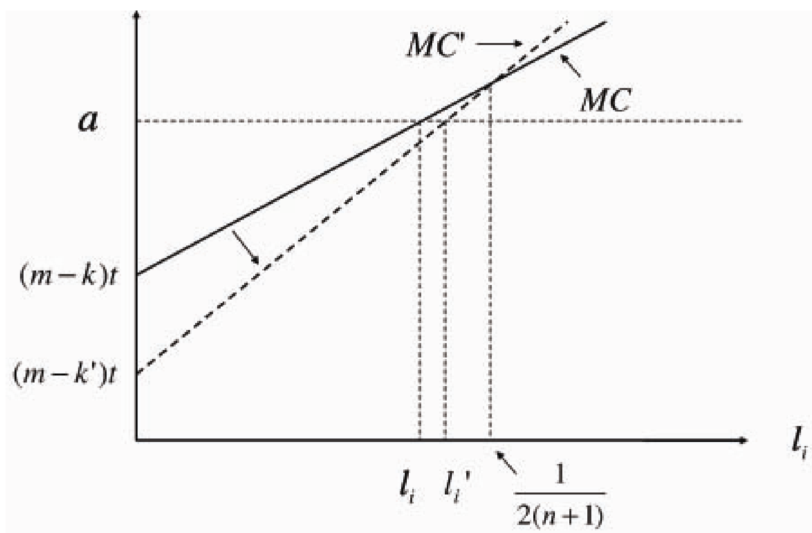
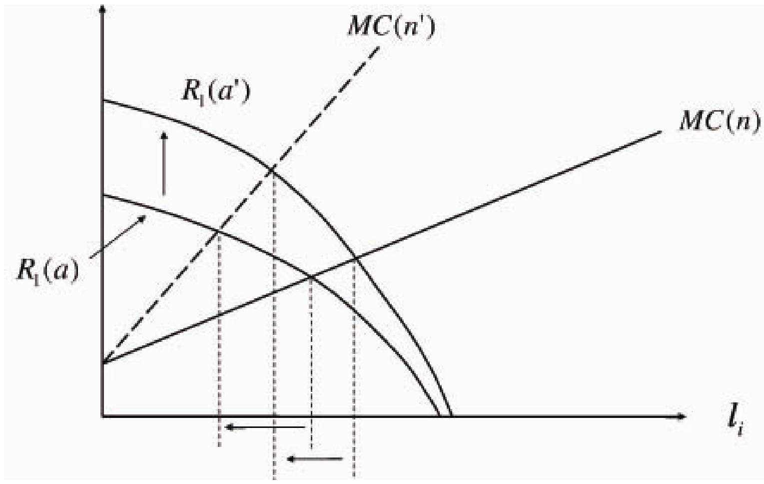


Figure 5. Complementarity between Productivity and the Number of Firms ($a < a'$, $n < n'$)



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