Labour Policy and Multinational Firms: the "Race to the Bottom" Revisited

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April 15, 2014

Abstract

This paper revisits the phenomenon of "race to the bottom" in labour markets in a model of strategic interaction with one monoposonist firm and two countries. The firm has to employ labour from both countries for its production and it has a constant elasticity of substitution production function (Arrow et al., 1961). Each country seeks to maximize its labour income. The countries simultaneously announce wages, following which the firm chooses its labour input in each country. The wages are bounded above and below, where the lower bound stands for the minimum wage prevailing in a country and the upper bound is the maximum wage acceptable to the firm. It is shown that there is no equilibrium with "race to the bottom" (i.e. both countries setting the minimum wage). Depending on the substitutability of the labour inputs of two countries, it is possible to have equilibrium where "race to the top" (i.e. both countries setting the maximum wage) takes place.

Keywords: constant elasticity of substitution, race to the bottom, race to the top

JEL Classification: F63, J42

1 Summary

- In this paper we revisit the phenomenon of "race to the bottom" in labour markets of different countries to attract foreign capital in a game-theoretic framework. We explore whether drastic strategic undercutting of labour's bargaining power as reflected in the expected wage labourers can get is an inevitable outcome of strategic competition between policy-makers of different countries.

- We model the strategic behaviour of the countries as a two-player game with simultaneous moves where the action of each country is to choose an index of factor price. The pay-offs to the players are determined by the production decision of a multinational monopsonist using the inputs provided by these countries. We explore the properties of the Nash equilibria. We find that "race to the bottom"

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never emerges as an equilibrium outcome while the complete opposite—"race to the top"—is possible for a range of relevant parameters of our model. Our model is a variant of price competition with product differentiation.

- While the idea of relaxing price competition through product differentiation is well-known, we provide an exact parametrization of the demand for inputs and by varying the parameter that determines demand we find its *dramatic* impact on the (im)possibility of "race to the bottom".

- We provide comparative statics with respect to a key parameter which provides an interesting implication for the labour policy for a developing country getting into competition for attracting investment: namely that the higher the domestic opportunity wage of the labourers in a country, the better they are in the price competition outcome.

2 Outline of the model

- There are two countries a, b. A monopsonist firm has to employ labour from both countries to carry out production (but the labour inputs from these two countries are substitutes). Let x_a, x_b denote the labour employed from countries a, b. The firm has a constant elasticity of substitution production function (Arrow et al., 1961) given by

$$F(x_a, x_b) = \left[\alpha x_a^{-\rho} + (1-\alpha)x_b^{-\rho}\right]^{-1/\rho} \tag{1}$$

where $0 < \alpha < 1$ and $\rho \in (-1, 0) \cup (0, \infty)$, i.e., $\rho > -1$ and $\rho \neq 0$.

- The function F also stands for the firm's profit. Assume that the firm has a fixed amount of capital $K > 0$ that it uses to pay for the inputs. Let w_a, w_b be the wages in countries a, b.

- The budget constraint of the firm is given by

$$w_a x_a + w_b x_b = K \tag{2}$$

For any $w_a, w_b > 0$, the firm's constrained profit maximization problem has a unique solution. Let the solution be (x_a^*, x_b^*). Let $\pi(w_a, w_b, K) = F(x_a^*, x_b^*)$ be the maximized value of the profit of the firm. For $i \in \{a, b\}$, let $\psi_i^M(w_a, w_b, K) = w_i x_i^*$ be the labour income from the "advanced sector" (i.e., wage income from the labour employed by the monopsonist) in countries a, b.

- It is assumed that the total labour population in countries a, b are $\overline{x}_a, \overline{x}_b$ which are assumed to be sufficiently large positive numbers for the time being so that for the firm's problem, the labour constraint is never binding. In country i,, labour that is not employed in the advanced sector works in traditional sector and earns wage $\underline{w}_i > 0$. Hence for $i \in \{a, b\}$, the labour income from traditional sector is $\psi_i^T(w_a, w_b, K) = \underline{w_i}(\overline{x}_i - x_i^*)$ and consequently the total labour income in country i is

$$\psi_i(w_a, w_b, K) = \psi_i^M(w_a, w_b, K) + \psi_i^T(w_a, w_b, K) = w_i x_i^* - \underline{w}_i x_i^* + \underline{w}\overline{x}_i \tag{3}$$

- For any (w_a, w_b), the payoff of each country is a weighted sum of the firm's profit and its labour income. Specifically, the payoffs of countries a, b are given by

$$\phi_a(w_a, w_b) = \omega_a \pi(w_a, w_b, K) + (1 - \omega_a)\psi_a(w_a, w_b, K),$$
$$\phi_b(w_a, w_b) = \omega_b \pi(w_a, w_b, K) + (1 - \omega_b)\psi_b(w_a, w_b, K), \quad (4)$$

  where $\omega_a, \omega_b \in [0, 1]$ and $\omega_a + \omega_b < 1$.

- Consider the simultaneous-move game G between countries a, b where countries simultaneously set policies so that the effective wages are w_a, w_b. Facing the pair (w_a, w_b), the firm solves its problem and profit and labour incomes are realized. The payoffs of countries are given by (4). We concentrate on the case where $\omega_a = \omega_b = 0$, i.e., the payoff of country i is its total labour income ψ_i only. Since any labour unit in country i can obtain wage $\underline{w}_i > 0$ in the traditional sector, it is never optimal for a country i to announce wage below $\underline{w}_i$, so we consider $w_a, w_b \geq \underline{w}_i$. To ensure existence of equilibrium, we assume there is $\overline{w} > \underline{w}_i$ such that the effective wages $w_a, w_b \leq \overline{w}$. Proposition 1 characterizes pure strategy Nash Equilibrium (NE) of G.

  Definition 1 A Nash equilibrium of G has

  (i) *race to the bottom* property if $w_i = \underline{w}_i$ for all $i \in \{a, b\}$.

  (ii) *race to the top* property if $w_i = \overline{w}$ for some $i \in \{a, b\}$.

  (iii) *complete race to the top* property if $w_i = \overline{w}$ for both $i \in \{a, b\}$.

3 Equilibrium with asymmetric countries

Let, without loss of generality, $\underline{w}_a > \underline{w}_b$.

Proposition 1 *Consider the game G with $\omega_a = \omega_b = 0$, i.e., the payoff of any country is its total labour income. Let $i, j \in a, b$ and $i \neq j$.*

(I) *Let $\rho \in (-1, 0)$ and $\delta \equiv -\rho \in (0, 1)$.*

  (i) *For any $w_j \geq 0$, country i has a unique best response $B_i(w_j)$. The best response function $B_i(w_j)$ is non-decreasing in w_j and $B_i(w_j) > \underline{w_i}$ for all $w_j \in [\underline{w_j}, \overline{w}]$.*

  (ii) *An NE of G exists and at any NE, $w_i > \underline{w_i}$ for all $i \in \{a, b\}$, i.e., no NE has race to the bottom property. Specifically*

    (a) *There is at most one NE with race to the top property.*

    (b) *There is at most one NE with neither race to the top nor race to the bottom property, i.e., there is at most one NE where $w_i < \overline{w}$ for both i's.*

    (c) *At least one of NE* (a) *or* (b) *exists, i.e., G has at most two NE.*

(II) *Let* $\rho \in (0, \infty)$.

(i) *For any* $w_j \in [\underline{w_j}, \overline{w}]$, *country* i *has a unique best response* $\overline{w}$.

(ii) G *has a unique NE. The NE has the complete race to the top property.*

(III) *The Nash equilibrium values* w_i*'s are increasing in* $\underline{w}_i$.

4 Equilibrium with Symmetric Countries

Now, let $\underline{w_a} = \underline{w_b} = \underline{w}$. Then we can say, in addition to Proposition 1:

Proposition 2 *Let* $\overline{w}/\underline{w} \equiv \theta > 1$ *and* $m = min\{\alpha/(1-\alpha), (1-\alpha)/\alpha\}$.

(a) *If* $\delta \leq 2/(1+\theta)$, *then there is a unique NE for any* $m \in (0,1)$. *This NE has race to the top property.*

(b) *If* $\delta > 2/(1+\theta)$ *and* $m \leq (1-\delta)/(\delta\theta - 1)$ [*or equivalently* $2/(1+\theta) < \delta \leq (m+1)/(m\theta+1)$], *then there is a unique NE. This NE has race to the top property.*

5 Discussions and Implications

Our work implies the following interesting features:

- Even with near-complete substitutability of inputs a competitive "race to the bottom" never happens.
- If substitutability of inputs is sufficiently low, then the converse feature–a race to the top–emerges in the equilibrium.
- Facing potential price competition to attract investment, it is profitable for a country to increase its domestic reservation wages.

References

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