Unionized labor markets and globalized capital markets

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Abstract

This paper studies the effects of international integration of capital markets in a world where countries differ in their labor market institutions: one country has a perfectly competitive labor market while the other is unionized. We show that workers should favor autarky in the unionized country, but oppose it in the non unionized country and vice versa for owners of capital. Aggregate gains from integration, however, are negative. We also show that, under capital mobility, an increase in relative bargaining power of unions does not always improve workers' welfare.

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1 Introduction

Over the past decade, the increase in capital flows between industrialized countries has been about four time as large as the increase in trade flows. This large increase in international capital flows and the speed with which capital markets of industrial countries have become integrated represent one of the most striking recent changes in the world economy. However, economists have not yet reached a common stance with respect to costs and benefits of capital markets' liberalization (see, e.g., Rodrik 1997, Bhagwati 1998, and Stiglitz 2004).

The contribution of this paper is to uncover the effect of world integration of capital markets on factor incomes and welfare, when factor returns between countries differ due to different degrees of unionization of labor markets.

In recent years a number of authors have investigated the interaction between labor unions and foreign direct investment (FDI), mostly looking at the factors influencing multinationals' choice of location and at the welfare consequences for the host country (see, among others, Skaksen and Sorensen 2001, Zhao 2001 and Naylor and Santoni 2003). We abstract from FDI, and provide a simple formal model to analyze the distributional effects of international competition for capital services between countries.[1] Thus, our set up differs substantially from those used in the unionization-FDI literature mentioned above, and is closer in spirit to early literature on factor market distortions and their impact for trade (see, e.g., Kemp and Negishi 1970 and Eaton and Panagariya 1979).

The conventional approach in the literature, to explain international factor movements, is to assume perfect competition in all markets and account for differences in factor returns by appealing to differences in fundamentals (such as factor endowments, technologies or preferences). However, differences in market structure may also explain why factor returns vary across countries. In our model there are

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[1]Although FDI inflows have considerably increased since mid 1980s', FDI inflows largely understate the extent to which foreign capital penetrates domestic markets. See, e.g., the UN World Investment Report, 2007.

two countries, identical in all dimensions except for unions' bargaining power. Symmetry allows us to focus on how divergences in the labor market structure across countries, per se, affect income levels and their distribution between capital owners and workers when capital movements are liberalized. To simplify the analysis, we assume that in one of the two countries there is perfect competition in the labor market (that is union power approaches zero), while in the other there is efficient bargaining over wages and employment between unions and firms. Typically, in a closed economy, sufficiently strong unions are able, through efficient bargaining, to influence the distribution of income to the benefit of workers and at the expense of capital owners; while returns to capital become lower than the marginal productivity of capital. Accordingly, when international factor movements are liberalized, capital flows from the highly unionized country into the less unionized country (in our case, to the perfectly competitive country): in the unionized country output and workers' income decrease while capitalists' income increases, and vice versa in the non unionized country.

With fixed factors' supply and full employment, unions are not able to influence resource allocation at the autarkic equilibrium, and given that both countries have the same endowments and technology, the marginal productivity of capital is identical across countries. Hence, allocation of capital across countries is efficient under autarky. Allowing for capital mobility triggers inefficient capital flows and leads to a decrease in world output. Also, workers' share of world output and income per capita at the world level decrease. Therefore, international capital mobility would not benefit workers, even if the gains obtained by capital owners were efficiently redistributed among all individuals, both at the world level and in the unionized country. The paper also addresses the issue of the desirable level of union bargaining power when capital is internationally mobile. It is shown that there is a critical level of union power above which an increase in union strength reduces union members' income.

These second best results are at odds with the prediction of standard models in

2

which capital mobility leads to overall welfare gains, and may explain unions' resistance towards globalization in a world with disparate workers' bargaining strength. Interestingly, the same effects would occur if we assume perfectly competitive labor markets and a redistributive capital tax, since in our set up the degree of unionization can be interpreted as a tax on capital returns. Hence, our work can also be related to the literature on tax competition, redistribution and capital mobility (see, e.g., Cremer et al. 1996 and Wilson et al. 2004).

The remainder of the paper is as follows. In Section 2 we present the model. In Section 3 we contrast autarky and perfect capital mobility. In Section 4 we explore the effects of capital movements, and Section 5 concludes.

2   The model

There are two countries, A and B, identical in everything except for union bargaining power. In each country there are $\bar{K}$ capitalists and $\bar{N}$ workers, each exogenously supplying one unit of their respective factor service. Both countries produce the same single good, taken as numeraire, with identical technologies. In each country there is a large number M of identical firms, each producing y^j units of output under perfect competition, according to the production function $y^j = F(k^j, l^j)$, $j = A, B$, where: k^j and l^j represent, respectively, the units of capital and labor used in production by a firm in country j; and F is a standard increasing, and concave-homogeneous of degree one function in k^j and l^j, with a constant elasticity of substitution $\sigma \in [1, \infty)$.[2] Capital is rented at the perfectly competitive rental rate r^j, while wages and employment are determined through efficient bargaining between unions and firms. Unions are firm specific, each one representing a fixed number of workers, $n^j \equiv \bar{N}/M$.[3] We assume that workers are also members of pen-

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[2] Accordingly, it is important to keep in mind for further results that $F_k, F_l > 0$, while $F_{kk}, F_{ll} < 0$, and $F_{kl} = F_{lK} > 0$, for $k, l > 0$. Note also that the elasticity of substitution satisfies the relation $\frac{1}{\sigma} = -\frac{F_{kk}k}{F_k} \Big/ \left(1 - \frac{F_k k}{F}\right)$.

[3] In many developed countries' labor markets wage bargaining occurs at increasing decentralized levels. Katz (1993), among others, reports evidence of the decetralization in the structure of

sion funds, and the latter diversify their portfolio, owning an equal amount of every domestic firm.[4] Accordingly, at a symmetric equilibrium, each worker receives $1/\bar{N}$ of every firm dividends out of his/her contributions. For each union the objective is to maximize the income of their members (wage and dividend earnings), while firms' objective is to maximize profits.

We consider a two-stage game and assume that in the first stage firms pre-commit to a given level of capital (k^j) knowing that the wage, w^j, and employment, l^j, will be negotiated afterwards, in the second stage of the game. To obtain the efficient bargaining solution we solve the generalized Nash bargaining problem, where the firm and union returns are net of their respective fallback (that is, net of the level of their returns in case no agreement is reached and production does not take place). Since, in case of disagreement, firms' return is $-r^j k^j$ and workers' return is the income from their private pension assets, w^j and l^j are the solutions of the following problem

$$Max_{w^j, l^j} \left[F(k^j, l^j) - w^j l^j \right]^{1-\gamma^j} \left[w^j l^j \right]^{\gamma^j}; \quad \text{s.t. } l^j \leq n^j,$$

where $1 > \gamma^j \geq 0$ represents country j's union bargaining power. The solution to this problem is: $l^j = n^j$ and $w^j = \gamma^j F(k^j, n^j) \frac{1}{n^j}$. By anticipating this bargaining outcome, the representative firm will choose to commit to the level of capital that maximizes profits, $(1 - \gamma^j) F(k^j, n^j) - r^j k^j$, which leads to the first order condition: $r^j = (1 - \gamma^j) F_k(k^j, n^j)$.[5] Using the Euler relations for the production function, it is easy to obtain the equilibrium levels of profits: $(1 - \gamma^j) F_l(k^j, n^j) n^j$. Hence, at the symmetric equilibrium, income per worker becomes: $w^{*j} = \gamma^j \frac{F(k^j, n^j)}{n^j} + (1 -$

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collective bargaining in most developed economies since the early 1980s.

[4] Private pension funds (and other means of private old-age maintenance) are particularly wide-spread among workers in anglo-saxon countries; while in many other countries, inside and outside the OECD, private funded pensions are increasingly taking over. The strong home bias displayed by pension and other institutional assets in OECD countries is widely documented. See, e.g., Davis (2002).

[5] Identical results would have been obtained had we considered that unions and firms only negotiate over wages, the level of employment having been previously fixed by firms. This is a special scenario of the right to manage model with a reverse timing, where firms chooses employment before bargaining takes place. See Lingens (2007), that rationalize this approach for countries where, due to substantial firing costs, employment cannot be adjusted quickly.

$\gamma^j)F_l(k^j, n^j).$

At a symmetric equilibrium, $K^j \equiv Mk^j$ and $L^j \equiv Ml^j = \bar{N}$ represent countries' total capital and labor services utilization. Exploiting the property of homogeneity of the production function, aggregate output is given by $Y^j = F(K^j, L^j)$ and equilibrium values of income, per capitalist and per worker, can be written as

$$r^j = (1 - \gamma^j)F_K(K^j, \bar{N}) \tag{1}$$

$$w^{*j} = F_L(K^j, \bar{N}) + \gamma^j F_K(K^j, \bar{N})\frac{K^j}{\bar{N}}, \tag{2}$$

while the respective (domestic) income shares correspond to

$$s_K^j \equiv \frac{r^j K^j}{F^j} = (1 - \gamma^j)\frac{F_K(K^j, \bar{N})K^j}{F(K^j, \bar{N})} \tag{3}$$

$$s_L^j \equiv \frac{w^{*j}\bar{N}}{F^j} = 1 - (1 - \gamma^j)\frac{F_K(K^j, \bar{N})K^j}{F(K^j, \bar{N})}. \tag{4}$$

Note that when $\gamma^j = 0$ we recover the case of perfectly competitive markets; the rental rate of capital and the income per worker corresponding to their marginal products and, given the joint assumptions of constant returns and perfect competition, zero equilibrium profits.[6] Compared to the perfectly competitive case, worker's income is above its marginal product and the return to capital is below its marginal product. Indeed for fixed amounts of capital and output, unions, through efficient bargaining, are able to influence the distribution of income to the benefit of workers at the expense of lower returns to capital.[7]

3 Equilibrium: Autarky vs Capital Mobility

In this section we examine the effects of movements from autarky to perfect capital mobility between countries with different union power. Although we focus on labor

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[6]In fact, with $\gamma^j = 0$ the labor market is characterized by a monopsony; with wages equal to zero and profits per worker corresponding to the marginal productivity of labor. However, since profits are distributed to workers, their income is exactly identical to that obtained in the case of a perfectly competitive labor market.

[7]Note that, unions' power always leads to positive profits and the workers' bargained wage is larger than the perfectly competitive wage (F_l) when union strength is sufficiently strong, i.e., $\gamma > F_l l/F$.

market distortions, identical results would have been obtained had we, instead, considered a distortion originating from a tax on capital income or from monopolistic competition.[8]

3.1. Autarky. At the autarkic equilibrium $K^j = \bar{K}$, with $j = A, B$, and $Y^A = F(\bar{K}, \bar{N}) = Y^B$. Two results are now worth emphasizing, for further comparison with the case of international capital mobility. First, world output $Y^T \equiv F\left(K^A, \bar{N}\right) + F\left(K^B, \bar{N}\right)$, with $K^A + K^B = 2\bar{K}$, is maximized when the condition $F_K^A = F_K^B$ is satisfied.[9] Since technologies and labor endowments are completely symmetric across countries, $K^A = K^B = \bar{K}$ represents the world efficient allocation and, therefore, *world output is maximized at the autarkic equilibrium.* Second, although the two countries have the same aggregate output, the income distribution between workers and capital owners differs, since it depends on the union bargaining power. Since capital and output are fixed under autarky, we can immediately see, from (2) and (4), that the effect of an increase in γ on workers' income and their respective share is positive. Hence, *in a closed economy* where fixed endowments of inputs are fully utilized, *the higher the union power the better off are the workers* as they can appropriate a larger share of income. If capital movements are liberalized, however, capital owners have the option to invest capital abroad and, as we shall see below, the impact of increased union power on workers' welfare may become negative.

3.2. Capital Mobility. We assume that capital owners can invest their endowments in both countries, even though those capital movements are not accompanied by physical movements of capitalists. Under perfect capital mobility, in addition to (1) and (2), a no-arbitrage condition in the world capital market $(r^A = r^B)$ needs to

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[8]Assume that the tax revenue is redistributed to the workers as a lump sum transfer, and that the government balances its budget. Alternatively, consider the existence of a final good, produced out of a continuum of identical intermediate products with a constant elasticity of substitution $1/\gamma^j$, and monopolistic competition in the intermediate sector. Then, equilibrium relationships (1)-(4) still apply, where γ^j denotes the tax rate on capital returns or, alternatively, the market power of the representative monopolistic firm.

[9]From now on we use the following notation $F_K^j \equiv F_K\left(K^j, \bar{N}\right)$.

be satisfied together with the world capital market clearing condition. Accordingly, the equilibrium levels of K^A and K^B are derived by solving the following equations

$$(1 - \gamma^A)F_K\left(K^A, \bar{N}\right) = (1 - \gamma^B)F_K\left(K^B, \bar{N}\right) \tag{5}$$

$$K^A + K^B = 2\bar{K}. \tag{6}$$

It can be checked that if $\gamma^A = \gamma^B$ then the solution $K^A = K^B = \bar{K}$ would follow, which is identical to the solution under autarky. Indeed, if both countries shared the same union power, the rental rates of capital under autarky would be identical across countries and there would be no incentives for capital movements. Hence, capital movements are induced by differences in union power: under autarky, rental rates of capital are lower in the more unionized country, inducing outflows of capital from the more to the less unionized country.

Hereafter, we assume that country A is the more unionized country and, to simplify matters, we assume that country B's labor market is perfectly competitive. This leads to,

$$\gamma^A = \gamma \text{ and } \gamma^B = 0. \tag{7}$$

In the appendix we show conditions under which a unique equilibrium $\left(K^A, K^B\right)$ exists, and satisfies $K^B > \bar{K} > K^A$. Accordingly, capital moves from the more to the less unionized country.

4   Effects of Capital Mobility

In this section we analyze the effects of capital mobility on world output and income distribution between countries, and examine the distribution of income between workers and capitalists. We also study the effects of changes in unions' bargaining power on equilibrium, under capital mobility.

4.1. Country and World Income.   Using (5) and (7), it is immediate to check that the equilibrium allocation under capital mobility implies $F_K^A > F_K^B$, so that the efficient allocation condition is no longer verified and, thus, world output

7

is not maximized. Indeed, differentiating world output and (6) with respect to K^A we obtain,

$$\frac{dY^T}{dK^A} = F_K^A - F_K^B > 0. \tag{8}$$

Therefore, the decrease in K^A resulting from allowing for capital mobility implies that world output is reduced. To evaluate the effect of capital mobility on countries' national income, let us denote country A's gross national product as $X^A \equiv F\left(K^A, \bar{N}\right) + F_K^B\left(K^B - \bar{K}\right)$. Differentiating the latter with respect to K^A, taking into account (6), we obtain,

$$\frac{dX^A}{dK^A} = \left[F_K^A - F_K^B - F_{KK}^B\left(K^B - \bar{K}\right)\right] > 0. \tag{9}$$

This expression takes a value zero at the autarkic solution, since $F_K^A = F_K^B$ and $K^B = \bar{K}$, but becomes positive as soon as capital mobility is allowed. Hence, the decrease in K^A implies that the unionized country experiences a loss in national income. We can therefore establish the following.

. Under capital mobility, income in the unionized country and in the world is lower than under autarky.

Turning to country B, gross national product under capital mobility is given by $X^B = F\left(K^B, \bar{N}\right) - F_K^B\left(K^B - \bar{K}\right)$, implying,

$$\frac{dX^B}{dK^A} = F_{KK}^B\left(K^B - \bar{K}\right) < 0. \tag{10}$$

Thus, as capital flows out from country A, income in the competitive country increases with capital mobility. Output in the less unionized country increases; however, at the expense of an even higher decrease of output in the more unionized country, leading to lower world output. Accordingly, different degrees of distortions across countries induce inefficient capital movements.

4.2. Distribution of Income between Workers and Capital. When international capital movements are liberalized, the marginal productivity of labor(capital) increases(decreases) in country B, since the utilization of capital services in this country is higher under capital mobility than under autarky. Accord-

8

ingly, by use of (1), (2) and (7), wages in country B increase, while the rental rate of capital decreases. In contrast, in the unionized country A, utilization of capital services is smaller under capital mobility and capitalists' income increases; while workers' income decreases, since it is composed by wages and profits which are both increasing in K^A.

Since some workers (capitalists) benefit, namely those from country B (country A), while others are hurt by liberalization of capital movements, it is important to establish whether capital mobility favors distribution of world income towards capital owners or workers. Workers' income share of world output, s_L^T, is given by $s_L^T \equiv \frac{w^{*A}\bar{N} + w^B\bar{N}}{F^A + F^B} = \frac{F^A}{F^A + F^B}s_L^A + \frac{F^B}{F^A + F^B}s_L^B$. After straightforward calculations, and by use of (3)-(6), we find,

$$sign\left\{\frac{ds_L^T}{dK^A}\right\} = sign\left\{(s_K^B - s_K^A)\left(\frac{\gamma F^B}{F^A + F^B} + \frac{1-\gamma}{\sigma}\right) + \gamma\left(\frac{1-\gamma}{\sigma}\right)(\sigma - 1)\frac{F_K^A K^A}{F^A}\right\}.$$
(11)

Since capital share in country B is higher than in country A ($s_K^B > s_K^A$),[10] the share of workers' income at the world level decreases when K^A decreases. Hence, liberalization of capital movements brings about an increase in the share of world output of capital owners at the expense of workers' share of world output.

4.3. Changes in Bargaining Power Totally differentiating (5) and (6) with respect to γ gives us the impact of a change in union power on equilibrium capital levels, that is,

$$\frac{dK^A}{d\gamma} = \frac{F_K^A}{F_{KK}^B + (1-\gamma)F_{KK}^A} < 0.$$
(12)

An increase in union power in country A widens the difference in returns of capital across countries under autarky, encouraging capital movement into country B even further and causing a decrease in utilization of capital services in country A. By use of (8)-(10), the effect of a change in γ on national income in both countries and

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[10]Using (4) and (7), note that $s_K^B - s_K^A > 0$ under autarky. Also, $\frac{ds_K^j}{dK^j} = \frac{s_K^j}{K^j}(1 - \frac{1}{\sigma})\frac{F_L^j \bar{N}}{F^j} > 0$. Hence, capital movements from the unionized country A to country B further increase $s_K^B - s_K^A$.

in the world can be easily computed

$$\frac{dX^A}{d\gamma} = \frac{dX^A}{dK^A}\frac{dK^A}{d\gamma} < 0; \quad \frac{dX^B}{d\gamma} = \frac{dX^B}{dK^A}\frac{dK^A}{d\gamma} > 0; \quad \frac{dY^T}{d\gamma} = \frac{dY^T}{dK^A}\frac{dK^A}{d\gamma} < 0. \quad (13)$$

Under autarky, capital and labor utilization in each country is fixed at equilibrium and, therefore, output and national income are constant and unaffected by changes in union power. Expressions (13) show, however, that under capital mobility a higher union power implies a net loss in national income in the unionized country and in the world (and a net gain in the competitive country). The following proposition summarizes this result.

. Under capital mobility, income in the unionized country and in the world is negatively correlated with union bargaining power.

Proposition 2 implies that the unionized country and the world are worse off when worker bargaining strength increases, due to the higher distortion in the unionized country and the induced inefficient capital movements. The competitive country, however, is better off for higher values of γ.

To study whether an increase in union power can, after all, benefit workers in the unionized country, we differentiate the workers' income function defined in (2) with respect to γ. However, in contrast to the case of autarky, we now have to take into account that, under capital mobility, K^A also varies with γ and, therefore, the following applies

$$\left.\frac{dw^{*A}}{d\gamma}\right|_{Mob} = \frac{\partial w^{*A}}{\partial \gamma} + \frac{\partial w^{*A}}{\partial K^A}\frac{dK^A}{d\gamma}, \quad (14)$$

where $\frac{dK^A}{d\gamma} < 0$ is given by (12). Using (2) we obtain $\frac{\partial w^{*A}}{\partial \gamma} = F_K(K^A, \bar{N})\frac{K^A}{N} > 0$ and $\frac{\partial w^{*A}}{\partial K^A} = \frac{K^A}{N}\left(\gamma\frac{F_K^A}{K^A} - (1-\gamma)F_{KK}^A\right) > 0$. Expression (14) reflects the fact that an increase in γ affects workers' income through two channels. First, there is a direct channel, which raises workers' income share for a given level of capital and output. The effect working through this channel, being represented by the first term in (14), is positive and is analogous to what occurs under autarky where capital and output do not change with changes in γ. Second, there is an indirect channel linked to the capital outflow triggered by the increase in union power; the latter, being

10

represented by the second term in (14), is negative. Hence, in contrast to autarky, where an increase in union power always increases workers' income, under capital mobility this result may be reversed: whether an increase in union power is able to increase workers' income at all under capital mobility depends on the overall sign of (14). We establish the following result.

. Under capital mobility, there is a threshold value γ^* above (below) which workers' income in the unionized country decreases (increases) with γ.

Proof: See Appendix

Accordingly, under internationally mobile capital, unions that are willing to maximize workers' income face a critical level of bargaining power, γ^*; Pushing their bargaining power beyond that level will only hurt workers.

5   Concluding Remarks

Labor unions fear international markets' liberalization, their main concern being that workers of the trading partner countries should be granted essential rights, preferably similar to those enjoyed by home workers. They claim that this is aimed at benefitting all workers, the struggle being between workers and capital owners around the world and not between workers from different countries. By contrast, many of those who are in favor of liberalization of world economic transactions claim that unions aim merely at protecting their members against competition from workers of less regulated countries. Our work shed some light on these issues and provide arguments on both sides of the debate.

We have shown that, if one country is unionized (with efficient bargaining over wages and employment) while the other is not, then, world output, workers' share of world income and income of unionized workers are higher under autarky, whereas workers from the non unionized country benefit from capital movement liberalization.

With capital internationally mobile, however, if the non unionized country were

to converge to the same degree of unionization of the other country no factor movements would occur at equilibrium; hence output would not be reduced and workers of the unionized country would not lose from liberalization. Accordingly, for workers in unionized countries, it may make sense to push towards achieving, prior to integration, similar levels of bargaining strength around the world. In contrast, under asymmetric unionization and integrated capital markets, if workers' bargaining strength in the unionized country is relatively high, a reduction in union power actually benefits union members, as it limits the size of capital flows out of the unionized country and its negative effects on workers' income.

Finally, let us remark that, to simplify the analysis and to establish a first set of relevant results, we have abstracted from considering unemployment. Our conjecture is that the existence of unemployment in the unionized country would reinforce the outflows of capital; the marginal productivity of capital in the unionized country would be lower and, thereby, the differential in capital return across countries would be higher. However, the final effects on factor returns, employment and output may depend on the way unemployment is generated and on the way unions and bargaining is modelled. These issues are left for future research.

Appendix

Existence of equilibrium (*free capital mobility*)

Assume that

$\lim_{K^A \to 0} F_K \left(2\bar{K} - K^A, \bar{N} \right) - (1-\gamma)F_K \left(K^A, \bar{N} \right) < 0$ *and*

$\lim_{K^A \to 2\bar{K}} F_K \left(2\bar{K} - K^A, \bar{N} \right) - (1-\gamma)F_K \left(K^A, \bar{N} \right) > 0$. *Then, under capital mobility there is a unique solution* $\left(K^A, K^B \right)$ *satisfying* $K^B > \bar{K} > K^A$.

By use of (6) and given the assumption in (7), (5) can be written as $Z(K^A) \equiv F_K \left(2\bar{K} - K^A, \bar{N} \right) - (1-\gamma)F_K \left(K^A, \bar{N} \right)$, and a solution for K^A satisfies $Z(K^A) = 0$. Given the assumptions on the production function, Z is a continuous increasing function of K^A, taking values in $\left(\lim_{K^A \to 0} Z(K^A); \lim_{K^A \to 2\bar{K}} Z(K^A) \right)$. Hence, $Z(K^A)$ takes the value zero for some $K^A \in \left(0, 2\bar{K} \right)$, provided that $\lim_{K^A \to 0} Z(K^A) < 0$

and $\lim\limits_{K^A \to 2\bar{K}} Z(K^A) > 0$. Moreover, $Z(\bar{K}) = F_K\left(\bar{K}, \bar{N}\right) - (1-\gamma)F_K\left(\bar{K}, \bar{N}\right) = \gamma F_K\left(\bar{K}, \bar{N}\right) > 0$; therefore, since $Z(K^A)$ is an increasing function of K^A, it can only become zero for $K^A < \bar{K}$.

Proof of proposition 3

Using (5)-(6), we obtain that $sign\left\{\left.\frac{dw^{*A}}{d\gamma}\right|_{Mob}\right\} = sign\left\{(1-\gamma)\frac{s_L^B}{\sigma}\frac{K_A}{K_B} - \gamma\right\}$. The latter expression is a continuous decreasing function of $\gamma \in [0, 1)$, taking all values in $\left[\frac{s_L^B}{\sigma}\frac{K_A}{K_B}, -1\right)$. Hence there is a critical value γ^* at which $\left.\frac{dw^{*A}}{d\gamma}\right|_{Mob} = 0$ and thus $\left.\frac{dw^{*A}}{d\gamma}\right|_{Mob} > 0$ for $\gamma < \gamma^*$ and $\left.\frac{dw^{*A}}{d\gamma}\right|_{Mob} < 0$ for $\gamma > \gamma^*$.

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