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Why Foreign Ownership May be Good for You

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Why Foreign Ownership May be Good for You*

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Abstract

We develop a general equilibrium two-country model with heterogeneous producers, self-selection of only the most productive firms into multinational activity and rent sharing at the firm level due to fairness preferences of workers. In this setting, we identify two major sources of a multinational wage premium. On the one hand, there is a pure composition effect, because multinational firms on average make higher profits, and therefore pay higher wages as well. Since rent sharing relates to a firm's global profits, there is in addition a firm-level wage effect: A multinational firm pays higher wages in its home market than an otherwise identical firm that chooses not to become multinational. We study in detail how these two sources interact in determining the multinational wage premium. In addition, we extend our model to one with technology differences between the two economies and analyse to what extent the multinational wage premium is governed by country-specific factors.

JEL-Classification: D31, F12, F15, F16, H25

Key words: Multinational Firms, Wage Premium, Heterogeneous Firms

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1 Introduction

The existence of a multinational wage premium is a stylised fact. However, the determinants of this premium are still under debate. One popular argument is that multinationals differ from their national competitors in certain aspects, such as their productivity, the composition of their workforce, or their capital intensity. While there is strong empirical evidence that such observable firm-specific factors are indeed important, it is as well clear that they are far from explaining the whole premium – at least as far as developing countries are concerned.¹ The unexplained residual can in fact be quite large, and a convincing explanation for its existence is so far missing. One approach taken in the empirical literature is to add country-specific factors to the analysis, and several studies have found this approach to be successful in shrinking the unexplained part of the multinational wage premium significantly.² In our paper we develop a theoretical framework in which firm-specific and country-specific factors interact in determining the multinational wage premium, thereby complementing the existing empirical studies.

We set up a general equilibrium two-country model, in which national and multinational firms coexist. Firms are heterogeneous due to differences in their productivity levels (see Melitz, 2003) and countries differ in technology. There is rent sharing at the firm level due to fair wage preferences of workers, and hence more productive firms pay higher wages because they make higher profits. Setting up a foreign production facility involves fixed costs, implying that only the most productive firms find it profitable to set up a foreign affiliate (see Helpman, Melitz and

¹Aitken, Harrison and Lipsey (1996), Te Velde and Morrisey (2003), and Lipsey and Sjöholm (2004) show that a multinational wage premium exists in developing countries and that it cannot be fully explained by firm-specific factors. Evidence for developed countries is less clear. For instance, Girma, Greenaway and Wakelin (2001) and Griffith and Simpson (2004) find evidence for a multinational wage premium in UK industries, which remains to exist even if controlling for firm characteristics. On the other hand, relying on data for Canada and Portugal, respectively, Globerman, Ries and Vertinsky (1994) and Almeida (2007) show that the multinational wage premium vanishes in these countries when controlling for firm and worker characteristics.

²Relying on empirical results for UK, Girma and Görg (2007) conclude that the nationality of the foreign investor is an important determinant of the multinational wage premium. In a similar vein, Aitken, Harrison, Lipsey (1996) find a large difference in the wage premium offered by multinationals in Venezuela, Mexico and the US. Girma, Greenaway and Wakelin (2001) show that the multinational wage premium in UK affiliates is more pronounced if the investor is from the US than if the investor is from Japan.

Yeaple, 2004). There are two effects that can in principle lead to a multinational wage premium in our model. The first is a pure composition effect: Multinational enterprises (MNEs) are more productive than national firms, they make higher profits, and therefore pay higher wages due to rent sharing at the firm level. Therefore, in every country the average wage paid by MNEs is higher than the average wage paid by national firms. The second effect is a firm-level wage effect: Since rent sharing relates to a firm's *global* profits, MNEs pay higher wages in their home market than an otherwise identical firm that does not choose MNE status.³ The firm-level wage effect interacts with the composition effect, since it influences the decision to become multinational and thereby the similarity of the pools of national and multinational firms with respect to their average productivity.

In a first step, we analyse the case of two symmetric countries and investigate how the two sources of a multinational wage premium interact. We show that the firm-level wage effect in this setting magnifies the compositional effect and further increases the multinational wage premium. In addition, we show that a decline in the impediments to multinational activity renders the composition of foreign multinationals and domestic competitors more similar, and hence lowers the multinational wage premium. Notably, in a setting with identical countries the multinational wage premium disappears once we control for firm characteristics: A domestic plant by a foreign MNE pays the same wage as a domestic firm with the same productivity since in the symmetric equilibrium this firm necessarily is an MNE as well, with the same level of profits as the foreign MNE.

In a second step, we extend our model to one with asymmetric countries to shed light on how firm-specific and country-specific factors interact in determining the multinational wage premium. Intuitively, the average domestic producer is less productive in the technologically backward economy. Furthermore, multinationals with headquarters in the technologically backward economy have on average higher productivity than multinationals with headquarters in the technologically advanced economy. The reason is that competition is stronger in the advanced country, and hence foreign multinationals need to be more productive in order to survive there.

³Budd, Konings and Slaughter (2005) find strong support for the idea of international profit sharing within multinational enterprises in European industries.

This result is well in line with the stylised fact that foreign investment flows (on net) from developed to developing countries (see Markusen, 2002; UNCTAD, 2009). Combining these insights, it follows that domestic and foreign firms are more similar in their average productivity level in the technologically backward country, implying that the multinational wage premium is less pronounced in this economy.⁴

Furthermore, in the technologically backward economy there exists a range of foreign multinationals and purely national competitors with identical productivity levels. Due to the firm-level wage effect, the multinational wage premium does not vanish in the technologically backward economy once controlling for firm-specific factors. By contrast, no such residuum exists in the technologically advanced economy. This result is well in line with the empirical findings in Aitken, Harrison and Lipsey (1996) that after controlling for firm-specific factors, an unexplained residuum of the multinational wage premium can be found for Mexico and Venezuela but not for the US.

There are only a few other papers, which, as we do, offer a theoretical model for explaining the multinational wage premium. Two of these papers emphasise the incentives of multinational firms for paying higher wages in order to reduce job turnover. Fosfuri, Motta and Rønde (2001) consider a multinational with access to a superior technology than local firms. However, the multinational needs to train its workers in the host country in order to make use of the better technology there. To avoid that workers are hired by a local competitor after being trained and to protect its technological superiority, the multinational has an incentive to pay a wage premium. Glass and Saggi (2002) also consider a model in which a multinational firm has a superior technology. If employed in the multinational enterprise, workers acquire knowledge of this superior technology, and hence offering a wage premium can be attractive in order to reduce job turnover and thus the risk of technology dissipation.

While productivity differences between multinational firms and national competitors also

⁴This result may be surprising at a first glance and there are as well arguments for a higher multinational wage premium in technologically backward countries. For instance, if the impediments to foreign investment are larger in the technologically backward economy, the multinational wage premium is magnified there. In any case, conclusive empirical evidence on the relative magnitudes of multinational wage premia across countries is, to the best of our knowledge, so far missing.

play a prominent role for explaining the multinational wage premium in this paper, there remain several important differences between our approach and those described above. For instance, we set up a general equilibrium model and endogenise the productivity distribution within the group of multinationals as well as within the group of national firms. Furthermore, we abstract from the risk of technology dissipation and instead argue that multinationals pay a wage premium because of rent sharing. The idea of rent sharing relates our model to Görg, Strobl and Walsh (2007) who consider a two-period bargaining model with on-the-job training. Assuming that training is more effective in multinational firms their model provides an explanation for a multinational wage premium in the second, post-training period.⁵ However, in contrast to us, Görg, Strobl and Walsh (2007) do not account for *international* profit sharing or the role of country-specific factors in explaining the MNE wage premium.⁶

Finally, Scheve and Slaughter (2004) argue that multinationals pay more than local firms to compensate workers for the greater labour market volatility associated with MNEs. While evidence that the risk of job loss is higher for workers in multinational enterprises than for those hired by their national competitors is not conclusive, recent empirical studies on the likelihood of plant closing lend at least first support to this hypothesis. For instance, Bernard and Jensen (2007) show for the US that the likelihood of closing plants is significantly higher for multinationals than for (single-plant) domestic firms.⁷ Although involuntary unemployment is

⁵Relying on a matched employer-employee dataset for Hungary, Csengödi, Jungnickel and Urban (2008) find evidence for the idea that rent sharing can explain a substantial part of the multinational wage premium. Their results are less supportive for the technology dissipation argument in Fosfuri, Motta and Rønde (2001) and Glass and Saggi (2002).

⁶Malchow-Møller, Markusen and Schjerning (2007) also consider a two-period model with on-the-job training. Similar to Görg, Strobl and Walsh (2007) they assume that the skill formation effect is stronger in high-productivity firms, and hence multinationals pay higher wages in the second, post-training period if they are more productive than their local competitors. However, by abstracting from wage bargaining and considering a perfectly competitive labour market, discounted labour income needs to be equalised across all jobs, so that multinationals pay lower wages in the first, training period. This differentiates the Malchow-Møller, Markusen and Schjerning (2007) approach from Görg, Strobl and Walsh (2007), where the first period wage discount does not necessarily materialize.

⁷A similar result is documented for the Irish manufacturing sector by Görg and Strobl (2003). However, these authors also show that “new jobs generated in multinational companies appear to be more persistent than jobs

also a key feature of our rent sharing model, we do not account for job insecurity as a separate channel for explaining the multinational wage premium.⁸

The remainder of the paper is organised as follows. Section 2 introduces the model and solves for the autarky equilibrium. In Section 3 we describe our assumptions regarding the open economy and analyse the decision of firms to become multinational. Section 4 solves for the open economy equilibrium with symmetric countries and offers first insights into firm-specific determinants of the multinational wage premium. Section 5 extends the model to one with asymmetric countries and shows how firm-specific factors interact with country-specific ones in determining the multinational wage premium. The last section concludes.

2 The Closed Economy

We consider an economy with a single factor of production, labour L , that is used in the production of differentiated intermediate goods which are sold under monopolistic competition. There is a second sector, which produces homogeneous final output Y under perfect competition, using the differentiated intermediates as the only inputs. The CES production function for final output is given by

$$Y = \left[M^{-(1-\rho)} \int_{v \in V} q(v)^\rho dv \right]^{1/\rho}, \quad 0 < \rho < 1, \quad (1)$$

with the measure of set V representing the mass of available intermediate goods M .⁹ We take final output as the numeraire, and hence the CES price index P corresponding to the production generated in indigenous plants" (p. 1), which counteracts the former effect.

⁸The rent sharing mechanism in this model leads to wage differentiation across firms, even though workers are ex ante identical. In this respect, our model contributes to a growing literature that looks at the impact of globalisation on intra-group wage inequality. Most of the existing studies to this literature choose, as we do, a Melitz (2003)-type model of heterogeneous producers, but at the same time differ in the source of labour market imperfection that hinders wages to equalise across firms. For instance, Davis and Harrigan (2007) consider a shirking model, while Amiti and Davis (2008) and Egger and Kreickemeier (2008, 2009) rely on the fair-wage effort approach to efficiency wages, which is also considered in this paper. Finally, Helpman, Itzhak and Redding (2009) choose a search and matching framework to generate intra-group wage inequality.

⁹Using technology (1) instead of the Ethier (1982) technology with external scale economies simplifies our analysis significantly, without affecting the main insights.

function in Eq. (1) is normalised to one. Profit maximisation of final goods producers results in an isoelastic demand function for each variety of the intermediate good:

$$q(v) = \frac{Y}{M} p(v)^{-\sigma}, \quad (2)$$

where $\sigma \equiv 1/(1 - \rho)$ equals the constant elasticity of substitution between the different varieties.

Each intermediate goods producer operates a single domestic plant and has to bear a fixed beachhead cost f , in units of final output, in order to run a distribution system for the firm-specific variety of the good. Output q of each firm in the intermediates sector is linear in labour input l , measured in efficiency units, and firm-specific labour productivity ϕ : $q = \phi l$. Intermediate goods producers maximise their profits by charging prices as a constant markup $1/\rho$ over their respective marginal cost, $w_i/(\phi_i \varepsilon_i)$, where w_i is the wage paid by firm i and ε_i is the effort exerted by workers employed in firm i . Substituting for p in (2) gives us the revenue for a firm of productivity ϕ

$$r(\phi) = \frac{Y}{M} \left(\frac{w(\phi)}{\rho \phi \varepsilon} \right)^{1-\sigma} \quad (3)$$

Wage and effort at the firm level are linked by a fair-wage effort mechanism along the lines of Akerlof and Yellen (1990): $\varepsilon_i = \min[w_i/\hat{w}_i, 1]$, where \hat{w}_i is the wage considered to be fair by workers in firm i .¹⁰ It is easily checked that a firm cannot reduce its marginal cost by paying less than the fair wage, as the effort in this case falls proportionally. Hence we can safely assume, following Akerlof and Yellen (1990), that firms pay at least the fair wage, and consequently $\varepsilon_i = 1$ for all i . Furthermore, it is shown below that firms can hire the profit maximising number of workers if they set $w_i = \hat{w}_i$, so this is what they do in equilibrium.

The wage considered to be fair by a worker depends on two factors: first, the economic success of the firm in which the worker is employed and, second, the income opportunities outside the present job, represented by the average wage in the economy. The latter is given by $(1 - U)\bar{w}$, where \bar{w} is the average wage rate of those who have a job and $1 - U$ is the employment rate. As in Egger and Kreickemeier (2008), we use operating profits of a firm as a measure for its

¹⁰Howitt (2002) and Bewley (2005) provide an extensive discussion of the empirical evidence that supports the importance of fairness considerations for real world wage payments.

economic success and define the fair wage constraint as

$$\hat{w}(\phi) = \left(\frac{r(\phi)}{\sigma} \right)^\theta [(1-U)\bar{w}]^{1-\theta}, \quad (4)$$

where $\theta \in (0, 1)$ measures the importance of the firm-internal component in a worker's fairness considerations, and hence can be interpreted as a rent-sharing parameter. Since all firms pay the fair wage in equilibrium, it is immediate from (4) that firms with higher operating profits pay higher wages.¹¹

Combining (4) with the demand function for the closed economy in (2) leads to:

$$\frac{w(\phi_1)}{w(\phi_2)} = \left(\frac{\phi_1}{\phi_2} \right)^{\theta\xi} \quad (5)$$

with $\xi \equiv (\sigma - 1)/[1 + \theta(\sigma - 1)]$. Hence, in the closed economy the relative wage paid by two firms 1 and 2 can be expressed as a function of their relative productivity levels. As $\theta\xi < 1$, wages increase less than proportionally with firm productivity, and hence more productive firms have lower marginal cost.

As in the Melitz model, it is possible – and very useful – to define an “average” firm with productivity $\tilde{\phi}$. This *productivity average* is implicitly determined by $q(\tilde{\phi}) = Y/M$, so that the output of the average firm equals the output per firm in the economy. Substitution in the demand function shows that this definition implies $p(\tilde{\phi}) = 1$, and hence aggregate revenues and aggregate profits are equal to $R = Y = Mr(\tilde{\phi})$ and $\Pi = M\pi(\tilde{\phi})$, respectively. In analogy to Melitz (2003) we can write the productivity average as

$$\tilde{\phi} \equiv \left[\frac{1}{1 - G(\phi^*)} \int_{\phi^*}^{\infty} \phi^\xi dG(\phi) \right]^{\frac{1}{\xi}}, \quad (6)$$

where $G(\phi)$ is the productivity distribution, and ϕ^* denotes the *productivity cutoff* that separates inactive firms ($\phi < \phi^*$) from those which actually take up production ($\phi \geq \phi^*$). The productivity cutoff is characterised by the zero profit condition $\pi(\phi^*) = r(\phi^*)/\sigma - f = 0$.

¹¹Notably, in fair wage-effort models workers from firms with low wage payments cannot successfully underbid wages in firms with higher payments. The reason is that firms are unable to write binding contracts on the effort of workers, and hence hiring an outsider at a lower wage would not reduce a firm's effective labour costs as the newly hired employee will reduce its effort immediately after getting the job. Fehr and Falk (1999) have designed a laboratory experiment in order to investigate the relevance of imperfect contracting for the fair wage effort mechanism. They show that the inability to write a binding contract on the workers' effort is indeed crucial for this mechanism.

We follow the by now common approach and choose the Pareto distribution to parametrise $G(\phi)$. In particular, we assume $G(\phi) = 1 - (\phi/\bar{\phi})^{-k}$, with $\bar{\phi}$ denoting the productivity floor and k being a shape paramter. Under the Pareto assumption, the productivity average, $\tilde{\phi}$, is proportional to the productivity cutoff, ϕ^* :

$$\tilde{\phi} = \left(\frac{k}{k - \xi} \right)^{\frac{1}{\xi}} \phi^*, \quad (7)$$

where $k > \sigma - 1$ is assumed throughout our analysis, in order to ensure a positive and finite value of $\tilde{\phi}$ for any possible θ . Using this proportionality between the average productivity and the cutoff productivity, we can rewrite the condition $\pi(\phi^*) = 0$ in terms of the profits of the average firm $\pi(\tilde{\phi})$ or – equivalently – the average profits in the economy $\bar{\pi} \equiv \Pi/M$. We get

$$\bar{\pi} = \pi(\tilde{\phi}) = \frac{\xi f}{k - \xi}, \quad (8)$$

and using the terminology introduced in Melitz (2003), Eq. (8) is the *zero cutoff profit condition*. Notably, in our setup with Pareto-distributed productivities the profits of the average firm are independent of $\tilde{\phi}$. That is, independent of the actual productivity of the average firm its profits are fixed by parameters f , σ , θ and k .

The actual value for the productivity cutoff is now determined by the entry decision of firms, which in this setting is modelled as a two stage process. First, an unbounded pool of potential entrants decides upon an initial investment f_e (in units of final output), which is immediately sunk. This investment provides access to a lottery, in which firms draw their productivity from the common distribution $G(\phi)$. Each firm has only one draw and, conditional on its productivity level, it decides upon starting production or remaining inactive. If starting production firms can realise preperiodical profits of $\pi(\phi)$ and hence only firms with a sufficiently high productivity level, $\phi \geq \phi^*$, will find it profitable to be active in the respective time period (see above). There is an infinite number of time periods, and in each of these periods firms face an exogenous probability of death δ .

Abstracting from time discounting and focussing on steady state outcomes, the present value of profits for a firm with $\phi \geq \phi^*$ is given by $\pi(\phi)/\delta$. In equilibrium the sunk costs f_e of entering the productivity draw must equal the present value of average profits of active firms $\bar{\pi}/\delta$,

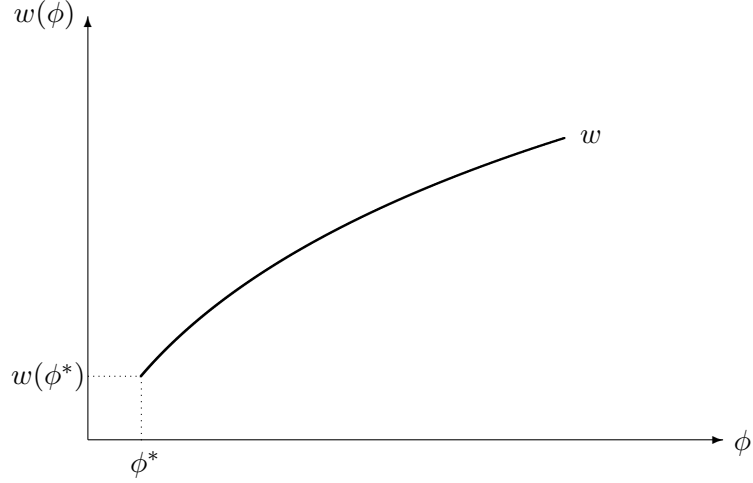


Figure 1: Wage profile in the closed economy

multiplied by the probability of a successful draw, $1 - G(\phi^*)$. Formally, using our assumption of Pareto distributed productivity levels, we get

$$\bar{\pi} = \delta f_e \left(\frac{\phi^*}{\bar{\phi}} \right)^k. \quad (9)$$

Together, Eqs. (8) and (9) give an explicit solution for ϕ^* :

$$\phi^* = \left[\frac{\xi f}{(k - \xi) \delta f_e} \right]^{\frac{1}{k}} \bar{\phi}. \quad (10)$$

Furthermore, accounting for (5), (7) and $w(\tilde{\phi}) = \rho \tilde{\phi}$ (due to $p(\tilde{\phi}) = 1$), the wage paid by the marginal firm can be derived as follows

$$w(\phi^*) = \rho \left(\frac{k}{k - \xi} \right)^{\frac{1}{\sigma - 1}} \phi^*. \quad (11)$$

Together, Eqs. (5) and (11) completely characterise the wage profile across firms which is depicted in Figure 1.¹²

¹²The model yields closed-form solutions for all aggregate variables in the autarky equilibrium. Since these results are not of central interest for our present analysis, we do not report them here. They are presented in Egger and Kreickemeier (2010).

3 The Open Economy: Firm-Level Aspects

We now consider a world economy with two countries, 1 and 2, that have the same population size L but may differ in their productivity floors $\bar{\phi}_i$, $i = 1, 2$.¹³ Market entry in both countries follows the mechanism described in the previous section, but after observing the realisation of their productivity draw, firms now have three options open to them: They can shut down immediately, they can decide to open a production plant in their home country, incurring the fixed cost f , or they can decide to open two plants, one in their home country, and one in the other country, incurring fixed cost $f + F$. In this case, a firm becomes a horizontal multinational (see Markusen, 1984; 2002) and hence serves domestic as well as foreign consumers through local production. In order to facilitate our analysis, we exclude two other forms of foreign market penetration. First, we assume that transportation of intermediate goods is subject to prohibitively high impediments and hence ignore trade as a possible alternative to horizontal investment. This is in contrast to the final goods sector, where trade is not subject to any impediments. Second, we assume that it is not attractive for firms to become a vertical multinational with headquarters in the home country and a single production facility in the foreign economy (see Helpman, 1984), because closing down the domestic plant and just operating the foreign one does not reduce total fixed cost $f + F$. As a consequence, becoming a horizontal multinational enterprise (*MNE* in short) is the only (relevant) option for a firm to serve foreign customers.

3.1 Determination of Wages at the Firm Level

Under openness, the fair wage is determined in analogy to the closed economy case: For each plant, it is a weighted average of the firm's operating profits and the average wage income of the country in which the plant is located. We henceforth focus on country 1 firms, but analogous expressions hold for country 2 firms. In the case of a purely national firm (superscript n) we

¹³One could as well allow for asymmetries in the population size of countries. But such endowment differences do not have an effect on the outcome of our analysis and hence we consider symmetry in this respect throughout our analysis.

have, taking into account $w = \hat{w}$:

$$w_1^n(\phi) = \left(\frac{r_1^n(\phi)}{\sigma} \right)^\theta \left(\rho \frac{Y_1}{L} \right)^{1-\theta}. \quad (12)$$

In the case of a multinational firm (superscript m) we obtain for the wages set in countries 1 and 2, respectively:

$$\begin{aligned} w_{11}^m(\phi) &= \left(\frac{r_1^m(\phi)}{\sigma} \right)^\theta \left(\rho \frac{Y_1}{L} \right)^{1-\theta}, \\ w_{12}^m(\phi) &= \left(\frac{r_1^m(\phi)}{\sigma} \right)^\theta \left(\rho \frac{Y_2}{L} \right)^{1-\theta}, \end{aligned} \quad (13)$$

where $r_1^m = r_{11}^m + r_{12}^m$ are the total revenues of a multinational firm based in country 1, from both of its plants. In formulating the two equations in (13), we assume that the fairness considerations of workers are not confined to operating profits of the local plant but rather stretch across a firm's overall operating profits. This captures the empirical observation of international profit sharing in multinational enterprises (see Budd, Konings and Slaughter, 2005). There are two immediate consequences of the fair-wage specifications in (13). First, multinational firms with the same productivity level pay the same wage rate irrespective of their headquarters location. Second, there is wage differentiation between the two plants of a single multinational firm if per capita labour income $\rho Y/L$ differs in the two economies. In particular the following result is immediate:

Lemma 1. *Multinational firms pay lower wages in the market with the lower per capita income.*

There is a second wage differential of interest, namely the one between the wage a multinational firm pays its domestic workers and the wage that would be paid by a national firm with the same productivity. This differential is important since it influences the decision of a firm whether or not to become multinational. Fair wage constraints (12) and (13) imply

$$\frac{w_{11}^m(\phi)}{w_1^n(\phi)} = \left(\frac{r_{11}^m(\phi)}{r_1^n(\phi)} \left[1 + \frac{r_{12}^m(\phi)}{r_{11}^m(\phi)} \right] \right)^\theta, \quad (14)$$

and hence the wage paid by a multinational firm in its domestic market relative to the wage paid by an otherwise identical national firm increases *ceteris paribus* in the relative revenues these firms make in the domestic market.

Using the demand function for intermediates together with the markup-pricing condition gives a further relation between relative wages paid by national and multinational firms, and their relative domestic revenues:

$$\frac{r_{11}^m(\phi)}{r_1^n(\phi)} = \left(\frac{w_{11}^m(\phi)}{w_1^n(\phi)} \right)^{1-\sigma}. \quad (15)$$

Higher wages lead to higher marginal cost, *ceteris paribus*, which imply higher prices and lower revenues. Equations (14) and (15) can be jointly solved to give

$$\frac{w_{11}^m(\phi)}{w_1^n(\phi)} = [1 + \Omega_1]^{\theta(1-\theta\xi)}, \quad (16)$$

$$\frac{r_{11}^m(\phi)}{r_1^n(\phi)} = [1 + \Omega_1]^{-\theta\xi}, \quad (17)$$

where $\Omega_1 \equiv r_{12}^m(\phi)/r_{11}^m(\phi)$ is the ratio for a given multinational firm between the revenues in its foreign and domestic markets. A multinational firm has to pay higher wages in its home market than a national firm with the same productivity, and, as a result, it has lower revenues in its home market.

The interpretation of Ω_1 is helped by substituting for the respective revenues from the demand functions for intermediate goods. Straightforward calculations lead to

$$\Omega_1 = \frac{M_{t1}}{M_{t2}} \left(\frac{Y_2}{Y_1} \right)^{1-(\sigma-1)(1-\theta)}, \quad (18)$$

where M_{t1} and M_{t2} are the number of firms selling in the respective market (including foreign multinationals). One can see that relative revenues in the two markets are the same for all multinationals of country 1. We will therefore interpret Ω_1 henceforth as a general measure of *relative foreign market potential*. From inspection of (18) we can conclude that a *ceteris paribus* increase in Y_2/Y_1 does not necessarily increase relative foreign market potential Ω_1 . There are two effects that work in opposite directions. On the one hand, a relative increase in foreign output raises demand for intermediate goods and thereby stimulates revenues that can be achieved by a multinational firm in the foreign economy. On the other hand, a higher foreign output raises per capita labour income and therefore wage claims of workers in country 2, according to (13). The second effect dominates if $\sigma - 1 > 1/(1 - \theta)$, implying that an increase in Y_2/Y_1 lowers Ω_1 in this case.

We can summarise the main insights from above as follows:

Lemma 2. *When becoming multinational, a firm is faced with higher wages in its domestic market, and with lower domestic revenues. The size of both effects is independent of the productivity level of the firm.*

3.2 The Decision to Become Multinational

In Helpman, Melitz and Yeaple (2004), differences in labour productivity across firms in combination with fixed foreign investment costs F lead to self selection of only the most productive firms into multinational status. There is an additional cost of having MNE status in our model, since – as we have just shown – with this status the *domestic* marginal costs of a firm increase. We now analyse how this extra cost affects the decision of firms to become multinational, deriving a condition for the “partitioning” of firms, with only the most productive ones self-selecting into MNE status.

In an equilibrium with partitioning of firms by their MNE status the productivity of the marginal multinational firm ϕ_1^m is implicitly defined by the indifference condition

$$\frac{r_1^m(\phi_1^m)}{\sigma} - F = \frac{r_1^n(\phi_1^m)}{\sigma},$$

i.e. the marginal MNE with productivity ϕ_1^m would make the same profits as either a national or a multinational firm. Rearranging terms gives

$$\frac{r_1^m(\phi_1^m)}{r_1^n(\phi_1^m)} [1 + \Omega_1] = 1 + \frac{\sigma F}{r_1^n(\phi_1^m)}.$$

Substituting $r_1^n(\phi_1^*) = \sigma f$ and considering (17) as well as $r_1^n(\phi_1^*)/r_1^n(\phi_1^m) = (\phi_1^*/\phi_1^m)^\xi$, we can rewrite the indifference condition in the following way:

$$[1 + \Omega_1]^{1-\theta\xi} = 1 + \frac{F}{f} \left(\frac{\phi_1^*}{\phi_1^m} \right)^\xi. \quad (19)$$

Selection of only the best firms into multinational activity requires $\phi_1^*/\phi_1^m < 1$, which is equivalent to

$$\left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] \frac{f}{F} < 1, \quad (20)$$

and this is guaranteed if F/f is sufficiently large. In the subsequent analysis we focus on parameter constellations for which condition (20) is fulfilled.

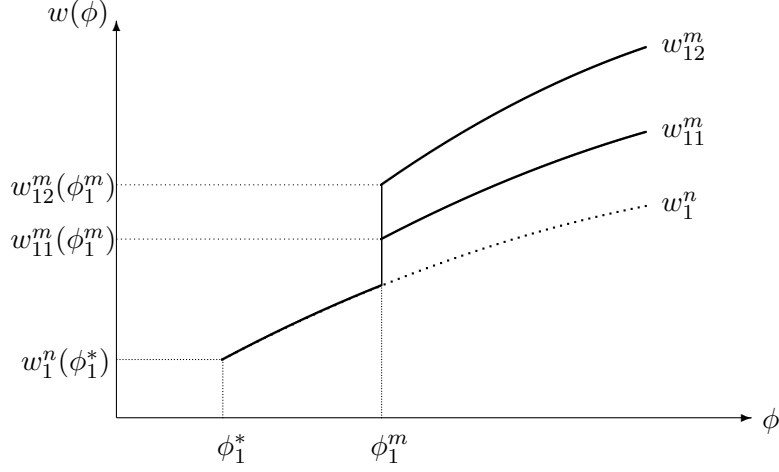


Figure 2: Wage profile across country 1 firms in the open economy

The wage paid by firms in country 1 as a function of their respective productivity is depicted in Figure 2. Within each regime (m and n , respectively), the relative wage of any two firms is still given by (5), and therefore wages are strictly increasing and concave in firm productivity within regimes (see Figure 1). Furthermore, we know from (16) that being multinational increases the wage a firm pays in its home market, *ceteris paribus*, and hence w_{11}^m lies strictly above w_1^n (the dotted part of w_1^n gives the wage a firm with productivity $\phi > \phi_1^m$ would have to pay if it were a national firm). Lastly, it follows from (13) that the intra-firm wage differential w_{12}^m/w_{11}^m is determined by Y_2/Y_1 : The multinational firm has to pay a higher wage in the market with the higher labour income per capita in order to satisfy the fair wage constraint of the local workforce (see Lemma 1). Figure 2 depicts the case where per capita labour income is higher in country 2.

4 The Open Economy with Symmetric Countries

We now turn to the analysis of the general equilibrium in the open economy. To this end, we start by focussing on the case where countries 1 and 2 are identical in all respects, implying that $\Omega_1 = \Omega_2 = 1$. The symmetry assumption allows us to neglect country indices in this section.

As analysed in Section 3, only firms with a productivity level higher than (or equal to)

ϕ^m find it attractive to set up a second production facility in the foreign economy. Thus, the *ex ante* probability that a successful entrant will become multinational is given by $\chi \equiv [1 - G(\phi^m)]/[1 - G(\phi^*)] = (\phi^*/\phi^m)^k$. Since firms know their productivity levels before they decide upon their export status, χ also gives the *ex post* fraction of multinationals, and hence $M_t = (1 + \chi)M$. Using (19) we find that with symmetric countries we can explicitly solve for χ :

$$\chi = \left[\left(2^{1-\theta\xi} - 1 \right) \frac{f}{F} \right]^{\frac{k}{\xi}} \quad (21)$$

The share of firms becoming multinational decreases with higher cost of MNE status, as would be expected.

Furthermore, with part of the firms being active in both countries, average profits per firm $\bar{\pi} = \Pi/M$ are larger than under autarky. As shown in the appendix, the relation between average profits in the closed and open economy is given by:

$$\bar{\pi} = \left(1 + \frac{\chi F}{f} \right) \bar{\pi}_a \quad (22)$$

Together with the unchanged free entry condition (9) we find the productivity cutoff for the open economy to be given by

$$\phi^* = \left(1 + \frac{\chi F}{f} \right)^{\frac{1}{k}} \phi_a^*. \quad (23)$$

The productivity cutoff is higher in the open economy with multinational presence than under autarky, due to the standard selection effect known from Melitz (2003).

With these insights at hand, we are equipped in principle for explicitly solving for the aggregate variables in the open economy. However, to keep the analysis in reasonable length we do not present the respective calculations here and instead focus on characterising the multinational wage premium, which is of centre stage interest in this paper.¹⁴ We measure the multinational wage premium ω in a country, say country 1, as the ratio of two average wages: One is the average wage of workers employed in country-1 plants of multinational firms with headquarters in country 2 (*foreign firms*, denoted by superscript f), while the other is the average wage of workers employed in country-1 plants of all firms with headquarters in country 1 (*home firms*,

¹⁴Results on other aggregates are available from the authors upon request.

denoted by superscript h). In general equilibrium, both averages – and therefore ω – depend on the composition of the respective firm pools, as well as the relative wages paid by national and multinational firms.

Total wage payments and employment levels for foreign firms are given by

$$W^f = \rho\chi M \int_{\phi^m}^{\infty} r^m(\phi) \frac{dG(\phi)}{1 - G(\phi^m)}$$

and

$$L^f = \chi M \int_{\phi^m}^{\infty} l^m(\phi) \frac{dG(\phi)}{1 - G(\phi^m)},$$

respectively, where we make use of the fact that wage payments are a fraction ρ of revenues in all firms. The resulting average wage is denoted by $w^f \equiv W^f/L^f$. For home firms, the respective variables are given by

$$W^h = W^f + \rho M \int_{\phi^*}^{\phi^m} r^n(\phi) \frac{dG(\phi)}{1 - G(\phi^*)}$$

and

$$L^h = L^f + M \int_{\phi^*}^{\phi^m} l^n(\phi) \frac{dG(\phi)}{1 - G(\phi^*)},$$

respectively, and the resulting average wage is denoted by $w^h \equiv W^h/L^h$. As shown in the appendix, ω can be computed from these expressions as:

$$\omega \equiv \frac{w^f}{w^h} = \frac{2^{-\theta\xi} - 2^{\frac{\theta\xi}{\sigma-1}} \left(1 - \chi^{-\frac{k-(1-\theta)\xi}{k}}\right)}{2^{-\theta\xi} - \left(1 - \chi^{-\frac{k-\xi}{k}}\right)} \quad (24)$$

It is easily checked that ω is equal to one if χ is equal to one, and larger than one otherwise. Furthermore, we find $d\omega/d\chi < 0$, and hence the multinational wage premium decreases monotonically in the share of firms that have MNE status. Using (21), we can furthermore relate ω to model parameters: The multinational wage premium is lower the lower the fixed cost F of FDI.

The main results from this section can be summarised as follows:

Proposition 1. *With symmetric countries and selection of the most productive firms into MNE status there exists a multinational wage premium, i.e. $\omega > 1$. The premium decreases monotonically in the proportion of firms that have MNE status.*

Intuitively, the multinational wage premium in (24) exists simply due to the fact that the pools of home and foreign firms differ in their composition: foreign firms, which by definition are all MNEs, are on average more productive than home firms. They make therefore higher profits, which via the rent-sharing mechanism lead to higher wages. The extent of self-selection into multinational status, and hence the size of this compositional effect, is influenced by the firm level wage effect identified earlier: firms of a given productivity have to pay a higher wage if they choose to become multinationals since their global profits are higher. With a higher χ the pools of foreign and home firms become more similar, thereby weakening the compositional effect that is responsible for the existence of the multinational wage premium. For $\chi = 1$ all firms engage in FDI and the premium vanishes.

Evidence in support of our result that MNEs are on average more productive than their domestic competitors, and also pay higher wages, is provided by Girma, Greenaway and Wakelin (2001). Furthermore, recollecting from Section 3.1 that multinational firms with the same productivity level pay the same wage rate irrespective of their headquarters location, the results in this section are also consistent with the observation in Heyman, Sjöholm, and Tingvall (2007) that foreign-owned firms tend to pay higher wages than domestically owned firms without foreign affiliates, but, on the other hand, they do not pay higher wages than domestically owned multinationals.

5 Asymmetric Countries and the Multinational Wage Premium

The analysis in the previous section has shed light on the role of firm characteristics for explaining the MNE wage premium, and there is indeed strong evidence that differences in firm characteristics can explain a substantial share of this premium (see Görg, Strobl, and Walsh, 2007). However, the empirical literature identifies country-specific factors as an additional set of relevant determinants of the MNE wage premium. For instance, Girma and Görg (2007) find that the wage payment of multinational firms crucially depends on the nationality of the foreign investor. This suggests that the MNE wage premium is governed by the economic fundamentals of the countries which are involved in the multinational activity. The role of these fundamentals cannot be studied adequately in a setting with symmetric countries, and hence we have to in-

introduce some form of asymmetry in our model in order to shed further light on this issue. One possibility to capture country asymmetries is to assume differences in the technology distribution, and the simplest way to model this form of asymmetry is to assume different productivity floors, i.e. $\bar{\phi}_1 \neq \bar{\phi}_2$.¹⁵

We start our formal discussion by noting that the marginal firm's revenue equals σf in both markets, so that $r_1^n(\phi_1^*) = r_2^n(\phi_2^*)$ and, in view of (3),

$$\frac{Y_2}{M_{t2}} \left(\frac{w^n(\phi_2^*)}{\rho \phi_2^*} \right)^{1-\sigma} = \frac{Y_1}{M_{t1}} \left(\frac{w^n(\phi_1^*)}{\rho \phi_1^*} \right)^{1-\sigma} \quad (25)$$

must continue to hold in the asymmetric countries case – at least as long as the marginal firm in either economy is active in its domestic market only, which we assume throughout our analysis. Together with the constant markup pricing condition, the fair wage constraint in (12) and the definition of Ω_1 in (18), we can then derive a simple relationship between the ratio of cutoff productivity levels, ϕ_1^*/ϕ_2^* , and the relative foreign market potential, Ω_1 . This relationship is given by

$$\frac{\phi_1^*}{\phi_2^*} = \Omega_1^{\frac{1}{\sigma-1}} \quad (26)$$

Eq. (26) establishes that the cutoff productivity ratio is a monotonically increasing function of the relative foreign market potential, with ϕ_1^* being larger than ϕ_2^* if and only if country 1 has the larger foreign market potential. The larger market therefore accommodates the survival of less productive firms. An increase in the cutoff productivity ratio lowers, all other things equal, the variable production costs of the marginal producer in country 1 relative to the marginal producer in country 2. This leads to a revenue differential between the two marginal firms, $r_1^n(\phi_1^*)/r_2^n(\phi_2^*) > 1$. Hence, the relative market size of country, as measured by Ω_1 , must increase in order to reestablish the condition that revenues of the marginal producers are the same in the two economies (see (25)).

In the open economy, both the relative cutoff levels and the relative market size are endogenous variables, of course. We now relate them to the exogenous difference in the countries' technology distributions, as measured by $\bar{\phi}_1/\bar{\phi}_2$. It is shown in the appendix that using the

¹⁵See Demidova (2008) for a discussion of more general technology differences between countries in a trade model with heterogeneous firms.

zero cutoff profit condition for the case of asymmetric countries together with the free entry condition in (9) gives

$$\frac{\phi_1^*}{\phi_2^*} = \left(\frac{f + \chi_1 F}{f + \chi_2 F} \right)^{\frac{1}{k}} \frac{\bar{\phi}_1}{\bar{\phi}_2}. \quad (27)$$

The share of country- i firms that are multinational, χ_i , is itself endogenous, and in analogy to (21) it is given by

$$\chi_i = \left\{ \left[(1 + \Omega_i)^{1-\theta\xi} - 1 \right] \frac{f}{F} \right\}^{k/\xi}, \quad i = 1, 2. \quad (28)$$

Taking into account $\Omega_2 = 1/\Omega_1$, Eqs. (26) to (28) give a system of four equations in the four unknowns ϕ_1^*/ϕ_2^* , Ω_1 , χ_1 , and χ_2 .

Taking into account the endogeneity of χ_1 and χ_2 , we can rewrite (27) as

$$\frac{\phi_1^*}{\phi_2^*} = C \left[B \left(\frac{\phi_1^*}{\phi_2^*} \right) \right] \frac{\bar{\phi}_1}{\bar{\phi}_2} \quad (27')$$

where – from Eqs. (26) and (28) – the derivatives $B'(\phi_1^*/\phi_2^*)$ and $C'(\Omega_1)$ are strictly positive. Implicit differentiation gives

$$\frac{d(\phi_1^*/\phi_2^*)}{d(\bar{\phi}_1/\bar{\phi}_2)} = \frac{C(\cdot)}{1 - (\bar{\phi}_1/\bar{\phi}_2)C'(\cdot)B'(\cdot)}$$

which is strictly positive if and only if $(\bar{\phi}_1/\bar{\phi}_2)C'(\cdot)B'(\cdot) < 1$. It can be shown that this condition holds in any equilibrium that leads to self-selection of the best firms into multinational status in both countries: $\chi_1 \in (0, 1)$, $\chi_2 \in (0, 1)$.¹⁶ Such an equilibrium exists if the difference in the productivity floors $\bar{\phi}_1$ and $\bar{\phi}_2$ is not too large and the fixed cost for additionally setting up a foreign production facility, F , is sufficiently high. Only in this case is the relationship between ϕ_1^*/ϕ_2^* and $\bar{\phi}_1/\bar{\phi}_2$ governed by (27). Since the cutoff productivities ϕ_i^* are equalised across countries if they have identical productivity floors $\bar{\phi}_i$, the previous analysis shows that the more advanced country (as measured by a higher $\bar{\phi}_i$) has the higher cutoff productivity ϕ_i^* and the higher share of firms that are multinational χ_i . It furthermore shows that the more advanced country has the higher foreign market potential Ω_i .

These results imply that the population of home firms differs in its composition between the two countries if $\bar{\phi}_1 \neq \bar{\phi}_2$, and that the same is true for the population of foreign firms. To say

¹⁶The computations are relegated to a mathematical supplement that is available from the authors upon request.

something more specific, we combine Eqs. (26) and (28), and furthermore use the relationship between χ_i and the multinational productivity cutoff, which is analogous to the case of symmetric countries: $\chi_i = (\phi_i^*/\phi_i^m)^k$. Solving for the relative multinational cutoff productivities, we get

$$\frac{\phi_1^m}{\phi_2^m} = \left\{ \left[\frac{(1 + 1/\Omega_1)^{1-\theta\xi} - 1}{(1 + \Omega_1)^{1-\theta\xi} - 1} \right]^{1+\theta(\sigma-1)} \Omega_1 \right\}^{1/(\sigma-1)}. \quad (29)$$

As shown in detail in the appendix, $d(\phi_1^m/d\phi_2^m)/d\Omega_1 < 0$. Since, as shown above, Ω_1 is increasing in $\bar{\phi}_1/\bar{\phi}_2$, the multinational productivity cutoff is higher in the technologically backward country. This is intuitive, because local competition is stronger in the technologically advanced economy, where firms have a higher productivity on average. As a consequence, it is more difficult to survive as a foreign multinational in the technologically advanced country. This is consistent with the stylised fact that foreign direct investment flows (on net) from developed to developing countries (see Markusen, 2002; UNCTAD, 2009).

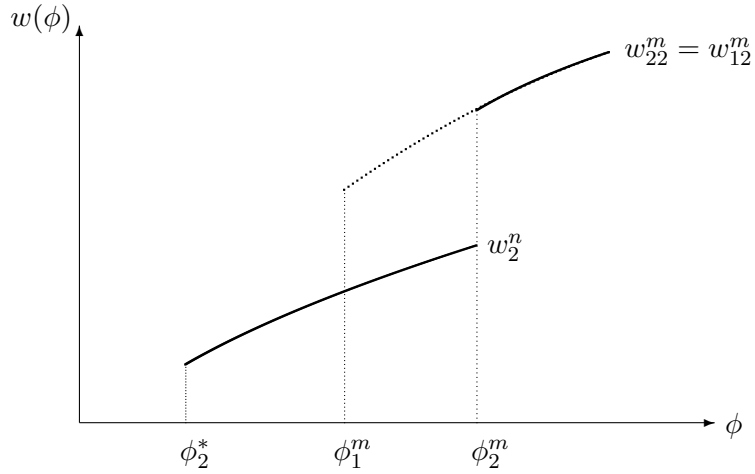


Figure 3: Residual wage premium in backward country 2

As an implication of the country-specific multinational cutoffs, in the technologically backward economy there is a subgroup of domestic *national* firms and foreign multinationals which have the same productivity levels. Hence, even if national firms and multinational ones use the same technology, they differ in their wage payments due to the wage premium that has to be paid by the multinational, according to (16). In other words, there is a *residual* wage

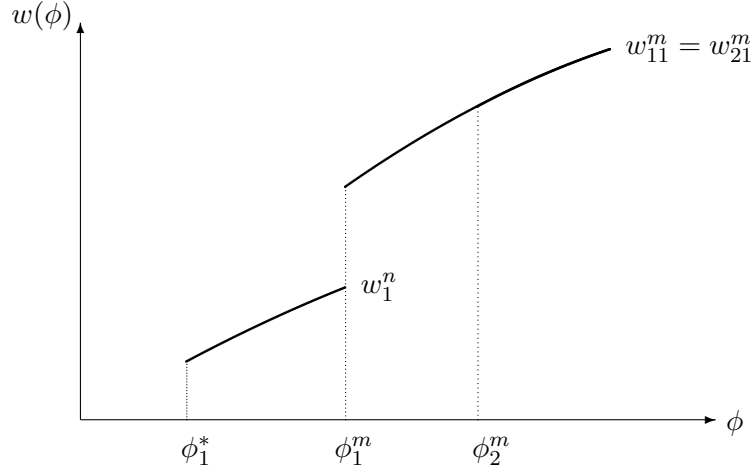


Figure 4: No residual wage premium in advanced country 1

premium – i.e. a premium that is not fully explained by firm characteristics – in the backward country. Figure 3 illustrates the residual wage premium, where country 2 is assumed to be the technologically backward country. In the productivity interval (ϕ_1^m, ϕ_2^m) there exists an overlap between national country-2 firms with wage payments $w_2^m(\phi)$ and foreign plants of multinational country-1 firms with wage payments $w_{12}^m(\phi) > w_2^m(\phi)$. In contrast, no residual wage premium exists in the technologically advanced country, since there is no overlap between the populations of domestic national firms and foreign nationals in terms of their productivity. This is illustrated in Figure 4.

These results are related to empirical evidence that an MNE wage premium remains to exist even if controlling for observable worker and/or plant characteristics. While the existence of such a residual premium in developed countries is still under debate (see Globerman, Ries and Vertinsky, 1994; Almeida, 2007), there is convincing evidence that the respective residuum does exist and is sizable in developing or transition economies (see Te Velde and Morrissey, 2003; Dobbelaere, 2004; Lipsey and Sjöholm, 2004). This is well in line with our model, which shows that the technology gap between the source and the host country of multinational activity is not only a key determinant of the investment decision of firms but also gives rise to a multinational wage premium in the technologically backward economy, which is not entirely captured by

differences in firm and worker characteristics.

With the composition of firms differing in the two economies, there are now additional effects on the MNE wage premium ω in both the technologically backward and the technologically advanced country. As shown in the appendix, the MNE wage premium with asymmetric countries is given for country 1 by

$$\omega_1 = \left(\frac{1 + \Omega_2}{1 + \Omega_1} \right)^{\frac{\theta\xi}{\sigma-1}} \left(\frac{\chi_1}{\chi_2} \right)^{\frac{\theta\xi}{k}} \frac{(1 + \Omega_1)^{-\theta\xi} - (1 + \Omega_1)^{\frac{\theta\xi}{\sigma-1}} \left(1 - \chi_1^{-\frac{k-(1-\theta)\xi}{k}} \right)}{(1 + \Omega_1)^{-\theta\xi} - \left(1 - \chi_1^{-\frac{k-\xi}{k}} \right)}, \quad (30)$$

with ω_2 determined analogously. The MNE wage premium for the case of symmetric countries, as given by (24), is recovered as the special case with $\Omega_1 = \Omega_2 = 1$ and $\chi_1 = \chi_2$.

Since we are not able to determine the impact of changes in the relative foreign market potential, Ω_1 , on the MNE wage premium ω_1 analytically, we have conducted a series of numerical simulation exercises in order to get insights on how country asymmetry affects the results from Section 4. The main insights from these exercises are shown in Figure 5. To separate the effect of country asymmetry from an overall efficiency effect, we leave the sum of the two productivity floors, $\bar{\phi}_1 + \bar{\phi}_2$, constant in the simulation exercise underlying Figure 5. Hence, an increase in the productivity floor of country 1 is associated with a *pari passu* decline in the productivity floor of country 2.¹⁷

Panel A depicts the share of foreign multinational plants in a country's overall population of firms as a function of country 1's productivity floor $\bar{\phi}_1$. Thereby, $\mu_1 = \chi_2 M_2 / M_{t1}$ represents the respective share in country 1 (dashed line), while $\mu_2 \equiv \chi_1 M_1 / M_{t1}$ represents the respective share in country 2 (solid line). From inspection of Panel A, we can conclude that the share of foreign multinational producers in the overall population of domestic firms is higher in the technologically backward economy, which is consistent with our previous insight that foreign direct investment flows (on net) into the country with lower productivity.

>Figure 5<

¹⁷We have checked robustness of our results with respect to the chosen parameter values in a series of different simulation experiments. Details on these robustness checks and the program code for *Mathematica 6.0* are available upon request.

Hence, other things equal, the populations of domestic firms and foreign multinationals are more similar in the technologically backward economy. Taking into account our previous results on how the composition of producers affects the multinational wage premium (see Section 4), this suggests that the multinational wage premium should be less pronounced in this economy. This is confirmed by Panel B, where the dashed curve represents the MNE wage premium in country 1, while the solid curve represents the respective premium in country 2.

This completes our discussion of the asymmetric country case and we summarise the main insights from the analysis in this section as follows.

Proposition 2. *The MNE wage premium depends on the economic fundamentals in the source and the host country of foreign investment, and in the case of technology differences it is larger in the country with the higher productivity floor. Controlling for observable firm characteristics (like productivity), an MNE wage premium still exists in the technologically backward economy.*

6 Concluding Remarks

The key objective of this paper is to present an analytically tractable theoretical framework that allows us to shed light on the multinational wage premium. For this purpose, we have set up a general equilibrium two-country model with heterogeneous firms, self-selection of the most productive producers into multinational activity and rent sharing at the firm level due to fairness preferences of workers. This framework generates wage differentiation across firms between ex ante identical workers. In addition, with rent sharing at the firm (instead of the plant) level, firms face an increase in their domestic wage if they expand production (and increase profits) by setting up a production facility in the foreign economy. The existence of such a firm-level wage effect influences a firm's decision upon investing abroad and thus has a bearing on the composition of the pools of national and multinational producers, respectively.

In this setting, we show how the composition effect and the firm-level wage effect interact to govern the size of the observed multinational wage premium. A decline in the impediments to foreign investment means that foreign multinationals and domestic firms become more equal in their average productivity levels, which lowers the multinational wage premium. In an extension

to our basic framework, we consider differences between the two countries in their level of technological development. This sheds light on the role of country-specific factors and their interaction with firm-specific ones in determining the multinational wage premium. There are two results which are particularly notable in this respect. First, the multinational wage premium is more pronounced in the technologically advanced economy. Second, if controlling for firm-specific factors, there remains a residual multinational wage premium in the technologically backward economy, because in this country there is an overlap in the productivity levels of national producers and foreign multinationals.

In summary, the analysis in this paper provides novel insights into the interaction of firm-specific and country-specific factors in determining the multinational wage premium, with the findings from this analysis being well supported by empirical evidence. However, there are several directions in which research needs to be extended before one can draw a comprehensive picture about the determinants of the multinational wage premium. On the one hand, by focussing exclusively on technology differences between the two economies as the country-specific determinant of the multinational wage premium, we abstract from other factors which may as well be important. For instance, it is broadly accepted among economists that institutional differences between Europe and the US are crucial for understanding the patterns of unemployment and wage inequality on both sides of the Atlantic. Such institutional differences are not accounted for in this paper in order to keep the analysis tractable. On the other hand, we do not account for vertical aspects in the foreign investment decision of firms, and hence abstract from one important form of multinational activity. While simultaneously allowing for both vertical and horizontal investment motives would enrich our insights on the multinational wage premium, such an extension is far beyond the scope of this paper and therefore left for future research.

Appendix

Derivation of Eq. (22)

With identical countries total revenues from local production in either country are equal to total output

$$Y = M \int_{\phi^*}^{\phi^m} r^n(\phi) \frac{dG(\phi)}{1 - G(\phi^*)} + 2\chi M \int_{\phi^m}^{\infty} r^m(\phi) \frac{dG(\phi)}{1 - G(\phi^m)}. \quad (31)$$

Accounting for (3), (5) and (17), we can rewrite the latter equation in the following way

$$\begin{aligned} Y &= Mr^n(\phi^*) \left[\int_{\phi^*}^{\phi^m} \left(\frac{\phi}{\phi^*} \right)^\xi \frac{dG(\phi)}{1 - G(\phi^*)} + 2^{1-\theta\xi} \chi \int_{\phi^m}^{\infty} \left(\frac{\phi}{\phi^*} \right)^\xi \frac{dG(\phi)}{1 - G(\phi^m)} \right] \\ &= Mr^n(\phi^*) \frac{k}{k - \xi} \left[1 + \left(2^{1-\theta\xi} - 1 \right) \chi \left(\frac{\phi^m}{\phi^*} \right)^\xi \right] \end{aligned} \quad (32)$$

which, in view of (19), simplifies to

$$Y = Mr^n(\phi^*) \frac{k}{k - \xi} \left(1 + \frac{\chi F}{f} \right). \quad (33)$$

Dividing the right-hand side of (33) by σ and subtracting overall fixed cost expenditures $Mf + \chi MF$ gives total profits of domestic producers:

$$\Pi = M \left[\frac{r^n(\phi^*)}{\sigma} \frac{k}{k - \xi} - f \right] \left(1 + \frac{\chi F}{f} \right). \quad (34)$$

Finally, substituting $r^n(\phi^*) = \sigma f$ and accounting for $\Pi = M\bar{\pi}$ establishes (22).

The Multinational Wage Premium with Symmetric Countries

The expressions for W^f and W^h given in the main text can be simplified to yield

$$W^f = \rho Mr^n(\phi^*) \frac{k}{k - \xi} 2^{-\theta\xi} \left[\left(2^{1-\theta\xi} - 1 \right) \frac{f}{F} \right]^{\frac{k-\xi}{\xi}}. \quad (35)$$

and

$$W^h = \rho Mr^n(\phi^*) \frac{k}{k - \xi} \left[1 - \left(1 - 2^{-\theta\xi} \right) \left[\left(2^{1-\theta\xi} - 1 \right) \frac{f}{F} \right]^{\frac{k-\xi}{\xi}} \right] \quad (36)$$

Considering further that total employment in domestic firms and foreign multinationals is given by

$$L^h = AM \left[1 - \left(1 - 2^{-\frac{\theta\xi\sigma}{\sigma-1}} \right) \left[\left(2^{1-\theta\xi} - 1 \right) \frac{f}{F} \right]^{\frac{k-(1-\theta)\xi}{\xi}} \right] \quad (37)$$

and

$$L^f = AM 2^{-\frac{\theta\xi\sigma}{\sigma-1}} \left[\left(2^{1-\theta\xi} - 1 \right) \frac{f}{F} \right]^{\frac{k-(1-\theta)\xi}{\xi}}, \quad (38)$$

respectively, where

$$A \equiv l^n(\phi^*) \frac{k}{k - (1 - \theta\xi)}. \quad (39)$$

Dividing (36) by (37) gives the average wage paid in domestic plants:

$$w^h = \frac{\rho r^n(\phi^*)}{A} \frac{k}{k - \xi} \frac{1 - [1 - 2^{-\theta\xi}] \left[(2^{1-\theta\xi} - 1) f/F \right]^{\frac{k-\xi}{\xi}}}{1 - [1 - 2^{-\frac{\theta\xi\sigma}{\sigma-1}}] \left[(2^{1-\theta\xi} - 1) f/F \right]^{\frac{k-(1-\theta)\xi}{\xi}}}, \quad (40)$$

while dividing (35) by (38) gives the average wage paid in the domestic plant of foreign multinationals:

$$w^f = \frac{\rho r^n(\phi^*)}{A} \frac{k}{k - \xi} \frac{2^{\frac{\theta\xi}{\sigma-1}}}{[(2^{1-\theta\xi} - 1) f/F]^\theta}. \quad (41)$$

Hence, the ratio between the two averages is given by

$$\begin{aligned} \frac{w^f}{w^h} &= \frac{2^{\frac{\theta\xi}{\sigma-1}}}{[(2^{1-\theta\xi} - 1) f/F]^\theta} \\ &\quad \times \frac{1 - [1 - 2^{-\frac{\theta\xi\sigma}{\sigma-1}}] \left[(2^{1-\theta\xi} - 1) f/F \right]^{\frac{k-(1-\theta)\xi}{\xi}}}{1 - [1 - 2^{-\theta\xi}] \left[(2^{1-\theta\xi} - 1) f/F \right]^{\frac{k-\xi}{\xi}}} \end{aligned} \quad (42)$$

Finally, accounting for (19) and (21) gives (24).

Derivation of Eq. (27)

In the case of asymmetric countries, total revenues of country-1 firms are given by

$$Y_1 = M_1 \int_{\phi_1^*}^{\phi_1^m} r_1^n(\phi) \frac{dG(\phi)}{1 - G(\phi_1^*)} + \chi_1 M_1 \int_{\phi_1^m}^{\infty} r_1^m(\phi) \frac{dG(\phi)}{1 - G(\phi_1^m)}. \quad (43)$$

Accounting for (3), (5), (17) and $r_1^m(\phi) = r_{11}^m(\phi) + r_{12}^m(\phi)$, $r_{12}^m(\phi)/r_{11}^m(\phi) = \Omega_1$, we can rewrite the latter equation in the following way

$$\begin{aligned} Y_1 &= M_1 r_1^n(\phi_1^*) \left[\int_{\phi_1^*}^{\phi_1^m} \left(\frac{\phi}{\phi_1^*} \right)^\xi \frac{dG(\phi)}{1 - G(\phi_1^*)} + (1 + \Omega_1)^{1-\theta\xi} \chi_1 \int_{\phi_1^m}^{\infty} \left(\frac{\phi}{\phi_1^*} \right)^\xi \frac{dG(\phi)}{1 - G(\phi_1^m)} \right] \\ &= M r_1^n(\phi_1^*) \frac{k}{k - \xi} \left\{ 1 + \left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] \chi_1 \left(\frac{\phi_1^m}{\phi_1^*} \right)^\xi \right\} \end{aligned} \quad (44)$$

which, in view of (19), simplifies to

$$Y_1 = M_1 r_1^n(\phi_1^*) \frac{k}{k - \xi} \left(1 + \frac{\chi_1 F}{f} \right). \quad (45)$$

Dividing the right-hand side of (45) by σ and subtracting overall fixed cost expenditures $M_1 f + \chi_1 M_1 F$ gives total profits of domestic producers in country 1:

$$\Pi_1 = M_1 \left[\frac{r_1^n(\phi_1^*)}{\sigma} \frac{k}{k - \xi} - f \right] \left(1 + \frac{\chi_1 F}{f} \right). \quad (46)$$

Substituting $r_1^n(\phi_1^*) = \sigma f$ and accounting for $\Pi_1 = M_1 \bar{\pi}_1$ gives average profits $\bar{\pi}_1 = (1 + \chi_1 F/f) \bar{\pi}_{1a}$.

Combining this zero cutoff profit condition with (9) and accounting for (10) further implies

$$\phi_1^* = \left[\frac{\xi f}{(k - \xi) \delta f_e} \left(1 + \frac{\chi_1 F}{f} \right) \right]^{\frac{1}{k}} \bar{\phi}_1. \quad (47)$$

Repeating the same steps as above for country 2, we get

$$\phi_2^* = \left[\frac{\xi f}{(k - \xi) \delta f_e} \left(1 + \frac{\chi_2 F}{f} \right) \right]^{\frac{1}{k}} \bar{\phi}_2. \quad (48)$$

The latter two equations establish (27).

FDI Cutoffs and Relative Foreign Market Potential

Let us define

$$\Phi(\Omega_1) \equiv \left[\frac{(1 + 1/\Omega_1)^{1-\theta\xi} - 1}{(1 + \Omega_1)^{1-\theta\xi} - 1} \right]^{1+\theta(\sigma-1)} \Omega_1. \quad (49)$$

Differentiating $\Phi(\Omega_1)$ gives

$$\begin{aligned} \frac{d\Phi(\cdot)}{d\Omega_1} &= - \frac{[1 + \theta(\sigma - 1)] \Phi(\cdot) [(1 + \Omega_1)^{1-\theta\xi} - 1]}{(1 + 1/\Omega_1)^{1-\theta\xi} - 1} \left\{ \frac{(1 - \theta\xi)(1/\Omega_1^2) (1 + 1/\Omega_1)^{-\theta\xi} [(1 + \Omega_1)^{1-\theta\xi} - 1]}{[(1 + \Omega_1)^{1-\theta\xi} - 1]^2} \right. \\ &\quad \left. + \frac{(1 - \theta\xi)(1 + \Omega_1)^{-\theta\xi} [(1 + 1/\Omega_1)^{1-\theta\xi} - 1]}{[(1 + \Omega_1)^{1-\theta\xi} - 1]^2} \right\} + \frac{\Phi(\cdot)}{\Omega_1}. \end{aligned}$$

Substituting $1 - \theta\xi = 1/[1 + \theta(\sigma - 1)]$ and rearranging terms, we further obtain

$$\begin{aligned} \frac{d\Phi(\cdot)}{d\Omega_1} &= -\frac{\Phi(\cdot)}{\Omega_1} \left\{ \frac{(1/\Omega_1)(1 + 1/\Omega_1)^{-\theta\xi} [(1 + \Omega_1)^{1-\theta\xi} - 1]}{[(1 + \Omega_1)^{1-\theta\xi} - 1][(1 + 1/\Omega_1)^{1-\theta\xi} - 1]} \right. \\ &\quad \left. + \frac{\Omega_1(1 + \Omega_1)^{-\theta\xi} [(1 + 1/\Omega_1)^{1-\theta\xi} - 1]}{[(1 + \Omega_1)^{1-\theta\xi} - 1][(1 + 1/\Omega_1)^{1-\theta\xi} - 1]} - 1 \right\} \\ &= -\frac{\Phi(\cdot)}{\Omega_1} \left\{ \frac{1}{1 + \Omega_1} \frac{(1 + 1/\Omega_1)^{1-\theta\xi}}{(1 + 1/\Omega_1)^{1-\theta\xi} - 1} + \frac{\Omega_1}{1 + \Omega_1} \frac{(1 + \Omega_1)^{1-\theta\xi}}{(1 + \Omega_1)^{1-\theta\xi} - 1} - 1 \right\}. \end{aligned} \quad (50)$$

Noting that

$$\frac{(1 + 1/\Omega_1)^{1-\theta\xi}}{(1 + 1/\Omega_1)^{1-\theta\xi} - 1} > 1, \quad \frac{(1 + \Omega_1)^{1-\theta\xi}}{(1 + \Omega_1)^{1-\theta\xi} - 1} > 1 \quad (51)$$

it follows that $\Phi'(\Omega_1) < 0$. In view of (29), this further implies $d(\phi_1^m/\phi_2^m)/d\Omega_1 < 0$.

Derivation of Eq. (30)

Total wage payments to country 1 workers in domestic plants are given by

$$W_1^{n+m} = \rho M_1 \int_{\phi_1^*}^{\phi_1^m} r_1^n(\phi) \frac{dG(\phi)}{1 - G(\phi_1^*)} + \rho \chi_1 M_1 \int_{\phi_1^m}^{\infty} r_{11}^m(\phi) \frac{dG(\phi)}{1 - G(\phi_1^m)}. \quad (52)$$

Proceeding as in the case of symmetric countries, we get

$$W_1^{n+m} = \rho M_1 r_1^n(\phi_1^*) \frac{k}{k - \xi} \left\{ 1 - \left[1 - (1 + \Omega_1)^{-\theta\xi} \right] \left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] \left[\frac{f}{F} \right]^{\frac{k-\xi}{\xi}} \right\}. \quad (53)$$

Total wage payments to country 1 workers in local plants of foreign multinationals are given by

$$\begin{aligned} W_1^m &= \rho \chi_2 M_2 \int_{\phi_2^m}^{\infty} r_{21}^m(\phi) \frac{dG(\phi)}{1 - G(\phi_2^m)} \\ &= \rho M_2 r_1^n(\phi_1^*) \frac{k}{k - \xi} \Omega_2 (1 + \Omega_2)^{-\theta\xi} \left\{ \left[(1 + \Omega_2)^{1-\theta\xi} - 1 \right] \left[\frac{f}{F} \right]^{\frac{k-\xi}{\xi}} \right\}. \end{aligned} \quad (54)$$

Let us now turn to the employment levels in the respective groups of firms. Total employment in local plants of domestic firms is given by

$$\begin{aligned} L_1^{n+m} &= M_1 \int_{\phi_1^*}^{\phi_1^m} l_1^n(\phi) \frac{dG(\phi)}{1 - G(\phi_1^*)} + \chi_1 M_1 \int_{\phi_1^m}^{\infty} l_{11}^m(\phi) \frac{dG(\phi)}{1 - G(\phi_1^m)} \\ &= A_1 M_1 \left\{ 1 - \left[1 - (1 + \Omega_1)^{-\frac{\theta\xi\sigma}{\sigma-1}} \right] \left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] \left[\frac{f}{F} \right]^{\frac{k-(1-\theta)\xi}{\xi}} \right\}, \end{aligned} \quad (55)$$

where A_1 is defined as in (39), with $l_1^n(\phi_1^*)$ instead of $l^n(\phi^*)$. Total employment in local plants of foreign multinationals is given by

$$\begin{aligned} L_1^m &= \chi_2 M_2 \int_{\phi_2^m}^{\infty} l_1^m(\phi) \frac{dG(\phi)}{1 - G(\phi_2^m)} \\ &= A_1 M_1 \Omega_2 (1 + \Omega_2)^{-\frac{\theta\xi\sigma}{\sigma-1}} \left\{ \left[(1 + \Omega_2)^{1-\theta\xi} - 1 \right] \frac{f}{F} \right\}^{\frac{k-(1-\theta)\xi}{\xi}}. \end{aligned} \quad (56)$$

Dividing (53) by (55), we obtain the average wage paid by local plants of domestic producers in country 1:

$$w_1^{n+m} = \frac{\rho r_1^n(\phi_1^*)}{A_1} \frac{k}{k-\xi} \frac{1 - \left[1 - (1 + \Omega_1)^{-\theta\xi} \right] \left[\left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] f/F \right]^{\frac{k-\xi}{\xi}}}{1 - \left[1 - (1 + \Omega_1)^{-\frac{\theta\xi\sigma}{\sigma-1}} \right] \left[\left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] f/F \right]^{\frac{k-(1-\theta)\xi}{\xi}}}. \quad (57)$$

Furthermore, dividing (54) by (56), gives the average wage paid by local plants of foreign multinationals in country 1:

$$w_1^m = \frac{\rho r_1^n(\phi_1^*)}{A_1} \frac{k}{k-\xi} \frac{(1 + \Omega_2)^{\frac{\theta\xi}{\sigma-1}}}{\left\{ \left[(1 + \Omega_2)^{1-\theta\xi} - 1 \right] f/F \right\}^{\theta}}. \quad (58)$$

Hence, the ratio of the two averages can be expressed as

$$\begin{aligned} \frac{w_1^m}{w_1^{m+n}} &= \frac{(1 + \Omega_2)^{\frac{\theta\xi}{\sigma-1}}}{\left\{ \left[(1 + \Omega_2)^{1-\theta\xi} - 1 \right] f/F \right\}^{\theta}} \\ &\quad \times \frac{1 - \left[1 - (1 + \Omega_1)^{-\frac{\theta\xi\sigma}{\sigma-1}} \right] \left[\left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] f/F \right]^{\frac{k-(1-\theta)\xi}{\xi}}}{1 - \left[1 - (1 + \Omega_1)^{-\theta\xi} \right] \left[\left[(1 + \Omega_1)^{1-\theta\xi} - 1 \right] f/F \right]^{\frac{k-\xi}{\xi}}}, \end{aligned} \quad (59)$$

which, accounting for (28), can be reformulated to (30).

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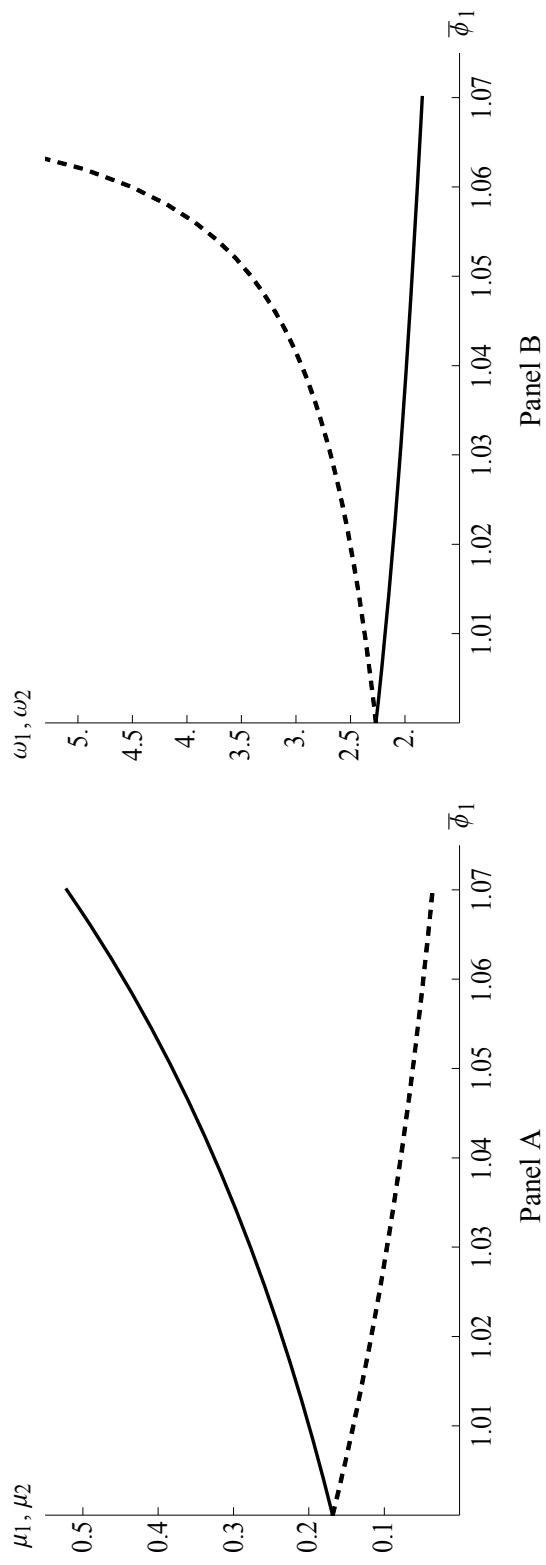


Figure 5: Technology differences, inward FDI and the multinational wage premium

Notes: Parameter values underlying Figure 5: $k = \sigma = 2$, $\theta = 0.5$, $f_e = 1$, $f = F = 10$, $\delta = 0.1$, $L = 10^6$, $\bar{\phi}_1 + \bar{\phi}_2 = 2$.