

# How Bad is Globalization for Labour Standards in the North?

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We analyse a world consisting of 'the North' and 'the South' where labour standards in the North are set optimally. There is an optimal level of standards as the latter are costly to firms but beneficial to workers. Higher standards can therefore increase output and welfare. Standards are exogenous in the South and are assumed to be suboptimal. Trade between these two countries can imply a reduction in work standards in the North. Moreover, when suboptimal standards in the South are increased, the North tends to lose out. Quantitatively, these effects are small and overcompensated for by gains in the South. The existing empirical literature tends to support our findings.

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## 1 Introduction

There is a widespread public perception in industrialized countries that globalization can lead to a deterioration of labour conditions. The claim is that rich countries that open their borders to trade with and FDI to poor countries are forced to reduce their labour standards in order to keep up with the increased competition. This would lead to what has been called a “race to the bottom” in labour standards.

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Empirically, we know little about the effect of trade or FDI on labour standards in the North (see section 5 below for a detailed discussion). We do know, however, that there are considerable international differences in occupational health and safety (OHS) standards. In industrialized countries, employees are protected against excessive exposure to chemicals and there are exposure limits for radiation protecting medical personnel and computer users sitting in front of a screen or using wi-fi. Construction workers have to wear helmets and are protected against falling by safety belts. More generally speaking, there are many regulations in place targeted at guaranteeing safety at workplaces. But what about developing countries? If we are willing to concede a link between OHS standards and accident rates, the difference is substantial. While in OECD countries the annual number of work-related fatal accidents per 100.000 employees is estimated to lie around 4, occupational accident rates rise up to 10 for India or China or even above 20 for other Asian countries or Sub-Saharan Africa (Hämäläinen et al., 2006). When countries compete with each other over international investments, do these differences constitute “unfair competition”? Can globalization potentially degrade labour conditions in the rich countries?

Given the scarcity of empirical knowledge, this paper first develops a theoretical framework that identifies conditions under which capital outflows in the form of FDI reduces labour standards in the North. Based on this framework, we then provide estimates of how important the effects of globalization are on OHS from a quantitative perspective. We focus our attention on three key questions: First, how do high OHS standards in the North affect international capital flows? Second, what are the repercussions of these trade flows on northern standards? Finally, what are the effects of rising OHS standards in the South?

Our framework is a two-country world with a capital-rich North and a capital-poor South. In addition to having more capital, the North has an institution that sets OHS standards optimally. OHS standards are assumed to have three effects on the economy. First, they reduce the total factor productivity. This allows us to capture the fact that labour standards are costly to firms. Second, they have a ‘pure health externality’: The higher the OHS standards are, the higher the share of time a worker is healthy and can work. The worker values this health per se (as an argument in the utility function). Third, there is an ‘aggregate labour supply externality’: The higher the OHS standards are, the more hours a population of a given size can actually work.<sup>2</sup>

In most industrialized countries, OHS standards have been the outcome of a long and complex process that usually starts with the activities of trade unions and ends with the creation of governmental agencies specialized in OHS standard setting and/or enforcement. For some standards, the process might take many decades and usually involve (1) collecting job hazard information, (2) establishing the scientific link between job hazard and workers’ health, (3) lobbying for and preparing the regulatory framework, (4) creating a governmental

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<sup>2</sup>There are convincing arguments that health also, and maybe predominantly so, affects institution building and through this economic growth (see e.g. Acemoglu et al., 2003). We have to neglect this aspect in our static analysis without negating its relevance.

agency, and (5) enforcing the standards. The importance of trade unions in all of these stages, mainly historically but also at present, has been stressed by Donado and Wälde (2011). In the present paper, we would like to capture the interaction between 'the North' and 'the South' for current economies and do not take a historical perspective. We assume the existence of an institution which sets OHS standards in the North. This is typically a governmental agency. We equip this agency with a utility function which allows us to propose a very simple and tractable model that is able to provide key insights on the interplay between globalization and labour standards.<sup>3</sup>

In our model, there are initially no institutions in the South that could set OHS standards. Standards are therefore low in this country. We allow for free trade in the final homogenous good and capital and analyze the welfare impact on OHS standards in the North. Capital flows from North to South until its marginal productivity is equal in both regions. As in traditional factor movement models, the impact of globalization due to a better capital allocation is welfare increasing for both regions. However, since the capital stock in the North is reduced, we also find that workers' wage income decreases. As the governmental agency takes labour income into account when optimally setting standards, the agency reacts by reducing its demands on high OHS standards. This has a negative effect on welfare in the North. This effect goes beyond the traditional distributional effect caused by factor movements.

We then consider the impact of globalization when standards are increased in the South. Via the 'pure health externality', higher OHS standards have a positive welfare impact. Due to the additional 'labour supply externality', the marginal productivity of capital in the South increases as well. This leads to even more capital flowing from North to South. The impact of globalization due to a better capital allocation is also unambiguously positive in both regions. In the North, however, the government agency sets even lower OHS standards, further reducing northern welfare.

We then calibrate our model and ask how strong the two central predictions of the model are from a quantitative perspective. These predictions are: (i) FDI inflows into the South increase when labour standards improve the health of southern workers and (ii) capital outflows from the North lead to a reduction of work standards in the North. Concerning (i), we find quantities which are far from negligible: If the safety levels in the South were at the same level as in the North, capital flows to the South would amount to a 6.7% increase in the southern capital stock and southern GDP would be 6.3% higher. The latter result is in line with the empirical evidence from Bonnal (2010) who finds that a reduction in the rate of injuries in a country is associated with higher rates of economic growth. With respect to (ii), we find that labour standards in the North do fall when capital flows into the South, but this effect is small. When the South increases safety standards, the negative welfare impact in the North caused by a reduction in the northern labour standards is overcompensated for

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<sup>3</sup>This immediately raises the question why an institution is needed and why the market cannot guarantee the efficient level of labour standards. We will return to this in detail at the end of sect. 2.1.

by the positive welfare impact in the South caused by better working conditions. Overall, world welfare increases due to globalization. Again, with an increase of southern safety levels in line with northern ones, northern GDP falls by .3% while world GDP as a whole would rise by .6%.

Our paper is related to various strands of the literature that could be classified into policy-oriented, empirical, and theoretical. First, there is a *policy-oriented* discussion on labour standards and the effect of globalization<sup>4</sup>. Srinivasan (1996, 1998) argues that endogenous labour standards will naturally differ between countries with different levels of development and that diversity in labour standards is not an argument against free trade. He also states that labour standards might not be provided efficiently in the presence of some market failures. Brown, Deardorff and Stern (1996, 1998) provide a broad overview and argue *inter alia* that in the case of market failures, minimum safety standards do not automatically restore Pareto optimality. For an international trade setup, universal labour standards will not internalize country-specific inefficiencies. Elliot and Freeman (2003) are more favourable to including labour standards into WTO trading rules. In his discussion, Maskus (2004) agrees that “individual enterprise owners can gain from weak labor rights [...] even if the economy is generally harmed”.<sup>5</sup> To the best of our knowledge, there is no paper that analyses the effects of FDI on standards, output and welfare as explicitly as we do.

Second, there is a sizeable *empirical* literature on labour standards and globalization (very broadly speaking). As the detailed discussion in section 5 will show, some of these analyses indirectly support our view, especially prediction (i) from above, and none contradicts it. There does not seem to be any study, however, which explicitly analyses our quantitative prediction (ii) on the impact of capital outflows on safety standards in the North. Our calibration results fill this gap.

Finally, the very small *theoretical* literature on globalization and labour standards has only considered the consequences for the South and has focused on two types of labour standards: child labour (Dinopoulos and Zhao, 2007 and Doepke and Zilibotti, 2009) and freedom of association and collective bargaining rights (Schutz 2009). Dinopoulos and Zhao’s framework is a small open economy with a modern and an agrarian sector. Children are employed only in the agrarian sector. In their model-based analysis, they conclude that trade policies or FDI that increase the modern-sector output reduce the incidence of child labour. Doepke and Zilibotti analyse the effects of labour standards imposed by rich countries. They find that standards that rule out child labour in export sectors can actually imply that political support for ruling out child labour also in the domestic sector is weakened. Schutz provides support for our prediction (i) since he finds that stronger labour standards can attract capital into

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<sup>4</sup>This literature in turn partially builds on more micro-oriented analyses of risk and regulation of which labour standards are an example. An early survey of research on labour standards is by Dickens (1984). An excellent recent introduction and overview is by Viscusi (2007). For further related literature, see section 5.

<sup>5</sup>Much more has been written in this relatively large but also very policy oriented literature. See sect. 5.2.2 below.

a country. However, as standards are exogenous in this paper, no conclusion can be drawn from it regarding our prediction (ii). Our paper contributes to this theoretical literature by introducing a model with endogenous standards that allows to study the output and welfare effects of higher southern standards on the North and, in particular, to answer the question posed in the title of this paper.<sup>6</sup>

## 2 The two-country model

### 2.1 Basic structure

Our model economy consists of the capital-rich North and the capital-poor South. Both countries produce a homogenous aggregate good  $Y^i$ , where  $i$  denotes either North or South. A typical firm produces the quantity  $y^i$  by employing capital  $k^i$  and labour  $l^i$ , the latter of which is measured in working hours. All firms use the same technology with TFP  $A(s^i)$ ,

$$y^i = A(s^i) f(k^i, l^i), \quad (1)$$

where capital and labour inputs have the usual neoclassical effects on output. We assume that all firms can hire from a spot market. There are no hiring or firing costs and it does not take any time to find a worker. Factors are paid their value marginal product.

The central focus of this paper is occupational health and safety (OHS) in a global world. This aspect is reflected in the production process via the TFP component  $A(s^i)$ . A job is safe(r) if a worker is (more) certain to return home in good health after 8 (or more) hours of work. We capture safer jobs by a higher  $s^i > 0$ .

Safe workplaces are clearly in the interest of the worker and, in many cases, OHS is also a central concern for employers. More often, however, there is a fundamental conflict of interest since OHS measures are costly. For modelling purposes, we go to the extreme and exclude firms from any benefits resulting from higher safety. We capture safety costs by letting OHS measures reduce TFP,  $A_{s^i} < 0$ ,<sup>7</sup> where throughout the paper subscripts denote partial derivatives. Given the spot market assumption, a sick worker would simply be replaced by a new healthy worker.

Utility of workers increases in consumption  $c^i$  and health  $z(s^i)$  but with a decreasing slope. We assume that better safety measures  $s^i$  improve health,  $z_{s^i} > 0$ . The utility function is given by

$$u^i = u(c^i, z(s^i)). \quad (2)$$

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<sup>6</sup>For a theoretical analysis of South-South competition (potentially) leading to lower standards in the sense of “race to the bottom - from the bottom”, see Chau and Kanbur (2006)

<sup>7</sup>One can always imagine that  $A$  initially increases in  $s$  but decreases above some threshold level.

On the aggregate level, consumption equals output  $C^i = Y^i$  and labour demand  $L^i$  equals labour supply,

$$L^i = z(s^i) N^i, \quad (3)$$

where  $N^i$  denote potential employment (also measured in hours and assumed to be fixed) multiplied by the share  $z(s^i)$  of time that workers are healthy and can actually work. More safety, implying more health, induces the 'pure health externality'. More safety also implies higher labour supply in each country – which we will call 'aggregate labour supply externality'.

We finally turn to the institution that sets OHS standards. There is a long history of fights, disputes and political bargaining about labour standards motivated by health effects of certain types of occupations. This starts from the black lung disease first claimed to be related to working in a coal mine in 1831 and continues until today (think of the burnout syndrome or “Karoshi” in Japan). Worker associations and unions played an important role in establishing appropriate OHS standards (Donado and Wälde, 2011). This is still the case for developing countries today where governmental institutions are not as strong as in OECD countries. In modern OECD countries, however, health and safety standards are by and large regulated by government agencies.

As we want to be very parsimonious in the modelling of OHS setting, we assume that there is an institution equipped with some utility function that sets standards. This institution could be a government agency or a union bargaining with employers. It could also represent the outcome of some more complex political process left in the background where government, firms and unions interact. Whatever the precise mechanism, we assume that this institution only internalizes the pure health externality but not the aggregate labour supply externality. This amounts to saying that the institution has some market power but is not as powerful as a central planner. An example for such an institution would be a firm-level or industry-level union or a government agency that sets standards for particular technologies. If workers are at least to some extent mobile across technologies, the institution cares about the direct health effect but not about the effect on labour supply as a whole.<sup>8</sup> Given preferences of households in (2), the utility function capturing this behaviour is given by

$$v^i = v(w^i l^i, z(s^i)). \quad (4)$$

Labour income of workers considered by our institution depends on the market wage  $w^i$  and on labour demand  $l^i$  of firms.<sup>9</sup>

As pointed out before, the presence of any institution raises the question why an institution is required. This paper takes the institution as given and asks what the implications of an

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<sup>8</sup>Extending our analysis to allow the institution to take the aggregate labour supply externality into account is straightforward. The qualitative results presented below would not be affected.

<sup>9</sup>A standard issue arising in the modelling of institutions being active at the sectoral or firm level is the indeterminacy of the number of firms or sectors, at least in a simple setup as the one we chose here. We avoid this issue by normalizing firm or sector size in our quantitative application. Future work could explicitly model firm size by allowing for imperfect competition.

institution that behaves according to its objectives in (4) are. Following the tradition of full-information compensating differential arguments (Rosen, 1974, 1986), we show in app. A that an institution is not required if workers are fully informed about health implications of a particular job. In fact, we believe that we would obtain similar results under the assumption of full information and without any institution. As argued in detail in Donado and Wälde (2011), however, full information does not seem to be a plausible assumption when it comes to occupational health and safety. It takes a lot of time for individuals to learn about health implications of certain jobs. Without an exchange of information among workers or without systematic collection of information by an institution, a decentralized economy is bound to be characterized by an inefficient factor allocation. Following this argument, we believe that our institutional setup is more plausible and “realistic” than a compensating-differentials setup under full information.

## 2.2 Occupational health and safety

We now ask what the OHS standard in the North would be if standards are set by an institution whose objective function is given by (4). The first-order condition is (see app. B)

$$v_{wl}wl_A A_s + v_z z_s = 0 \quad (5)$$

and the safety level resulting from (5) will be denoted as  $s^v$ . The trade off is nicely revealed by (5) by showing the costs (the first term) and the benefits (the second term) of more safety. The costs are a reduction in utility  $v$  due to a reduction in the labour income  $wl$ . The labour income is reduced since a higher safety level decreases the total factor productivity  $A$  which in turn decreases the labour demand  $l$ . The benefits accrue since more safety increases health  $z$  which then increases utility.

## 2.3 Equilibrium

The North can carry out FDI and trade the final homogeneous good with the South. In autarky, the South has a lower capital stock and safety levels are lower as well. For simplicity and without losing any insight, we consider the southern safety level to be exogenous. As the law of one price holds without barriers to trade, the single determinant for capital flows are international differences in the marginal product of capital. Using the aggregate version of technology (1) and the equilibrium on the labour market (3), the marginal product of capital in the North is given by

$$r = r(s, K - \Delta) = A(s) \frac{\partial f(K - \Delta, z(s)N)}{\partial (K - \Delta)}, \quad (6)$$

where  $K$  is the endowment of the capital stock in the North and  $\Delta$  are North-South capital flows. As this expression shows, OHS standards  $s$  have an ambiguous effect on the interest

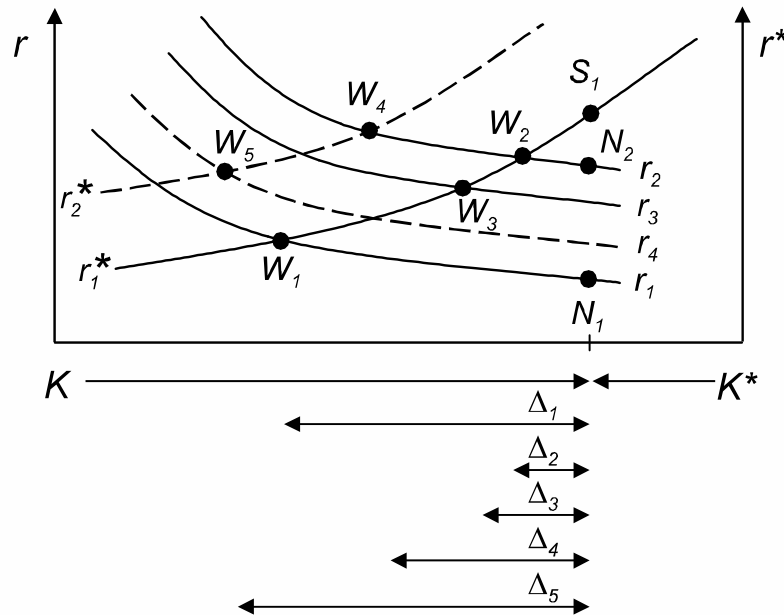
rate: If the safety level is too low, capital owners are in favour of more safety since they see the overall positive effect of healthier workers. If the safety level  $s$  is too high, the TFP-reducing effect is stronger than the labour-supply effect.

Equilibrium on the world capital market requires equality of the factor rewards for capital,

$$r(s, K - \Delta) = r(s^*, K^* + \Delta), \quad (7)$$

where an asterisk denotes southern variables. This equation determines  $\Delta$ , given the exogenous autarky endowments  $K$  and  $K^*$ , an exogenous southern safety level  $s^*$  and the endogenous safety level  $s$  in the North, i.e.  $\Delta = \Delta(s)$ . The northern safety level continues to be determined by a government agency, a union or a political process in the North as described by (5). An equilibrium in our setup is therefore given by (5) and (7). These two equations determine two endogenous variables: capital flows  $\Delta$  from North to South and safety levels  $s$  in the North.<sup>10</sup>

The equilibrium on capital markets is plotted in fig. 1. The horizontal axis shows the northern capital stock from the left and the southern from the right such that the total length of the horizontal axis reflects world endowment with capital,  $K + K^*$ . The vertical axis on the left shows the northern interest rate and on the right the interest rate in the South. Capital demand curves plot loci which give the interest rate as a function of capital used in the North and South, respectively.



**Figure 1** *Autarky equilibria  $N_i$  and  $S_i$  and world equilibria  $W_i$  with free capital flows*

<sup>10</sup>Keeping  $s^*$  exogenous simplifies the exposition. It would become endogenous if we introduced an equation in analogy to (5) for the South as well.

## 2.4 Benchmark cases

In order to analyse the impact of globalisation on safety standards, we need to derive, as a reference point, the safety levels that a central planner (focusing on aggregate consumption or on welfare) and that capital owners would set. For this purpose, we need the objective functions of “consumption planner”, “welfare planner” and capital owners which are given by

$$C(s) = Y(A(s), K - \Delta(s), z(s)N) + r^*(s)\Delta(s), \quad (8a)$$

$$U(s) = U(C(s), z(s)), \quad (8b)$$

$$R(s) = r[K - \Delta(s)] + r^*(s)\Delta(s). \quad (8c)$$

A central planner in a two-country world maximizing consumption in the North, as in (8a), would take the effects of the safety level  $s$  both on domestic production  $Y(\cdot)$  and on capital income from abroad,  $r^*(s)\Delta(s)$ , into account. The welfare planner has structurally the same objective function (8b) as households in (2). The objective function of capital owners in (8c) adds domestic capital income to foreign capital income.

The optimality conditions that result from maximizing  $s$  for each of the objective functions (8a-c) read (see app. B)

$$[Y_A + \tilde{r}_A\Delta]A_s + [Y_LN + \tilde{r}_LN\Delta]z_s = 0, \quad (9a)$$

$$U_C[Y_A + \tilde{r}_A\Delta]A_s + [U_C[Y_LN + \tilde{r}_LN\Delta] + U_z]z_s = 0, \quad (9b)$$

$$\tilde{r}_AA_s + \tilde{r}_Lz_sN = 0, \quad (9c)$$

where  $\tilde{r}$  is the equilibrium interest rate. For reference below, the maximum safety levels resulting from conditions (9a-c) will be respectively denoted by  $s^C$ ,  $s^U$ , and  $s^R$ .

The first terms of all optimality conditions in (9) show the costs and the second terms the benefits of an increase in the safety level from each agent’s perspective. In all three conditions the costs originate from a reduction of TFP caused by an increase in the safety level, but the variables affected are different. In fact, a lower TFP implies in condition (9a) a lower consumption  $C$  (due to a reduction in both  $Y$  and  $\tilde{r}$ ), in condition (9b) a lower welfare  $U$  (due to a reduction in consumption), and in condition (9c) a lower interest rate.

The benefits described by the second terms of all three conditions originate from an improvement in the health level  $z$  of the labour force. A higher health level implies in condition (9a) a higher consumption  $C$  (due to an increase in both  $Y$  and  $\tilde{r}$ ), in condition (9b) a higher welfare  $U$  (due to an increase in consumption and in health per se), and in condition (9c) a higher interest rate (due to an increase in the labour supply).

### 3 OHS under trade and capital flows

Let us now analyse the effects of “globalization”, i.e. international capital flows, on safety standards and thereby on output and welfare.

#### 3.1 Capital flows in a two-country world

Thinking of a scenario where countries are in autarky and then open up for capital flows, let us begin by assuming that the safety standards are exogenous and equal in both countries and that the only difference between the two countries is that the North has more capital than the South. When the initial capital endowment before capital flows is given as drawn in fig. 1, factor rewards in the South at  $S_1$  are higher than in the North at  $N_1$ . With free capital flows, the new world-equilibrium point is at  $W_1$  where capital flows from the North to the South of a total volume of  $\Delta_1$  imply an equalization of returns to capital.

Are capital flows from the North to the South a realistic description of reality? It is well-known that the US as one of the richest countries in the world is one of the biggest recipient of foreign investments. When capital flows in “all” countries in the world are analysed, capital flows from the North to the South from the 70s to the mid 80s, reverses subsequently and flows South to North from the end of the 90s (Prasad et al., 2006, chart 2). If the focus is on FDI, however, capital always flows from North to South (Prasad et al., 2006, chart 4). If the world excluding the US is analysed, capital also flows from North to South (chart 3). Lane and Milesi-Ferretti (2007, fig. 9) make a similar point: Net foreign assets (i.e. accumulated flows) are positive for industrialized countries and negative for the US and emerging and developing countries. Capital flows from North to South are therefore a realistic view of the world if the focus is on FDI (which comes the closest to our variable  $\Delta$  in this long-run static equilibrium) or if the focus is on industrialized countries other than the US.<sup>11</sup>

Second, if we introduce endogenous safety levels in the North, the autarky safety level is higher than without endogenous OHS setting. Let us assume this OHS level does not respond to changes in the capital stock. This holds for the objective function (4) of our standard-setting institution if the former has a Cobb-Douglas structure. As long as this OHS level is not beyond the capital-return maximizing point (i.e. as long as  $s^v < s^R$  from (9c)), the capital demand function moves up from  $r_1$  to  $r_2$ . As has been discussed after the expression for the marginal productivity of capital in (6), capital owners are actually in favour of higher safety levels as long as this has a positive effect on capital rewards (again, as long as  $s^v < s^R$ ). Starting with the same initial capital distribution, the starting points are now  $S_1$  and  $N_2$  and the new world-equilibrium point is  $W_2$ . Capital flows from the North to the South are now

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<sup>11</sup>If one focuses on gross flows, it is even more apparent that North-South flows are very relevant. Capital outflows from the US from 1960 to 2007 are on average 3.8 times higher than (absolute) net flows (BEA, 2008).

lower and amount to  $\Delta_2$  only. Higher (but not too high) safety levels reduce capital outflows from the North.

If we however considered the realistic situation where health and income are bad substitutes (corresponding to a negative  $\lambda$  for a CES specification of (4) as in our calibration further below in (16)), safety standards would fall after capital outflows. Starting from  $N_2$  and  $S_1$  as before, capital outflows will lead to a “temporary” equilibrium at  $W_2$ . Falling OHS levels reduce the northern capital demand function to  $r_3$  and the final equilibrium point is  $W_3$ . Capital outflows are larger due to the fall in OHS levels in the North but still lower than in a situation without any northern OHS standards. Generally speaking, this contradicts the often stated view that capital flows to where standards are lower. If standards are so low that marginal productivity of capital suffers, capital will stay in the North.

### 3.2 Capital flows and welfare

Let us now turn to the welfare effects of international capital flows. Welfare in both countries in (8b) is a function of consumption and health. In the North, endogenous OHS standards  $s$  and therefore health are a function of capital flows,  $z(\cdot) = z(s(K - \Delta))$ . In the South, health  $z^*(s^*)$  is exogenous due to exogenous safety levels  $s^*$ . Consumption in the North is given by domestic production plus capital income from abroad,  $Y + r^*\Delta$ , while in the South it is domestic production minus capital income paid to foreign capital owners in the North,  $Y^* - r^*\Delta$ . Making the dependence of consumption on capital flows  $\Delta$  explicit, we obtain two expressions related to (8a),

$$C = Y(A(s(K - \Delta)), K - \Delta, z(s(K - \Delta))N) + r^*(K^* + \Delta)\Delta, \quad (10)$$

$$C^* = Y^*(A^*(s^*), K^* + \Delta, z^*(s^*)N^*) - r^*(K^* + \Delta)\Delta. \quad (11)$$

We see that capital flows  $\Delta$  affect the northern consumption level through TFP, the capital stock, labour supply and the northern interest income. For the South, only the southern capital stock and the interest payments are affected. Computing the welfare effects of capital flows then gives (see app. C.1)

$$\frac{dU}{d\Delta} = U_C[r^* - r + r_\Delta^*\Delta] + U_C Y_s \frac{\partial s}{\partial \Delta} + U_z z_s \frac{\partial s}{\partial \Delta}, \quad (12)$$

$$\frac{dU^*}{d\Delta} = -U_{C^*} r_\Delta^* \Delta > 0, \quad (13)$$

where again subscripts denote partial derivatives: e.g.  $r_\Delta^*$  is the change in the southern interest rate due to capital inflow into the South.

Capital flows influence northern welfare through the “classic channel”, the “efficiency channel” and the “health channel”. The first term in (12) starting with  $U_C$  is the classic channel which says that if the southern interest rate  $r^*$  does not react to capital flows from

the North (that is, if  $r_{\Delta}^* \Delta = 0$ ), there are welfare gains as long as the foreign interest rate is larger than the domestic one ( $r^* > r$ ). This is the well-known condition for gains from capital mobility. However, if a sizable amount of capital has already flowed out and the southern interest rate falls when more capital flows (that is, if  $r_{\Delta}^* \Delta < 0$ ), there might not be gains from additional capital flows. In fact, in a two-country world, welfare-maximizing capital flows should stop before the domestic interest rate equals the foreign one.<sup>12</sup> As the gains from higher capital rewards abroad compensate for the losses from the fall in foreign capital rewards when capital flows just start, we conclude that, overall, there are gains from international capital flows.

The second term,  $U_C Y_s \partial s / \partial \Delta$ , can be called the “efficiency channel”. If the planner in the North maximized output and set OHS standards equal to  $s^Y$ , this term would be zero,  $Y_s = Y_A A_s + Y_L z_s N = 0$ . The negative TFP effects of safety (the expression  $Y_A A_s$ ) would just be compensated for by the positive labour supply effect  $Y_L z_s N$ . If, however, OHS standards were below the output-maximizing safety  $s^Y$ , that is if  $Y_s > 0$ , and noting that an outflow of capital reduces the safety level ( $\partial s / \partial \Delta < 0$ , as discussed after fig. 1), a further reduction of  $s$  caused by capital outflows would increase inefficiencies in the North and thereby reduce output.

The final term in (12)  $U_z z_s \partial s / \partial \Delta$  relates more to the government agency and its impact on higher OHS standards. The closer the endogenous safety level is to the social welfare-maximizing level  $s^U$ , the higher the social welfare is. If the endogenous safety level is lower than  $s^U$ , that is, if  $U_z > 0$ , any reduction in safety levels (due to capital outflows) reduces welfare. Consequently, the welfare effect of reduced OHS standards is negative.

Combining all three channels, capital flows increase northern welfare due to a more efficient factor allocation but reduce welfare since less capital implies lower OHS standards which were already too low before capital flows. This reduction has a negative effect on efficiency and health per se. Welfare gains through capital flows are therefore reduced by negative OHS effects.<sup>13</sup>

For the South, however, the welfare effects are unambiguously positive. For each unit of capital flowing into the country, it pays the local marginal product. Hence, the term  $r - r^*$  we see in (12) is zero in (13). It benefits, however, from the reduction of the domestic interest rate caused by inflows,  $r_{\Delta}^* < 0$ . There is no health channel as safety standards are exogenous in the South.

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<sup>12</sup>This effect is familiar from the literature on international factor flows in two-country worlds or in the case of *large* open economies. We are grateful to Juergen Meckl for discussion of this point.

<sup>13</sup>Clearly, if one believes that OHS standards are excessive, i.e. above  $s^U$ , capital outflows implying a reduction of safety levels would imply welfare gains caused by capital flows per se and by reduced OHS standards.

## 4 OHS standards in the South

We now ask how the results obtained so far are affected if a standard-setting institution is also introduced in the South. What are the welfare consequences for the North, the South, and the world economy and how would northern endogenous OHS standards react to this?

### 4.1 International capital flows and OHS

We stipulate that southern safety levels increase if a standard-setting institution is introduced in the South. If we assume that this new level is still lower than the interest-maximizing southern safety level (that is, if  $s^* < s^{R*}$ ), an increase in the southern safety level will increase the capital demand curve from  $r_1^*$  to  $r_2^*$  (see fig. 1). Capital owners are better off. Of course the question arises why it takes an extra institution like the government or even a union to help capital owners to increase their returns from investment. However, the answer is simple: In a society with few economic institutions and no well-functioning financial systems, each capital owner is basically an entrepreneur who owns his own firm. OHS standards imply costs but there are no institutions which would allow capital owners to coordinate their activities and credibly jointly increase safety levels. Firms are caught in a prisoners' dilemma. The need for higher safety levels is more pressing for workers as they are physically affected by negative health effects. Hence, even though each individual firm in the South will be opposed to higher OHS standards, capital owners as a group will gain.

For an invariant safety level in the North (again, the Cobb-Douglas case for preferences in (4)), this implies that the equilibrium moves from  $W_2$  to  $W_4$  and the flow of capital to the South increases from  $\Delta_2$  to  $\Delta_4$ . For the empirically most relevant bad-substitution case (i.e.  $\lambda < 0$  in the parametric version below in (16)), capital outflows to the South reduce safety levels in the North. If safety levels were below the interest rate maximizing level  $s^R$ , capital demand in the North would be reduced from  $r_3$  to  $r_4$  and the equilibrium would move from  $W_3$  to  $W_5$ . Capital outflows from the North would increase from  $\Delta_3$  to  $\Delta_5$ .

At first glance, it might be surprising that allowing for higher standards in the South can increase capital inflows to this country. But, if TFP losses are not too large, northern investors simply profit from a healthier labour force in the South. This idea is supported by empirical evidence. For example, Alsan et al. (2006) find that an improvement in a population's health increases gross FDI inflows to low- and middle-income countries. More directly, Flanagan (2006) finds a significant negative correlation between fatal job accident rates and FDI inflows. See sect. 5 for more details.

## 4.2 Global standards and welfare

What are the welfare implications of higher southern safety levels? Preserving  $s^*$  as an exogenous quantity, welfare effects for the North and South are (see app. C.2),

$$\frac{dU}{ds^*} = U_C r_{s^*}^* \Delta + U_C Y_s \frac{\partial s}{\partial s^*} + U_z z_s \frac{\partial s}{\partial s^*}, \quad (14)$$

$$\frac{dU^*}{ds^*} = -U_{C^*}^* r_{s^*}^* \Delta + U_{C^*}^* Y_{s^*}^* + U_{z^*}^* z_{s^*}^*. \quad (15)$$

These conditions look similar to those in (12) and (13) where the effects of capital flows were analysed. In fact, term one in (14) corresponds to the classic channel above. In contrast to above, however, we start from an integrated world economy with  $r = r^*$  and capital flows are now induced by changes in southern OHS standards  $s^*$ . However, this term is now positive since we are making the plausible assumption that the southern safety level  $s^*$  is lower than the interest-maximizing safety level  $s^{R^*}$ . The second term is the efficiency channel and the third term is the direct health channel. More safety in the South has a positive effect on interest payments but reduces output and health levels in the North.

We saw above that capital flows increase northern welfare but falling OHS standards can reduce these welfare gains. What remains here on balance? First of all, an increase in southern safety increases interest rates paid on previous investments  $\Delta$  since  $r_{s^*}^* > 0$ . As opposed to (12), the classic channel here leads to gains for the North: Higher  $s^*$  increases returns for investors as higher labour supply in the South increases marginal productivities of capital in the South (by more than lower southern TFP would reduce it). The second, efficiency, channel is negative if the safety level in the North is below its output-maximizing level (i.e.  $Y_s > 0$ ) and if more safety in the South implies capital outflows from the North and thereby a reduction of safety levels in the North, i.e.  $\partial s / \partial s^* < 0$ . The third channel does not bring good news for the North either: If OHS standards  $s$  and thereby the average health level fall, welfare falls through this health channel as well.

Do these channels capture any concerns spelled out in policy discussions? On the one hand, commentators seem to be afraid of low labour standards in the South as this might reduce standards in the North. According to our view, Northern standards can fall due to globalization as capital leaves the country. But are commentators also afraid of potentially rising standards in the South? Admittedly, this is not so often heard. What is heard, however, is the fear that the North might lose due to a catching up of the South. More knowledge, human capital and better technologies in the South increase competition from the South and market shares of northern firms could get lost. If this process of development goes hand in hand with better standards (as empirical work suggests), the fear of the South catching up could partially also be seen as of a fear of higher standards in the South.

For the South, two new terms as compared to (13) appear. The second and third term can easily be identified as the efficiency and health channels in the South. Term one is negative;

terms two and three are positive: The South loses out due to higher interest payments to the North but gains from efficiency gains in production caused by higher OHS standards and from health per se.

## 5 Quantitative findings

Our model makes two central qualitative predictions: (i) FDI inflows increase when labour standards improve health/ productivity of workers so that returns to capital investment increase. (ii) Capital outflows from the North lead to a reduction of work standards in the North. The purpose of this section is to offer a quantitative picture of these predictions. How strong are these effects? Before we do so, however, we offer a brief overview of related empirical work. This will allow us to put our findings into a broader context and draw more convincing conclusions about the central question posed in the title of our paper.

There is relatively good empirical support for our first prediction. The second prediction will sound controversial to many. When we look at existing empirical work, however, there is no study which contradicts our view and there are some that indirectly support it.<sup>14</sup>

### 5.1 The effect of standards

The empirical literature can be classified into whether standards are used as an explanatory variable or whether standards are to be explained. When standards are used as explanatory variables, one can inquire into the effect e.g. on trade patterns. The OECD (2000) provides a summary of various studies. They ask whether labour standards influence or “bias” trade patterns in any way. While there are some surprising findings (higher standards reduce exports of skill-intensive goods), it is not always straightforward to draw conclusions from these findings. See Brown (2000) for a detailed appraisal.

One can also analyse the effects of standards on FDI. Flanagan (2006, p. 135 and tab. A6.3) points out that “with one exception, labor conditions in a country are not significantly correlated with the country’s share of investment inflows. The exception is job safety: other things equal, investment shares are lower in countries with relatively high fatal job accidents rates.” Other labour standards (like right for collective bargaining etc.) have basically no effect.

A study which does *not* explicitly use standards as an explanatory variable is undertaken by Alsan et al. (2006). They find empirical evidence that an improvement in a population’s health increases gross FDI inflows to low- and middle-income countries. They measure population health by life expectancy. The study is useful for our question as a simple (yet

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<sup>14</sup>Before we proceed, it is worth pointing out that we do not take the huge empirical literature on the effects of trade on wages, relative wages or unemployment into account. While this might sound obvious, some commentators conclude that trade cannot have an effect on standards as it has no effect on the wage structure. We believe that conclusions of this type are not really supported by evidence.

conditional) conclusion can be drawn from it. *If* standards have a positive effect on life expectancy (something one would expect), better standards increase FDI.

## 5.2 Determinants of standards

Generally speaking, the empirical literature finds that there are no harmful effects caused by trade or FDI on labour standards in the South. We did not find any explicit analysis of the effects on northern countries.

### 5.2.1 The child labour literature

In the child-labour literature, Edmonds and Pavcnik (2006) find that countries that trade more have less child labour. They attribute this relationship to the positive effect of trade on income. Levine and Rothman (2006) have basically very similar findings.<sup>15</sup> Neumayer and Soysa (2005) find that the effect of FDI is just as positive as trade. This effect is confirmed by Davies and Voy (2009). This suggests that globalization is not so bad for the South after all.

Davies and Voy (2009) use data from the ILO on labour force participation of children aged 10-14 as their dependent variable. They find in their regressions, instrumented, pooled or not, that FDI has a negative significant or a negative insignificant effect on child labour. The effect becomes insignificant when income is added as an explanatory variable. As income is highly significant in basically all of their regressions (tables 1 to 3), child labour seems to be a poverty problem but not an FDI problem. They conclude that FDI is a good instrument to combat child labour as FDI increases income.

### 5.2.2 Informal discussions of labour standards

There is a huge literature which discusses labour standards and the effects of globalization in an informal way. This literature is very informative and full of details but cannot be used as a test for our model. An excellent introduction to issues surrounding labour standards and trade is provided by Basu et. al (2003). Aspects related to “races to the bottom” are discussed in this book by Singh (2003, part II, ch. 2). OECD (2000) has a short informal section on “race to the bottom”. Various informal discussions stress that competition under perfect information limits firms’ possibilities for reducing labour standards. It is acknowledged that this might not hold in second-best economies. Historical evidence concerning the US seems to suggest that there was a race to the bottom concerning child-labour before 1938.

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<sup>15</sup>Edmonds et al. (2009) analyse the effect of India’s 1991 trade tariff reform. While child labour has been on the decline in India generally speaking, the decline is attenuated in urban areas where tariff reduction hit the population most strongly. The interpretation of these results is less straightforward as the authors discuss themselves.

Elliot and Freeman (2003, p. 126) conclude their detailed description of various case studies by stating that “trade pressure and incentives from consumers and governments can lead to improved labor standards in LDCs”. In this sense, trade combined with the right incentives is beneficial for standards as well.

### **5.2.3 Investigating standards more directly**

Turnbull and Wass (2007) provide a careful analysis of various case studies concerning the effect of reforms in ports. They argue that "globalization [...] brought in its wake a marked deterioration in dock workers' terms and conditions of employment." They find that reforms generally worsen workers' working conditions. These results are not derived, however, by standard econometric analysis.

The most informative analysis is undertaken by Flanagan (2006). He uses various measures for standards as dependent variables. They include “weekly hours”, “life expectancy” or “child labour” but also “fatal accidents” (on the job). As reported in tab. A3.3, GDP per capita significantly reduces fatal accidents (and also child labour or weekly hours). These results are less strong, however, when additional institutional variables are added as explanatory variables (tab. A3.4), at least for fatal accidents. In a panel analysis with fixed effects (tab. A4.1), the trade share and a measure of “open policy” has a negative impact on fatal accidents. Unfortunately, the complete results of regressions including GDP per capital and openness measures are not reported. One could conclude, however, that trade and higher GDP per capital reduces job injuries and improve standards. This is similar to the findings for FDI and trade on child labour cited above.

This positive conclusion is in line with Flanagan himself who, generally speaking, draws a very positive picture about the link between trade and standards. He also finds, however, that firms in import-competing sectors in the North tend to reduce (or at least do not increase) labour standards. (The same is true for some firms in export-processing zones.) He also states (p. 85) that “more open trade may be threatening the working conditions of some workers in industrialized countries”.

## **5.3 Our quantitative predictions**

We now return to our two-country world and calibrate it so that various targets are met. We then use this calibrated version in order to analyse the effects of international capital flows on northern safety and the effects of higher OHS standards in the South.

### 5.3.1 Calibration

We now assume a CES structure for the utility function of the institution that sets the standards,

$$v = \left\{ \gamma [wl]^\lambda + [1 - \gamma] z(s)^\lambda \right\}^{1/\lambda}, \quad (16)$$

and a Cobb-Douglas production function for firms,

$$y^i = A(s^i) (k^i)^\alpha (l^i)^{1-\alpha}. \quad (17)$$

The link between safety  $s$  and TFP  $A(s)$  and the share  $z(s)$  of the healthy workforce is assumed to follow

$$A(s) = be^{-\phi s}, \quad z(s) = 1 - qe^{-\chi s}. \quad (18)$$

The parameter  $b$  gives the upper bound to TFP which is obtained under zero safety measures ( $s = 0$ ). The elasticity of TFP with regard to safety is captured by  $\phi$ . Similarly,  $q$  captures the share of sick individuals in an economy without safety measures and  $\chi$  is the response elasticity with respect to  $s$ . Optimal safety levels for these functional forms are special cases of the general results in (9) and are provided in app. E.

Given these functional forms, we can now calibrate our model. As we would like to understand the implications of various policy experiments, we need an initial equilibrium which reflects the real world in a quantitatively sufficiently good way. Our initial equilibrium should satisfy four targets. It should display (i) a reasonable endogenous share  $z(s^v)$  of healthy workers in the North, (ii, iii) GDP levels in the North and South which represent relative economic importance and (iv) a share  $z(s^C)$  of healthy workers under the consumption planner which satisfies  $z(s^C) > z(s^v)$ . This makes sure that endogenous standards are above the level desired by each individual firm. The institution does not succeed, however, in pushing the safety level all up the way to the consumption-maximizing level. We believe this to be a plausible outcome of some deeper political-economy mechanism where firms, the government and unions determine safety levels.

The desired quantities for these targets are shown in the upper left part of tab. 1. In the European Union, 2% of working days are lost due to health issues related to work (Parent-Thirion et al., 2007, Table 7.3), i.e.  $z(s^v) = .98$ . The relative economic importance of the North and the South is captured by setting  $Y$  equal to the GDP of the average G7 country and  $Y^*$  to the population-weighted mean of China and India.<sup>16</sup> Our calibration therefore captures the effect of integrating capital markets of the average of China's and India's economies with the capital markets of the average G7 country. We achieve target (iv) by setting  $z(s^C)$  at .99.

We further set various parameters at levels which correspond to observations in the data. This group appears in the upper right corner of tab. 1. Taking into account that accident

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<sup>16</sup>All nominal data is in 2006 PPP US\$. All data is taken from World Bank (2008).

rates in non-industrialized countries are 4 to 6 times higher than in industrialized countries (Hämäläinen et al., 2006), the absence rate due to health is, say,  $5 * 2\% = 10\%$  in the South and therefore  $z^* = .9$ . The parameter  $q$  will determine (see the discussion after (18)) the share of healthy workers when there are no safety measures at all. If we are willing to assume that high accident countries (i.e.  $z = .9$ ) are countries with close to no safety measures (i.e.  $s = 0$ ), we can conclude  $q = .1$  from (18). The output elasticity  $\alpha$  for capital is standard and does not need further discussion. Population size  $N$  in the North is normalized to unity and population size  $N^*$  in the South corresponds to the ratio of the population size of China plus India to the population size of the G7 countries.

Parameters which are not reported in the table are  $\phi$ ,  $\chi$ ,  $\lambda$  and  $K + K^*$ . The parameters  $\phi$  and  $\chi$  from (18) matter only as their ratio  $\Phi \equiv \phi/\chi$  to be discussed below. The parameter  $\lambda$  is set equal to  $-1$  (which is the bad-substitution case often referred to above) and does have only minor effects on parameters or equilibrium properties. The world capital stock was set to 300 which gives a reasonable interest rate of 4.9%.

We hit our targets  $z(s^v)$ ,  $Y$ ,  $Y^*$  and  $z(s^C)$  by calibrating the parameters  $b$ ,  $b^*$ ,  $\gamma$  and  $\Phi \equiv \phi/\chi$ , taking equilibrium equations (5) and (7) into account. The parameters are shown in the lower left corner. For a summary of calibration equations, see app. E.5.

endogenous quantities to be matched				parameters from other data			
$z(s^v)$	$Y$	$Y^*$	$z(s^C)$	$z^*$	$q$	$\alpha$	$N^*$
.98	38,000 <sup>16</sup>	5,800	.99	.9	.1	.33	$\frac{2422}{722}$
calibrated parameters				equilibrium quantities			
$b$	$b^*$	$\gamma$	$\phi/\chi$	$\frac{K-\Delta}{K+K^*}$		$z(s^U)$	
6.1	.81	.96	.0067	84.3%		.997	

**Table 1** *Calibrating the free capital flow equilibrium (see text for details)*

The calibrated values are in the range one would expect. Relative TFP between the North and South implied by  $b$  and  $b^*$ , is maybe a bit larger than usual; if differences in education and experience levels between workers in the North and South are taken into consideration, however, relative TFP would fall and become closer to standard ratios. The parameter with a relatively high value is  $\gamma$ , the weight attached by the OHS setting institution to labour income.

In the resulting equilibrium, 84.3% of the world capital stock is used in the North. The health level of a welfare maximizing planner would be 99.7% i.e. it exceeds the output-maximizing level by 0.7%.

### 5.3.2 Quantitative globalization effects on northern safety

We can now provide an estimate of how much safety in the North fell (or rose) due to globalization. We know the stock of a country's wealth held abroad from estimates by Lane and Milesi-Ferretti (2007). This stock corresponds to  $\Delta$  in our model. We can also obtain comparable stocks  $K^i$  of country's  $i$  capital that is used for domestic production from AMECO (2010). Based on these data, we make two assumptions. First, for countries in which  $\Delta^i$  is positive (that is, for countries in which globalization implied a capital outflow), we assume that the capital stock in a hypothetical closed economy is equal to  $K^i + \Delta^i$ . This is clearly an extreme assumption since it implies that any unit of capital invested abroad is one unit lost at home (there is, however, evidence on the aggregate level supporting this assumption, see Desai et al., 2005). Second, for countries in which  $\Delta^i$  is negative, we assume that the capital stock in a hypothetical closed economy is only  $K^i$ .

In both cases, we can compute the hypothetical safety level  $s_i^{hyp}$  in this hypothetical closed economy  $i$  with a capital stock of  $K^i$  (when  $\Delta^i$  is negative) and  $K^i + \Delta^i$  (when  $\Delta^i$  is positive) by using expression (5). It is then straightforward to obtain the health level  $z \left( s_i^{hyp} \right)$  in such a non-globalized closed economy. The difference between this health level and the percentage of healthy workers as given in the data (we used .98 above in tab. 1 in our EU average) is the gain or loss caused by globalization.

The ratio of  $\rho \equiv (K^i + \Delta^i) / K^i$  for G7 countries (excluding Japan for data inconsistency reasons) from 1991 to 2004 varies from 82.2% (i.e.  $\Delta^i < 0$ ) for Canada in 1991 to 105.9% for Germany in 1991. For all years where  $\rho < 100\%$ , globalization actually *improved* health levels in the North as capital flowed into the country. Starting from our 98% health level under globalization from tab. 1, the range we attribute to globalization extends from an increase in the health level in the North from 97.85% without international capital flows to 98% (the Canadian case) and a decrease from 98.04% to 98% (the German case).

These results are clearly *very* small and almost negligible. Even a reduction of the capital stock by 20% leads to an increase in the sickness rate from 2% to 2.15% only. The main reason for this very low capital-stock-to-health elasticity is the fact that the North is very close to the social optimum. At this point, the slope of health with respect to the capital stock is very low. As our estimates should be considered as an upper bound, we conclude that northern inhabitants should not worry too much about negative effects of capital outflows on northern health standards.

### 5.3.3 The quantitative effects of higher standards in the South

Qualitatively, we have seen that the North tends to lose out due to higher OHS standards in the South and only the South seems to gain. Should OHS standards in the South then be increased? We can provide a more convincing answer to this question by quantifying the effects. Starting from the equilibrium in tab. 1, our policy experiment consists of increasing

the Southern level  $z^*$  from .9 to the northern level of .98, or put differently, to decrease absence rates in the South from 10% to 2%.

The implied capital flows from the North to the South constitute the “real test” for our calibration as these flows should be consistent with the estimates of Alsan et al. (2006). They find that every additional year of life expectancy implies a 9% increase in FDI inflows to low- and middle-income countries. Average life expectancy in their sample is 64.6 years, i.e. one can translate an additional year into a  $100/65\% \approx 1.5\%$  increase in hours worked. Increasing hours worked from 90% to 98% in our counter-factual experiment corresponds to an increase of approx. 9% (not percentage points), i.e. an increase of  $9/1.5 = 6$  additional years in life expectancy. Such a change should imply an increase of inflows of  $6 * 9\% = 54\%$ . As \$1 of inflows amounts to an increase of domestic investment of \$1 (on the aggregate level, see Desai et al., 2005) and investment to capital stock ratios are around 10%, a 54% increase in inflows implies a 5.4% increase in the capital stock. Hence, our policy experiment where we increase southern health shares from 90% to 98% should imply an increase of the southern capital stock by 5.4%.

We find that our capital flows amount to a 6.7% increase in the southern capital stock, i.e. they are very consistent with the findings of Alsan et al. (2006).<sup>17</sup> Concerning health effects, international capital flows imply a decrease in safety levels  $s$  in the North which imply that the share  $z(s)$  of time individuals are healthy decreases by 0.006%. GDP in the North decreases by 0.29% and increases in the South by 6.3% implying an increase of world GDP by .6%. Put differently, rising OHS standards in the South do have a theoretical but not a practical negative effect on work standards in the North. Similarly, higher southern standards do reduce domestic production in the North, but only by a negligible amount. In contrast, southern production increases considerably, leading to an overall increase in world output.

### 5.3.4 What does this tell us?

Given our brief survey of the empirical literature and given our quantitative results, what do we learn from this? Concerning our first prediction about FDI inflows, our findings are in line with the findings of Flanagan (2006) and (indirectly) Alsan et al. (2006) concerning the effects of standards as explanatory variables for capital inflows. We provide a theoretical setup which offers a possible explanation for their findings that lowering fatal job accident rates and increasing life expectancy increases FDI. The new condition we identify for these findings to be theoretically consistent says that OHS standards in the South are lower than the interest-rate maximizing safety level  $s^R$ . If this is the case, any improvement increases inflow of FDI. If some countries have well-functioning institutions and the safety level is close to  $s^R$ , the effect of an increase in OHS standards - while it could still increase welfare - might reduce FDI inflows.

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<sup>17</sup>We did try to calibrate  $\lambda$  so that the flows would match the ones in the data exactly. While  $\lambda$  does have an effect on the flows, it is much too small to be relevant here.

Let us turn to the second strand of the literature inquiring into the determinants of standards (mainly in the South). According to our setup, it is no surprise to find no effect of trade and FDI in the South if the South lacks institutions which face and solve a health-wage trade-off as modelled here for the North in (4). Looking at the effects of FDI outflows on safety in the North, our second prediction claims that an outflow of capital in the North reduces standards in the North. If we translate this into an empirical statement, we need to be careful about “outflow of capital”. What our model really predicts is that a reduction in the capital stock in the North (keeping TFP constant) reduces standards in the North. We therefore would *not* expect that large FDI outflows reduce standards if the domestic capital stock does not change. Similarly, large FDI outflows even with a reduction of the domestic capital stock would *not* reduce standards according to our model, if there is a simultaneous TFP increase which keeps labour income constant as in (4). Care should therefore be taken when trying to identify the effects of FDI outflows on capital stocks and wages.

Evaluating the second prediction given that we have seen here that the effects are probably very small and that FDI flows relative to stocks are also very small, we would conclude that globalization is bad for labour standards in the North - but only in a marginal sense. If globalization acts through the channels that we have looked at here, there is no need for big concerns.

## 6 Conclusion

There are three questions we pose in this paper: What is the effect of international differences in occupational health and safety (OHS) standards on international capital flows? What is the effect of these capital flows (i.e. “globalization”) on OHS standards when the latter are endogenous? How does a rise in standards in the South affect northern standards and international capital flows?

International differences in OHS levels caused by endogenous and high standards in the North can lead to more or less capital in the North relative to a situation where standards are low. If the standard-setting institution in the North is moderate, capital flows to the South will be reduced (compared to an economy with low standards) as some level of health is better than none and marginal productivities of capital are higher under endogenous standards. Clearly, if standard-setting institutions put a lot of emphasis on health or even when the social planner maximizes welfare, some capital will be driven out of the country due to high OHS standards - but still less than in a *laissez-faire* economy. Concerning the second question, capital outflows from the North to the South reduce safety standards in the North. Finally, when standards increase in the South, output in the world as a whole will rise and so will welfare. There are strong distributional effects, however, and the North might lose out.

The quantitative analysis has shown that the effects of integrating capital markets on northern standards is not too high. A 1% reduction of the northern capital stock would lead

to an increase in the sickness level of less than one tenth of a percentage point. Globalization effects on OHS standards through the channel we look at do therefore not provide an argument against globalization. The gains from higher OHS standards in the South for the South, however, cannot be neglected. The losses in the North caused by further capital outflows are again negligible and are by far overcompensated by gains in the South.

## A Appendix - Compensating differentials can imply efficiency

Is an institution really needed for setting OHS standards? An alternative could consist in firms that offer contracts with wage-safety pairs. This section analyses the implied equilibrium in a closed economy under full information in the tradition of Rosen (1974, 1986). Such a full-information equilibrium could be a very long-run equilibrium where all workers and firms have learned about the health implications of jobs.

Profits of firms are  $\pi = A(s) f(k, l) - rk - wl$ . They are maximized subject to a worker indifference condition  $u(c, z(s)) \geq u_0$  implying that the wage-safety bundle  $(w, s)$  offered by the firm must be at least as good as the one offered by another firm. Consumption if working at this firm is given by  $c = wz(s)n + \kappa$ , where  $w$  is the hourly wage paid in this firm,  $z(s)n$  is the total number of hours a worker can work given safety standards  $s$  in this firm, and  $\kappa$  is non-labour income which is independent of where the worker works. Given that there is no reason for the firm to offer more to the worker than just his outside option  $u_0$ , the inequality becomes an equality and the Lagrangian associated with this problem reads  $\mathcal{L} = \pi + \lambda [u(wz(s)n + \kappa, z(s)) - u_0]$ . The first-order conditions with respect to  $k, l, w$  and  $s$  are

$$Af_k = r, \quad Af_l = w, \quad \lambda u_c z n = l, \\ \lambda [u_c w z_s n + u_z z_s] = -A_s f.$$

The first two equations determine capital and labour input. The third and the fourth jointly with the constraint  $u(c, z(s)) = u_0$  determine the multiplier  $\lambda$ , the wage, and the safety level in this firm. Eliminating  $\lambda$ , writing  $y_A A_s$  for  $A_s f$ , and rearranging gives the equation determining the safety level in this firm

$$u_c \left[ y_A A_s \frac{zn}{l} + w z_s n \right] + u_z z_s = 0. \quad (20)$$

This condition is the firm-level counterpart of the optimality condition that results if a social planner chooses a safety level that maximizes welfare in a closed economy, which can be written as

$$U_Y [Y_A A_s + Y_L z_s N] + U_z z_s = 0. \quad (21)$$

Comparing (20) and (21) makes clear that aggregating (20) gives (21) since at the aggregate level  $C = Y$ ,  $zN = L$ , and  $w = Y_L$ . In other words, in a closed economy with perfect information, the equilibrium is efficient.

In an open economy, the condition that maximizes welfare is given by (9b) which we reproduce here for convenience:

$$U_C [Y_A A_s + Y_L z_s N + [\tilde{r}_A A_s + \tilde{r}_L z_s N] \Delta] + U_z z_s = 0. \quad (22)$$

Comparing (20) and (22) makes clear that aggregating (20) only gives (22) for a small economy that is not able to influence the world interest rate  $\tilde{r}$  when setting different safety levels, that is, when  $\tilde{r}_s = 0$  so that  $\tilde{r}_A A_s + \tilde{r}_L z_s N = 0$ . This implies that for a small open economy, the compensating-differentials equilibrium is efficient under perfect information.

If the economy is big enough and is able to influence the world interest rate when setting different levels, then the compensating-differentials equilibrium (22) is not efficient. The reason for this is that at the firm level  $\tilde{r}$  is taken as given but at the country level the central planner could influence  $\tilde{r}$ . Only the central planner is able to exploit his market power at the international level when choosing different safety levels.

More generally speaking, however, the assumption of full information about health implications of various jobs is empirically not convincing. We therefore believe that a description of the standard-setting mechanism would always involve some institution like unions or a governmental agency.

## References

- Acemoglu, D., J. Robinson, and S. Johnson (2003): “Disease and Development in Historical Perspective,” *Journal of the European Economic Association*, 1(2/3), 397–405.
- Alsan, M., D. E. Bloom, and D. Canning (2006): “The Effect of Population Health on Foreign Direct Investment to Low- and Middle-Income Countries,” *World Development*, 34(4), 613–630.
- Ameco (2010): “Annual macro-economic database,” European Commission DG ECFIN. [http://ec.europa.eu/economy\\_finance/db\\_indicators/ameco/index\\_en.htm](http://ec.europa.eu/economy_finance/db_indicators/ameco/index_en.htm).
- Basu, K., H. Horn, L. Román, and J. Shapiro (2003): *International labor standards: history, theory, and policy options*. Blackwell.
- Bonnal, M. (2010): “Economic Growth and Labor Standards: Evidence from a Dynamic Panel Data Model,” *Review of Development Economics*, 14(1), 20–33.

- Brown, D. K. (2000): *International Trade and Core Labour Standards: A Survey of the Recent Literature*. OECD Labour Market and Social Policy Occasional Papers, No. 43, OECD Publishing.
- Brown, D. K., A. V. Deardorff, and R. M. Stern (1996): "International Labor Standards and Trade: A Theoretical Analysis," in *Fair Trade and Harmonization: Prerequisites for Free Trade?*, ed. by J. N. Bhagwati, and R. E. Hudec. MIT Press.
- (1998): "Trade and Labor Standards," *Open Economies Review*, 9, 171–194.
- Bureau of Economic Analysis (2008): "U.S. International Transactions, 1960-present," <http://www.bea.gov/international/index.htm>, download on 10 June 2008.
- Chau, N. H., and R. Kanbur (2006): "The race to the bottom, from the bottom," *Economica*, 73, 193–228.
- Davies, R., and A. Voy (2009): "The Effect of FDI on Child Labor," *Journal of Development Economics*, 88, 59–66.
- Desai, M. A., C. F. Foley, and J. R. Hines Jr. (2005): "Foreign Direct Investment and the Domestic Capital Stock," *American Economic Review*, 95(2), 33–38.
- Dickens, W. T. (1984): "Occupational Safety and Health Regulation and Economic Theory," in *Labor Economics: Modern Views*, ed. by W. Darity Jr., pp. 133–173. Kluwer-Nijhoff.
- Dinopoulos, E., and L. Zhao (2007): "Child labor and globalization," *Journal of Labor Economics*, 25.
- Doepke, M., and F. Zilibotti (2009): "International Labor Standards and the Political Economy of Child-Labor Regulation," *Journal of the European Economic Association*, 7(2/3), 508–518.
- Donado, A., and K. Wälde (2011): "How Trade Unions Increase Welfare," *Economic Journal*, forthcoming.
- Edmonds, E., N. Pavcnik, and P. Topalova (2009): "Child Labor and Schooling in a Globalizing World: Some Evidence from Urban India," *Journal of the European Economic Association*, 7(2/3), 498–507.
- Edmonds, E. V., and N. Pavcnik (2006): "International Trade and child labor: Cross-country evidence," *Journal of International Economics*, 68, 115–140.
- Elliott, K. A., and R. B. Freeman (2003): *Can Labor Standards Improve under Globalization?* Institute for International Economics, Washington DC.

- Flanagan, R. J. (2006): *Globalization and labor conditions: working conditions and worker rights in a global economy*. Oxford University Press.
- Hämäläinen, P., J. Takala, and K. L. Saarela (2006): “Global Estimates of Occupational Accidents,” *Safety Science*, 44, 137–156.
- Lane, P. R., and G. M. Milesi-Ferretti (2007): “The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970 - 2004,” *Journal of International Economics*, 73, 223–250.
- Levine, D. I., and D. Rothman (2006): “Does trade affect child health?,” *Journal of Health Economics*, 25, 538–554.
- Maskus, K. E. (2004): “Global Labor Standards and the WTO: A Crack Opens?,” *Labor History*, 45, 497–503.
- Neumayer, E., and D. Soysa (2005): “Trade openness, foreign direct investment and child labor,” *World Development*, 33, 43–63.
- OECD (2000): *International trade and core labour standards*. OECD.
- Parent-Thirion, A., E. F. Macías, J. Hurley, and G. Vermeulen (2007): “Fourth European Working Conditions Survey,” *European Foundation for the Improvement of Living and Working Conditions*, Dublin, Ireland.
- Prasad, E., R. G. Rajan, and A. Subramanian (2006): “Patterns of international capital flows and their implications for economic development,” in *Proceedings of the Federal Reserve Bank of Kansas City*.
- Rosen, S. (1974): “Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition,” *Journal of Political Economy*, 82(1), 34–55.
- (1986): “The theory of equalizing differences,” in O. Ashenfelter and R. Layard (eds.) *Handbook of Labor Economics*. North Holland, Amsterdam.
- Schutz, N. (2009): “Labor Standards and International Trade in a Search-Matching Model,” Discussion paper, Paris School of Economics.
- Singh, N. (2003): “The impact of international labor standards: A survey of economic theory,” in *International labor standards: history, theory, and policy options*, ed. by K. Basu, H. Horn, L. Román, and J. Shapiro, chap. 2. Blackwell Publishing Ltd.
- Srinivasan, T. N. (1996): “International Trade and Labor Standards from an Economic Perspective,” in: *Challenges to the New World Trade Organization*, P. van Dijck and G. Faber, eds., pp. 219–243.

- (1998): “Trade and Human Rights,” in *Constituent Interests and U.S. Trade Policies*, ed. by A. V. Deardorff, and R. M. Stern, chap. 12, pp. 225–253. University of Michigan Press.
- Turnbull, P. J., and V. J. Wass (2007): “Defending Dock Workers: Globalization and Labor Relations in the World’s Ports,” *Industrial Relations*, 46.
- Viscusi, K. W. (2007): “Regulation of Health, Safety, and Environmental Risks,” in *Handbook of Law and Economics*, ed. by M. A. Polinsky, and S. Shavell. Elsevier.
- World Bank (2008): *World Development Report*. World Bank, Washington DC.