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ABSTRACT

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This paper presents a capability-augmented model of on the job search, in which sweatshop conditions stifle the capability of the working poor to search for a job while on the job. The augmented setting unveils a sweatshop equilibrium in an otherwise archetypal Burdett-Mortensen economy, and reconciles a number of oft noted yet perplexing features of sweatshop economies. We demonstrate existence of multiple rational expectation equilibria, graduation pathways out of sweatshops in complete absence of enforcement, and country-specific efficiency and distributional responses to competitive forces and social safety nets depending precisely on whether graduation criteria are met.

JEL Classification: J64, J88, O15

Keywords: sweatshop equilibrium, on the job search, capability deficits

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"The wages of labour vary with the ease or hardship, the cleanliness or dirtiness, the honourableness or dishonourableness of the employment". (Smith 1776, Ch. X Pt. 1.)

"The [sweat]shops of Ciudad Hidalgo were not, however, efficient; they were having real trouble competing in the international marketplace; and the blatant violation of international standards was not helping matters, indeed quite the contrary ... One had to conclude that if the changes had been imposed by international labor standards, however imperialistic, they would have contributed to efficiency." (Piore 2004)

1 Introduction

Excessive overtime, wholesale disregard of safety and health conditions, low wages and lack of rights and representation make up an ensemble of workplace conditions that have come to be referred to as sweatshops (USGAO 1988). With roots going back to conditions of work in tenement houses in the U.S. and in England at the turn of the 19th century, sweatshop conditions have continued unabated affecting the poorest workers particularly in developing countries. The impetus of the current debate is furthermore strengthened by a concern for both the quality and quantity dimensions of work in the face of rising globalization (Engerman 2004), culminating in calls to achieve *Decent Work for All* in a recent influential ILO report (The Commission on the Social Dimensions of Globalization 2004). The expressed goal is to safeguard a set of enabling conditions in the workplace, to be achieved by abandoning the set of labor practices subsumed under the term sweatshop jobs (Bourguignon 2005).

As an institution, a sweatshop job is first and foremost an employment contract, not viable of course unless there is worker participation. Powell and Skarbek (2006) provide stylized profiles of sweatshop and decent work earnings by comparing protested hourly sweatshop wages as reported in the media – oft cited as evidence of worker exploitation and unfair trade – with decent work wages, and per capita incomes. In almost all cases, decent work wages outstrip sweatshop wages, while sweatshop earnings at 70 hours a week in turn far exceed per capita gross national income. Such a ranking of job-specific workers' compensation stands at the heart of the sweatshop debate, for it suggests (i) workers' incentives consistent with voluntary transition from unemployment to sweatshop jobs or decent work, but simultaneously (ii) an outright absence of a compensating differential (Smith 1776, Rosen 1986) that should reflect *the ease or hardship* of sweatshop work if employment is indeed voluntary. It is thus little wonder that anti-sweatshop legislations are controversial: Does a ban on sweatshops simply deter welfare improving transitions out of unemployment,[1] or does it steer workers incentives clear of accepting low wages in exchange for sweatshop conditions, or a combination of both?

A sweatshop also embodies a production function, relevant only when there is employer participation. At the level of the firm, whether sweatshops are more efficient relative to decent work is not at all self-evident, for while sweatshop conditions combine long hours with savings on inputs required to raise safety and health standards, these are accomplished at the possible risk of diminishing worker productivity (Piore 2004, Singh 2003). In the aggregate, evidence on whether greater exports volumes are systematically associated with lower labor standards is likewise mixed (Rodrik 1996, Brown 2000). However, if sweatshops are not selected out in equilibrium in a market otherwise unfettered by regulations or other market imperfections, a *prima facie* case is often made that blanket restriction on the choice of sweatshop technique simply means less work and less exports overall, rather than a shift favoring more decent work (Robinson 1964, Bardhan 2004). Indeed, reservations about labor standards legislations in general are likewise often couched in terms of their efficiency tradeoffs, wherein the sharing of the fruits of production beyond the level that the market dictates can come at a cost through the quantity of employment (Bardhan 2005: ch.12, Singh 2003).

The controversy over sweatshops is distinctive in this context precisely because it departs from a singular focus on the quantity of employment, and draws attention instead to a hitherto sparsely studied aspect of labor markets – the capability set of the *employed* (Sen 1993).[2] In reconciling the unemployment, efficiency and distributional implications of sweatshop jobs, this paper argues that important mileage and new insights can be gained by fleshing out the consequences of the capability dimension of work. In the broader context of labor market problems that juxtapose the quality and quantity dimensions of employment, we identify key gaps in inferences that can be drawn from archetypal labor market models when the conditions and capability

[1]The oft mentioned quotation from Robinson (1964) – "The only thing worse than being exploited by a capitalist is not being exploited by a capitalist" – reflects precisely this view. Likewise, in reference to sweatshop employment in development countries, Bardhan (2005) articulates a similar view – "the poor are often banging at the gates of these sweatshops for a chance to enter, since their current alternatives – inferior occupations, work conditions, or unemployment – are much worse".

[2]Sen (1993) articulates workers' capability deficit in the form of an inability to / a pessimistic attitude about the prospects of breaking free from status quo: "Our desires and pleasure-taking abilities adjust to circumstances...those who are persistently deprived... the routinely overworked sweatshop worker in exploitative conditions...tend to come to terms with their deprivation."

deficits the working poor are not taken into account, for a full range of issues going from the efficiency and equity implications of enhanced competition for labor, the rationale for social safety nets in the face of open unemployment, to the interplay between trade and international labor standards (OECD 1996, 2000, Brown, Deardorff and Stern 1997).

In particular, we focus on a specific type of capability deficit of employed sweatshop workers – their ability to search on the job while on the job. As a simple matter of time constraint, excessive overtime alone can undermine the freedom of a worker to search on the job. Using household survey data conducted in South Africa, Schöer and Leibbrandt (2006) additionally demonstrate the importance of physical health, as well as time constraint, as key determinants of job search strategies.[3]

Thus, as an employment contract, we take a sweatshop job as one associated with: (i) a higher disutility of work arising from poor work conditions and long hours, (ii) a corresponding diminished ability to search on the job relative to workers engaged in decent work, and (iii) in the presence of law enforcement a higher chance of exogenous break-up of employment relationship relative to decent work subsequent to discovery.[4] As a production function, we additionally allow for the possibility of inefficient sweatshops, in the sense that the disutility associated with sweatshop conditions can outweigh output gains per worker, if any.[5]

We adopt as our workhorse the Burdett-Mortensen model of on-the-job search (Mortensen 1990, Burdett and Mortensen 1998), and do so for three reasons. It provides an ideal stochastic and dynamic setting in which to study the issue of voluntary quits with on-the-job search. Second, in both developed and developing countries, observed labor market search strategies consistent with the implications of model have been found, where job search takes place both while

[3] Of course, reports of more extreme methods of retention also exist. For an international account, see Rivoli (2005).

[4] These distinguish sweatshop labor as analyzed here from bonded labor arising from, for example, debt bondage (Basu and Chau 2003, 2004), where workers are furthermore denied the ability to quit, and exploitative labor based on deceit (Rogers and Swinnerton 2008) where workers are lured into employment without full information.

[5] Most models of search intensity endogenize the likelihood of receiving a job offer by introducing a cost of job search, typically independent of the number of hours of work. See Rogerson, Shimer and Wright (2005) for an excellent survey. Benhabib and Bull (1983) is one exception where search intensity depends explicitly on the number of hours of work forgone. Here, as well as in the larger literature on endogenous hours of work over the course of the business cycle, workers are assumed to be freely able to choose. The key difference between this important class of models from the present setup is thus that the freedom to choose the number of hours of work is undermined in sweatshops. The link between relative inefficiency of sweatshops and work conditions including excessive overtime is also absent in this earlier literature.

unemployed, as well as on the job, depending on the wage and non-wage characteristics of the job (Blau 1991, Banerjee and Bucci 1995). Furthermore, by incorporating a two sector rural-urban framework with endogenous migration, we show that the full general equilibrium model predicts employment, wages, and production outcomes in ways identical to the familiar Ricardian model or the Ricardo-Viner model of international trade in the limit as entry cost tends to zero. Issues concerning comparative advantage can thus be readily addressed, covering the full range of cases from costly to free entry.

The augmented model of on-the-job search allows us to put a fix on: voluntary worker participation with full knowledge of the capability deficit associated with sweatshop jobs; endogenous employer choice of techniques, and the resulting dispersed distribution of sweatshop and decent work contract values. A list of useful insights follow. The first explains why the discounted value of sweatshop earnings can fail to fully reflect the Smithian compensating differential even when employment is strictly voluntary. In particular, we find the capability deficit to imply a single-crossing condition, such that employers offering a sufficiently high valued contract (accounting for pay, work conditions, and endogenous retention likelihoods) will never resort to imposing sweatshop conditions, for there is little need for them to preempt on the job search. Importantly, this offers an endogenous labor demand side rationale for why sweatshop workers are always situated at the utmost bottom rung of the equilibrium distribution of consummated job offers in overall value terms – a sufficiently well paid job that adequately compensates for sweatshop conditions relative to an average decent work is simply not in the equilibrium opportunities set. So long as sweatshop jobs are no worse than outright unemployment, our model implies a relative equilibrium ranking of the value of decent work, sweatshop jobs, and unemployment in ways fully consistent with the stylized facts already discussed.

Our second set of results revisits the intrinsic merit of unregulated choice of technique. We find that inefficient sweatshops that should otherwise be selected out of the market are in fact made profitable by workers' inability to freely seek self-betterment through on the job search. As such, just because employers adopting *inefficient* sweatshop technology and more efficient decent work technology coexist, it does not follow that a ban on sweatshop will lower output, or exports in equilibrium.[6]

[6]Equilibrium firm level heterogeneity is subject of longstanding interest in search models where frictions or entry

These observations allow us to examine next a broad set of issues, including (i) the existence and comparative statics properties of sweatshop equilibria, (ii) the efficiency and equity implications of equilibrium sweatshop jobs, and (iii) the output and trade consequences of efforts to enforce anti-sweatshop legislations. We find embedded within the Burdett-Mortensen model a sharp demarcation between two classes of economies, those that have graduated where sweatshops are a non-issue, and those that have not. Graduation out of sweatshops even in the complete absence of enforcement is possible, depending on technological parameters, entry costs, policies that govern social safety nets for the unemployed, and global forces through the terms of trade.

Interestingly, we also find that sweatshops have a tendency to beget even more sweatshops in a rational expectation equilibrium. Our model illustrates the set of parameter values that support multiple equilibria through a self-reinforcing mechanism. Here, the emergence of sweatshops provides the very justification for the equilibrium persistence of sweatshops, as workers increasingly see sweatshop employment as the dominant form of employment available. The resulting (rational) pessimism concerning the virtues of searching for decent work is then reflected in a *downward* adjustment in the endogenously determined reservation wage, further raising profits. The important message here is thus that the impact of sweatshops reverberates throughout the entire offer distribution adversely impacting decent work and sweatshop workers, while the benefits of the distributional shift go to sweatshop and decent work employers alike.

Furthermore, the two classes of economies – differentiated either by whether graduation criteria are met, or whether strict enforcement of sweatshop legislations is in play – exhibit distinctly different behaviors when subject to market forces. First, enhanced competition in sweatshop-free economies thanks to lower cost of entry tends to the "competitive" outcome in the limit with universal marginal productivity pricing and zero profits. In contrast, unfettered entry in the other class of economies without compensating changes in enforcement tends to almost universal sweatshop employment instead, a persistent violation of marginal productivity pricing, but nonetheless zero expected profits. Similar contrasts extend to policy impacts as well: The provision of unemployment safety nets in a sweatshop-free economy unambiguously lowers net manufacturing surplus by raising unemployment in the expected way, while the opposite may

costs confer firms with *de facto* monopsony power (Manning 2001). For expositions, see for example Mortensen (2003) and Rogerson et. al (2005). In our model, capability deficit is shown to affect choice of techniques even when entry costs tend to zero.

well be true in a sweatshop economy.

Turning now to whether there is in fact a tradeoff between aggregate efficiency and equity in this second best world with inefficient sweatshops, we demonstrate that the answer is nuanced, and consequently, the policy choice is non-trivial. Indeed, sector-wide efficiency as measured by the net surplus (total value of output net of entry costs and disutility costs of work), distributional bias as measured by the share of total surplus going to employed workers, as well as the quantity of equilibrium *unemployment* are shown to rise when sweatshops are removed by strict enforcement. These findings highlight two distinct effects at work during the transition to decent work: a negative quantity of employment effect, and simultaneously a composition of employment effect that allows higher decent work surplus to be generated per worker.

Finally, in a full general equilibrium two-sector setting, relative rankings of urban unemployment, intersectoral labor allocation, and output are provided. We distinguish between three cases: (i) equilibrium coexistence of sweatshops and decent work in the urban sector of a two-sector economy augmented with endogenous migration, (ii) the sweatshop-free Burdett-Mortensen benchmark of the same economy thanks to strict enforcement, and finally (iii) the Ricardo-Viner benchmark of once again the same economy with no sweatshops, thanks to strict enforcement *and* cost free entry. The progression from one benchmark to the next highlights the two distinct distortions in a sweatshop equilibrium: inefficient choice of technique made profitable by the capability deficit, and costly entry. Piecemeal correction of just one of these through strict enforcement of labor standards going from (i) to (ii) is shown to induce rural-urban migration, raise urban unemployment, but the combined net outcome in terms of total output and thus exports is ambiguous, depending on rural labor supply response to improvements in urban workers' welfare.

The next section describes the model. Sections 3 examines the issues of existence, configuration, and comparative statics properties of a sweatshop equilibrium. Section 4 explores the unemployment, efficiency, distributional, and general equilibrium implications of lax enforcement of sweatshop legislations. Section 5 concludes.

2 The Model

We begin with a partial equilibrium analysis of a manufacturing sector in a two sector economy,[7] and scrutinize the equilibrium allocation of manufacturing job vacancies between sweatshop jobs and decent work. Employment is determined via a model of on-the-job search in continuous time. There are N_m workers and v_m number of vacancies, both exogenously given for the time being. The model features voluntary worker participation and quits from any job, expected profit maximizing choice of technique between sweatshop jobs and decent work, and endogenous determination of the distribution of income and contract values.

2.1 Worker Participation and Compensating Differential

There are three states of employment (i): sweatshop jobs (s), decent work (d), and unemployment (u). Each worker chooses a plan to maximize the lifetime expected value of the stochastic stream of instantaneous utility, at rate of time preference r, $E_0 \int_0^\infty u(y(t), e(t))exp(-rt)dt$ where E_0 denotes expectation at time 0. Instantaneous utility $u(y(t), e(t)) = y(t) - e(t)$ depends on earnings $y(t)$ and the disutility of work $e(t)$.

With earnings and work disutility both parts and parcels of employment, let W denote the overall expected lifetime contract value of a job offer, and $F(W)$ the cumulative probability distribution of W on offer, with associated density $f(W)$ where the derivative exists.[8] The relevant range of W on $[0, \infty]$, as well as the share and rank of sweatshop job and decent work offers along the contract value distribution will be determined endogenously in the model. For now, the only assumption we adhere to is that workers' choices are made with full information about $F(W)$, including the type of employment, d or s, required by any job offer.

Relative to decent work, sweatshop jobs exact poorer work conditions and longer hours of work. These differences will be reflected in the contract value of a job offer in three ways. First, the disutility of sweatshop employment is the highest, with $e_s > e_d \geq 0 = e_u$. At unemployment income $b \geq 0$, the instantaneous utility of an unemployed worker is $u(b, 0) = b \geq 0$.

Second, job search – a random draw from the distribution $F(W)$ – takes place both on the job in a decent workplace, and while unemployed. For these workers, the intensity of job offer

[7] The full general equilibrium two-sector model with rural urban migration and free entry is the subject of Section 5.

[8] We show in Section 3 that $F(W)$ is continuously differentiable in the relevant range.

arrival is governed by a Poisson process with parameter $\alpha_u = \alpha_d = \alpha \geq 0$.[9] Sweatshop workers by contrast can find their capability to search on-the-job undermined, for excessive overtime and sweatshop conditions can directly constrain a worker's time and physical resources to search on-the-job. At its worst, $\alpha_s = 0$. To recover the capability to search, a sweatshop worker must first quit and transition into unemployment.

A final issue concerns law enforcement. We assume an exogenous job destruction rate $\delta_s = (1+\lambda)\delta_d = (1+\lambda)\delta > 0$. $\lambda \geq 0$ characterizes the frequency of enforcement of labor laws that breaks up sweatshop employment. In summary, unless otherwise compensated by way of higher earnings, sweatshop jobs are undesirable from workers' perspective in all three regards.

The following Bellman equations can now be furnished, the solutions of which give the steady state contract values W_i of each type of employment at earnings y_i, $i = s, d$:

$$rW_s = y_s - e_s - \delta(1+\lambda)(W_s - W_u) \quad (1)$$

$$rW_d = y_d - e_d - \delta(W_d - W_u) + \alpha \int_{W_d}^{\infty} (W - W_d)dF(W) \quad (2)$$

(1) and (2) carry the usual interpretation that the flow value of employment depends on instantaneous utility $(y_i - e_i)$, the possibility of capital losses due to exogenous separations ($W_i - W_u$ at rate δ_i), and capital gains and self-betterment feasible only in decent work through voluntary separation following successful on-the-job search ($W - W_d$ if $W > W_d$ and zero otherwise at rate α).

The value of unemployment W_u solves:

$$rW_u = b + \alpha \int_{W_u}^{\infty} (W - W_u)dF(W). \quad (3)$$

Since no worker will accept a job offer with contract value less than W_u, W_u is taken to be the lower support of the range of job offers.

Translating (1) - (3) in terms of costs, the (instantaneous) minimal hiring cost required to secure contract value $W \geq W_u$ can be expressed as $y_i(W) = \min\{y_i | W_i \geq W\}$:

$$y_s(W) = e_s + rW + \delta(1+\lambda)(W - W_u) \quad (4)$$

$$y_d(W) = e_d + rW + \delta(W - W_u) - \alpha \int_{W}^{\infty} (x - W)dF(x). \quad (5)$$

[9] Alternatively, we have also examined the case with $\alpha_u > \alpha_d > 0$. This generates similar qualitative results, but little new insights that are not already well known in the literature. These are available on request.

Together these give the familiar steady state compensating differential, $y_s(W) - y_d(W)$, with the only caveat that W is held constant. We do not know at this point of the analysis whether sweatshop jobs and decent work span the same range of W. Equivalently, we do not know whether there exists a sweatshop job that pays a wage high enough to fully compensate for the conditions of sweatshops relative to decent work of comparable expected lifetime value W. For now, however, it suffices to note that the differential is indeed strictly positive at given W, as long as $e_s > e_d$, $(1+\lambda) \geq 1$ and $\alpha \geq 0$. In addition both $y_s(W)$ and $y_d(W)$ are monotone increasing functions of W with differential rates of increase,

$$\frac{\partial y_s(W)}{\partial W} = r + \delta(1+\lambda) > 0, \quad \frac{\partial y_d(W)}{\partial W} = r + \delta + \alpha(1 - F(W)) > 0.$$

With voluntary participation and quits, a job offer W_i is attractive enough for an unemployed worker, and not so unattractive as to instigate quits, if and only if $W_i \geq W_u$, or equivalently $y_i \geq y_i(W_u)$ from the monotonicity of $y_i(W)$ in W, $i = s, d$.[10] Thus, while the reservation contract value of an unemployed worker is identical across jobs at W_u, the corresponding reservation earnings $(y_i(W_u))$ are job-specific:

$$y_s(W_u) = e_s + b + \alpha \int_{W_u}^{\infty} (x - W_u) dF(x) \tag{6}$$

$$y_d(W_u) = e_d + b, \tag{7}$$

where the two reservation earnings compensate for work disutility, forgone unemployment income and the option to search where applicable.

2.2 Employer Participation and Single-Crossing

There is a large number (v_m) of employers, each with one vacancy to offer. The same output can be produced under sweatshop or decent work conditions, though the implied revenue (p_i) and wage cost $(y_i(W))$ per worker differ. Denote $p_i = pq_i$ as the average revenue of a worker in i. p is an exogenously given relative price of the manufacturing output in this two-sector economy, and q_i denotes marginal product per worker in i, adjusted to account for any change in revenue per worker associated with the provision of better work conditions, and the difference in hours of work between d and s. Instantaneous profit is $p_i - y_i(W)$ when output is positive and 0 otherwise.

A successful employer-worker match generates joint employer-worker instantaneous surplus s_i amounting to $p_i - y_i(W)$ plus $y_i(W) - e_i$ at opportunity cost b to workers, or, $s_i \equiv p_i - e_i - b$.

[10] We show in what follows that there will be no equilibrium transition from decent work to sweatshop jobs.

Henceforth, we maintain that both technologies are viable, $s_i > 0$, and in addition, decent work is relatively more efficient in a static sense, so that the degree of static relative efficiency[11]

$$\rho \equiv \frac{p_d - e_d - b}{p_s - e_s - b} = \frac{s_d}{s_s} \geq 1.$$

The problem of an employer with rate of preference r, in choosing a plan to maximize the discounted expectation of the stream of (stochastic) profits involves two decisions: (i) a contract value W to post,[12] and (ii) a technique (sweatshop or decent work) to adopt given the cost of doing so $y_i(W)$.

We begin with (ii). For a contract offering $W \geq W_u$, the adoption of sweatshop conditions implies a steady state value function $J_s(W)$, which solves $rJ_s(W) = p_s - y_s(W) - \delta(1+\lambda)J_s(W)$. Adoption of decent work condition by contrast yields flow value $rJ_d(W) = p_d - y_d(W) - \delta J_d(W) - \alpha(1 - F(W))J_d(W)$. These flow values depend on instantaneous profits, the possibility of capital losses either because of exogenous separation, or voluntary separation in case of decent work with on-the-job search:

$$J_s(W) = \frac{p_s - y_s(W)}{r + \delta(1+\lambda)}, \quad J_d(W) = \frac{p_d - y_d(W)}{r + \delta + \alpha(1 - F(W))}. \tag{8}$$

(8) makes plain the set of tradeoffs employers face. From (4) - (5), sweatshop employers face a positive compensating differential ($y_s(W) > y_d(W)$) at constant W and a higher likelihood of work stoppage due to law enforcement, λ. Decent work employers weigh these against an augmented likelihood of voluntary separation $\alpha(1 - F(W))$ induced by on-the-job search, short of offering the highest contract value (at W_{max} where $F(W_{max}) = 1$).[13]

From (8), a single-crossing result obtains – the net profit gains from sweatshop as opposed to decent work cross at most once – since $(J_s(W) - J_d(W))$ is monotonically decreasing in W:

$$\frac{\partial(J_s(W) - J_d(W))}{\partial W} = -\frac{(p_d - y_d(W))\alpha f(W)}{(r + \delta + \alpha(1 - F(W)))^2} < 0 \tag{9}$$

[11] The equilibrium consequences of the case where ρ is less than one can be easily inferred from our setup as well. Maintaining the relative efficiency assumption throughout however allows us put focus on cases where sweatshops arise despite its relative inefficiency. Where useful insights apply, the results pertaining to the case of efficient sweatshops $\rho < 1$ will be separately noted.

[12] W is a take it or leave it offer. This is consistent with sweatshop employment relations that do not accommodate individual level / collective bargaining.

[13] The interested reader can readily verify that if $\alpha_s = \alpha$, or in other words, if sweatshop conditions have no impact at all on sweatshop workers' capability to search on the job, $J_d(W)$ always outstrip $J_s(W)$, following the steps explained below if and only if $\rho > 1$. Inefficient sweatshops are thus always selected out in equilibrium without the capability deficit.

whenever instantaneous profit $(p_d - y_d(W))$ is positive. Thus, a sweatshop job at a high enough contract value W has little appeal for employers, since the likelihood of voluntary quits $\alpha(1 - F(W))$ from decent work diminishes with W in any case. We can now define a unique endogenous threshold

$$\bar{W} = \max\{W | J_s(W) - J_d(W) \geq 0\}$$

where job offers with low contract values $W \leq \bar{W}$ are sweatshop jobs. Employers offering higher contract values by contrast choose decent work:

Proposition 1 *If sweatshop and decent work coexist, an endogenous critical contract value* $\bar{W} = \max\{W | J_s(W) - J_d(W) \geq 0\} \geq W_u$ *separates the two. Equilibrium sweatshop contract values are never higher than that of decent work.*

With the value rank of the two types of jobs as shown in Proposition 1, the relative shares of the two types of job offers can be simply characterized. Denote $\sigma \equiv F(\bar{W})$ as the fraction of offers that exact sweatshop conditions, and $1 - \sigma$ the fraction of decent work offers.

To briefly sum up, the choice between sweatshop and decent work from a workers' perspective yield job-specific reservation earnings $y_i(W_u)$ consistent with the standard compensating differential view of worker compensation. Accounting for endogenous choice of technique from employers' perspective amends this view, and sweatshop contracts are shown to be inferior to decent work contract in overall value terms $W_u \leq \bar{W} \leq W_d$. All these leave the existence of the critical contract $\bar{W}$, the distribution $F(W)$, and the associated share of sweatshop job offers $F(\bar{W}) = \sigma$ to be ascertained. To this end, we depart from the problems of the individual worker and employer, and proceed to discuss aggregate level steady state conditions.

2.3 Steady State Distributions and Match Success Odds

Pick at random any worker from the pool of job seekers to be matched with a job offer W. An employer-worker match is consummated if W is no less than the worker's reservation contract value: W_u for the unemployed, or for a worker searching on the job, the value of his existing contract. The odds that an offer W finds a match should thus depend on the relative size of the unemployment pool, and the distribution of existing realized contract values. But what difference will the prevalence of sweatshop jobs make? What about law enforcement that supposedly only break up sweatshop contracts?

Let n_i, $i = s, d, u$ be the fraction of workers in each of the three states of employment, with $n_s + n_d + n_u = 1$. Their steady state values solve the following systems of linear differential equations, requiring that inflows into any state of employment equal outflows. For any given fraction of sweatshop offers $\sigma \in [0, 1]$,

$$\begin{aligned} \dot{n_d} &= -\delta n_d + \alpha(1-\sigma)(1 - n_d - n_s) = 0 \\ \dot{n_s} &= -\delta(1+\lambda)n_s + \alpha\sigma(1 - n_d - n_s) = 0 \end{aligned}$$

δn_d and $\delta(1+\lambda)n_s$ represent outflows due to exogenous separation in d and s. In reverse direction from unemployment to employment, overall job arrival α now consists of: (i) *decent work arrival* $\alpha(1-\sigma)$, and (ii) *sweatshop job arrival* $\alpha\sigma$.[14] Steady state outcomes are:

$$n_d = \frac{\alpha(1-\sigma)(1+\lambda)}{\delta(1+\lambda) + \alpha(1 + \lambda(1-\sigma))}, \quad n_s = \frac{\alpha\sigma}{\delta(1+\lambda) + \alpha(1 + \lambda(1-\sigma))} \tag{10}$$

$$n_u = \frac{\delta(1+\lambda)}{\delta(1+\lambda) + \alpha(1 + \lambda(1-\sigma))}. \tag{11}$$

Setting $\lambda = 0$, and $\sigma = 0$, (11) is just the familiar steady state unemployment rate in models of job search, with α and δ affecting equilibrium unemployment share in the expected way. Beyond these, (10) and (11) jointly highlight two important issues not previously addressed, showing employment shares of two distinct types of work, s and d, and the addition of sweatshop arrival (σ) and law enforcement (λ) as determinants of aggregate employment patterns.

By inspection, a rise in σ raises steady state employment in sweatshops, and lowers participation in decent work. On net, if and only if law enforcement is positive, a rise in σ exposes more workers to a higher exogenous rate of separation, and results in higher steady state unemployment, at constant α.

(11) also shows important tradeoffs between labor standard enforcement and aggregate employment. Holding σ constant, an increase in law enforcement decreases the share of sweatshop jobs, and increases the share of decent work, but the net effect is nonetheless an *increase* in total unemployment from (11), as long as $\sigma > 0$. This dilemma will be played out further in subsequent sections, when the endogeneity of both σ and α with respect to λ is unveiled. For now, we state

[14] Note also that even with on-the-job search, no worker in a decent workplace will accept a job offer that subjects him to sweatshop conditions, since $\bar{W}$ strictly separates the two types of employment from Proposition 1. Meanwhile, no sweatshop worker can transition into decent work without first going through unemployment, for $\alpha_s = 0$.

Proposition 2 *All else equal, stricter enforcement is associated with a higher steady state rate of unemployment if and only if $\sigma > 0$. A higher fraction of sweatshop offers σ is likewise associated with higher steady state unemployment rate if and only if $\lambda > 0$.*

Let the steady state cumulative distribution of realized contract values be $G(W)$ among the $N_m(1-n_u)$ number of employed workers. With two different types of work separated by the critical contract $\bar{W}$, consider to begin with any sweatshop contract $W \in [W_u, \bar{W}]$. Balancing outflows of sweatshop contracts $N_m\delta(1+\lambda)G(W)(1-n_u)$, and inflows of unemployed workers $N_m\alpha F(W)n_u$, we have, using (10) and (11),

$$G(W) = \frac{F(W)}{1+\lambda(1-\sigma)} \text{ for } W \leq \bar{W}, \tag{12}$$

where the fraction of realized sweatshop contracts is increasing with the fraction of sweatshop offers $F(W)$, but inversely related to enforcement λ. At the margin, $G(\bar{W}) = \sigma/(1+\lambda(1-\sigma))$.

Extending the range now to include both decent work and sweatshop contracts with $W \geq \bar{W}$, note that contract termination arises because of (i) exogenous separation from sweatshop jobs $(N_m\delta(1+\lambda)G(\bar{W})(1-n_u))$, (ii) exogenous separation from decent work $N_m(\delta(G(W)-G(\bar{W}))(1-n_u))$, and (iii) voluntary separation due to on-the-job search $N_m(\alpha(1-F(W))(G(W)-G(\bar{W}))(1-n_u))$. As before, unemployment to employment transitions constitute inflows $N_m(\alpha F(W)n_u)$. In a steady state, jobs destroyed are balanced by jobs created when

$$G(W) = G(\bar{W}) + \frac{(1+\lambda)}{(1+\lambda(1-\sigma))}\frac{\delta(F(W)-\sigma)}{(\delta+\alpha(1-F(W)))} \text{ for } W > \bar{W}. \tag{13}$$

The share of realized decent work contracts $G(W) - G(\bar{W})$ rises with enforcement λ, and decreases with the share of sweatshop jobs σ. Naturally, the best contract offer, W_{max}, such that $F(W_{max}) = 1$, gives the best realized contract, for $G(W_{max}) = [\sigma+(1+\lambda)(1-\sigma)]/[(1+\lambda(1-\sigma))] = 1$.

The employment shares n_i and the distribution of realized contracts $G(W)$ in (10)-(13) fully characterize the likelihood of a successful match between any given offer $W \geq W_u$ and a randomly selected job seeker. Let us denote this likelihood as $h(W)$, the match success rate. For any sweatshop offer $W \leq \bar{W}$, $h(W)$ is simply the share of unemployed in all workers receiving an offer:[15]

$$h(W) = \frac{N_m\alpha n_u}{N_m[\alpha n_u + \alpha(1-n_u)(1-G(\bar{W}))]} = \frac{\delta}{\delta+\alpha(1-\sigma)} \equiv \bar{h}(\alpha,\sigma) \text{ if } W \leq \bar{W} \tag{14}$$

[15]This follows since no workers in decent work have contracts that yield less than $\bar{W}$ from Proposition 1, and since no sweatshop workers participate in on-the-job search.

where $N_m[\alpha n_u + \alpha(1-n_u)(1-G(\bar{W}))]$ is the sum total of workers receiving job offers, of which $N_m \alpha n_u$ are unemployed and will therefore accept a sweatshop offer as long as $W \geq W_u$. $N_m\alpha(1-n_u)(1-G(\bar{W}))$ are workers in decent work receiving a new job offer thanks to on the job search. Since these workers only accept job offers that are no worse than their decent work contracts, direct voluntary employment transitions from decent work to sweatshop jobs are accordingly ruled out (Proposition 1).

For decent work offers $W \geq \bar{W}$, $h(W)$ additionally accounts for job seekers already with existing decent work contracts that are outmatched by W, $(N_m\alpha(1-n_u)(G(W)-G(\bar{W})))$. The revised match success likelihood is:

$$h(W) = \frac{N_m[\alpha n_u + \alpha(1-n_u)(G(W)-G(\bar{W}))]}{N_m[\alpha n_u + \alpha(1-n_u)(1-G(\bar{W}))]} = \frac{\delta}{\delta + \alpha(1-F(W))} \text{ if } W > \bar{W} \tag{15}$$

The match success rate $h(W)$ is thus piecewise continuously differentiable and weakly increasing in W from (14) - (15). Given $F(W)$, $h(W)$ summarizes the workings of the labor market equilibrium in a steady state (1) - (13). Intuitively, for a decent work contract, the odds of match success diminishes with the rate of decent work arrival $\alpha(1-F(W))$, appropriately adjusted to reflect the share of decent work that outmatches W. For either sweatshop jobs, or the marginal decent work offer, the corresponding match success odds $\bar{h}(\alpha,\sigma)$ is likewise inversely related to decent work arrival $\alpha(1-\sigma)$. But since *any* decent work outmatches sweatshop jobs (Proposition 1), $\bar{h}(\alpha,\sigma)$ is locally independent of W, at $\delta/(\delta+\alpha(1-\sigma))$.

This inverse relationship between the match success odds of the marginal decent work offer $\bar{h}(\alpha,\sigma)$ and the decent work arrival rate $\alpha(1-\sigma)$ will play a key role in the sequel, and is shown in Figure 1. Clearly, as decent work arrival tends to zero, the corresponding match success odds approaches its maximum at $\bar{h} = 1$. With better job opportunities simply not available, it makes little sense for any worker to refuse a marginal offer, in hopes of a better draw down the road. By contrast, as decent work arrival approaches infinity asymptotically, the match success odds of a marginal offer $\bar{W}$ tends to zero.

3 Sweatshop Equilibrium

Whether sweatshop jobs and decent work co-exist in a steady state equilibrium ultimately depends on the expected profits of an employer with a vacancy. Thus let $\Psi(N, v_m)$ be a matching technology representing the total number of matches (Pissarides 2000) between v_m number of vacancies (inclusive of sweatshop jobs and decent work) and N job seekers $N = N_m(n_u + n_d)$. The total number of job seekers is thus endogenous, and include all but sweatshop workers for whom $\alpha_s = 0$. We assume that Ψ is homothetic, monotonically increasing in both arguments, with $\Psi(0, v_m) = \Psi(N, 0) = 0$.

The overall rate of (sweatshop plus decent work) job arrival for workers is $\alpha = \Psi(N, v_m)/N = \Psi(1, v_m/N)$ and the rate of an employer-worker match is $\alpha_e = \Psi(N, v_m)/v_m = \Psi(N/v_m, 1)$. Both rates depend on the ratio of vacancies to job seekers v_m/N. Accordingly denote $\alpha = \Psi(1, v_m/N) \equiv \psi(v_m/N)$ and $\alpha_e = \Psi(N/v_m, 1) \equiv \psi_e(N/v_m)$, where $\psi(v_m/N)$ and $\psi_e(N/v_m)$ are monotone increasing functions with $\psi(0) = \psi_e(0) = 0$.

The expected profit of an employer with a new vacancy offering W is thus

$$\pi(W) = \alpha_e h(W) \max_{\{i=s,d\}} J_i(W),$$

which accounts for the likelihood of an employer-worker match (α_e), the likelihood that a contract offer W will be successfully consummated given a match ($h(W)$), and the maximal expected value of the contract given a successful match ($\max_{\{i=s,d\}} J_i(W)$).

From Proposition 1 which solves $\max_{\{i=s,d\}} J_i(W)$, along with $h(W)$ as expressed in (14) and (15), and $J_i(W)$ in (8), the expected profit function $\pi(W)$ can now be stated

$$\pi_s(W) = \frac{\alpha_e \delta(p_s - y_s(W))}{(\delta + \alpha(1-\sigma))(r + \delta(1+\lambda))} \text{ if } W \in [W_u, \bar{W}] \tag{16}$$

and

$$\pi_d(W) = \frac{\alpha_e \delta(p_d - y_d(W))}{(\delta + \alpha(1 - F(W)))(r + \delta + \alpha(1 - F(W)))} \text{ otherwise.} \tag{17}$$

Define a steady state sweatshop equilibrium as a threshold contract value $\bar{W}^*$, a contract value distribution $F^*(W)$, a corresponding share of sweatshop offers $\sigma^* = F^*(\bar{W}^*)$, and an equilibrium job arrival rate α^* (and thus α_e^*) such that (i) all contract offers yield the same expected profit π^* given (1) - (17), and (ii) expected profit maximizing employers freely enter or exit subject to a per vacancy entry cost c:[16]

$$\pi^*(W) = c. \tag{18}$$

There are four sets of equalities that are of particular interest, the joint solutions of which give the sweatshop equilibrium.

[16]In what follows, an asterisk denotes steady state equilibrium values.

3.1 The Equilibrium Threshold Sweatshop Contract

The first requires that all sweatshop contracts yield the same expected profits for any $W \in [W_u^*, \bar{W}^*]$, or equivalently from (16),

$$p_s - y_s(W_u^*) = p_s - y_s(W) = p_s - y_s(\bar{W}^*).$$

Since the hiring cost $y_s(W)$ is strictly increasing in W from (4),

Proposition 3 *In a sweatshop equilibrium, all sweatshop jobs, if they exist, identically offer the same contract value equaling the equilibrium value of unemployment W_u^*. The threshold contract $\bar{W}^*$ coincides with the value of unemployment, and σ^* measures a point mass of $F^*(W)$ at W_u^*.*

The intuition follows from (14) and (16). For a sweatshop employer, any attempt to raise the contract value beyond the reservation level W_u increases hiring cost through $y_s(W)$, but leaves unchanged the odds of a successful hire $\bar{h}(\alpha^*, \sigma^*) = \delta/(\delta + \alpha^*(1 - \sigma^*))$. To maximize expected profits, all sweatshop jobs offer just enough incentives for workers to agree to participate, and to refrain from voluntary quits once on the job, but no more. Consequently, equilibrium sweatshop offers σ^* represents a mass of job offers at the lower support $W_u^* = \bar{W}^*$.

3.2 Equilibrium Distribution of Decent Work Contracts

A second set of equalities requires that all decent work offers ($W > \bar{W}^*$) yield the same expected profit: $\pi_d(\bar{W}^*) = \pi_d(W)$. From (17), a higher valued decent work offer is consummated with a strictly higher probability $h(W)$, but at a wage cost $y_d(W)$ that is likewise increasing in W. Equilibrium expected profit equalization now implies a dispersed steady state distribution of decent work contract value offers summarized by $F^*(W)$ at and beyond the point mass $W_u^* = \bar{W}^*$. Using (17), $F^*(W)$ solves:

$$\frac{(\delta + \alpha^*(1 - F^*(W)))(r + \delta + \alpha^*(1 - F^*(W)))}{(\delta + \alpha^*(1 - \sigma^*))(r + \delta + \alpha^*(1 - \sigma^*))} = \frac{p_d - y_d(W)}{s_d} \tag{19}$$

To gain even sharper insights, let us henceforth examine cases where there is no discounting of the future, but where sweatshop workers nonetheless willingly accept doing without the option to search, while sweatshop employers choose to put up with the possibility of law enforcement discovery. Even here, equilibrium $F^*(W)$ can still be obtained with $r \to 0$:[17]

$$F^*(W) = 1 + \frac{\delta}{\alpha^*}\left(1 - \frac{1}{\bar{h}(\alpha^*, \sigma^*)}\sqrt{\frac{p_d - y_d(W)}{s_d}}\right), \quad W \geq W_u^*. \tag{20}$$

To complete the characterization of the distribution $F^*(W)$, let W_{max}^* denote the equilibrium upper support of the range of decent work contracts. With $\sigma^* = F^*(W_u^*)$ from Proposition 3, it must be the case that $\int_{W_u^*}^{W_{max}^*} f^*(W)dW = 1 - F^*(W_u^*) = 1 - \sigma^*$, or:

$$W_{max}^* \quad = \quad W_u^* + 2\bar{h}(\alpha^*, \sigma^*)(1 - \bar{h}(\alpha^*, \sigma^*))s_d/\delta. \tag{21}$$

Evidently, the emergence of sweatshops impacts every worker in the economy, as σ^* is in fact subsumed in both the equilibrium range and offer distribution of decent work through its impact on the match success odds $\bar{h}(\alpha^*, \sigma^*)$.

We now come full circle, for the distribution of decent work offers is in turn a key determinant of the profitability of sweatshops through the reservation earnings term $y_s(W_u^*)$ in (6). Note also that since the contract value of all sweatshop workers is pinned to the reservation level from Proposition 3, $y_s(W_u^*)$ represents the instantaneous earnings of all sweatshop workers, and thus

Proposition 4 *In a sweatshop equilibrium, the earning of any sweatshop worker diminishes with the equilibrium share of sweatshop jobs σ^*, rises with the surplus of decent work $s_d = p_d - e_d - b$, and is independent of the surplus of sweatshop jobs $s_s = p_s - e_s - b$:*

$$y_s(W_u^*) = e_s + b + \left(1 - \bar{h}(\alpha^*, \sigma^*)\right)^2 s_d.$$

Proposition 4 illustrates two sets of intriguing findings. To start, sweatshop workers in fact do not directly partake in the fruits of sweatshop production as $y_s(W_u)$ is independent of p_s, at constant α^* and σ^*.[18] The pay that they command depends entirely on the credibility of their willingness to hold out longer in search of better decent job opportunities in the labor market $\alpha \int_{W_u}^{W_{max}^*}(W - W_u)dF^*(W) = \left(1 - \bar{h}(\alpha^*, \sigma^*)\right)^2 s_d$ from (6), (20) and (21). A low decent work surplus s_d, among other things, is thus bad news for sweatshop workers in earnings terms.

In addition, it has been shown in (14) that the match success rate of the marginal decent work offer $\bar{W}^*$ (and thus sweatshop offer since $\bar{W}^* = W_u^*$ from Proposition 3) rises as sweatshops

[17] From (20), the associated density is $\partial F^*(W)/\partial W = f^*(W) = (\delta + \alpha^*(1 - \sigma^*))^2/(2\alpha^* s_d) \geq 0$ evaluated at $r = 0$.

[18] This is in sharp contrast to workers in decent work, whose average earnings can be shown to be monotonically increasing p_d. We discuss this in greater detail in section 4.

become more prevalent ($\bar{h}(\alpha^*, \sigma^*) = \delta/(\delta + \alpha^*(1-\sigma^*))$). The associated impacts are two-fold. First, a rise in σ^* reverberates throughout the entire *decent work offer distribution* in (20), and gives rise to a first order stochastically dominating change, all else equal, as employers respond to the relative ease of finding workers even with a marginal offer. Consequently, rising prevalence of sweatshop jobs σ^* is consistent with a pessimistic though nonetheless rational expectation about the foreseeable gains from refusing a sweatshop job offer.

Second, the same rise in σ^* also directly impact sweatshop earnings, as individual unemployed workers act out this pessimism by demanding *less* sweatshop pay $y_s(W_u)$. These suggest that the emergence of sweatshops has a tendency to beget even more sweatshops. Indeed, expected sweatshop profit $\pi_s(W_u)$ is strictly increasing in $\bar{h}(\alpha^*, \sigma^*)$, and thus σ^* from (16) and Proposition 4:

$$\pi_s(W_u) = \alpha_e \bar{h}(\alpha^*, \sigma^*) s_s \left(1 - (1 - \bar{h}(\alpha^*, \sigma^*))^2 \rho\right) / (\delta(1+\lambda)). \tag{22}$$

These wage cost savings spill over to benefit decent work employers as well. For the marginal decent work employer, such gains arise twice, once through a diminished likelihood of voluntary work stoppage $\alpha^*(1-\sigma^*)$ instigated by successful on the job search in (8), and once more through the likelihood of a successful match $\bar{h}(\alpha^*, \sigma^*)$. In equilibrium, all decent work employers offering $W \geq \bar{W}^*$ earn identical expected profit, and collectively benefit from the emergence of sweatshops through (7) and (17)

$$\pi_d(W) = \alpha_e \bar{h}(\alpha^*, \sigma)^2 s_d / \delta, \;\; W \geq W_u^*. \tag{23}$$

(22) - (23) jointly present a set of two opposing forces on the relative profitability of sweatshop jobs versus decent work, as the incidence of sweatshop jobs rises. The balance between the two will in the end determine the configuration of a sweatshop equilibrium.

3.3 Equilibrium Relative Profitability of Sweatshop Jobs

An employer with a new vacancy prefers sweatshops over decent work, evaluated at the critical contract $\bar{W}^* = W_u^*$, if and only if $\pi_s(W_u^*) - \pi_d(W_u^*) \geq 0$. From (22) and (23), sweatshop wins out whenever[19]

$$\Delta\pi(\rho, \lambda, \bar{h}(\alpha^*, \sigma^*)) \equiv \frac{1-\rho}{\rho} + (1-\lambda)\bar{h}(\alpha^*, \sigma^*) - \bar{h}(\alpha^*, \sigma^*)^2 \geq 0. \tag{24}$$

[19](24) follows immediately upon taking the difference between (22) and (23) using the definition of $\bar{h}(\alpha^*, \sigma^*)$.

(24) reduces the problem of employers' choice of technique to a simple evaluation of the relative magnitudes of three factors: the relative efficiency of decent work over sweatshop as measured by ρ, the match success likelihood $\bar{h}(\alpha^*, \sigma^*)$, and the intensity of law enforcement λ.

Two specific cases point to the main thrust of the inequality in (24). First, suppose that the relative efficiency of decent work is sufficiently pronounce, with $\rho \gg 1$. The sweatshop equilibrium in this case is trivial, with $\sigma^* = 0$. Our model thus readily reduces to the Burdett-Mortensen model with the addition of work disutility e_d. Second, as long as sweatshops are relatively inefficient ($\rho > 1$), (24) shows that *sweatshops only* equilibria cannot prevail even in the complete absence of law enforcement.[20]

These said, what (24) importantly shows is that an equilibrium mix of inefficient sweatshop and decent work cannot be ruled out by the relative inefficiency of sweatshops alone.[21] From (24), $\Delta\pi(\cdot)$ first increases, achieves a maximum at $\bar{h} = (1-\lambda)/2$, then decreases with $\bar{h}$ as long as enforcement is not too strict ($\lambda < 1$).

These are illustrated in Figure 2, where $\Delta\pi(\cdot)$ is plotted against the match success rate $\bar{h}$ with successively increasing levels of enforcement ($\lambda' > \lambda$). Where there is stiff competition for workers corresponding to a low match probability, Figure 2 shows that sweatshops are too expensive to be profitable for the hiring cost $y_s(W_u)$ is too high (Proposition 4), even though the need to pre-empt workers from on the job search is also at its highest here. This wage cost disadvantage of adopting sweatshop technologies narrows as sweatshops become prevalent, however, for $y_s(W_u)$ falls with σ. Effectively, sweatshops reinforces the reasons for its own existence as unemployed job seekers increasingly see sweatshops as the dominant form of employment available. But for match success odds $\bar{h}$ high enough and beyond the threshold $(1-\lambda)/2$, the need to preempt on the job search is no longer as high a priority as new workers can readily be found. A further rise in $\bar{h}$ thus eventually favors employers adopting decent work, who nonetheless continue to benefit from rising incidence of sweatshops through better retention, and higher rates of match success (23).

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[20] Since $\rho > 1 \geq 1/(1+\lambda)$,

$$\Delta\pi(\rho, \lambda, \bar{h}(\alpha, 1)) = \frac{1-\rho}{\rho} - \lambda < 0, \tag{25}$$

evaluated at the endpoint $\sigma = 1$.

[21] The case of efficient sweatshops ($\rho < 1$) thus constitute a special case in the other direction, where $\Delta\pi(\rho, \lambda, 0) = (1-\rho)/\rho > 0$ and $\Delta\pi(\rho, \lambda, 1) = (1-\rho)/\rho - \lambda > 0$ if and only if $\lambda < (1-\rho)/\rho$, and negative otherwise. It follows that there are two possibilities. If and only if λ is less than $(1-\rho)/\rho$, there is a unique equilibrium mix of sweatshop and decent work. Otherwise, equilibrium is characterized by a complete specialization in sweatshop.

Taken together, an equilibrium mix of inefficient sweatshop and decent work is possible if and only if $\Delta\pi(\rho, \lambda, (1-\lambda)/2) > 0$ evaluated at its maximum at $\bar{h} = (1-\lambda)/2$, or equivalently,

$$4(1-\rho)/\rho + (1-\lambda)^2 \equiv R(\rho, \lambda) > 0$$

a condition that is fulfilled whenever relative decent work efficiency ρ, and enforcement intensity λ are relatively small. At an interior equilibrium, the associated equilibrium match success odds $\bar{h}^* = \bar{h}(\alpha^*, \sigma^*)$ equalize the two expected profits, and are given by the roots of $\Delta\pi(\rho, \lambda, \bar{h}^*) = 0$ from (24). To examine these solutions in greater detail, denote the roots of $\Delta\pi(\rho, \lambda, \bar{h}^*) = 0$ as $\bar{h}_{min}$ and $\bar{h}_{max}$:

$$\bar{h}_{min}(\rho, \lambda) \equiv \frac{1-\lambda-R(\rho,\lambda)^{1/2}}{2} \leq \frac{1-\lambda+R(\rho,\lambda)^{1/2}}{2} \equiv \bar{h}_{max}(\rho, \lambda).$$

These roots are real if and only if $R(\lambda, \rho) > 0$, and lie strictly between $(0, 1)$ if $\rho > 1$. We have thus

Proposition 5 *If ρ and λ are sufficiently high, and thus $R(\rho, \lambda) \leq 0$, expected decent work profits always outstrip sweatshop profits $\pi_s(W_u) \leq \pi_d(W_u)$. If however $R(\rho, \lambda) > 0$, expected sweatshop profits are higher for intermediate values of $\bar{h} \in (\bar{h}_{min}(\rho, \lambda),\ \bar{h}_{max}(\rho, \lambda))$, and lower for extreme values, when either $\bar{h} < \bar{h}_{min}(\rho, \lambda)$, or when $\bar{h} > \bar{h}_{max}(\rho, \lambda)$.*

In Figure 2, the equilibrium $\bar{h}_{min}$ marks the minimal match likelihood required to kick-start a run of relative sweatshop profitability. The other expected profit equalizing match success likelihood is at $1 > \bar{h}_{max} > \bar{h}_{min}$ where decent work is uniformly more profitable thereafter.

3.4 Sweatshop Equilibria with Endogenous Entry

A final equilibrium condition governing entry incentives closes the model, and determines the equilibrium job arrival rate for workers α^*, the odds of successful match for employers $\bar{h}^*$, and jointly, σ^* through $\bar{h}^* = \bar{h}(\alpha^*, \sigma^*)$. With endogenous entry as in (18), as well as the definition of $\pi_d(W_u^*) = \pi^*(W_u^*)$ in (17):

$$\alpha_e^* = \delta c/((\bar{h}^*)^2 s_d) = \psi_e(N^*/v_m^*).$$

Equilibrium job arrival rate is thus:

$$\alpha^* = \psi\left(v_m^*/N^*\right) = \psi\left(\left(\psi_e^{-1}\left(\frac{\delta c}{(\bar{h}^*)^2 s_d}\right)\right)^{-1}\right) \equiv \alpha^*\left(\frac{(\bar{h}^*)^2 s_d}{\delta c}\right) \tag{26}$$

Since ψ and ψ_e are monotonically increasing functions, it follows therefore that both the ease of entry $(1/c)$, the expected gains upon entering $(\bar{h}^*)^2 s_d$, are positively associated with equilibrium overall job arrival α^*.

Figure 3 illustrates. The upward sloping OO schedule shows an *overall job arrival* schedule α^* based on (26), and plots the overall entry response to varying levels of match success odds $\bar{h}^*$. The downward sloping *decent work arrival* schedule $\alpha^*(1-\sigma^*)$ DD follows from our earlier discussion, and is re-incorporated here to determine the sweatshop equilibrium. As has been noted, DD summarizes the workings of the labor market from (1) - (13), which collectively imply that the higher the rate of decent work arrival, the lower will be the match success odds of a marginal decent work offer: $\bar{h}^*(\alpha^*, \sigma^*) = \delta/(\delta + \alpha^*(1-\sigma^*))$.

Clearly, when overall job arrival (α^*) coincides with decent work arrival $(\alpha^*(1-\sigma^*))$ at $(\bar{h}^o, \alpha^o)$, sweatshops are a non-issue $(\sigma^* = 0)$.[22] Henceforth, we will refer to this outcome as the sweatshop free benchmark.

Now to the right, any match success odds $\bar{h}^*$ higher than $\bar{h}^o$ may be sustained if overall job arrival α^* is greater than decent work arrival $\alpha^*(1-\sigma^*)$. Or equivalently, if sweatshops prevail $(\sigma^* > 0)$. The vertical distance between the two schedules gives the equilibrium incidence of sweatshop offers $\alpha^*\sigma^*$ consistent with free entry and labor market equilibrium (1) - (13).

Finally, match success odds to the left of $\bar{h}^o$, at $\bar{h}^{**}$, say, can never be an equilibrium outcome, for the incidence of sweatshops can never be strictly negative. Figure 4 combines (i) the overall job arrival schedule O, (ii) the decent work arrival schedule DD, and (iii) the endogenous choice of technique $\Delta\pi$ in (24). Together, they show the existence and configuration of the sweatshop equilibrium. The bottom panel furthermore illustrates a family of overall job arrival schedules (O_1, O_2, O_3) evaluated at successively lower costs of entry c.

There are two sets of cases of interest. The first set is straightforward, and includes all cases where ρ and λ are sufficiently large, such that expected decent work profits always exceed sweatshop profits (as with $R(\rho', \lambda') < 0$ in Figure 4). The model reduces to the Burdett-Mortensen world, where the sweatshop equilibrium coincides with the sweatshop-free benchmark $(\bar{h}^o, \alpha^o)$. Both $\bar{h}^o$ and α^o respond to exogenous shocks in the expected way: a rise in entry incentives s_d/c (going from O_1 to O_3) raises equilibrium job arrival α^o, to be followed by a corresponding decline

[22]From the definition of $\bar{h}^*(\alpha^*, \sigma^*)$, DD asymptotically approaches ∞ as $\bar{h} \to 0$, and zero as $\bar{h} \to 1$. Since the OO schedule is upward sloping, an intersection like $\bar{h}^o$ is thus unique and always exist.

in the odds of successful match $\bar{h}^o$.

Now for $R(\rho, \lambda) > 0$, endogenous choice of techniques in (24) requires that expected sweatshop and decent work profits are equalized at an interior equilibrium, respectively at match success odds $\bar{h}_{min}$ and $\bar{h}_{max}$. Together with the overall and decent work arrival schedules, three distinct types of equilibrium outcomes are revealed, depending on the relative positioning of the expected profit equalizing $\bar{h}_{min}$ and $\bar{h}_{max}$, and the sweatshop-free benchmark level $\bar{h}^o$. Since $\bar{h}^o$ ultimately depends on entry incentives s_d/c, let us define two critical decent work surplus to entry cost ratios, when overall job arrival $\alpha^*(\bar{h}^2 s_d/(\delta c))$ coincides with decent work arrival $\alpha^*(1-\sigma^*) = \delta(1-\bar{h}^*)/\bar{h}^*$ respectively at the two expected profit equalizing levels of match success odds $\bar{h}_{min}$ and $\bar{h}_{max}$:[23]

$$\begin{aligned} d_{min}(\rho, \lambda) &\equiv \{s_d/c| \;\; \alpha^*(\bar{h}^2_{min} s_d/(\delta c)) = \delta(1-\bar{h}_{min})/\bar{h}_{min}\}, \\ d_{max}(\rho, \lambda) &\equiv \{s_d/c| \;\; \alpha^*(\bar{h}^2_{max} s_d/(\delta c)) = \delta(1-\bar{h}_{max})/\bar{h}_{max}\}. \end{aligned}$$

Since $\bar{h}_{min} < \bar{h}_{max}$, it follows that $d_{min} > d_{max}$. Consider therefore to begin with any $s_d/c < d_{max}$ (O_1 in Figure 4 where $\bar{h}^o_1 > \bar{h}_{max}$). Here, the relative cost of entry is far too high, and consequently equilibrium match success $\bar{h}^o_1 > \bar{h}_{max}$ is likewise high enough so that the pre-emption of on the job search is not yet a priority. Expected sweatshop profits are thus strictly lower than expected decent work profit as shown for any $\bar{h}$ to the right of $\bar{h}^o_1$. The sweatshop equilibrium here once again coincides with the sweatshop-free $\bar{h}^o_1$.

With incentives to enter in the intermediate range $s_d/c \in [d_{max}, d_{min}]$ and thus $\bar{h}^o \in [\bar{h}_{min}, \bar{h}_{max}]$ (O_2), sweatshops are now more attractive on two grounds: (i) match success odds in the absence of sweatshops $\bar{h}^o_2$ is low enough to render worker retention a priority, while (ii) the relative cost of entry is likewise low enough to justify the adoption of inefficient sweatshops. There is thus a unique sweatshop equilibrium at the expected profit equalizing $\bar{h}_{max}$ in Figure 4. Compared to the sweatshop-free benchmark, the introduction of sweatshops implies a higher rate of overall job arrival $\alpha^*_2 > \alpha^o_2$, but decent work arrival $\alpha^*_2(1-\sigma^*_2)$ is diminished relative to α^o_2. Consequently, while the emergence of sweatshops does increase the number of jobs offers available per job seeker through ($\alpha^*_2 > \alpha^o_2$), this is accomplished at the expense of the rate of decent work arrivals ($\alpha^*_2(1-\sigma^*_2) < \alpha^o_2(1-\sigma^o_2) = \alpha^o_2$).

Even more striking is the last set of cases where $s_d/c > d_{min}$, where entry incentives are at

[23]This follows from the definition of match success odds $\bar{h} = \delta/(\delta + \alpha(1-\sigma))$, or $\alpha(1-\sigma) = \delta(1-\bar{h})/\bar{h}$.

their highest (O_3). There are three possibilities. If sweatshops are absent to begin with, acute competition for workers implies a very low match success likelihood $\bar{h}_3^o (< \bar{h}_{min})$ and a correspondingly high reservation sweatshop wage $y_s(W_u^*)$ (Proposition 4). This reinforces employers' incentives to adopt decent work, and accordingly, expected sweatshop profit is strictly less than decent work for any $\bar{h} < \bar{h}_{min}$ as shown in the figure. The sweatshop free benchmark $\bar{h}_3^o$ can thus be sustained as one possible equilibrium outcome.

The other two equilibrium outcomes apply if sweatshops have already been in existence at $\bar{h}_{min} > \bar{h}_3^o$ and $\bar{h}_{max} > \bar{h}_3^o$. Here, the reservation wage of the unemployed is made artificially low, and inefficient sweatshops profitable precisely because of the prevalence of sweatshops. The corresponding sweatshop equilibria are respectively at $\bar{h}_{min}$ and $\bar{h}_{max}$. In both cases, equilibrium overall job arrival rates $\alpha_{3,min}^*$ and $\alpha_{3,max}^*$ exceed their sweatshop-free counterpart α_3^o, and the corresponding incidences of decent work offers ($\alpha_{3,min}^*(1-\sigma_{3,min}^*) < \alpha_3^o$ and $\alpha_{3,max}^*(1-\sigma_{3,max}^*) < \alpha_3^o$) decline as soon as sweatshops emerge. Between the two equilibria, we note that $\bar{h}_{min}$ is additionally unstable in the standard Marshallian sense, since expected net profit gains from sweatshops is rising in $\bar{h}$ and hence σ^* in the neighborhood of $\bar{h}_{min}$. Henceforth, our comparative statics analysis of interior sweatshop equilibrium will focus on $\bar{h}_{max}$. In summary:

Proposition 6 *There are three possible sweatshop equilibrium configurations:*

I. *If $R(\rho, \lambda) < 0$, or if s_d/c is less than $d_{max}(\rho, \lambda)$, there exists a unique sweatshop equilibrium at $\sigma^* = 0$.*

II. *For $R(\rho, \lambda) > 0$, and intermediate surplus to entry cost ratio $s_d/c \in [d_{max}(\rho, \lambda), d_{min}(\rho, \lambda)]$, there exists a unique sweatshop equilibrium, where*

$$\sigma_{max}^* = 1 - \frac{\delta(1 - \bar{h}_{max})}{\alpha^*((\bar{h}_{max})^2 s_d/(c\delta))\bar{h}_{max}} \in (0, 1).$$

III. *For $R(\rho, \lambda) > 0$, and sufficiently high surplus to entry cost ratio $s_d/c > d_{min}(\rho, \lambda)$, there exist three distinct sweatshop equilibria $\{0, \sigma_{min}^*, \sigma_{max}^*\}$ where*

$$\sigma_{max}^* = 1 - \frac{\delta(1 - \bar{h}_{max})}{\alpha^*((\bar{h}_{max})^2 s_d/(c\delta))\bar{h}_{max}} > 1 - \frac{\delta(1 - \bar{h}_{min})}{\alpha^*((\bar{h}_{min})^2 s_d/(c\delta))\bar{h}_{min}} = \sigma_{min}^* \in (0, 1).$$

4 Discussion

Figure 5 plots in $(s_d/c, \rho)$ space the parameter combinations that support the three distinct sweatshop equilibria I - III in Proposition 6, when λ is less than unity.[24] A number of useful observations follow. For easy reference, we list here the expressions for some of the key variables of interest, evaluated at the equilibrium $\bar{h}^* = \bar{h}(\alpha^*, \sigma^*)$. Respectively, these are the equilibrium distribution of realized contracts $G^*(W)$ for $W \geq W_u^*$:

$$G^*(W) = \frac{\delta(1+\lambda)}{\alpha^*(1+\lambda(1-\sigma^*))}\left(\frac{1-\sqrt{\frac{p_d - y_d(W)}{s_d}}}{\sqrt{\frac{p_d - y_d(W)}{s_d}}}\right) + \frac{\sigma^*}{1+\lambda(1-\sigma^*)}, \tag{27}$$

and the total earnings of all workers including sweatshop and decent work:[25]

$$\begin{aligned} & N_m(n_d^* + n_s^*)\left(\int_{W_u^*}^{W_{max}^*} y_d(W) dG^*(W) + G^*(\bar{W}^*) y_s(\bar{W}^*)\right) \\ = \; & N_m n_d^*[(1-\bar{h}^*)p_d + \bar{h}^*(e_d + b)] + N_m n_s^*[e_s + b + (1-\bar{h}^*)^2 s_d]. \end{aligned} \tag{28}$$

4.1 Graduating out of Sweatshops

Figure 5 shows a sharp break between economies depending on the relative efficiency parameter ρ. For economies with high ρ's (regime Ia with $R(\rho, \lambda) < 0$ shaded in blue in the figure) sweatshops are never a concern. The break occurs at $\hat{\rho} = 4/(4 - (1-\lambda)^2) > 1$. In the complementary range of economies ($\rho \in [1, \hat{\rho})$), complications abound, with equilibrium outcomes ranging from no sweatshops in Ib, to II where employers can knowingly open up sweatshops (σ^*) even though sweatshops are relatively inefficient, and finally to III where there is a multiplicity of possible sweatshop equilibria.

Now since relative efficiency $\rho = (pq_d - e_d - b)/(pq_s - e_s - b)$ is governed by world price p, productivity q_i, effort cost e_i and unemployment income b, there is an amalgam of possible routes out of sweatshop equilibria, even in the complete absence of enforcement. It can be easily verified

[24] Regimes Ia and Ib in Figure 5 correspond respectively to the case of $R(\rho, \lambda) < 0$, and the case of $s_d/c < d_{max}(\rho, \lambda)$ in Proposition 6. A fourth regime in the figure includes cases where $\rho < 1 < 1/(1+\lambda)$, where as has already been noted in footnote 21, equilibrium is characterized by complete specialization in sweatshops ($\sigma^* = 1$), since $\bar{h}^*_{max} = 1$ is at one corner, while $\bar{h}^*_{min} = 0$ is at the other. The forgoing discussion can be straightforwardly extended to incorporate comparisons between all sweatshop jobs (Regime IV) and all decent work (Regime I) equilibria as well, by noting that the corresponding equilibrium overall job arrival rate can be simply read off of Figure 5 using the overall job arrival schedule O evaluated at $\bar{h}^* = 1$ in an specialized equilibrium with sweatshop jobs only.

[25] This follows from (5) and (10) - (13), upon a change a variable $F^*(W) = v$ with range $v \in [\sigma^*, 1]$ corresponding to $W \in [W_u^*, W_{max}^*]$.

that economies with low unemployment income b, for example, are naturally more prone to be trapped in the range of economies where the possibility of equilibrium sweatshops exists ($\rho < \hat{\rho}$). Similarly, costly improvements in labor standards that lowers the disutility of decent work e_d but at the cost of a diminished decent work surplus $pq_d - e_d - b$ overall has a similar effect. Finally, an increase in world price p in the absence of a corresponding increase enforcement will also favor the emergence and persistence of sweatshops if $\rho > 1$.

4.2 Enforcement and Unemployment Tradeoffs

A key question that besets the sweatshop debate is whether the emergence of sweatshop jobs (i) create jobs for the unemployed otherwise not available, or (ii) exchange decent jobs for sweatshop jobs with no net gains in total employment. To assess these questions, note first of all from Figure 5 that as enforcement λ rises, the range of ρ ($\rho \leq \hat{\rho}$) that accommodates regimes Ib, II and III is compressed, while the relevant zones for regimes II and III shift to the right.[26] In the limit as $\lambda \to 1$, sweatshops are a non-issue in any economy where decent work is relatively efficient, as $\hat{\rho} \to 1$ and the areas corresponding to regimes Ib, II and III vanish.

We can thus compare steady state employment rates n_d, n_s, as well as unemployment rate n_u in the two polar cases of (i) a sweatshop-free equilibrium due to strict enforcement sweatshop legislations as $\lambda \to 1$ and (ii) the corresponding interior sweatshop equilibrium with no enforcement in regimes II and III. With (10) and (11), as well as help from Figure 3 where $\bar{h}^*$ has been shown to be greater than $\bar{h}^o$, and α^* greater than α^o:

$$n_u^o = \frac{\delta}{\delta + \alpha^o} > \frac{\delta}{\delta + \alpha^*} = n_u^*$$

$$n_d^o = \frac{\alpha^o}{\delta + \alpha^o} = \frac{\delta(1 - \bar{h}^o)}{\bar{h}^o(\delta + \alpha^*((\bar{h}^o)^2 s_d/(c\delta)))} > \frac{\delta(1 - \bar{h}^*)}{\bar{h}^*(\delta + \alpha^*((\bar{h}^*)^2 s_d/(c\delta)))} = \frac{\alpha^*(1 - \sigma^*)}{\delta + \alpha^*} = n_d^*$$

$$n_s^o = 0 < \frac{\alpha^* \sigma^*}{\delta + \alpha^*} = n_s^*.$$

The expressions for decent work employment n_d^o and n_d^* follow by definition of $\bar{h} = \delta/(\delta + \alpha(1 - \sigma))$. Strict enforcement of sweatshop legislations thus gives rise to (i) the replacement of some sweatshop jobs by new decent work vacancies ($n_d^* < n_d^o$), but nonetheless (ii) a higher unemployment rate overall as enforcement has a net deterrent effect on the entry of vacancies ($\alpha^* > \alpha^o$).[27]

[26] To see this, note that by definition d_{min} and d_{max} in Figure 5 intersect at $s_d/c = 4\delta\alpha^{*-1}(\delta(1+\lambda)/(1-\lambda))/(1-\lambda)^2$. This intersection tends to ∞ as λ tends to 1.

[27] Unemployment impact of small changes in λ at an interior equilibrium is likewise of interest. From Propositions

4.3 Enforcement and Efficiency

With both a replacement of sweatshop jobs by decent work, and an overall increase in unemployment as entry is deterred, the impact of sweatshop legislations in efficiency terms is uncertain *a priori*. Thus, denote net manufacturing surplus at any instant as the sum of decent work and sweatshop surplus net of the total cost of entry: $N_m(n_d^* s_d + n_s^* s_s) - v_m^* c$. Total entry cost $v_m^* c$ can be obtained by noting from the definition of the matching function and endogenous entry (23) that $\alpha^* N_m(n_d^* + n_u^*) = \alpha_e^* v_m^*$, and $\alpha_e^*(\bar{h}^*)^2 s_d/\delta = c$ or

$$v_m^* c = \alpha^* N_m(n_d^* + n_u^*)(\bar{h}^*)^2 s_d/\delta.$$

Since the emergence of sweatshops unchecked by enforcement has been shown to raise the match success rate of the marginal decent work offer from $\bar{h}^o$ to $\bar{h}^*$, the relative ease of match success now encourages employers to incur entry cost $v_m c$ that would not have been spent if sweatshops were banned. Making use of (10), (11) and (23), it can be readily verified that net manufacturing surplus can be simply expressed as:

$$N_m(n_d^* s_d + n_s^* s_s) - v_m^* c = N_m(1 - \bar{h}^*)^2 s_d \tag{29}$$

where the equilibrium match success odds $\bar{h}^*$ once again plays a critical role. Thus, measured in terms of total manufacturing surplus net of the cost of entry, the combined effect of strict enforcement on sector-wide efficiency is in fact an unambiguous increase in net manufacturing surplus.

This result – where more (net manufacturing surplus) can be achieved with less (total manufacturing employment $N_m(n_s + n_d)$) – by enforcement of labor standards will be a real surprise if sweatshop prevails in an otherwise first-best world. But clearly this is not the case here since entry cost is positive and $\alpha^* < \infty$, and in addition inefficient sweatshop technology is chosen in a sweatshop equilibrium because of the capability deficit. We will return to the issue of the implications of two distinct types of distortions in Section 4.7.

2 and 6, stricter enforcement puts into motion three distinct forces going in different directions: a first effect which exposes more workers to a higher exogenous separation rate, and a second effect which lowers the incidence of sweatshops all else equal, and a third effect which lowers overall job arrival α^* as enforcement deters entry. Thus, the relationship between unemployment and enforcement may well be non-monotonic, with some economies aspiring to eliminate sweatshops through enforcement finding unemployment rising within some range of enforcement intensities, and others just the polar opposite along the road.

4.4 Enforcement and Distribution

To assess the distributional consequences of equilibrium sweatshops between employers and workers, let S^o denote the share of steady state workers' surplus net of opportunity cost b ($u(y_i, e_i) - b = y_i - e_i - b$) to total manufacturing surplus in the absence of sweatshops. From (28):

$$S^o \equiv \frac{N_m n_d^o \left(\int_{W_u^o}^{W_{max}^o} (y_d(W) - e_d - b) dG^o(W) \right)}{N_m n_d^o s_d} = 1 - \bar{h}^o$$

where n_d^o represents total decent work employment in the absence of sweatshops ($n_d^o = \alpha^o/(\alpha^o + \delta)$ from (10)), and $G^o(W)$ follows from (27) evaluated at $\sigma^* = 0$. Similarly, the share of net surplus going to decent work and sweatshop workers in the absence of enforcement can be similarly expressed using (28) as:

$$S_d^* \equiv \frac{N_m(n_d^* + n_s^*) \left(\int_{W_u^*}^{W_{max}^*} (y_d(W) - e_d - b) dG^*(W) \right)}{N_m n_d^* s_d} = 1 - \bar{h}_{max}^*,$$

$$S_s^* \equiv \frac{N_m(n_d^* + n_s^*)(y_s(\bar{W}) - e_s - b)G^*(\bar{W})}{N_m n_s^* s_s} = (1 - \bar{h}_{max}^*)^2 \rho < 1 - \bar{h}_{max}^*$$

The last inequality follows from (24) at an interior equilibrium $\bar{h}_{max}^*$. Comparing S^o, S_d^* and S_s^* with the help of Figure 3, we have the following ranking

$$S_s^* < S_d^* < S^o < 1,$$

since $\bar{h}_{max}^* > \bar{h}^o$ whenever sweatshops prevail in equilibrium. Thus, sweatshop laborers receive the smallest share of the (sweatshop) pie, but the emergence of sweatshops means that decent work employees command a smaller share of total decent work surplus compared to the sweatshop-free benchmark as well. Put another way, strict enforcement of anti-sweatshop legislations alters the equilibrium distribution of surplus. Importantly, the distributional shift associated with a policy ban on sweatshops actually goes against the interest of decent work employers.

In brief summary of what we have examined so far, strict enforcement of sweatshop legislation raises sector-wide net manufacturing surplus (section 4.3), and shifts the distribution of surplus in favor of continuing workers (section 4.4). The unavoidable cost of the policy, however, is in the unemployment that it creates as the legislation discourages entry (section 4.2).

4.5 Differential Responses to Competitive Forces

To further highlight the distinctive behaviors of economies with and without sweatshops, and thus of economies with and without adequate enforcement of sweatshop legislation, let us now examine the labor market responses to enhanced competition through ease of entry. Such an examination is of importance as it revisits a longstanding question: can competition for labor alone can bring forth efficient outcomes when at least some employed workers are subject to capability deficits.

Starting from a sweatshop-free equilibrium (region Ia,b or region III at the first one of the three equilibria at $\sigma^* = 0$ in Figure 5), it follows directly from (26) that as entry cost c tends to zero, the OO schedule rotates backwards. Consequently, equilibrium job arrival $\lim_{c\to 0} \alpha^o$ tends to infinity, while equilibrium match success $\lim_{c\to 0} \bar{h}^o = \lim_{c\to 0} \delta/(\delta + \alpha^o)$ tends to 0. Equilibrium profits $\lim_{c\to 0} \pi_d(W)$ likewise tends to 0 evaluated at $\sigma^* = 0$, since labor is priced based on marginal productivity in the limit ($y_d(W) \to p_d$ for all $W \geq W_u^o$ from (28) as $\bar{h}^o \to 0$). As should be expected, cost free entry in the sweatshop free benchmark gives rise to (i) zero expected profits, (ii) full employment ($\lim_{c\to 0} n_u^o = \delta/(\delta + \alpha^o) = 1$), and (iii) universal marginal productivity pricing of labor with $S^o = 1$ in the limit.

Starting instead from parameter values consistent with $\sigma^* > 0$ (Regime II, or σ^*_{max} in III) with inefficient sweatshops, lower entry cost increases the overall job arrival α^* in the usual way by rotating the overall job arrival schedule anticlockwise. Thus, employers expected profits approach zero as before, as the ratio of job seekers to employers $N_m(n_d^* + n_u^*)/v_m^*$, and hence α_e^* in (16) and (17), declines with successive waves of new entry. In tandem, sector-wide unemployment $n_u^* = \delta/(\alpha^* + \delta)$ also tends to zero.

But unlike the sweatshop free benchmark, a key difference here concerns how new job opportunities are in the end divided between sweatshop jobs and decent work. From (24), it can be clearly seen that once entry decision is made and the cost of entry (c) sunk, the equilibrium match success rate ($\bar{h}_{max}$) that equalizes the expected profits of sweatshop jobs and decent work is independent of c, all else equal. Equivalently, total decent work arrival $\alpha^*(1-\sigma^*) = \delta(1-\bar{h}_{max})/\bar{h}_{max}$ is independent of c. Unfettered free entry of new job opportunities without compensating increases in ρ, or in law enforcement can thus only lead to a corresponding decrease in the share of decent work offers ($\lim_{c\to 0}(1 - \sigma^*) = lim_{\alpha^*\to\infty}\delta(1 - \bar{h}_{max})/(\alpha^*\bar{h}_{max}) = 0$). In essence, any surge in job offers α^* brought about by lower entry cost alone will entirely be of the sweatshop variety.[28]

[28]To see this, suppose instead that a small fraction of new employers elect decent work, and by so doing they

Finally, in terms of the pricing of labor, note that since the equilibrium $\bar{h}_{max}$ is invariant to entry cost c, sweatshop workers' share of sweatshop surplus S_s^* also remains untouched at $(1-\bar{h}_{max})^2\rho$, and the corresponding share for decent work $S_d^* = 1-\bar{h}_{max}$ are both strictly less than one, and likewise invariant to c.

Two implications regarding the role of enhanced competition for labor in economies with equilibrium sweatshops can now be singled out. First, competition for labor alone is not sufficient to steer employers incentives clear of choosing inefficient sweatshop techniques for enhanced competition for labor brought about only by ease of entry is shown to in fact heighten the incentive for even more sweatshop jobs. Second, with lower cost of entry and rising prevalence of sweatshops, *expected* profits for any new entry of employers is driven to zero in the limit due to the paucity of workers that remain willing to hold out in search of opportunities other than sweatshop jobs, rather than the need to pay each worker in strict accordance with their marginal product in the sweatshop free benchmark to pre-empt voluntary quits with on the job search. Thus, competition for labor alone is not sufficient to correct for the biases in distribution S_s^* and S_d^* introduced by equilibrium sweatshops, nor can it bring about marginal productivity pricing in this setting, as individual employers continue to see little need to raise pay to retain workers.

4.6 Differential Responses to Policy Change

Economies with and without adequate enforcement of sweatshop legislations can also be seen to exhibit different responses to policy changes. Consider for example the role of unemployment benefits b. In a sweatshop free economy such as $(\bar{h}^o, \alpha^o)$ in Figure 3, a small increase in b rotates the overall job arrival curve clockwise for decent work surplus s_d is strictly decreasing in b. Equilibrium overall job arrival α^o accordingly falls, raising unemployment in familiar fashion $n_u^o = \delta/(\alpha^o+\delta)$. Concurrently, net manufacturing surplus $N_m(1-\bar{h}^o)^2 s_d$ falls, as higher unemployment benefits raise the reservation wage, and deter entry.

In contrast, starting from a sweatshop equilibrium with $\sigma^* > 0$ and no enforcement, the same increase in unemployment benefit rotates the overall job arrival curve as before. However, raising unemployment income also discourages worker participation in sweatshops, and by so

collectively lower the match success odds of the marginal decent job offer ($\bar{h} = \delta/(\delta + \alpha(1-\sigma))$) to the left of $\bar{h}_{max}$ in Figure 4. This intensifies the need to retain workers, and raises the relative expected profits of sweatshop jobs for $\Delta\pi$ is strictly positive for $\bar{h} < \bar{h}_{max}$ in the vicinity of $\bar{h}_{max}$. In equilibrium, it must be the case that total decent work arrival $\alpha^*(1-\sigma^*)$ remains constant despite new entry.

doing it steers employers away from the adoption of sweatshops since relative efficiency of decent work $\rho = s_d/s_s$ rises with unemployment income b (Section 4.1). Graphically, this results in a downward shift of the $R(\rho, \lambda)$ schedule, and a corresponding reduction in the equilibrium match success odds $\bar{h}_{max}$. Thus, whereas overall job arrival declines, unemployment $n_u^* = \delta/(\delta + \alpha^*)$ rises, and decent work surplus $s_d = p_d - e_d - b$ decreases with b, net manufacturing surplus $(N_m(1 - \bar{h}_{max})^2 s_d)$ can nonetheless increase with enhanced social safety net, as the composition of the work force shifts in favor of decent work.

4.7 General Equilibrium Implications

It is now a simple matter to extend the partial equilibrium setting of an urban manufacturing sector with a fixed number of workers N_m to a general equilibrium context. To see the key insights that this addition yields, it suffices to include one additional rural sector. Indeed, consider the simplest case, where production and employment in the rural economy is governed by a production function $Y_r = Y_r(\mathcal{L} - N_m)$, with diminishing marginal product $Y_r'(\mathcal{L} - N_m) \geq 0$ and $Y_r''(\mathcal{L} - N_m) < 0$. $\mathcal{L}$ denotes total manufacturing and rural population.

In addition, let rural employment be governed by marginal productivity pricing, with rural wage y_r determined by $y_r = Y_r'(\mathcal{L} - N_m)$ consistent with cost-free entry and the freedom to search on the job for all rural workers within the rural sector. In a steady state, the flow value of employment in the rural sector is thus simply:

$$rW_r = Y_r'(\mathcal{L} - N_m).$$

Migration equilibrium requires that the flow values of rural employment and urban job search are equalized, $rW_r = rW_u$, or from (3) and (6), $Y_r'(\mathcal{L} - N_m^*) = b + \alpha^* \int_{W_u^*}^{W_{max}^*} (W - W_u^*) dF^*(W)$. Using Proposition 4, we have

$$Y_r'(\mathcal{L} - N_m^*) = b + (1 - \bar{h}^*)^2 s_d, \tag{30}$$

where $(1 - \bar{h}^*)^2 s_d = \alpha^* \int_{w_u^*}^{W_{max}^*} (W - W_u^*) dF^*(W)$ is just the expected size of capital gains facing the urban unemployed contingent on arrival of decent work offer. In the absence of sweatshops in manufacturing production ($\bar{h}^* = \bar{h}^o$), the corresponding labor market equilibrium reads:[29]

$$Y_r'(\mathcal{L} - N_m^o) = b + (1 - \bar{h}^o)^2 s_d. \tag{31}$$

Finally, if in addition there is cost-free entry in manufactures, $\bar{h}^o \to 0$ from Section 4.5, and (31) further reduces to the labor market equilibrium of the standard two-sector trade model of the Ricardo-Viner variety, with intersectoral earnings differential equaling exactly the disutility of work e_d, since $\lim_{c \to 0} \bar{h}^o = 0$ and all manufacturing workers earn their marginal value product p_d:[30]

$$Y_r'(\mathcal{L} - N_m^c) = b + s_d = p_d - e_d \tag{32}$$

where a superscript "c" denotes equilibrium values in the standard two-sector trade model augmented with disutility of work $e_d > 0$.

In the parlance of the theory of the second best, any deviations of the sweatshop equilibrium with endogenous migration in (30) from the standard Ricardo-Viner world (32) can be decomposed, in terms of two distinct sources of distortions: (i) insufficient enforcement (where applicable in Regimes II and III), which accounts for any difference between (30) and (31), and (ii) costly entry which distinguishes (31) from (32).

In this context, sweatshops can be seen as partially offsetting the issue with lack of entry in this second-best world by raising the share of surplus going to all employers including *decent work* employers in the form of higher profits. However, it does so by creating its own distortion, as migration is deterred, and total labor allocation in manufacturing falls below N_m^o, because sweatshops bias the distribution of manufacturing surplus against workers. In particular, we have the following ranking of rural-urban labor allocation from (30) - (32):

$$N_m^c > N_m^o > N_m^*.$$

Thus, the lack of cost-free entry in manufacturing limits rural-urban migration, and the decline in workers' earnings due to the incidence of sweatshops limits rural-urban migration even further.

[29] Alternatively, we can additionally allows for on-the-job search for manufacturing sector jobs from the agricultural sector in a static general equilibrium model as in Fields (1989), by assuming a positive manufacturing job arrival rate for a rural seeker of urban manufacturing jobs, though at a frequency strictly less than that of an urban job seeker. This can be accomplished by augmenting the flow value of rural employment with capital gains that arise from urban job arrivals. The qualitative results of what we state in the sequel remains unchanged.

[30] Of course, if there is in addition constant marginal product of labor in the rural sector, the standard two-sector Ricardian model obtains.

Now rank order the magnitude of economy-wide unemployment,

$$N_m^o n_u^o > N_m^* n_u^* \geq N_m^c n_u^c = 0$$

where the emergence of sweatshops lowers both the rate of unemployment n_u^* and total unemployment as well since $N_m^* < N_m^o$ relative to the sweatshop-free benchmark, though universal employment cannot be attained unless there is cost free entry ($n_u^c = 0$) as shown in Section 4.5 as c tends to zero.

Finally, the juxtaposition of costly entry in manufacturing and insufficient enforcement has in general an ambiguous impact on total manufacturing employment, since the migration effect ($N_m^* < N_m^o$) runs in opposite direction from the employment effect ($n_d^* + n_s^* > n_d^o + n_s^o$) of sweatshops. Nonetheless, it follows directly from (30) and (31) that if and only if the elasticity of rural inverse labor demand schedule $\epsilon \equiv -d\log(Y_r'(\mathcal{L} - N_m))/d\log(\mathcal{L} - N_m)$ is sufficiently low, the size effect dominates, and:

$$N_m^c > N_m^o n_d^o > N_m^*(n_d^* + n_s^*)$$

since $n_u^c = 0$, and $n_s^o = 0$. Similarly, raising enforcement can have opposing impacts on manufacturing output, and in the end, the pattern of trade. Specifically, total manufacturing output is:

$$Q_m^* \quad = \quad N_m^*(n_d^* q_d + n_s^* q_s).$$

Favoring an increase in manufacturing output, strict enforcement encourages rural-urban labor migration, raising N_m^*. Favoring a decrease in manufacturing output, stricter enforcements decreases manufacturing employment rate $(1 - n_u^*)$. Finally, if in addition $q_s > q_d$, so that output per work in sweatshop is indeed greater than decent work, a final effect can further favor a decrease in manufacturing exports, as sweatshop employment n_s^* varies with λ from (11), (26) and Proposition 6. To pick out a clear cut possibility, if the rural sector of the economy resembles a reserve army of laborers, characterized by a relatively low elasticity of inverse labor demand ϵ, the first of these three effects dominate, and

Proposition 7 *Starting from a sweatshop equilibrium with $\sigma^* > 0$, strict enforcement of anti-sweatshop legislations raises the size of the manufacturing workforce ($N_m^* > N_m^o$). Manufacturing output likewise rises with enforcement ($N^*m(n_d^* q_d + n_s^* q_s) > N_m^o n_d^o q_d$) if the elasticity of the inverse labor demand ϵ is sufficiently low.*

5 Conclusion

Sweatshop jobs embody a broad range of work conditions other than earnings, including hours, health and safety standards, as well as representation. These conditions have been viewed as a cost or a productivity enhancing item in employers' annual balance sheets; a plus or minus term in a workers' instantaneous utility, and furthermore, as we have articulated in this paper, a set of conditions that dictates an employed workers' capability to participate in the market process of search. We find that the archetypal on-the-job search model of the labor market, augmented with all three of these features, generates a extensive list of new insights concerning labor markets where sweatshop jobs, decent work, and unemployment co-exist.

At the level of individual workers and employers, it has been shown that (i) the value of sweatshop jobs are pinned to the bottom of the equilibrium distribution of endogenously generated contract values, and (ii) unregulated choice of techniques can generate inefficient outcomes even in this world with no scale economies, or learning and informational considerations. In the aggregate, our analysis underscores the joint importance of social safety nets, technologies, ease of entry, as well as domestic and global market forces in determining the prevalence of sweatshops even in the complete absence of enforcement.

Interestingly, in the second best world of inefficient sweatshops, efficiency considerations as measured by the size of the net manufacturing surplus, and equity considerations as measured by the share of total manufacturing surplus going to employed workers, are shown to be not at all in conflict with one another. However, anti-sweatshop proposals will nonetheless present a set of non-trivial tradeoffs for policy-makers, if unemployment eradication is high on the policy agenda.

The value-added of focusing on the capability deficit of employed workers is furthermore shown here through the distinctive implications that market forces and policies can have on the two classes of labor markets, within the same Burdett-Mortensen model of on-the-job search. Indeed, the capability deficit sheds new light on the extent of trickle-down pricing from output price to sweatshop wages, the role of entry in inducing efficient choice of technique, as well as the efficiency implications of social safety nets.

These suggest a number of directions for future research, incorporating consumer, producer, and labor supply issues. To begin with, the effectiveness of "no-sweat" consumer activism clearly depends on the extent of trickle-down pricing from output price to wages. Meanwhile, the impact of firm level heterogeneity due, for example, to foreign direct investment, is likewise of interest particularly since we now have a framework that illuminates how decent work employers in fact strictly benefit from equilibrium prevalence of sweatshops. Finally, the impact of worker heterogeneity, due for example to international migration, is also relevant here since a generous welfare state can nonetheless be home to workers vulnerable to sweatshop employment, as long as there are workers, such as immigrant workers, who do not have access to social safety nets.

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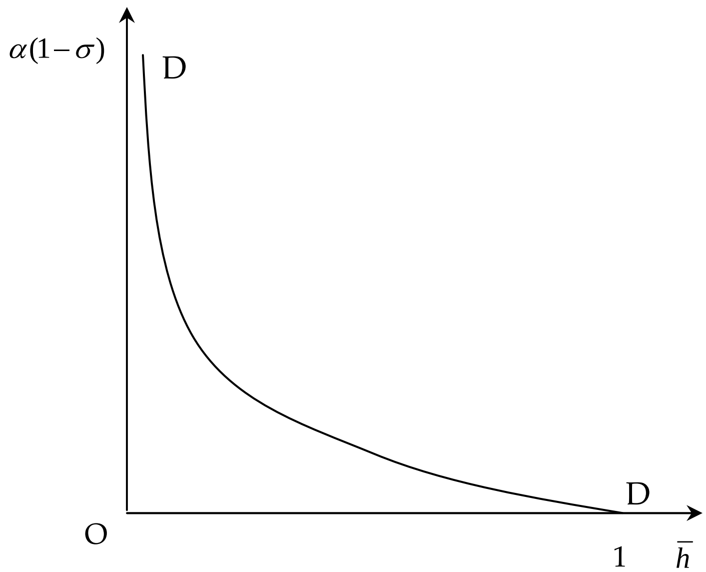

Figure 1
Decent Work Arrival Schedule

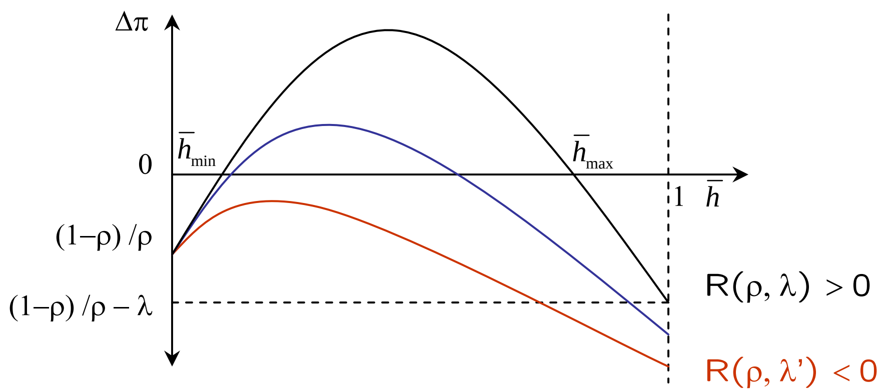

Figure 2
Expected Profit Equalization

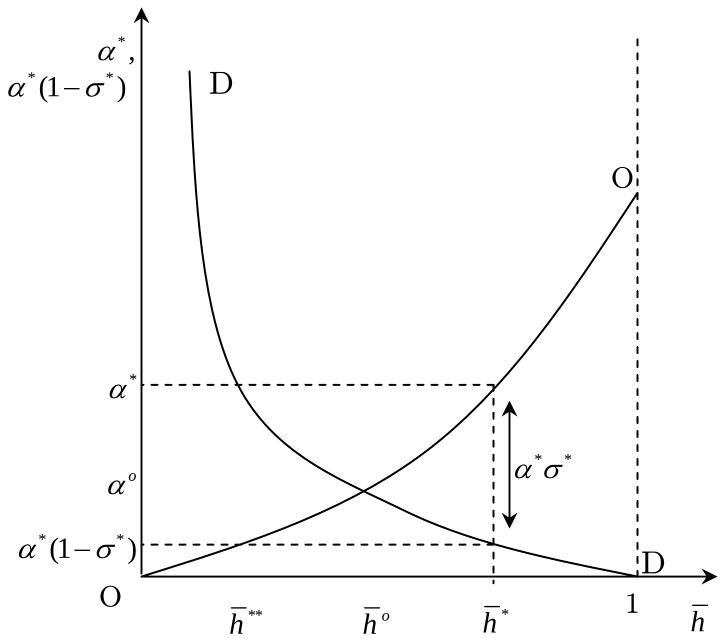

Figure 3
Overall Job Arrival and Decent Work Arrival
Schedules

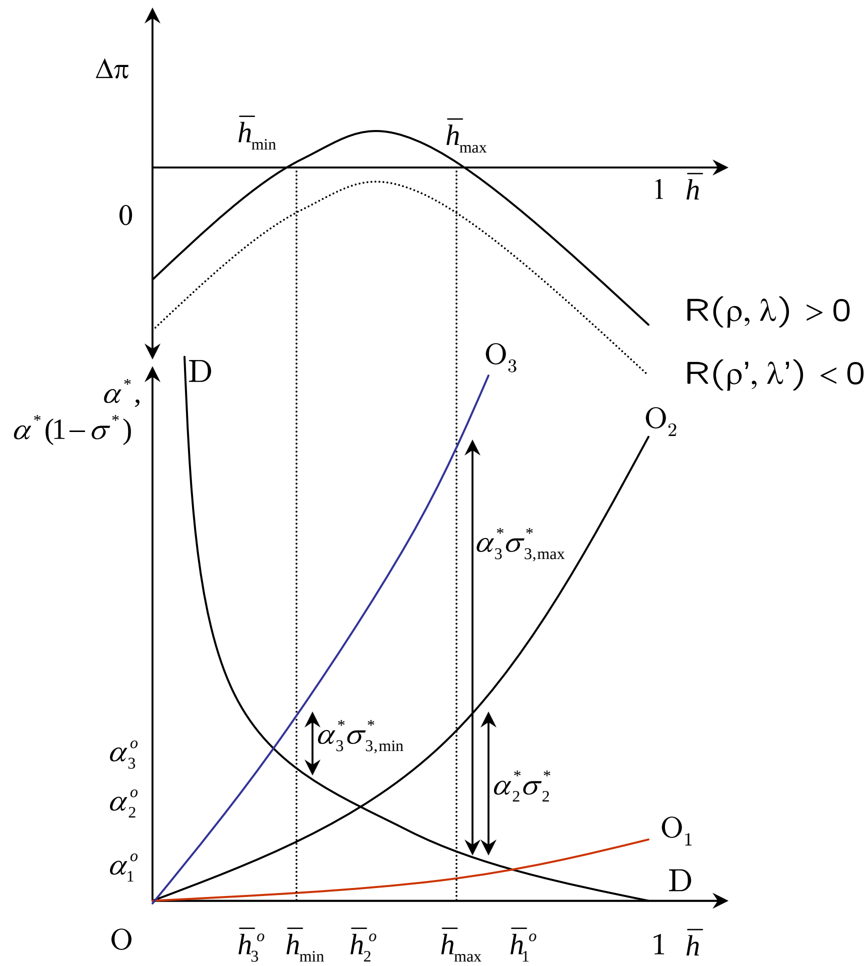

Figure 4
Equilibrium Match Success Odds and Job Arrival Rates

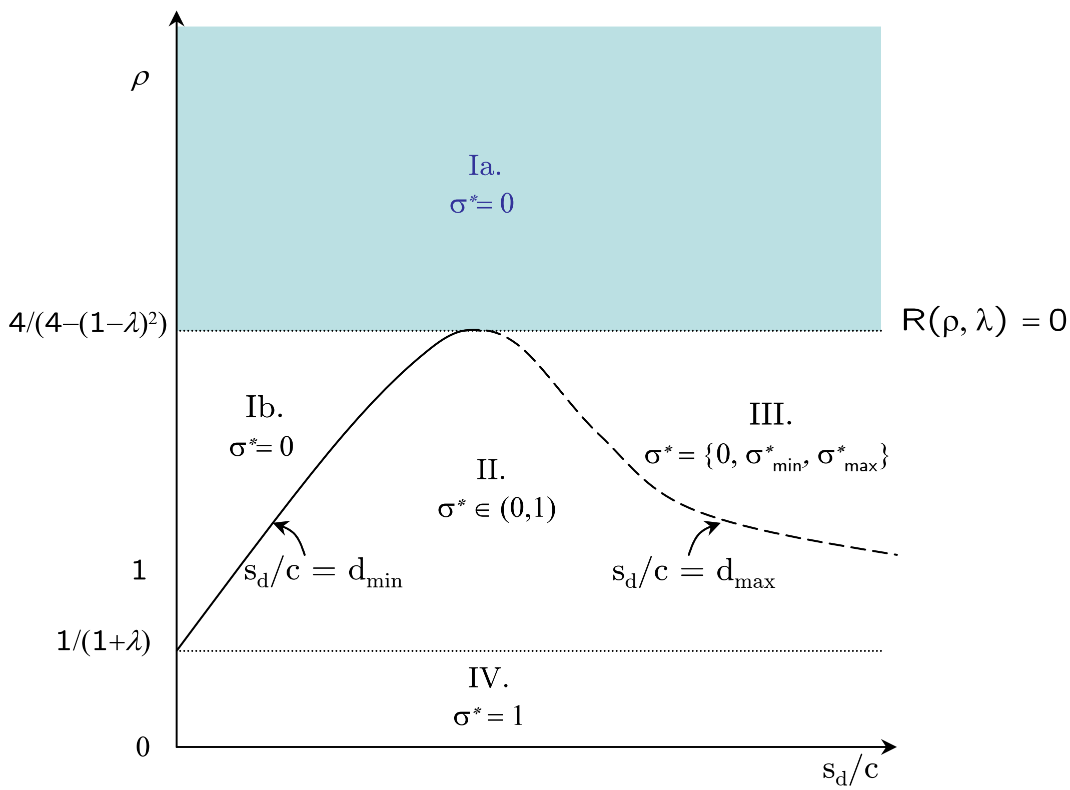

Figure 5
Sweatshop Equilibria