



Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/econmod

Labor market effects of export processing zones in the presence of unemployment

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ARTICLE INFO

JEL code:

F16

F22

Keywords:

Foreign firms

Host country workers

Unemployment

ABSTRACT

When foreign firms motivated by higher profits engage in off-shore production activities of unemployment ridden host countries, concerns increase about the possibility of exploitation of local workers. However, using a two good two factor model this paper shows that foreign firms' engagement under the scenario actually improves the host country's structure of wages, skill composition, employment level and wage inequality which cannot be achieved under full employment in the host countries. This paper thus presents a mechanism that explains the effects of export processing zones observed in most of the transitional economies of the world. Results have practical implications for traditional structural changes expected for these economies. Although foreign firms come to earn profits, it is possible for host country workers to take a part of the rent away from the foreign firms as they are doing currently in different parts of the world.

1. Introduction

The creation of Export Processing Zones (EPZs) has become an integral part of the globalization and integration of world trade. Its impact on the growth of exports and efficient utilization of global supply of goods and services has varied by countries. Discussions have also taken place about the economic and political resistance against it. One common element in these debates and discussions is that EPZs have been created mostly in the transitional economies and newly industrialized countries. These countries usually suffer from severe unemployment and one of the most important objectives that has been cited for creating EPZs is to increase employment.

Interestingly however, theoretical underpinning of the rationale behind the offshore trading or EPZs (also known as the enclave sector) so far has been done using the assumption of full employment (Brown et al., 2007; Lipsey, 2002; Arndt, 1999). The work that deserves a special attention in this regard is that of Jones and Marjit (1995, henceforth referred as J & M) who have picked a theoretical point that hasn't found its place in the literature before but that has been a stylized fact of many EPZs all over the world. The point in their analysis is that the foreign element in the new technology brought in by the foreign firms activates certain hidden traits of the domestic labor force. With that notion they have described and modelled the labor market effects of foreign investment in an enclave sector of an underdeveloped economy, however, with the assumption of full employment.

It reminds us that the factor that attracts foreign firms, namely the availability of cheap labor is more likely with unemployment. The analysis in the current paper borrows the core model of J & M to show that foreign firms would have much more favorable effect on employment, wage structure, skill composition and wage gaps of the host country when it faces unemployment compared to full employment in that country. This incorporation of unemployment is the difference between the core model of J & M and the model used for this paper where labor market effects cover more facets than described by J & M. The presence of unemployment actually brings out the efficacy of their model used in describing the real world situations (see also Gaston and Gulasekaran, 2013).

For example, as presented in their report to International Labor Office (ILO), Fu and Gao (2007) show that the introduction of EPZs has increased employment in China by 18% from 1995–2007 and increased the share of capital intensive and technology intensive industries from 64% to 76% during that time period. The share of average wage of Chinese Enterprises in that of Foreign Funded Enterprises has increased from 62% to 90%, and the share of expenditure on education and skill training in total expenditure has also grown at a high rate during that period. Creation of EPZs is also credited for robust regional growth in Vietnam (where they are known as Special Economic Zones) which has attracted a significant foreign capital together with foreign technology (Pan and Ngo, 2016). These effects encompassing different aspects of the labor market are also observed in Bangladesh, Kenya,

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<http://dx.doi.org/10.1016/j.econmod.2017.05.008>

Received 23 October 2016; Received in revised form 11 May 2017; Accepted 12 May 2017
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Malaysia and some other countries (Milberg and Amengual, 2008).

The purpose of this paper is to explain a mechanism through which all these changes experienced by China, Vietnam, Sri Lanka, Bangladesh and many other transitional developing economies are brought in by the offshore trading or the EPZs.

To maximize profits foreign firms, in this model with unemployment, move to the offshore areas of a host country to use its low wage unskilled labor with foreign skilled labor and advanced technology. Furthermore, foreign firms believe that some of the unskilled workers of the host country possess a potentially developable hidden skill that, if revealed after working in the foreign firms for a given period, would match the skill level of foreign skilled workers. Foreign firms would then be able to replace the costly foreign workers with the newly skilled local workers. The nature of the foreign technology is such that it brings out the hidden talent of the host country unskilled workers. This is a rather unrealistic assumption. However, when this assumption is replaced with a more plausible scenario where foreign firms train these workers for a given period of time conclusions still hold. Using a two good two-factor model the analysis in this paper shows that foreign firms' engagement in the offshore production activities reduce unemployment that is not possible in the model developed by J & M. Since additional production activities are supposed to create employment, this result is not at all counter-intuitive and it matches with the employment effects cited in the literature (Bottini et al., 2007; Goldberg and Pavcnik, 2007; UNCTAD, 2004; Lipsey, 2002; Arndt, 1999).

However, the production structure in this paper's model provides additional channels to favorable employment effects. This structure is consistent with the profit motives of foreign firms and it helps to reduce the unemployment further. For example, the skilled workers that foreign firms bring with them are costly not only because they are from the high wage source country, but they also need to have additional wage incentives to work in a place far from home. To lower the production cost, firms are expected to transform at least some of the hired unskilled host country workers into skilled workers by bringing out their hidden potential (either by allowing them to work as unskilled workers for a while or by formal training) to replace high wage skilled workers. This creates demand for local workers. This is evident from the impact of EPZs in China and Vietnam. For example, as mentioned before, EPZs in certain regions of China have spent as much as 7% of total expenditure in training and skill development (ILO, 2005).

Furthermore, since the production structure uses a mix of skilled and unskilled workers, additional demand for host country workers (to be used with skilled workers) is created (e. g., skilled and unskilled workers are used in a fixed proportion which portrays the use of non-production and production workers in the empirical analysis of Feenstra and Hanson, 1997). Finally, an enclave-led growth or growth induced by offshore production activities stirs up investment in local productive activities (by creating more human capital suitable for local industries) that becomes a new source of employment. This expansion of productive activities and investment in human capital become a component of productivity growth resulting from enhanced export (See Yang and Mallick, 2014). The possibility of hiring local workers and the complementarity between skilled and unskilled workers are also present in the core model of J & M; however, unlike their model these features are used to generate the favorable employment effect in the present paper.

With regard to the skill formation, the existing literature lacks any direct analysis of effects of foreign production activities on skill composition of the host country work force. However, the World Bank (1997) argues that developing countries should adopt policies to encourage additional human capital formation to attract more FDI. Moreover, several empirical studies suggest that both demand for skilled workers and skilled workers' wages (although under different sets of assumptions) go up in the host country following the production

activities of the foreign firms (Ernst and Sanchez-Ancochea for Costa Rica, 2007; Feenstra and Hanson, for Mexico, 1997; Fajnzylber and Fernandes for Brazil, 2004; Amiti and Konings for Indonesia, 2005).¹

In this paper's analysis, foreign firms convert local unskilled workers into skilled workers to replace high-cost home-country workers. Thus, the host country will have new kind of skilled workers suitable only for the foreign production. Additionally, the enclave-led growth results in new capital formation that leads to increased investment in human capital suitable for the domestic industry. Thus the model in my paper increases the skill composition of labor force by creating two types of skilled workers suitable for two different types for production activities—one for the foreign production and the other for the host country production. This phenomenon has also been observed in several studies. In describing the potential non-neutrality of technological advancement, Mallick and Sousa (2017) using National Bureau of Economic Research and Center for Economic Studies manufacturing data base show that technology has a positive and statistically significant relationship with skill-unskilled labor ratio. This rising skill endowment usually increases the welfare of the whole economy (Lutz and Turrini, 2006).

In discussing the wage inequality, empirical evidence provides a mixed picture. Brown et al. (2007) suggest favorable effects of foreign direct investment (FDI) and multinational firms on wages and working conditions of the host country workers. Feenstra and Hanson (1997) and Pissarides (1997) show an unfavorable effect in the form of increased wage gap between high and low skilled workers when outsourced low skill-intensive goods from the North become relatively high skill-intensive goods in the South. Jones and Marjit show that under full employment with a homogeneous labor force, foreign firms' production activities affect the structure of local wages favorably, even when these firms keep on earning a profit higher than what they have contemplated.² In my model, the interaction between the foreign production structure and the labor market distortion not only generates higher wages for newly skilled local workers suitable for foreign production activities, it also increases the wages of host country unskilled workers. This reduces both the inequality between similarly skilled foreign and host country workers and the wage gap between skilled and unskilled workers of the host country. Unskilled workers' wages that stayed stagnant in the core model by J & M, go up in my model because of the incorporation of unemployment. This reiterates the argument that McMillan and Rodrik (2011) has put forth in their NBER paper that transitional economies experience reduction in productivity gap and thus the wage gap as they go through structural changes (see also Jingjing, 2013).

The conventional belief is that foreign firms move in to earn profit and their ex-post profits are usually higher than their contemplated profit. In my analysis the ex-post profit under unemployment is lower than that with full employment and it is also lower than the contemplated profit, at least, for a part of foreign firms' stay in the off-shore areas.

The actual dispersion between the ex-ante and the ex-post profit depends on how the labor market distortion in the host country plays itself out. Foreign firms, therefore, cannot be sure about the actual profit. While the foreign firms, motivated to earn profit, may take this uncertainty into consideration, their total profit will still be positive should they move to the off-shore area.

Furthermore, the world economy will gain not only because of the higher employment and production but also from the favorable skill composition and the income distribution effects in the labor market of the host economy (by siphoning off some of the rents of the foreign

¹ However, Bardhan (2006) shows with data from China that FDI creates a huge middle class and Egger and Egger (2003) show for Czech Republic and Hungary that demand for unskilled workers goes up.

² For other empirical evidence see Aitken et al., 1996; Budd et al., 2002; Cooper, 2001; Glewwe, 2000; University of Chicago Magazine, 2000; World Trade Organization, 2000.

firms). We see that results will hold irrespective of whether unemployment is created by the exogenous or the endogenous distortion. The role played by these distortions are never focused in J & M's model although it opens up possibilities for both the developed and the developing countries. The developing (host) countries can thus have a choice in pursuing a policy of labor market distortion when they try to lure foreign firms. Policy debates in the foreign countries for those engaging in the offshore area trading will also be influenced by the profit prospects of the footloose firms (firms that tend to move to other countries). This analysis sheds new lights on the argument that foreign firms and multinationals exploit workers in the developing countries by paying low wages. Thus, the paper complements the literature in the debate over whether the movement of foreign firms in the developing countries reduces the wages of the local workers and whether the mobility of factors (foreign capital and technology) results in the deterioration of the working condition of the local workers.

The following section presents the core model followed by the discussions of the effects on the wages structure, the skill composition and the employment of the host country in Section 3. Section 4 compares the effects of the exogenous distortion with that of the endogenous distortion. The concluding remarks are in Section 5.

2. Model

In the following two subsections I lay out the production structures and related assumptions in both the mainland of the host country and its offshore area. Similar production structure has been used by Jones and Marjit (1995) but with full employment.

2.1. Mainland production structure in the presence of unemployment in the host country

The host country produces two goods, X and Y , under constant returns to scale using both skilled and unskilled workers (H and L). The production conditions can be written as

$$X = F(H^X, L^X) \quad (1)$$

$$Y = G(H^Y, L^Y) \quad (2)$$

Where $H^j(L^j)$ denotes $H(L)$ going into production of j th commodity, $j = X$ and Y . The competitive profit conditions for the hinterland can be expressed as $C^j(W_H, W_L) = P_j$. The employment conditions in this economy are

$$C_H^X(W_H, W_L)X + C_H^Y(W_H, W_L)Y = H \quad (3)$$

$$C_L^X(W_H, W_L)X + C_L^Y(W_H, W_L)Y = L \quad (4)$$

when W_i is the wage of each type of workers, $i = H, L$ and C_i^j , that denotes the partial derivative of cost, C^j , with respect to W_i , shows the unit input co-efficient. H is the total number of skilled workers and L is the number of unskilled workers who are employed. The country actually starts with N individuals and a special resource K . This special resource is used to transform a part of N into skilled work force, H .³ Thus $E (= N - H)$ is the size of the unskilled work force of which L is used in the production process. The level of K in the country together with the rule of equalization of discounted net income streams from the skilled and the unskilled labor market determine the size of the initial skilled labor force. K is not large enough to transform the entire labor force into skilled workers. There is perfect competition in both commodity and factor markets. This description would perfectly fit the Heckscher-Ohlin framework except that in the unskilled labor market $L = E - U$, where E is the total supply of unskilled workers and U (L) is the number of unemployed (employed) workers in the

unskilled labor market. This unemployment is the result of a distortion created by the efficiency wage (which is an above equilibrium wage) in the labor market.⁴ The above-equilibrium wage and the resulting unemployment are used to induce non-shirking in this market (The derivation of the non-shirking equilibrium is given in the Appendix A).⁵ Although this is an above equilibrium wage, it is still attractive to the foreign producers.

2.2. Interactions between the Host country (Mainland) and its Offshore Area⁶

The host country (a small open economy) is engaged in trade with the outside world, let's say, a developed country by exporting the relatively unskilled labor intensive good Y and importing the relatively skilled labor intensive good X .⁷ Host country workers can't move out of the country. Thus, job- markets in other countries are not accessible to these workers.

Suppose that foreign firms move in the offshore areas with their skilled labor and advanced technology that is not at all familiar to the host country workers. Foreign producers use a fixed combination of skilled and unskilled workers to produce a unit of output of a good, Z , and hire unemployed unskilled workers from the mainland labor market to work with its skilled workers. To lure foreign firms, the host country usually provides concessions (such as relaxed regulations and tax exemptions) for the offshore area. Local workers don't shirk in the enclave area because they are energized with the expectation of revealing their skill and earning higher wages. The foreign firms, thus, don't face non-shirking constraints or any other labor market distortions while hiring workers from the main land.⁸

Although foreign firms hire these workers to satisfy the demand for unskilled workers, they believe that some of these unskilled workers possess a potentially developable hidden skill which, if revealed, would match the skill level of foreign skilled workers employed with the wage, W_s^* . It implies that local workers' hidden skill would be revealed once they work in the foreign firms for a while as unskilled workers. Although this assumption is rather extreme, it is used to keep the analysis simple. More realistic story is that foreign firms are usually eager to invest in training the local workers to bring up their potential skill to the skill level of foreign workers. However, it can be shown that a formal training for a specified period, say, a year or more would bring similar results.⁹ This revealed skill can be used only with foreign technology and it has no demand in the mainland. Thus, the return to this skill is zero in the mainland. The distribution of this hidden skill among host country workers is unknown to both the foreign firms and the local workers.

Foreign firms hire only unskilled workers from the mainland. They believe that skilled workers of the host country either don't have that particular skill suitable for the offshore area production or their hidden

³ It can be thought of as the specific educational input such as a composite of teachers, laboratories, computers, etc. (see Findlay and Kierzkowski, 1983).

⁴ The literature supports the existence of efficiency wages in developing countries (see Agenor, 1999; Gatica et al., 1999; Basu, 2004a, 2004b). Also see Davidson (1990) and Kreiakemeier and Nelson (2006).

⁵ See also Akerlof and Yellen (1986 and 1990); Katz (1986); Yellen (1984); and Shapiro and Stiglitz (1984).

⁶ A similar structure has been used by Jones and Marjit (1995) in their analysis of the effect of foreign firms under full employment.

⁷ The literature on offshore area growth allows limited amount of trade for the mainland; however, the nature of that limited trade is not revealed. In my analysis I introduce an explicit trade pattern for the host country.

⁸ Unskilled workers' jobs are usually dirty, dangerous and monotonous, whereas skilled workers' jobs are usually clean, safe and rewarding (in the sense of having fun with invention and innovation). The expectation of revealing the latent skill and becoming a skilled worker in the future keeps local unskilled workers in the enclave from shirking.

⁹ As one of the reviewers has suggested, this training or rather the cost of training can be treated as wage subsidy to deal with the participation constraint or to lure the workers to the off shore.

skill (useful for offshore activities) may be gone because of their training for a specific skill used only in the mainland productive activities. In the market for unskilled workers, foreign firms will hire the unemployed unskilled workers because these workers may be willing to work at a wage lower than the wage that unskilled employed workers earn from the mainland.

The revelation of the hidden skill occurs after the mainland unskilled workers work with foreign skilled workers for a year (for example). The workers who reveal their skill no longer would work as unskilled workers and would work alongside the foreign skilled workers performing the same tasks (same productivity), earning the same wage W_s^* (wage premium) and eventually replacing all the foreign skilled workers.¹⁰ The workers, revealed not to have the skill, go back to the mainland because they lose the prospect of earning the wage premium. They will no longer be willing to work in the foreign firms as unskilled workers at a wage lower than their expected wage in the mainland. The process continues as foreign firms keep on hiring a new set of unskilled workers from the mainland in each period until all foreign skilled workers are replaced assuming a given level of output.¹¹

When all foreign workers are replaced, wages of the newly skilled local workers in the offshore area fall to the level of mainland wage (which is less than W_s^*) of the unskilled sector. Since production in the offshore area needs skilled workers and newly skilled workers have no other alternative employment, they accept the mainland wage of the unskilled employed workers (maximum wage they could earn if employed in the mainland). The host country unskilled workers take all these factors (possibility of earning W_s^* for a period, then earning a lower mainland wage and return migration) into consideration and move to the off-shore area when discounted lifetime return in the offshore area is higher than that in the unskilled labor market of the host country. The commodity, Z , produced in the offshore area is a Hicksian composite mix of various commodities. All output of Z is for export markets and the price of Z is determined in the world market. I assume that only a fixed amount of Z is produced.¹²

Suppose in the first period offshore firms need $a_u \bar{Z}$ of unskilled workers together with a given number of foreign skilled workers to produce a fixed amount of \bar{Z} where a_u is the unit requirement of unskilled workers. If η is the probability of revelation of hidden skill, $\eta a_u \bar{Z}$ of the initial batch of unskilled workers becomes skilled and replaces foreign skilled workers.¹³ The rest of the unskilled workers goes back to the mainland. In the next round a new batch of $a_u \bar{Z}$ unskilled workers will be hired from the mainland and the process will continue in the following periods. This implies that at the beginning of each period, t , the quantity of local newly skilled labor (those who have revealed their hidden skill) hired by the foreign firms is given by $(t - 1)\eta a_u \bar{Z}$. Let's assume that all foreign workers are replaced in period n . So the hiring of unskilled workers will continue up to period n . From that period onwards a fixed proportion of unskilled and local newly skilled workers carry on off-shore production.

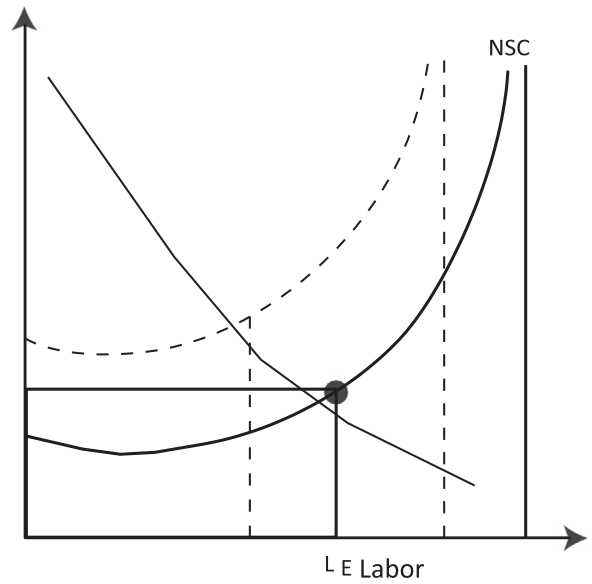


Fig. 1. Labor market with efficiency wage.

We know that an unemployed worker will join the foreign firms when the discounted present value of income stream from the offshore area is higher than that in the main land. In the following, the process is described using Fig. 2A. The wage of an unemployed unskilled worker in the mainland is her expected wage. The expected wage in period t is $W_e = \lambda_t W_L + (1 - \lambda_t)0$ when $\lambda_t (=L_t/E_t)$ is the probability of being employed in the mainland ($0 < \lambda_t < 1$) and W_L is the wage of the employed mainland unskilled workers. Note that $W_e < W_L$ because of the existence of a pool of unemployed unskilled workers in the host country (see Fig. 2A). In the revelation period (the first period in the offshore area), the offshore wage for the unskilled workers is W'_t and it is lower (explained below and shown in Fig. 2A) than W_e . Local workers accept this lower wage in the first period because it is expected to be offset by the wage/skill premium if they reveal to be skilled.

The migration of unemployed unskilled workers out of the mainland and the return migration of those workers who reveal not to possess the skill suitable for foreign production activities affect the unskilled labor market of the host country according to the efficiency wage hypothesis (as derived in the Appendix A).¹⁴ Following the migration to the offshore area and the return migration, the size of the host country unskilled labor market or E goes down and the non-shirking curve or the labor supply curve satisfying the non-shirking condition for equilibrium moves upward. As a result the wage of the unskilled workers, W_L , rises and the employment or L falls. In Fig. 2A, we see that after the first period W'_t is rising and it keeps on rising till period n when all foreign workers have been replaced and migration from the mainland stops. This would affect the probability of employment following the migration in any period t , L_t/E_t . Since $0 < \frac{\partial L_t}{\partial E_t} < 1$ (see Eq. (11) in Appendix A), the probability of employment can move in either direction. The expected wage thus can go up or down. Let's assume that the mainland unskilled workers' wage following migration and return migration of workers goes up by γ_t in each period t and the new wage is $\gamma_t W_L$ when $\gamma_t > 1$.¹⁵ Let's also suppose that the probability of being employed changes in each period t by ρ_t . Thus the expected wage in the mainland changes in each period by $\gamma_t \rho_t$ (values of γ_t and ρ_t

¹⁰ If foreign firms provide training for a specific period to develop the human capital of the local workers, the wage premium would be less to take care of the training cost.

¹¹ To meet the initial need for skilled workers, foreign firms bring their own skilled workers. However, they usually replace their high-wage workers with cheaper locally skilled or newly skilled host country workers. It supports the fact that foreign workers usually are eager to return to home country. In analyzing data from International Monetary Fund and International Financial Statistics for Export Processing Zones (EPZ) of four Asian countries, Warr (1989) has acknowledged that unskilled host country workers usually get training to work with foreign advanced technology. This opens up the possibility of revealing the hidden skill of the local workers. He also has noted that wages and employment of both skilled and unskilled workers go up in the host countries as they open up the EPZs. My paper models a scenario when this can happen.

¹² The consideration of a growing output is expected to affect local skilled workers wage in the offshore area more favorably if the rate of growth of output is higher than the rate at which workers' skills are revealed.

¹³ Neither the mainland workers nor the foreign firms know the actual value of η except that $0 < \eta < 1$.

¹⁴ See Appendix A, especially equation 10, if necessary.

¹⁵ Note that following the migration and the return migration of mainland workers, the hinterland wage, W_L , goes up according to the efficiency hypothesis. The assumption here is just about the magnitude of the increase which is γ_t .

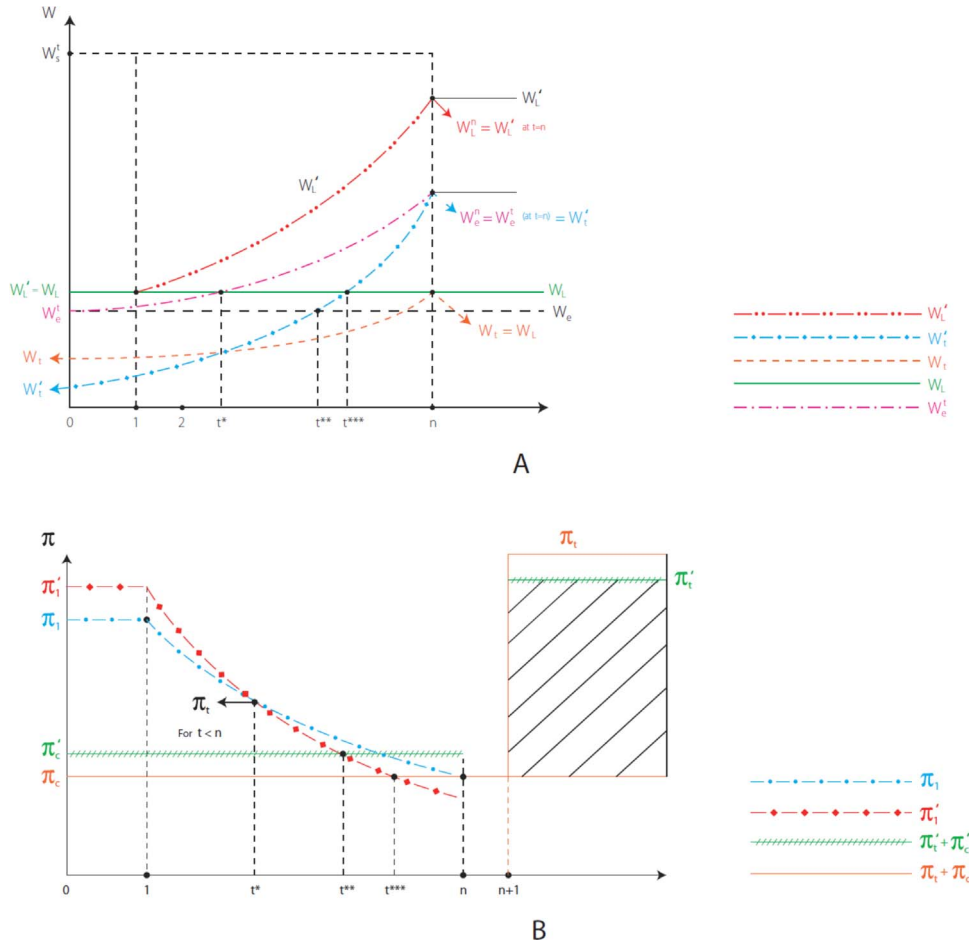


Fig. 2. Wages and profit with enclave production: Rising expected wage.

will depend on the elasticity of NSC curve and thus will vary) after the production activities start in the offshore area and until all foreign skilled workers are replaced. After the first period when foreign firms need to hire a new batch of unskilled workers in each t , the probability of these workers being employed in the mainland is no longer λ_t and thus the expected wage is no longer $\lambda_t W_L$. The expected wage in $t = 2$ becomes $\lambda_t W_L (\gamma_t \rho_t)$ where $t = 2$, and after period 2 it becomes $\lambda_t W_L \prod_{i=3}^S (\gamma_i \rho_i)$ for the period, $S = 3, \dots, n$.¹⁶ This is seen by the rising W_t^e . Since it keeps on rising until period n , at one point, say t^* , it cuts W_L and at n it is equal to W_t' . As the expected wage rises W_t' (the reservation wage of the migrant worker) rises too and at t^* it cuts W_t (reservation wage under full employment) and some later date, say t^{**} and t^{***} , it cuts W_e^e and W_L . Since there is unemployment, in Fig. 2A, W_t' starts below W_t . Although both start rising W_t' rises faster than W_t and thus W_t' crosses W_t .

I assume that workers are infinitely lived and income is discounted at the rate $\delta = \frac{1}{1+r}$ where r is the market rate of interest. Let's define V_M as the discounted present value of the expected income stream of an unskilled worker in the host country¹⁷ and V_E as the discounted present value of the expected income of a local worker in the offshore area. $V_E = W_t' + A + B$ where W_t' is the starting wage in the off-shore area; A is the income if the worker reveals to have the skill needed for the offshore area production and B is the income if the worker does not

possess the needed skill.¹⁸

Unskilled workers would be willing to move to the offshore area until the discounted value of the expected income stream is the same in the mainland as it is in the offshore area. Equating V_M with V_E we see that W_t' , the initial wage or the wage before the revelation of the hidden skill of the migrant offshore worker, will be less than the initial expected wage in the mainland, i.e., $\lambda_t W_L$. Thus, $W_t' = \frac{\lambda_t W_L}{1-\delta} A - B$ (shown in Fig. 2A). A migrant unskilled worker is willing to accept a

¹⁸ $V_E = W_t' + \eta \{ (\delta W_t^* + \dots + \delta^{n-t} W_t^*) + (\delta^{n+1-t} W_L \prod_{i=2}^n \gamma_i + \delta^{n+2-t} W_L \prod_{i=2}^n \gamma_i + \dots) \} + (1-\eta) \{ (\lambda_t (\gamma_t \rho_t) \delta W_L + \lambda_t \prod_{i=2}^3 (\gamma_i \rho_i) \delta^2 W_L + \dots + \lambda_t W_L \prod_{i=2}^n (\gamma_i \rho_i) \delta^{n-t} \} + (\lambda_t \prod_{i=2}^n (\gamma_i \rho_i) \delta^{n+1-t} W_L + \lambda_t W_L \prod_{i=2}^n (\gamma_i \rho_i) \delta^{n+2-t} + \dots)$ where η is the probability that the worker has the skill needed by the offshore production. $\eta \{ (\delta W_t^* + \dots + \delta^{n-t} W_t^*) + (\delta^{n+1-t} W_L \prod_{i=2}^n \gamma_i + \delta^{n+2-t} W_L \prod_{i=2}^n \gamma_i + \dots) \}$ is the discounted present value of income if the skill is revealed and after summing terms, this equals $\eta \left\{ \frac{\delta W_t^* (1-\delta^{n-t})}{1-\delta} + \frac{\delta^{n+1-t} W_L \prod_{i=2}^n (\gamma_i \rho_i)}{1-\delta} \right\}$ which I would call A , and $(1-\eta) \{ (\lambda_t (\gamma_t \rho_t) \delta W_L + \lambda_t \prod_{i=2}^3 (\gamma_i \rho_i) \delta^2 W_L + \dots + \lambda_t \prod_{i=2}^n (\gamma_i \rho_i) W_L \delta^{n-t} \} + (\lambda_t \prod_{i=2}^n (\gamma_i \rho_i) \delta^{n+1-t} W_L + \lambda_t W_L \prod_{i=2}^n (\gamma_i \rho_i) \delta^{n+2-t} + \dots)$ or B is the discounted present value of income if the skill is not revealed. In the above equation (for V_E) $(\delta W_t^* + \dots + \delta^{n-t} W_t^*)$ is the discounted income for the periods when an offshore area worker, after revelation of her skill, earns a wage that matches the wage of the foreign skilled workers, W_t^* ; $\{ (\delta^{n+1-t} W_L \prod_{i=2}^n \gamma_i + \delta^{n+2-t} W_L \prod_{i=2}^n \gamma_i + \dots) \}$ is the wage for the newly skilled workers in the offshore area after all foreign workers have left and the wage of the newly skilled workers matches the actual wage of the mainland unskilled employed workers (note that due to the change in the non-shirking condition or shift of the NSC curve the unskilled workers' wage in the main land rises by γ in each period). $\{ (\lambda_t (\gamma_t \rho_t) \delta W_L + \lambda_t \prod_{i=2}^3 (\gamma_i \rho_i) \delta^2 W_L + \dots + \lambda_t \prod_{i=2}^n (\gamma_i \rho_i) W_L \delta^{n-t} \} + (\lambda_t \prod_{i=2}^n (\gamma_i \rho_i) \delta^{n+1-t} W_L + \lambda_t W_L \prod_{i=2}^n (\gamma_i \rho_i) \delta^{n+2-t} + \dots)$ is the discounted income of the workers who do not possess any skill and return to the hinterland.

¹⁶ Although the wage of the employed unskilled workers in the mainland rises in each period for period $1 < t \leq n$, it is not expected to exceed W_S^* .
¹⁷ $V_M = (1-\lambda_t)0 + \frac{\lambda_t W_L}{1-\delta}$

lower wage in the revelation period because she knows that after the revelation period she will not only earn a premium of $W_s^* - \prod_{t=2}^S (\gamma_t \rho_t) \lambda_t W_L$, $S = 2, 3, \dots, n$, in each period if she possesses the hidden skill, but her expected wage will also be higher if she doesn't possess the hidden skill and returns to the mainland (as described on pg. 12–13).

Since host country workers are willing to accept a wage, $W_t' < W_t^e$, while moving offshore, the offshore area wage for the unskilled workers in the revelation period for each new batch of workers is affected by the probability of being employed (λ_t) in the mainland. If the unemployment is high, or probability of getting a job in the mainland is low, the wage of the revelation period (or period t) in the offshore area will be low. The high unemployment rate thus becomes an attractive factor for the foreign entrepreneurs.

We know that after n periods there would not be any foreign workers in the offshore area. Thus from period $n + 1$ the off-shore area wage of those workers, who have revealed a special skill suitable for the offshore production, will match the wage of employed mainland unskilled workers in period $n + 1$, i.e., $W_L \prod_{t=2}^n \gamma_t$. This wage is higher than the unskilled workers' wage in the initial period i.e., W_L but lower than W_s^* (since new skill has no use in the mainland, workers will accept this lower wage). This is shown in Fig. 2A where $W_L^n = W_L'$. While moving to the shore area the workers are thus aware that for the rest of their working life they will earn a premium. If their hidden skill is revealed, the premium is given by the second term in the right hand side of $W_t' = \frac{\lambda_t W_L}{1-\delta} - A - B$ and if skill is not revealed, the premium is given by the third term of that equation.

The expected wage is defined as the actual wage times the probability of being employed. Depending on the wage effect (γ_t) and the employment effect (ρ_t), the expected wage in the mainland may either increase or decrease after the production activities start in the offshore area. I will focus on the effects of offshore area production on the host country labor market when expected wages go up.¹⁹

3. Effect on the wage structure, the unemployment and the skill composition in the host country

Suppose that the proportionate increase in wage (γ_t) and the proportionate change in employment rate (ρ_t) are such that the expected wage goes up.

3.1. Foreign and host country wage gap and skilled-unskilled wage gap

In the presence of unemployment in the host country the offshore wage of the unskilled worker in the revelation period, $W_t' (= \lambda_t W_L)$, will be lower than that with full employment in the mainland, W_t^e (see Fig. 2A). In each period $1 < t \leq n$, both W_t' and W_t^e will rise for each new batch of workers. With full employment in the host country as t increases, the number of period these new workers can earn skill premium is reduced. So W_t^e rises to make up for that loss. With unemployment, the loss in premium as t (as a starting period) rises, comes from two sources: i) the number of period the workers can earn premium is reduced ii) the size of the premium (the difference between the expected wage and the off-shore wage) is reduced as expected wage of unskilled workers in the host country increases by varying $\gamma_t \rho_t$ in each period. Thus, the reduction in the skill premium will be higher with unemployment in the host country than that with full employment. As a result, W_t' will rise more steeply in the following periods compared to the rise of W_t^e (Fig. 2A).

Furthermore, from period $n + 1$ when all foreign workers have been

¹⁹ When expected wages fall, the revelation wage for each successive batch of workers will fall and wage premium will go up. This will result in higher profits for the foreign firms in all the periods. The detailed derivation and the graphs can be made available if requested.

replaced (period n) the foreign firms will have to pay the newly skilled workers a wage, $W_L \prod_{t=2}^n \gamma_t$ ($= W_L'$ or unskilled workers' wage in the mainland at that time), that is higher than the wage, W_L , paid to the local workers with full employment in the host country. The opening up of the offshore production in the presence of the endogenous wage distortion in the host country thus changes the wage structure of the unskilled workers of the mainland in two distinct ways. It not only creates a wedge between the wage received by those who reveal their latent skill, W_s^* or $W_L \prod_{t=2}^n \gamma_t$ (after period n), and the expected wage of those who reveal to be unskilled and remain unemployed, $\lambda_t W_L \prod_{t=2}^n (\rho_t \gamma_t)$, but, in addition, it changes the wage levels of employed unskilled workers in the mainland in each period until all foreign workers have left the off-shore production (i.e. period n) from W_L to $W_L \prod_{t=2}^n \gamma_t$ (or W_L'). Thus, it reduces the wage gap not only between foreign skilled and local skilled workers in the enclave, but it also reduces the skilled-unskilled wage gap in the mainland. Under full employment the wage gap between foreign workers and the newly skilled offshore workers (after all foreign workers are gone) is $W_s^* - W_L$; under unemployment this gap reduces to $W_s^* - W_L \prod_{t=2}^n \gamma_t$. This tendency towards reduced disparity of world's skilled wages is possible because of the endogenous wage distortion in the unskilled labor market of the host country. Furthermore, under full employment the skilled/unskilled wage gap is $W_H - W_L$; under unemployment this gap is $W_H - W_L \prod_{t=2}^n \gamma_t$. Thus, compared to the situation when there is full employment in the host country, migrant unskilled workers under unemployment will earn a premium in each period after the revelation no matter whether they possess the hidden skill. The total lifetime premium will also be higher than what it will be under full employment. This would have implications for the profit expectations of the foreign entrepreneurs (shown in Section 3.3 using Fig. 2A and B).

3.2. Skill composition

I will now describe how the offshore production changes the labor composition of the host country. Before production starts in the offshore area, the host country has two types of workers H (skilled workers) and E (total unskilled workers of which L is employed). As the offshore production activities start, a different group of skilled labor or local skilled workers usable only in foreign firms, H' , is created in the offshore area. The total number of skilled workers, \bar{H} , equals $H + H'$. The total number of unskilled workers is $E - H' = E'$. Since $H < \bar{H}$ and $E > E'$, \bar{H}/E' will rise. Thus offshore production raises skilled-unskilled labor ratio in the host country.

Furthermore, since a bigger size of the total mainland workers (both skilled and unskilled) are now employed and since unskilled employed workers in the host country earn higher wage compared to the wage before the offshore production starts, the host country enjoys an increase in total income. This will generate additional savings/investment. New capital goods (special input, K) would be created. From our discussion of skill formation in Section 2.1, we can see that it would be possible for the host country to increase the size of its skilled workforce suitable only for mainland production from H to H'' . The total number of skilled workers is now $\bar{H} = H + H' + H''$ and this will increase skilled/unskilled labor composition further.

3.3. Implication for profits

The contemplated profit (that foreign firms expect from their moves to the offshore area), \prod_c , of the foreign entrepreneurs will be higher in the presence of the unemployment in the host country than what it would be if the country enjoys full employment. This happens because the reservation wage of unskilled workers with unemployment in the host country, $\lambda_t W_L (= W_L)$ is less than the reservation wage, W_L (host country wage) without unemployment. We know that $\prod_c = P - a_u W_L - a_s W_s^*$ and $\prod_c' = P - a_u W_e - a_s W_s^*$ are the contemplated profits under full employment and unemployment respectively.

For $t < n$ since $W_c < W_L$, $\Pi_c < \Pi'_c$ and that is why Π'_c lies above Π_c .

(see Fig. 2A and B for changes in profits resulting from changes in wages).

Suppose the starting wage of an employed unskilled worker in the host country is the same under unemployment and full employment. After offshore productive activities start, the employed unskilled worker in the mainland will gain in actual wages only under unemployment. This is an extra benefit from offshore area growth with the efficiency wage distortion in the host country. We see that although the existence of unemployment in the host country makes the foreign entrepreneurs think that there is a greater prospect of profit in the presence of unemployment compared to that with full employment, unskilled workers enjoy a higher wage and higher life time income while foreign entrepreneurs' profit goes down at least for a part of their stay. In Fig. 2B profit with unemployment, Π'_t , is higher than the profit with full employment, Π_t in the first period; then it starts going down and matches Π_t at t^* when W'_t (revelation period's wage under unemployment) intersects W_t (revelation period's wage under full employment) and W_c intersects W_L . Π'_t becomes lower than Π_t for $t > t^*$. We see that $\Pi'_t = \Pi'_c$ for $t = t^{**}$ when $W'_t = W_c$ and $\Pi'_t = \Pi_c$ at $t = t^{***}$ when $W_c = W_L$ (see Appendix B for detailed explanation of implications for profits).

After period n , say $n+1$, $\Pi_t > \Pi'_t$ because under full employment migration of workers to the offshore area does not change W_L . However, migration under endogenously created unemployment raises the wages of unskilled workers in the mainland. This increased wage then becomes the wage of the newly skilled mainland workers (who moved to the offshore area) when all foreign workers have left. Thus, $\Pi'_t < \Pi_t$ in Fig. 2B.

It is also important to note that, although unemployment in the host country may excite foreign investors to take advantage of unemployed resources, foreign entrepreneurs will end up earning a profit that is, at least for a part of their stay in the host country, lower than the profit earned with full employment. Thus with a factor market distortion, the host country gains more from offshore area activities.²⁰

3.4. Implication for trade

Offshore area activities will increase H and reduce L thus increasing the supply of the import good X and reducing the supply of the export

²⁰ The scenario presented in this paper describes the long-run effects. In the short run, the host country workers wouldn't be successful in taking away from foreign firms as much rent as shown in the paper. They would still enjoy a skill premium but it would be much less than what they enjoy in the long-run. It should be noted that there is a difference between the H-T structure and the model presented in this paper. Although both of them have similarity as regards the wage gap between the short run and the long run, in H-T model labor moves from a sector with full employment to a sector with unemployment and the long run equilibrium is achieved as unemployment equilibrium. The unemployment in the urban sector plays a crucial role in achieving this equilibrium from the short run to the long run. In this paper, labor moved from the sector with unemployment to the sector with full employment. Long run equilibrium is achieved with a decision by firms to stop hiring workers or to stop migration when all foreign workers have been replaced. Unemployment or migration resulting from unemployment thus is not a crucial factor in achieving this equilibrium in the long run. The long run result is obtained through the competitive behavior of the firms. A firm in the EPZ offers (W_0, W_H) where in a simple two period model, W_0 is the wage for the first period and in period 2, after skill is revealed, the firm offers W_H . The worker compares his life time earning between the main land and the EPZ and tries to maximize his reservation wage W_r . His maximization problem then becomes $Max \{2W_r, (W_0 + pW_H + (1-p)W_r)\}$ where p is the probability of the skill being revealed. If he doesn't migrate he gets W_r in both the periods and if he migrates then he gets $W_0 + pW_H + (1-p)W_r$. Thus, in equilibrium $2W_r = W_0 + pW_H + (1-p)W_r$ or $W_0 = W_r - p(W_H - W_r)$ or $W_0 = (1+p)W_r - pW_H$. In the short run when there is only one firm W_0 would be less than what it would be in the long run when due to free entry there are more firms. In comparison to H-T model, one may think of the existence of full employment in the EPZ as a limitation of the model requiring a different look at the comparison of the short and long run environment when more firms enter the EPZ. Although the foreign firms start with a given level of W_0 and W_H , they would change if there is competition in the EPZ due to the entry of new firms.

good Y . Even if the host country is not large enough to influence the world terms of trade, the volume of trade of the host country will be affected. If we define E_Y and E_X as the excess supplies of good Y , and good X then E_Y will decrease and E_X (which is negative before offshore production starts) will increase.

Thus, both volume of exports and volume of imports from the mainland will go down. Although offshore activities generate exports, they do not necessarily increase trade for the host country. This is contrary to the common belief that foreign firms increase trade by using the unused unskilled workers. Thus, when offshore growth under unemployment is taken into consideration, factor mobility may not augment movement of goods across national boundary.

4. Enclave activities under exogenous distortion

I will now describe a scenario when the host country government will not let its workers move to its off-shore area unless the foreign entrepreneurs agree to pay a minimum wage (for example, a wage that is equal to the host country wage, W_L). It will be easier for the host country government to ask for a minimum wage in the offshore area if it already pursues a policy of a minimum wage in the mainland (which is observed in many developing countries).

As in the case of the endogenous distortion the expected wage will be lower than the actual wage with the minimum wage distortion (that creates unemployment). In the case of the endogenous distortion the expected wage may increase each time some of the unskilled workers move to the offshore area (due to the increase in the actual wage following the shift of the NSC curve). With the exogenous distortion the expected wage does not increase that much because the actual wage stays the same (although the reduction in unemployment following the exodus of some of the unemployed workers will increase the expected wage somewhat). Thus, with the exogenous distortion, the profit in the revelation period will be higher than that with the endogenous distortion but it will be less than that with no distortion.

Since the expected wage will keep on rising as unemployed workers move to the offshore areas, W'_t and W'_t for $1 < t \leq n$ will keep on rising after the revelation period as it does with the endogenous distortion. The rise in the W'_t curve will be steeper than the case when there is no unemployment. However, it will be less steep than W'_t under the endogenous distortion. Π'_t will decline for $1 < t \leq n$ and the decline in Π'_t will be steeper than Π_t (full employment profit) but less steep than that under the endogenous distortion. Since W'_t at one point intersects W_c before reaching W_L , I expect Π'_t to intersect Π'_c at that point. After that it will eventually be equal to Π_c . But the level of profit will still be higher than the level of profit under the endogenous distortion. For the period $t \leq n$, foreign investors will earn highest profit in period one.

What is interesting is that with the exogenous distortion for $t > n$, $\Pi'_t = \Pi_t$. It happens because migration of workers from the mainland does not affect the actual wage in the mainland. So W_L stays the same and at $t = n$, $W'_t = W_L$ (the wage at which unskilled workers are hired in the mainland) and the wage of the newly skilled local workers in the offshore area after all foreign skilled have left is also equal to W_L . So, $\Pi'_t = \Pi_t$. With the exogenous distortion, the host country may be able to get rid of unemployment by encouraging foreign entrepreneurs to come to the offshore area. This is in contrast with the result under the endogenous distortion since unskilled labor market must have some unemployment with the efficiency wage distortion. The existing literature on effects of foreign firms shows favorable employment effect and increased wage inequality effect in the host country. My paper while including the most realistic issue of unemployment, shows the favorable employment effect, the reduced international wage inequality and the reduced skilled-unskilled wage inequality. Furthermore, it shows the favorable skill composition effect not shown in the literature so far.

If the host country government does not allow foreign firms to pay lower than the minimum wage, W_L , and if the employed unskilled

workers cannot move to the offshore area, the host government will be able to siphon off some of the rent as increased wages for the unskilled workers.

5. Conclusion

This paper presents a mechanism that explains the changes brought in by offshore area trading or EPZs in China, Vietnam, Sri Lanka, Bangladesh and many other transitional developing economies. The favorable labor market effects of the foreign firms in an export processing zone or an offshore area of a less developed country that have been analyzed in this paper are based on a special assumption described as “highly stylized” in the core model I borrow. The foreign technology requires a skill that though alien to the local workers, may exist in some of them in a dormant form and can be revealed after working in the foreign firms for a while. Foreign firms use this skill together with the local unskilled labor to produce for the world export market and that results in favorable labor market effects. The point that is underscored in this paper is that favorable effects are much broad under unemployment that they are with full employment in the host country.

This paper shows that in the presence of unemployment, the mainland or the host country workers are more effective in taking the rent away from profit seekers in the form of higher wages and higher employment than they are with full employment. International factor mobility (i.e., movement of the foreign capital and skilled workers to the enclave) with unemployment in the host country not only changes the local wage structure and employment, but it also affects the skill composition of the local labor market favorably. The factors of production that are trapped in the mainland thus gain more from the foreign factor mobility in the presence of efficiency-wage induced unemployment in the hinterland. The gap between the foreign and domestic wage as well as the skilled/unskilled wage gap go down. However, the movement of foreign firms does not necessarily augment trade. Despite a large pool of unused labor, the prospect of profits for the foreign firms may actually decrease. The loss of profit will be higher

if unemployment is created by an endogenous distortion than if unemployment is created by an exogenous distortion. This happens because after the revelation of the hidden, but potentially developable skill, unemployed workers enjoy a bigger premium stream compared to that under full employment and it is induced by the efficiency wage distortion in the host country. More importantly, this analysis adds to the argument that profit-seeking foreign firms/multinationals cannot exploit host country workers by paying low wages.

My analysis also suggests that developing countries while trying to lure foreign firms in the offshore regions can think of a type of labor market distortion that will work more favorably for them. Policy debates in the developed countries, involving production in offshore areas of other countries, will also benefit from thinking about the labor market distortion in the host country. Finally, the analysis would hold even if we replace the revelation of highly stylized version of dormant skill by the training of the host country workers for a specified period of time, the discounted cost of which can be considered in calculating the future income stream.

Incorporation of unemployment in this paper has made the analysis of the labor market effects of export processing zones more realistic than what we have seen before with full employment. However, to keep it simple I have avoided the reality of labor mobility between nations. The challenge that lies ahead is to include that labor migration together with the unemployment to make the analysis more practical and thus effective.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgement

I would like to thank the reviewers for their helpful comments to improve the paper. My special thanks go to the Editor for helping me with detailed comments for the paper. Errors are all mine.

Appendix A

Workers' Effort Decision in the Unskilled Labor Market.

I follow [Shapiro and Stiglitz \(1984\)](#) to show workers' effort decision in each market. Workers select an effort level to maximize their discounted utility stream.²¹ I assume that the utility function is separable. The effort decision of individuals is such that they provide either $e = 0$ (shirking) or $e > 0$ (non-shirking) i.e., some fixed positive amount.²² I assume that a worker contributes one unit of effective labor if she does not shirk. Otherwise she contributes nothing. The expected lifetime utility in the unskilled market is expressed in asset equation form. In the unskilled workers' market if workers decide to shirk then

$$rV_L^S = (W_L + \phi_i)/P + (b + q)(V_L^U - V_L^S) \quad (A1)$$

where V_L^S is the expected lifetime utility for a shirker in this market. W_L is the market wage for unskilled workers; b is a normal exogenous turnover rate of workers, ϕ_i is the individual holding of a special resource or capital asset, K_i and r is the given market rate of interest.²³ The probability of getting caught while shirking is exogenously given by q and V_L^U is the expected lifetime utility if unemployed in the unskilled labor market. For each worker, interest rate times asset value, rV_L^S , is equal to the flow return (i.e., current utility like dividend, $(W_L + \phi_i)/P$) plus the expected capital loss, $(b + q)(V_L^U - V_L^S)$. This loss occurs because workers enter into unemployment when there is normal turnover of workers and/or when workers are caught while shirking. If workers do not shirk

$$rV_L^N = ((W_L + \phi_i)/P) - e + b(V_L^U - V_L^N) \quad (A2)$$

where V_L^N is the expected lifetime utility for a non-shirker.

If workers are unemployed then the expected lifetime utility

²¹ A worker living infinite number of periods (discrete) and with a discount rate, r , will maximize $W_L = E \sum_0^{\infty} U(W(t), e(t), \exp(-rt)dt$

²² If e is a continuous variable, it would not change the result.

²³ The assumption of a fixed turnover rate is introduced to avoid explicit modeling of job turnover and it is a standard assumption in the literature covering efficiency wages (see [Bulow and Summers, 1986](#); [Jones, 1987](#); [Shapiro and Stiglitz, 1984](#)).

$$rV_L^U = \phi_i/P + a(V_L - V_L^U) \quad (A3)$$

where V_L is the expected utility of an employed worker (which is equal to V_L^N in equilibrium), and a is the probability of getting out of the pool of unemployed workers. Workers would not shirk if $rV_L^N \geq rV_L^S$. Using (A1) and (A2), we can write

$$V_L^S = [((W_L + \phi_i)/P) + V_L^U(b + q)]/r + b + q \quad (A4)$$

$$V_L^N = [((W_L + \phi_i)/P) - e + bV_L^U]/r + b \quad (A5)$$

Using (A4) and (A5) the no shirking condition (NSC) is written as

$$W_L/P \geq -\phi_i/P + \frac{e(r + b + q)}{q} + rV_L^U \quad (A6)$$

We can solve (A3) and (A5) simultaneously for V_L^N and V_L^U to give

$$rV_L^U = (\phi_i/P)(b + r) + a\left[\left(\frac{W_i + \phi_i}{P}\right) - e\right]/(a + b + r) \quad (A7)$$

$$rV_L^N = \{[(W_L + \phi_i)/P - e](a + r) + \frac{b\phi_i}{P}\}/(a + b + r) \quad (A8)$$

Substituting the expression for V_L^U in Eq. (A6), we get the NSC

$$(W_L/P) \geq e + e(a + b + r)/q \quad (A9)$$

If bL is the number of workers going into the unemployment pool and $a(E - L)$ is the number of workers getting out of the unemployment pool, then in the steady-state equilibrium $a(E - L) = bL$ so $a = (bL/(E - L))$. Eq. (A9) can then be written as

$$W_L/P \geq e + er/q + (e/q)(bE/(E - L)) \quad (A10)$$

This is the non-shirking condition (NSC) for the unskilled labor market.²⁴ This suggests that wages would have to be at least as great as the right hand side of Eq. (A10) if employers do not want their workers to shirk.²⁵ To close the model we need firms' hiring behavior which says that firms hire up to the point where marginal product of labor equals wage or $F'(eL) = W_L/P$.

See Fig. 1.

From (A10) we can write $L = E(A - eb)/A$

Where $A = (W_L/P)q - eq - er$

E = Total unskilled labor supply in the urban sector. L = Employed unskilled labor in the urban sector.

Thus, $0 < (\partial L/\partial E) < 1$

or

$$(\partial U/\partial E) = 1 - (\partial L/\partial E) > 0$$

$$E = L + U; 1 = (\partial L/\partial E) + (\partial U/\partial E) \quad (A11)$$

This implies that any increase in the size of the unskilled labor market will increase the number of both employed and unemployed workers.

With cost minimizing firms, (A10) will be solved as equality in equilibrium and firms will set W_L/P to minimize W_L/e^*P which is the wage per unit of effective labor. Given wages, this implies that NSC would determine the equilibrium level of employment. For future use we write (A10) as

$$W_L/P = (e + (e/q)(\{bE/E - L\}))r \quad (A12)$$

Equilibrium in the unskilled workers' market determines the equilibrium level of employment L . Any equilibrium in this market would have to be non-shirking equilibrium. Since while non-shirking, a worker provides one unit of effective labor, NSC in (A11) gives the economy's total supply of unskilled workers at different wage levels, given b, q, r and an effort level, $e > 0$. The point with $NSC = W_L/P$ shows the equilibrium level of L in Fig. 1.

Appendix B

Foreign Firms' Profit in Different Time Periods.

I will now describe the behavior of profit after production activities start in the enclave.

$\Pi'_1 > \Pi_1$ where Π_1 is the profit at the end of the revelation period with full employment in the hinterland and Π'_1 is the profit at the end of the revelation period with unemployment in the hinterland. $\Pi_1 = P - a_u W_i - a_s W_s^*$ or $\Pi_1 = \Pi_c + a_u(W_L - W_i)$ and $\Pi'_1 = P - a_u W'_i - a_s W_s^*$, or $\Pi'_1 = \Pi'_c + a_u(W_e - W'_i)$ Although $W_e - W'_i$ is expected to be higher than $W_L - W_i$ in the revelation period, even if they are equal $\Pi'_1 > \Pi_1$ because $\Pi'_c = (P - a_u W_e - a_s W_s^*) > \Pi_c = (P - a_u W_L - a_s W_s^*)$.²⁶

²⁴ This derivation involves maximization of the expected present discounted value of utility.

²⁵ Let us suppose $(W_L/P)_i = w_i$ is individual i 's non-shirking wage; i.e. the value of W_L/P that equates two sides of (A9) for individual i . According to (A9), w_i would be positive and would vary across individuals due to the difference in ϕ_i . Let us suppose w_i is a continuous random variable with density function of $f(w_i)$ which all firms are assumed to know. Since all firms will expect shirking when $W_L/P < w$, the expected efficiency of a worker hired by a firm will equal $e = \int_0^{W_L/P} f(w)dw = F(w)(A)$ where $F(0) = 0$ by assumption.

Assuming also that the f -function is single peaked, the distribution function F represents the familiar S-shaped relation between e and W_L/P . Since a portion $q(1 - e)$ of total work force employed will be fired for shirking,

$$L = (1 - q(1 - e))E$$

will be the net labor. Suppose e^* is the expected efficiency of L , so that $e^*L = eE$

Then from (A), $e^* = e/[1 - q(1 - e)]$ where $F^*(W_L/P) = F(\bullet)/\{1 - q[1 - F(\bullet)]\}$ and F^* satisfies the property of F .

²⁶ $W_e < W_L$ because $W_e = \lambda W_L$ and $W'_i < W_i$ because unskilled workers expect more premium in the future when there is unemployment in the hinterland and thus they don't mind to start with a reservation wage, W'_i , that is lower than the reservation wage, W_i . The proportionate gap in $(W_i - W'_i)$ is expected to be higher than the proportionate gap in $(W_L - W_e)$ because of the prospect of bigger premium in the future.

With unemployment the actual hinterland wage of unskilled workers in period 1, W_L' , keeps on rising up to period n in Fig. 2A, while with full employment W_L stays the same up to period n . Since W_t and W_t' increase in each t , before reaching period n (when all skilled workers would be local workers) Π_t and Π_t' will keep on declining from period 1 to period n . However, the profit will decline more sharply with unemployment in the hinterland than profit with full employment because W_t' is rising more steeply than W_t (Fig. 2A). Let's look at the behavior of profit for different values of t .

a) $\Pi_t' > \Pi_t$ for $1 < t < t^*$ and $\Pi_t' = \Pi_t$ at t^*

Let's now see what happens to profit for $1 < t \leq n$. We know that both Π_t and

Π_t' decline up to period n . Whether $\Pi_t' < \Pi_t$ at any period $1 < t < n$ will depend on how $W_L - W_t$ behaves compared to $W_e - W_t'$. With full employment W_L stays the same in each period. With unemployment although $W_e < W_L$ in the first period, W_e keeps on rising and cuts W_L at t^* . Furthermore, although $W_t' < W_t$, to start with and both W_t and W_t' are rising, W_t' rises more than W_t and intersects W_t at t^* where $W_t' = W_t$. Thus Π_t' which declines more steeply than Π_t intersects Π_t at $t = t^*$ where $\Pi_t' = \Pi_t$. After that point, W_e exceeds full employment W_L and W_t' exceeds W_t .²⁷

b) $\Pi_t' < \Pi_t$ for $t^* < t < n$

Since W_L is fixed and W_t is rising and since both W_e and W_t' are rising but the rate of increase in W_e is less than the rate of increase in W_t' , $(W_L - W_t) > (W_e - W_t')$ at each time period. So $\Pi_t' < \Pi_t$ for $t^* < t < n$ (Fig. 2B). The enclave production drives up the unskilled hinterland wage and consequently the replacement wage bill for the enclave. Although foreign entrepreneurs start with a profit under unemployment that is higher than first period's profit with full employment in the hinterland ($\Pi_t' > \Pi_t$), there is a possibility that, at least for some values of t , the profit in $t > 1$ will be much less with the unemployment than without unemployment.

c) $\Pi_t' < \Pi_c'$ for $t^{**} < t < n$ and $\Pi_t' < \Pi_c$ for $t^{***} < t < n$

I will now compare Π_t' and Π_c' . $\Pi_c' = P - a_U W_c - a_S W_S^*$ and $\Pi_t' = \Pi_c' + (W_e - W_t')a_U$

In period 1, $(W_e - W_t') > 0$ and $\Pi_t' > \Pi_c'$. In their calculation of contemplated profit foreign entrepreneurs uses initial W_e . But W_e' in the enclave keeps on rising because of the wage distortion. Since W_t' rises with a rising W_e' and the rate of increase is higher for W_t' than that for W_e' , W_t' soon crosses initial W_e at t^{**} in Fig. 2A and after that $\Pi_t' < \Pi_c'$. Note that W_t' continues to rise and intersects W_L at t^{***} and $\Pi_t' < \Pi_c$ (or Π_c' & Π_t) after that. At $t = n$, $\Pi_n = \Pi_c$ under full employment and $\Pi_n' < \Pi_c < \Pi_c'$ with unemployment.

d) $\Pi_t' < \Pi_t$ for $t > n$.

For $t > n$, $\Pi_t' = P - a_U W_t' - a_S W_e^n$ and $\Pi_t = P - a_U W_L - a_S W_L$. Since $W_e^n > W_L$ and $W_t' > W_t = W_L$ (after $t = n$), $\Pi_t' < \Pi_t$ for $t > n$. Comparing Π_t' with Π_t' for $t > n$ we see that $\Pi_t' = P - a_U W_L' - a_S W_S^* \infty$ and $\Pi_t = P - a_U W_t' - a_S W_e^n$ for $t > n$. Since $W_L' < W_t'$ for $t > n$, even when $W_S^* > W_e^n$ for $t > n$ it is possible that $\Pi_t' < \Pi_t'$. This happens when difference between the starting wage and highest wage of the unskilled workers in the enclave dominates the difference between wage of foreign skilled workers and local skilled workers employed in the enclave.

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²⁷ While contemplating their profit prospects foreign entrepreneurs think that they will keep on hiring hinterland unskilled workers at W_e , the initial expected wage; however, because of the efficiency wage distortion W_e or the expected wage keeps on rising.

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