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Working Paper

Labor market aspects of enclave-led growth

Diskussionsbeiträge - Serie II, No. 179

Provided in Cooperation with:

Department of Economics, University of Konstanz

Suggested Citation: Jones, Ronald Winthrop; Marjit, Sugata (1992) : Labor market aspects of enclave-led growth, Diskussionsbeiträge - Serie II, No. 179, Universität Konstanz, Sonderforschungsbereich 178 - Internationalisierung der Wirtschaft, Konstanz

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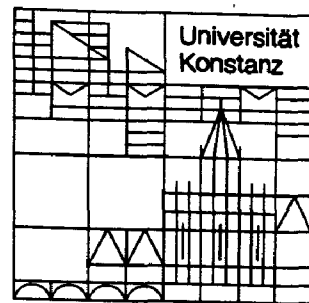
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Sonderforschungsbereich 178
„Internationalisierung der Wirtschaft“

Diskussionsbeiträge



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**Labor Market Aspects
of Enclave-Led Growth**

LABOR MARKET ASPECTS OF ENCLAVE-LED GROWTH

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Serie II - Nr. 179

Juni 1992

* *We are indebted to Glenn MacDonald for helpful discussions.*

LABOR MARKET ASPECTS OF ENCLAVE-LED GROWTH

by

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The purpose of this paper is to model and describe the consequences for labor markets in an underdeveloped economy of foreign investment in an enclave sector. Foreign technology tends to expose some of the hidden talents in the local labor force. Replacement of foreign labor by domestic labor coupled with a process of skill revelation generate non monotonic wage and profit movements in the local economy. We also discuss the effects of growth and skill development on the pattern of wage movement and the exit period of foreign personnel both in the fixed and variable proportions cases.

Labor-Market Aspects of Enclave-Led Growth

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At early stages of the development process a country is unfamiliar with many of the products and processes of more advanced economies. International trade may be limited, and international mobility of the country's labor force severely constrained. However, the low level of wages prevailing in the economy serves as a beacon to attract foreign investment in an enclave sector in which foreign skills and technology can be combined with local unskilled labor to produce commodities for the world market. This advanced technology may require skills that are not in demand in those activities undertaken in the traditional economy, so that the distribution of skills among the local labor force which may be of value in the alien technology are unknown both to local workers and to potential foreign employers. This suggests that in the process of supplying unskilled labor to the enclave, the presence of potentially developmental skills may be revealed and that for workers possessing these skills returns may be attainable which substantially exceed the wage rate for unskilled labor. The purpose of this paper is to describe and model the consequences for labor markets in an underdeveloped economy of foreign investment in an enclave sector.

The term "enclave" is often found in the literature on Export Processing Zones (EPZ). EPZs in different countries use domestic labor and foreign capital to produce exportables for the world market. These zones or enclaves are usually provided with a host of concessions by the local governments. Warr (1989) has described the

performances of different EPZs in Asia. Our paper fits in well with an institutional environment that contains export processing zones. Theoretical literature in this area is related to the positive and normative aspects of commercial policies adopted by the local government. Our paper picks up a theoretical point, which, though related to the notion of foreign enclave in a LDC, has not found its place in the existing literature: The "foreign" element in the new technology activates certain hidden traits of the domestic labor force.

The basic model, called the "core" model, is laid out in section 1. A variant of this model, in Section 2, wherein the developing country imposes a minimum wage, is used as a benchmark comparison. The necessity for a period of on-the-job training during which skills are gradually acquired by those locals with potential is modelled in Section 3. The assumption of rigid technical requirements in the core model is modified in section 4's discussion of factor substitutability. Our focus on the behavior of labor markets has deflected attention from output growth in the enclave, and this is to some extent repaired in section 5. The non-monotonic path of profits is discussed in section 6, along with the appraisal of the distribution of welfare gains between (and among) developing country residents and foreign entrepreneurs. Section 7 provides concluding remarks.

1. *The Core Model*

It proves useful to begin by laying out simple assumptions about labor markets in the enclave – assumptions which subsequently we wish to amend in more realistic fashion.

Our focus is on an underdeveloped economy in which all production initially takes place in a "hinterland" in which every member of the labor force earns the same return. This return is to "unskilled" labor. Some members of the labor force possess

latent skills that would prove to be productive in advanced economies; since no local demand exists in the hinterland for such skills, the return there to these skills is zero. The economy is then stimulated by the development of an enclave in which foreign entrepreneurs introduce a technology which is completely unfamiliar to local labor. A certain fraction (λ) of the local labor force possesses the skills required by the new technology, at least in latent form, but a period of work in unskilled occupations in the enclave is required before either workers or entrepreneurs can determine which individuals are skilled. Once this favored group is identified, it can switch from being used as unskilled labor and put to work alongside foreign skilled workers accomplishing the same task. At early stages of enclave production most skilled inputs are provided by foreign workers, who can be hired at a fixed wage rate prevailing in world markets (w_s^*), and this rate does not get altered as the level of activity in the enclave changes. In this section's core model we assume that no period of skill-development is required; after the initial revelation period in which labor is assigned unskilled tasks, those members of the local labor force identified as skilled immediately achieve the productivity levels of their alien counterparts. This highly unrealistic assumption is altered subsequently so that potential skills are converted to actual skills only with the time-consuming process of gaining experience in skilled occupations.

An additional assumption is made in this core section: Input-output coefficients are rigid. Dispensing with physical capital as an input, we assume instead that a_u units of unskilled labor (all supplied locally) per unit of output are combined with a_s^* units of effective skilled labor to produce a unit of output. This output represents a Hicksian composite mix of various commodities, all of which have prices determined on world markets. Furthermore, we simplify by assuming the enclave is outward-looking; all output is intended for export markets.

Foreign investors are attracted by low wages in the enclave, and make a profit or

return on their possession of the modern technology utilized in production. We assume there is sufficient diversification among foreign entrepreneurs in the enclave so that the return to skilled local labor is driven up to the world wage rate, w_s^* , even though local workers cannot emigrate to participate in world markets. As the local labor force continues to provide skilled workers, foreign skilled workers are eventually replaced, unless output growth in the enclave outstrips the rate at which local skills are being revealed.

In the core model we begin by assuming that there is a given level of output X , in the enclave, and subsequently allow for growth in production. Therefore, the need for alien skilled workers will eventually disappear. As long as foreigners are required, competition in the enclave serves to peg the local skilled wage to that received by foreigners, w_s^* . However, once foreigners are completely replaced, the wage rate which local skilled workers can receive plummets to the level of unskilled workers, since input coefficients are rigid, and skilled workers have no alternative occupations. Local workers contemplating employment in the enclave are aware of this possibility and factor this into their willingness to work at a wage rate that falls short of w_H , the wage available in the hinterland. The reason why enclave wages for unskilled workers are driven below w_H is that there is a possibility that any worker may have skills which have been dormant in the hinterland but which would receive a higher return, w_s^* , once revealed in the enclave sector.

The calculation made by potential labor entrants to the enclave involves a comparison of the discounted return to labor offered in the hinterland to the expected value from working in the enclave. We assume that workers are infinitely lived and that they share a discount rate, δ . A worker who remains behind in the hinterland can expect a present discounted value of earnings of v_H , shown by:

$$(1) \quad v_H = \frac{w_H}{(1-\delta)}$$

By contrast, if a worker enters the enclave at date t , first period wages (for the requisite unskilled work) are whown by w_t . This is not a constant wage, since the time period remaining when foreign skilled workers are required in employment, thus guaranteeing a wage rate w_s^* for all skilled workers, depends upon the date at which the local laborer enters enclave employment.

Suppose that enclave activity commences in the first period, and that foreign skilled workers are required to the first n periods. (Thereafter they will be completely replaced by skilled locals). A worker entering the enclave at the beginning of period t will earn w_t during the skill-revelation period and subsequently, if skills are revealed, will earn w_s^* $(n-t)$ periods. But the probability of this is only $\lambda < 1$. If, after one period, the worker is revealed to be unskilled, that worker's optimal move is back to the hinterland since "raw" (still untested) local labor would be willing to work for a wage that is lower than w_H . In other words, labor is subject to an "up-or-out" paradigm.

More formally, a new entrant can expect to earn w_t the first period of employment in the enclave. Thereafter, two possible paths are followed: With probability λ , the stram w_s^* will be earned for the subsequent $(n-t)$ periods, followed by a reversion to the hinterland wage. With probability $(1-\lambda)$, the hinterland wage, w_H , will be received for all periods subsequent to the revelation period since the unskilled worker leaves the enclave immediately after the lack of skills is revealed. With appropriate discounts for future periods, the present discounted value of the option of entering the enclave as raw labor, V_E , is:

$$(2) \quad V_E = w_t + \lambda \{ [\delta w_s^* + \delta^2 w_s^* + \dots + \delta^{n-t} w_s^*] + [\delta^{n+1-t} w_H + \delta^{n+2-t} w_H + \dots] \} \\ + (1-\lambda) \{ [\delta w_H + \delta^2 w_H + \dots + \delta^{n-t} w_H] + [\delta^{n+1-t} w_H + \delta^{n+2-t} w_H + \dots] \}$$

After summing terms this yields:

$$(3) \quad V_E = w_t + \frac{\delta [1 - \delta^{n-t}]}{1 - \delta} \{ \lambda w_s^* + (1 - \lambda) w_H \} + \frac{\delta^{n+1-t}}{1 - \delta} w_H$$

A comparison with (1) (to equate V_E with V_H) allows a solution for w_t in terms of the date, n after which foreign workers have exited:

$$(4) \quad w_t = w_H - \lambda \frac{\delta}{1 - \delta} [1 - \delta^{n-t}] (w_s^* - w_H)$$

This expression states that the wage for local labor in the hinterland during the revelation period is driven below the hinterland wage rate since there is a probability, λ , that a worker may be skilled, in which case that worker earns a premium of $(w_s^* - w_H)$ over its unskilled counterpart, but only for $(n-t)$ periods, starting the following period. The finite stream, $(w_s^* - w_H)$ must therefore be discounted by the term, $\frac{\delta}{1 - \delta} [1 - \delta^{n-t}]$.

It is clear from (4) that the enclave wage during the revelation period, w_t , steadily rises with time as the number of periods remaining when skilled workers earn the rate, w_s^* , determined in world markets, steadily shrinks. Consider two extremes. On the one hand, suppose the time never comes when alien skills are not required – growth in the enclave exceeds the rate at which local skills are revealed.¹ That is, a worker whose skills have been revealed can be expected to earn the premium, $(w_s^* - w_H)$ forever, in which case w_t is shown by (4'), and is a constant:

$$(4') \quad w_t = w_H - \lambda \frac{\delta}{(1 - \delta)} (w_s^* - w_H)$$

By contrast, suppose there is only one period left for local skilled workers to earn w_s^* – after the next period everyone earns the hinterland wage. In such a case (4'') shows how w_t , which is w_{n-1} , is only slightly lower than w_H :

$$(4'') \quad w_{n-1} = w_H - \lambda \delta (w_s^* - w_H)$$

(w_n is equal to w_H).

Figure 1 illustrates the wage gap in the enclave between "raw" labor entering the revelation period, whose return is w_t , and those members of the local labor force whose skills have been revealed, whose return is w_s^* . After period n all foreign skilled labor departs and no skill premiums are earned by locals.

If enclave output is steady instead of growing, it is an easy matter to calculate the number of periods in which foreign skilled labor will have to be obtained from abroad. With the arrival of foreign activity in the enclave, the first batch of raw labor, L , is given by the requirement:

$$(5) \quad L = a_u X$$

The following period another $a_u X$ batch of raw labor is utilized as unskilled labor, together with $\lambda a_u X$ local skilled labor and the remnant of the foreign skilled corps still required. The total demand for skills is:

$$(6) \quad L_s = a_s^* X.$$

Therefore, at the start of each period, t , the quantity of local skilled labor is given by the stock variable, $(t-1) \lambda a_u X$. All alien skilled workers will have been replaced by the beginning of period $n + 1$, so that:

$$(7) \quad n \lambda a_u = a_s^*$$

Rewrite this as:

$$(8) \quad n = \frac{R}{(1 - \lambda)}$$

where $R \equiv \left(\frac{a_s^*}{a_u} \right) / \left(\frac{\lambda}{1 - \lambda} \right)$

The rationale for this substitution lies in the importance of the comparison between techniques used in the enclave – the ratio of skilled to unskilled labor – and the endowment proportions of (dormant) skilled to unskilled labor in the local population.

Perhaps there is no reason to suppose that the latter ratio, $\lambda/(1-\lambda)$, should differ from the comparable ratios found in other countries. If not, the question remains as to the nature of the activity that has been attracted to the enclave. Presumably it has been the low wage rate for unskilled labor that has drawn foreign investment, so that R may have a value short of unity. In this case condition (8) suggests that n is quite small. This result serves strongly to highlight the importance of our assumption that one period's work as unskilled labor in the enclave is sufficient to reveal which laborers possess latent skills, an assumption we choose to retain, as well as the assumption that skill-revelation is everything. No further training or experience is required in order that local labor can turn latent skills into actual skills at the level possessed by foreign workers. Such an assumption makes a mockery of the notion that costs are required to create human capital.

A crude way to alter the low value for n suggested by (8) involves the assumption that after the revelation period local labor possessing dormant skills achieve a constant skill level that is only a fraction, α , of that possessed by skilled foreigners. That is, for n periods they receive αw_s^* as the wage. The number of local workers required completely to replace foreign skilled workers would rise to (a_s^*/α) times output, so that the expression for n in (8) could be rewritten as:

$$(8') \quad n = \frac{R}{\alpha(1-\lambda)}$$

yielding a higher value of n . Instead of following this route, we shall sketch out a process whereby home skills are more gradually developed by work experience in the enclave.

2. *A Variant on the Core Model: Minimum Wages in the Enclave*

So far little has been said about the developing country's official attitude towards foreign investment in the enclave. As a variant on our previous scenario, we suppose

now that the home country allows its labor to be hired by foreign entrepreneurs, but stipulates that a minimum wage (exceeding w_t) be paid. In particular, suppose the wage is set at w_H , the wage rate ruling in the hinterland.² Since technology used in the economy's hinterland has no use for skills required in the enclave, there is an obvious attraction for local labor to move to the enclave if the presence of such skills is possible. In the face of the minimum wage requirement, this would lead to the kind of phenomenon familiar from the Harris-Todaro inspired literature, in which unemployed workers exist in the enclave, hoping to be among the lucky set chosen for work the next period. The Harris-Todaro literature on rural-urban migration assumes that the probability of obtaining a job is the same for every urban laborer. In that case it is hard to see why existing employed labor would loose their jobs and compete with the fresh batch of unemployed migrants. To avoid this possibility, we assume that workers in the enclave once employed have job security and that no positive incentive exists for those who have been branded unskilled to return to the hinterland. That is, we assume workers stay put in the hinterland until there is a call for them in the enclave – the government controls the exodus from the hinterland to prevent unemployment.

This variation in wage structure serves to cut back on the enclave's fresh demand for raw labor. In the second period only $\lambda a_u X$ laborers are brought in, to replace those who have revealed their skill potential. The following period sees fewer new entrants – only $\lambda^2 a_u X$ come in to replace the equivalent number who have been determined to have skills. Thus the stock of local skilled laborers grows, but at an ever decreasing rate. Letting n again denote the number of periods of enclave activity, the quantity of local skilled workers available after all foreigners leave is:

$$(9) \quad L_s = \lambda a_u X (1 + \dots + \lambda^{n-1}) = \frac{\lambda a_u X}{(1-\lambda)} (1 - \lambda^n)$$

A comparison with the number of skilled labor hours required, $a_s^* X$, reveals that the

foreign skilled labor force will be entirely replaced only if π reaches the value shown by (10):

$$(10) \quad \lambda^n = 1 - R,$$

where R , as defined in (8), compares the skilled/unskilled factor proportions ratio required in the enclave to the proportions in which these skills are found in the local population. We have argued above that R is less than unity if it is unskilled-labor intensive activity that is attracted to the enclave. Should this not be the case, foreign workers never get entirely displaced. This would prove a boon to the local economy, since it keeps local skilled wages at the high w_s^* level.

Comparing the results of this minimum-wage scenario with the earlier version in which free markets prevail is instructive in revealing the potential gain received by the economy by imposing the wage floor. The enclave's new technology exposes the possibility for gain in the local labor force from providing an opportunity to make productive use of skills that are lying dormant in the hinterland economy. Note that the returns from these skills could have been captured by foreigners if, for example, we had assumed that enclave activity was controlled by a single firm which could exercise monopsony power in the labor market. Instead, we have assumed that there exists enough competition amongst foreign firms in the enclave to ensure that skilled local labor receives the rents from its productivity. However, competition from raw labor in the hinterland serves to erode these gains for the community, since they offer their services as unskilled labor during the revelation period for a wage rate that is lower than the hinterland wage by precisely the discounted value of the premium expected on skills. Thus foreign firms do capture the rentals indirectly, while the local labor force experiences a redistribution of earnings between those revealed to have skills and those who are genuinely lacking in such abilities. The rent capture is indirect, in that the gains to foreigners take the form of a lower unskilled/skilled ratio of wage rates

compared to the alternative hypothesized monopsony scenario. In any case, the imposition of a minimum wage serves to prevent this transfer to foreigners. This may induce a smaller amount of activity in the enclave, depending upon the array of alternative profitable investment opportunities elsewhere for the foreign advanced technology. We are treating the volume of output in the enclave as exogenously determined. Ignoring such output changes, it is clear that the less developed country can gain by imposing the minimum wage and thus improving its terms of trade with the enclave.

3. *The Skill-Development Process*

It is patently unrealistic to assume that latent skills can instantaneously be transformed into productive accomplishment at the same level as those with years of work experience and/or schooling. Some treatments of this issue focus on the importance of education in developing skills, with a key role played by the assumption that education takes time, and that during that time no income is earned. (Instead, expenditures on education are incurred).³ We choose an alternative strategy – developing skills while on the job, with rates of pay determined by the level of development already achieved.

Figure 2 illustrates how the number of labor hours required per unit output in a skilled occupation is reduced as the time spent on the job increases, perhaps asymptotically approaching the foreign skilled input/output coefficient, a_s^* . Let $a_s(i)$ represent the coefficient appropriate for a local worker whose skill has been revealed and who has been working in the skilled occupation for i periods. One formal possibility would be captured by the functional form:

$$(11) \quad a_s(i) = a_s^* \{1 + [a_o/a_s^* - 1] \mu^{-i}\},$$

where a_o is the input-output coefficient for a new entrant to the skill pool, $a_s(0)$, and

μ is a positive number exceeding unity. We assume that the wage rate paid to a local worker with i periods of experience is bid up to be proportional to the productivity of such a worker so that:

$$(12) \quad \frac{w_s(i)}{w_s^*} = \frac{[1/a_s(i)]}{[1/a_s^*]}$$

The relationship shown by equation (12) not only serves to link the wage for a skilled worker that has been employed for i periods to that of a foreign skilled worker, it also establishes a rental schedule for local workers of various vintages:

$$(13) \quad \frac{w_s(i)}{w_s(j)} = \frac{[1/a_s(i)]}{[1/a_s(j)]}$$

This link is shown in Figure 3 by the rising solid curve for $w_s(i)$ from the first period when local workers practice skilled occupations ($t = 2$) until after period n when all foreign workers have departed. Once all foreign workers have left, the link to w_s^* is broken but the structure of heterogeneous payments to those locals remaining in the skilled activity is intact, shown by (13). The problem, however, is that local skilled workers have their productivity improved with the passage of time, so that fewer of them are required to supply all the skilled labor necessary to produce X . The link of the payments schedule to w_s^* is replaced by the drop in the least skilled worker's return to the wage rate earned by the unskilled, w_H . This is shown by the rising dashed curve in Figure 3. The falling w_s curve past period n indicates that positive rents are still being collected by the most experienced of the skilled workers, but these rents are disappearing as more and more younger skilled workers find that their skills are no longer required; the improvement in the productivity of the more senior workers dispenses with the need for their services. As this process continues, the return to the most experienced workers is driven down by the competition of those less experienced who are becoming marginal workers, earning the hinterland wage.

Note in Figure 3 that the return to workers in the revelation period is restored to w_H once foreigners have all left. Although positive returns to some skilled workers are still being earned, these are not returns that can be anticipated by raw recruits entering the enclave. Instead, there is a return flow of workers previously employed in the enclave returning to the hinterland economy.

4. *Variable Coefficients in Enclave Technology*

Technology may not be as rigid as we have been assuming. Instead, suppose that it is possible to use more or less skilled labor-intensive techniques. We start by returning to the assumptions laid out for the core model – local labor needs no time to become as productive as their foreign counterparts as long as their skills have been established in the revelation period.

The wage rate received by alien workers while they are still required in the enclave is not altered, since this is set by conditions in the rest of the world. However, since w_t rises (as the period when foreigners all exit approaches), firms in the enclave are encouraged to use skilled workers more intensively.⁴ This serves to lengthen the period during which a mix of foreign and local skilled labor is used (i.e., to increase n) for two reasons: Since the a_s^* coefficient has been raised, more skilled workers overall are required for a given level of output. Furthermore, the reduction in a_u implies that fewer raw recruits are going to be processed in the revelation period, thus slowing down the accumulation of new labor revealed to have skills. After date n when foreigners have all left, the stock of skilled workers is still expanding. For example, period $(n + 1)$ the quantity of skilled workers goes up by $\lambda a_u(n)X$. This serves to raise the ratio of skilled to unskilled workers, and, since the wage rate paid to local skilled workers is now cut loose from foreign w_s^* , such an increase lowers the skilled wage. This process continues in a manner suggested in Figure 4. The ability

to alter factor proportions has softened the blow to local skilled wages delivered by the departure of alien workers. As compared with Figure 1 for the fixed coefficient case, the profile of skilled wages for local labor remains at the high w_s^* level for a longer period ($n' > n$), it descends towards the hinterland wage at a slower rate, and the profile for wages paid during the revelation period does not rise as rapidly as earlier. The latter reflects the discounting by raw labor of the improved profile for those whose skills have been ascertained. Even after n' , these workers can contemplate some returns to skills.

5. *Labor Markets with Growth in Enclave Output*

The appearance of a modern technology has stimulated an ongoing flow of labor from the hinterland even though the output level in the enclave has been treated as fixed. More realistically, foreign investment in the enclave could aim at increasing output levels over time, and such growth would ^{λ} ~~engender~~ ^{g} even a more rapid transformation of the local labor supply and postpone the date at which local supplies of skilled labor could replace the alien labor force.

Suppose that output is growing at a steady rate in the enclave. Compare the number of new entrants to the local skilled worker pool with the extra demand for new skilled workers in the case in which there is no period required for full development of skills once revealed. In period t the quantity of new local skilled labor is $\lambda a_u X_{t-1}$, while the extra number of skilled workers required is $a_s^* \Delta X$. Rewriting, letting g represent the growth rate of output, the number of newly revealed skilled workers exceeds the new requirements if:

$$(14) \quad \lambda a_u > a_s^* g, \text{ or}$$

$$(14') \quad g < (1 - \lambda)/R.$$

This inequality seems likely to be satisfied for relevant values of the growth rate, so

that the process whereby foreign skilled factors get replaced completely by the local personnel being revealed as skilled should be completed in finite time.

Equation (14') might be compared with equation (8). However, (14') refers to a situation in which output is growing, while the value for n in equation (8) refers to a situation in which output levels are constant. Keeping this in mind, (14') can be rewritten as:

$$(14'') \quad gn < 1.$$

6. *The Path of Profits in the Enclave*

Return to the simple core model and assume output is constant. The rate of profit is presumed to be positive – this is what attracts foreign technology to the enclave. But the profit rate does not remain constant, even if we continue to assume that goods produced in the enclave can be sold at fixed world prices and that enclave activity does not increase the hinterland wage rate.

Consider what we might call the "contemplated" profit rate, π_c , the rate that could be earned per unit output if foreign investors could hire unskilled workers at the hinterland wage rate but had to pay w_s^* for skilled workers:

$$(15) \quad \pi_c \equiv p - (a_u w_H + a_s^* w_s^*)$$

This is indeed the profit rate earned in section 2's discussion of the minimum wage set at the level of the hinterland wage. But once activity in the enclave commences, in a free market workers would be willing to accept a lower wage, w_t , during the revelation period in the hopes that they possess skills which will be rewarded at the higher rate, w_s^* . If a mix of local and alien skilled personnel are employed, that is if $t \leq n$, the expression for π_t is:

$$(16) \quad \pi_t = p - (a_u w_t + a_s^* w_s^*)$$

Relating this to the contemplated profit rate,

$$(16') \quad \pi_t = \pi_c + a_u(w_H - w_t) \text{ for } t \leq n$$

which must exceed π_c as long as $t < n$.

Once all the skilled ranks have been filled by locals, the wage rate for all skills collapses to w_H so that

$$(17) \quad \pi_t = p - (a_u w_H + a_s^* w_H) \text{ for } t > n.$$

Alternatively put,

$$(17') \quad \pi_t = \pi_c + a_s^*(w_s^* - w_H) \text{ for } t > n.$$

Thus π_t is never lower than the (naive) contemplated profit rate, π_c , and equals this rate only in period n when w_t has risen to the hinterland level, w_H .

Figure 5 illustrates the time profile of the profit rate. Note that starting with period $(n+1)$ the profit rate attains a constant level, and this level exceeds the highest profit rate previously experienced. For periods 1 through n the profit rate steadily declines since, as illustrated in Figure 1, the wage rate for raw labor, w_t , steadily rises. Therefore to confirm the high profit rate after period n it is only necessary to contrast π_t for $t > n$ with π_1 , the highest rate during the earlier "mixed" period. From (4) and (16'),

$$(18) \quad \pi_1 = \pi_c + a_u \lambda \frac{\delta}{1-\delta} (1 - \delta^{n-1}) (w_s^* - w_H)$$

Compare this with (17') to establish (with the help of equation (7)) that π_t (for $t > n$) exceeds π_1 if

$$n > \frac{\delta}{1-\delta} [1 - \delta^{n-1}].$$

But recall that the right hand side is the sum of a series, so that it can be rewritten as

$$n > \delta + \delta^2 + \dots + \delta^{n-1}.$$

This inequality follows since, with $\delta < 1$, each of the $(n - 1)$ terms on the right-hand side is less than unity.

The shaded areas in Figure 5 indicate the undiscounted excess of profits over and above the rate contemplated by naively looking at the hinterland wage. The first (triangular) area reveals the extra profits earned as local workers are willing to serve as unskilled labor during the revelation period at a wage lower than that prevailing in the hinterland. The second (rectangular) area reveals the higher profit rate available when entrepreneurs no longer have to pay high w_s^* for skilled labor. Our assumption that newly-skilled local workers are trapped within their economy helps explain why foreign entrepreneurs receive this extra gain. A minimum wage would serve to capture the first area for the local economy, but even with such a wage (set at w_H), the second area accrues to foreign entrepreneurs.

The world gains by having previously latent skills utilized by the advanced technology. In the core model these gains are captured by foreigners. Locally there is a redistribution of income from those workers branded as unskilled to those who possess skills that have been revealed.

7. *Concluding Remarks*

The core model of this paper represents a crude attempt to highlight some features of the emergence of a backward economy into the modern world via contact with an advanced foreign technology in an enclave. Enclave technology requires some skills for which no previous demand existed in the hinterland economy. However, these skills are dormant in some fraction of the population, whose identity remains unknown both to individuals and employers. More generally, one might envisage a heterogeneous output pattern and skill use in the hinterland. The essential element required is a positive finite gap between technologies such that there exist further latent skills whose

location among individuals is not known with certainty.

Enclave activity must, initially, make use of foreign skills. The return to these skills has been taken as exogenous, since it would be determined by global possibilities, and we are not modelling global equilibria. Implicit is the notion that this enclave activity is a small part of total demand, so that world prices are unaffected. The enclave is also small relative to the hinterland, so that hinterland wages are assumed fixed, instead of being driven up in the development process.

Skills are revealed in one period – a revelation period – and revealed with certainty. It would be possible to model uncertainty either in possession of skills (e.g. might miss skills that are there or suggest skills that are not). As well, there may be a multiplicity of skill types that are being sought, and these may not all have the same return. The assignment problem comes up, with the possibility of mistakes made in the allocation of laborers to jobs. Another feature of the revelation period is that unskilled work is accomplished. An alternative route involves allocating raw labor to a separate testing period, whose output is skill revelation but no other productive work being accomplished. As for the skill development process, our model is of the learning-by-doing variety. A popular alternative involves a separate sector in which workers receive a formal education.

Competition amongst foreign firms allows skilled workers to capture all the rents. However, unless there is something like a minimum wage stipulation, these rents are transfers from other (raw) local workers (i.e. eventually from revealed unskilled to revealed skilled). A minimum wage leads to a scenario in which new technology creates new sources of local income from previously unutilized but existent skills. We have assumed that local skilled labor cannot emigrate. In such circumstances the skilled wage rate to locals is linked to the high value in world markets only as long as entrepreneurs still have need for foreign workers. Once they have departed, the skill

reward profile gets anchored to the hinterland wage rate. During the development process non-monotonicity is a feature both of the path of skilled and unskilled returns - but in opposite directions. From the hinterland level of wages, skilled wages rise and then fall in the enclave, while unskilled wages fall suddenly, and then gradually rise.

References

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2. Harris, J.R. and M. Todaro (1970), "Migration, Unemployment and Development: A Two Sector Model," American Economic Review, March.
3. Warr, P. (1989), "Export Processing Zones – The Economics of Enclave Manufacturing," World Bank Research Observer, 4, 65-88.

Endnotes

- ¹ Such growth would occasion an eventual rise in the hinterland wage. We have been assuming that the enclave activity's demand for local labor does not disturb wages in the hinterland.
- ² The local government may wish to set a higher wage in an attempt to improve its "terms of trade."
- ³ See, for example, the treatment by Findlay and Kierzkowski (1983).
- ⁴ With w_s^* constant and w_t rising, profits to entrepreneurs in the enclave are being reduced. We assume this does not alter output levels, which are affected as well by alternative investment opportunities in the rest of the world.

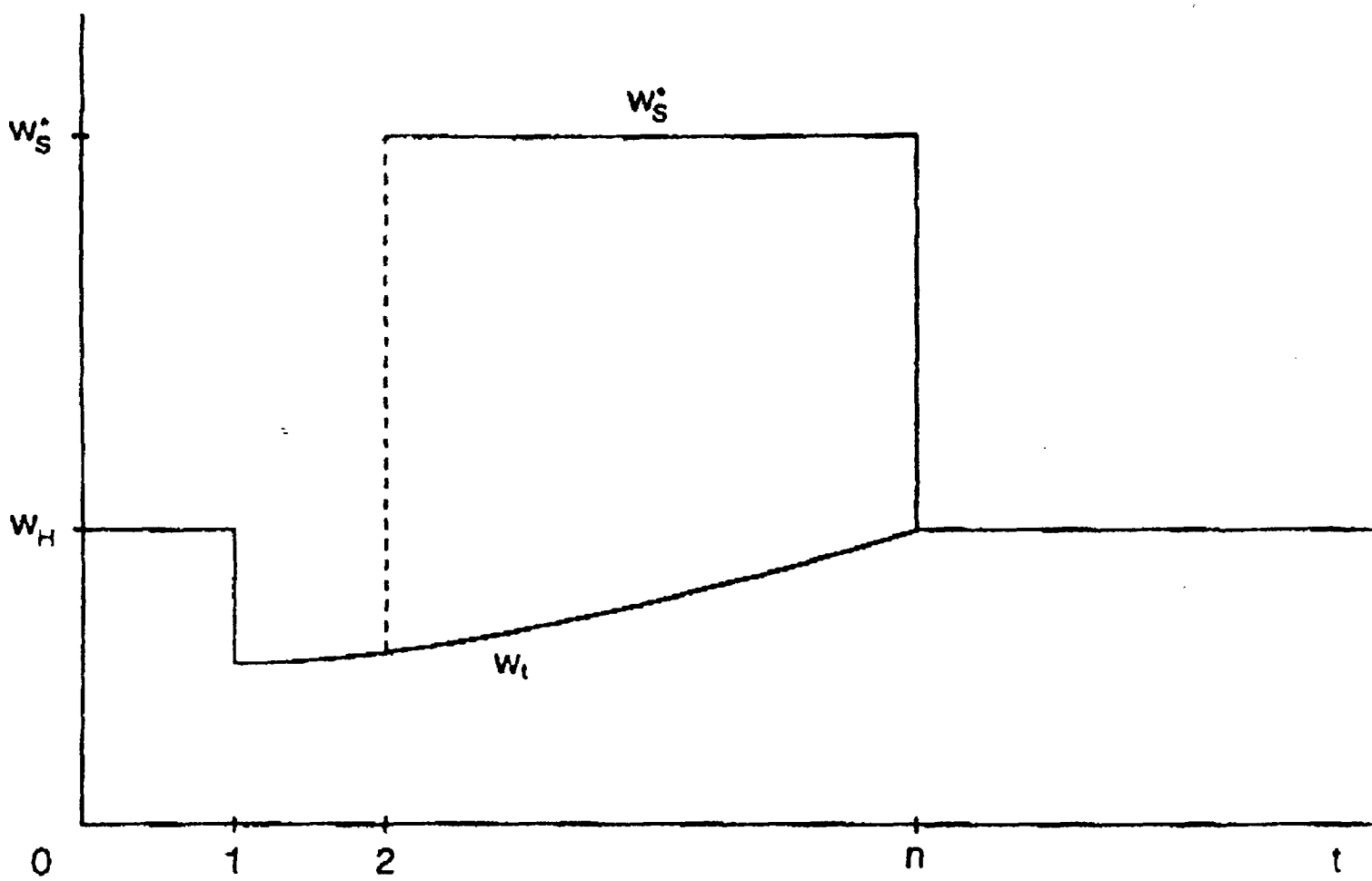


Figure 1

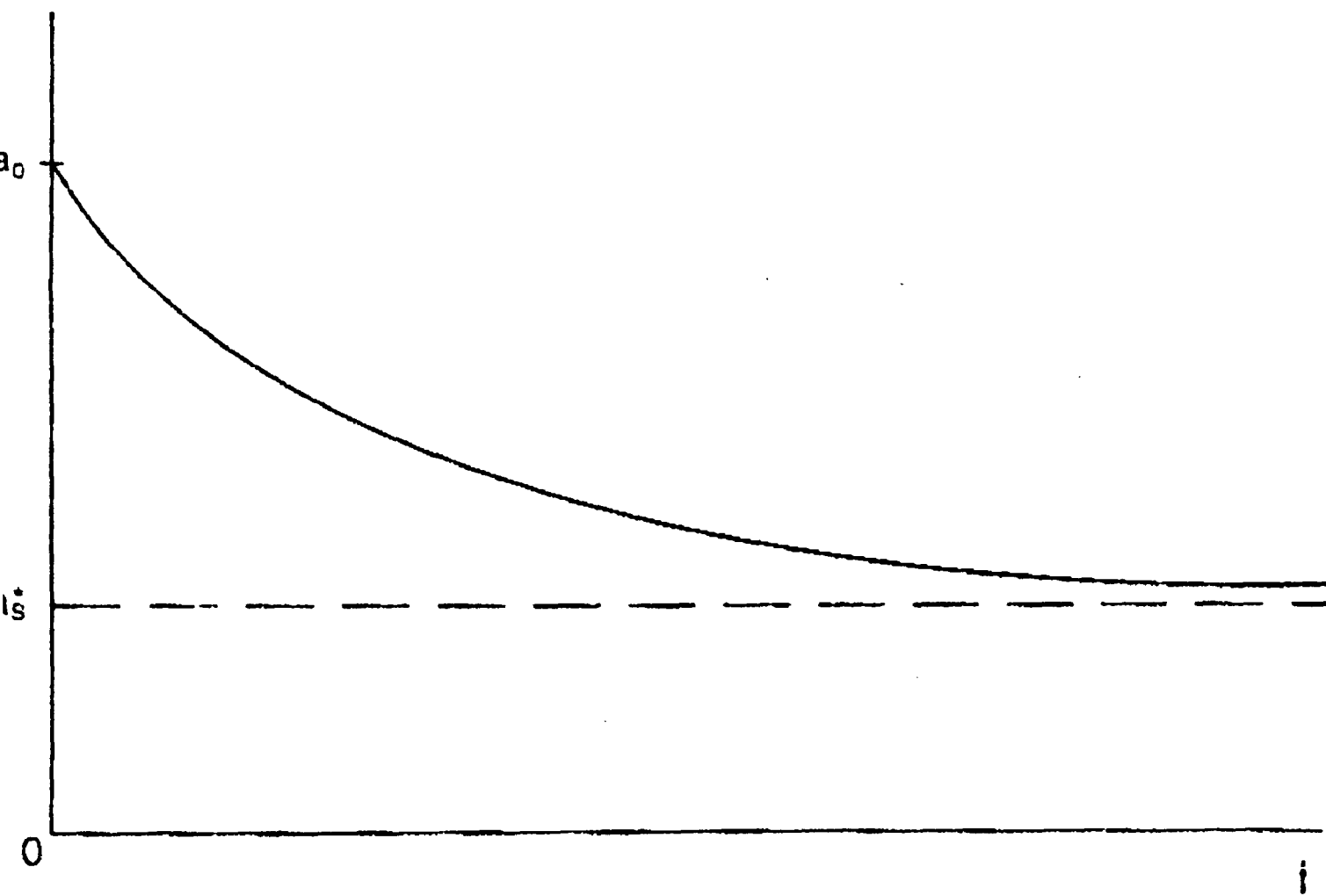


Figure 2

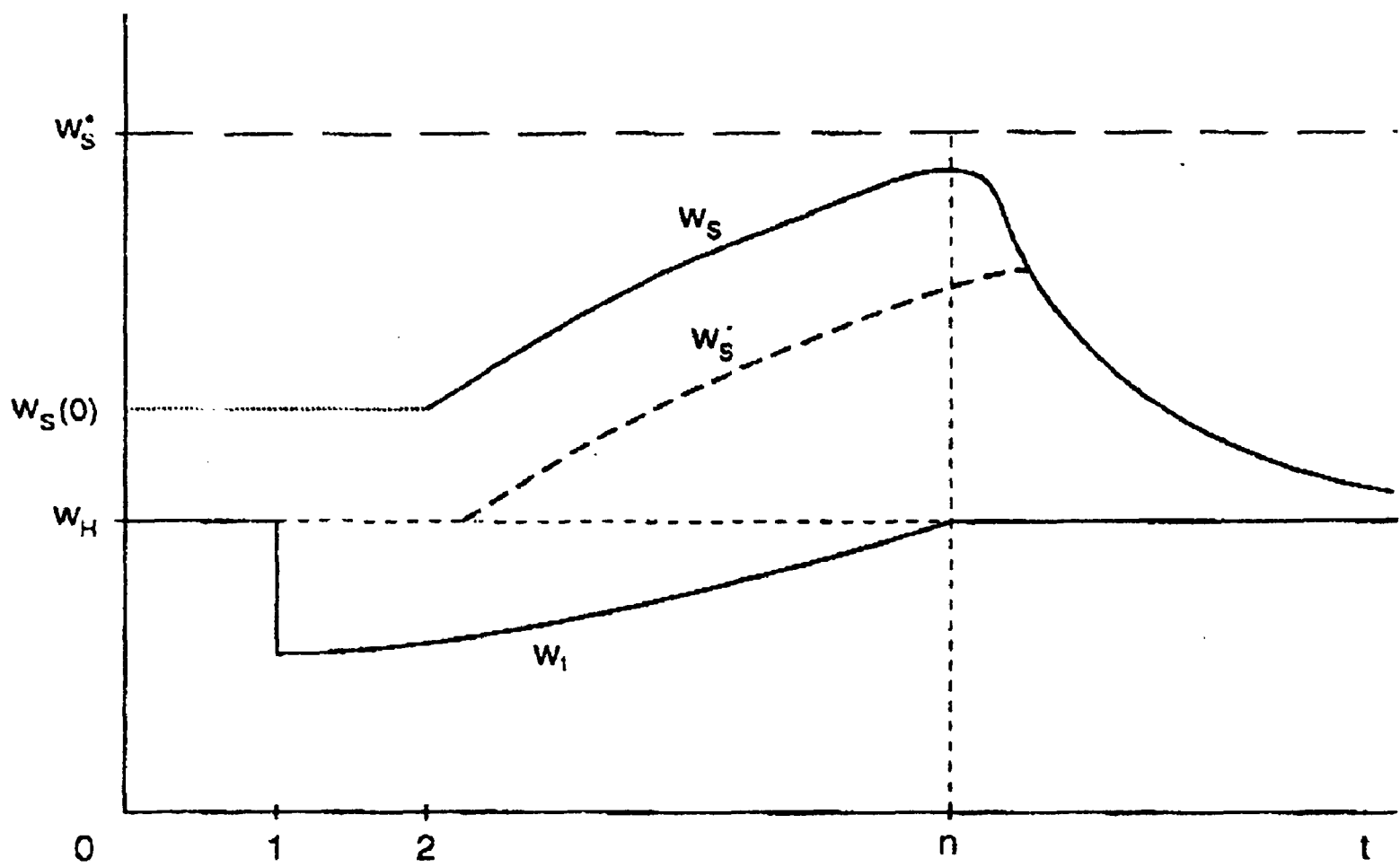


Figure 3

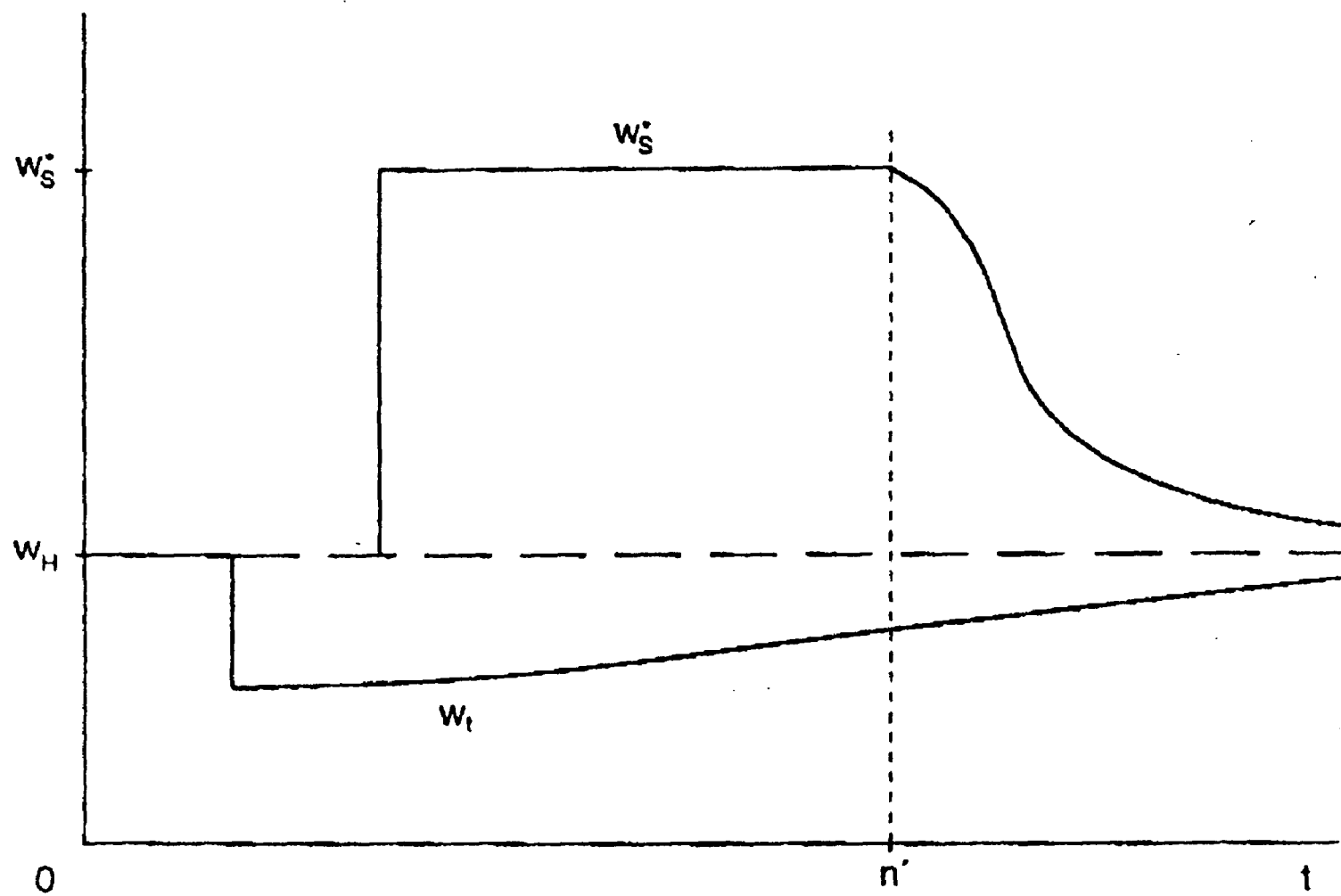


Figure 4

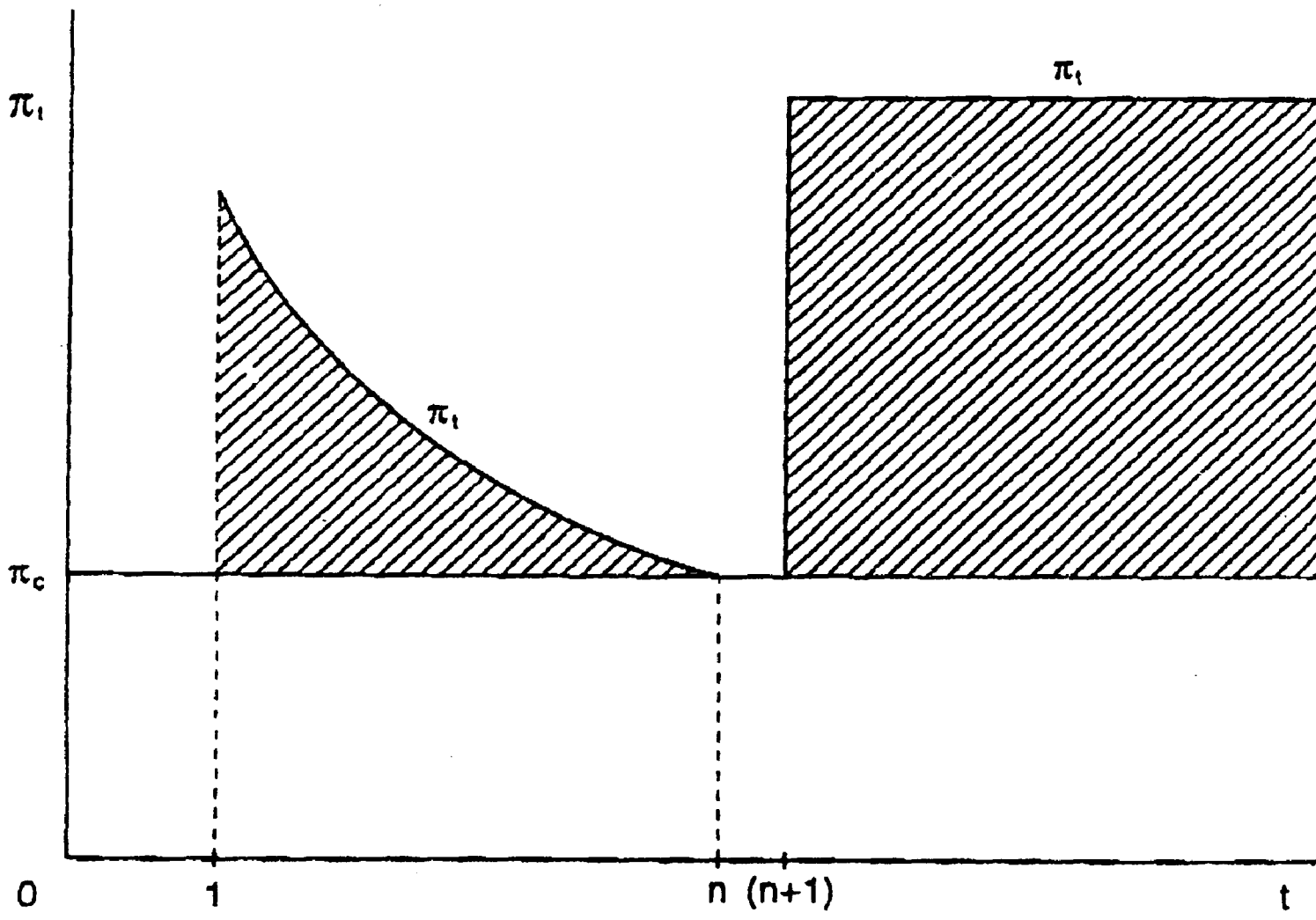


Figure 5