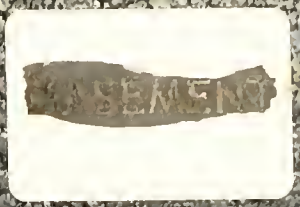

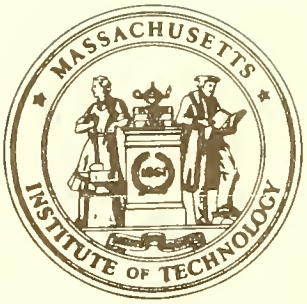

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DOMESTIC DISTORTIONS, IMPERFECT INFORMATION AND THE BRAIN DRAIN

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Thanks are due to the National Science Foundation for partial financial support of the research underlying this paper. The paper was prepared for the Bellagio Conference on the Brain Drain and Income Taxation, 15-19 February 1975. It is best read as a companion piece to the Bhagwati-Hamada (1974) paper, whose analysis it extends.

The traditional, theoretic analysis of the welfare effects of the brain drain, initiated by Grubel and Scott (1966) and developed by Berry and Soligo (1969) and several others, has been based on the assumption of perfect competition, including perfect information and full wage flexibility.

A departure from these assumptions was made in an earlier paper of ours--Bhagwati-Hamada (1974)--by permitting the presence of wage rigidity and unemployment. In the context of this model, the basic Grubel-Scott contention that (infinitesimal) emigration would not affect the welfare (conventionally defined) of those left behind was clearly not valid and a welfare loss could well be imposed on the non-migrant group. In addition, the Bhagwati-Hamada analysis introduced the possibility of the "emulation effect" whereby the migration could raise the wage levels of the class of migrants by virtue (or rather, vice) of the implied, consequent integration internationally of this class of labor: such a "distortion-augmenting" emulation effect could accentuate then the welfare loss imposed on those left behind.

In this paper, we utilize the same, basic model but extend it in three directions which bring it closer to alternative facets of reality in the LDC's.

First, we consider the phenomenon of "overqualification," i.e. where jobs have been upgraded and the educated are working in jobs that, objectively speaking, do not "require" the education.[1] The extension of

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[1] For a statement of this basic model, see Bhagwati (1972) and the systematic, general-equilibrium analysis of education in this framework in Bhagwati and Srinivasan (1975). The latter paper re-christens the overqualification model as the "job ladder" model.

our analysis to the situation where overqualification is present shows that, in the absence of the emulation effect, brain drain from the class of skills characterized by overqualification can help, rather than hurt, those left behind.

Secondly, we extend our analysis to the phenomenon that has sometimes been described as the "internal brain drain" but is more aptly called the "internal diffusion" of professionals. Thus it is well known that doctors tend to congregate in the urban areas and rural areas tend not to attract doctors. However, there is also a process of internal diffusion going on: with doctors, as the congestion in the cities increases and cuts into average incomes, increasingly moving to the countryside partially or fully.[2] This internal diffusion process is likely to be inhibited as the possibility of external brain drain from the LDC (cities) is opened up. We will model this phenomenon and demonstrate formally the welfare-reducing impact of migration in such a context.

Thirdly, we introduce an element of imperfect information into the analysis of the brain drain. Arrow (1973) and Spence (1974) have developed a "screening" theory of education.[3] In its simplified form, the theory states that education is important not so much because it increases the productivity of workers as because it plays the role of filtering efficient labor from labor in general. We utilize this notion and consider the case

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[2]The partial movement frequently occurs through opening up clinics or offices in the neighboring towns, with the city doctor spending part of the month there.

[3]A concise statement of four alternative theories of education (the Schultz-Becker "human capital" theory, the radical "socialization" theory, the Arrow-Spence screening theory and the Bhagwati-Srinivasan "job-ladder" and fairness-in-hiring theory) is provided in Bhagwati and Srinivasan (1975).

where the brain drain serves to identify and thus screen the more efficient from the less efficient. It turns out that if the domestic labor market cannot discriminate as effectively as the international market for professionals, then the economy tends to lose essentially because emigrants are picked up from the category of the more efficient.

This analysis of market distortions and imperfect information will demonstrate that the welfare effects of the brain drain, and accordingly the nature of the policy intervention necessary, differ significantly depending on the nature of distortion or imperfection that the LDC economy is facing; in fact, within each LDC, different classes of professional emigrants (e.g. doctors, engineers, etc.) may correspond to different models. While this analysis takes the domestic distortions as given exogenously, we raise in our concluding section the significant possibility that migration itself could influence these distortions, accentuating or moderating them.

I: The Basic Framework and the Welfare Criterion

We initially state the basic Bhagwati-Hamada (1974) model, with its special features such as the presence of wage rigidity and unemployment.[4] Consider an economy satisfying the small-country assumption such that the relative commodity price-ratio between two tradeable commodities is fixed internationally. Let there be two kinds of labor: uneducated and educated labor. Uneducated labor can be transformed into educated labor at constant costs. Corresponding to the two goods, there are two sectors in the economy: the traditional sector that normally employs uneducated labor, and the developed sector that normally employs educated labor.[5] Wages are assumed to be exogenously given by the international emulation process and possibly by the "leap-frogging" process discussed in the Bhagwati-Hamada (1974) paper.[6] It is also assumed that unemployment exists in both of the sectors.

The production function of the traditional sector is given by:

$$F_o(L_o) \quad [\text{with } F_o' > o, \quad F_o'' < o]$$

where L_o is the employment of labor in the traditional sector. The production function of the developed sector is given by:

$$F_e(L_e) \quad [\text{with } F_e' > o, \quad F_e'' < o]$$

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[4] Only the barest minimum details are provided here; the reader can consult the original Bhagwati-Hamada paper for a more leisurely statement of the model.

[5] The use of the qualifying adverb "normally" is pertinent to our analysis in the next section.

[6] Bhagwati and Hamada, op.cit. Most of the results below remain valid so long as the wage of educated labor is determined exogenously. The wage of uneducated labor may be determined by marginal or average productivity.

where L_e is the employment of labor in the developed sector. We shall assume that $F_e'(L_e) > F_o'(L_o)$ for an identical amount of labor $L_e = L_o$.

The total labor force N is divided into two categories: uneducated labor N_o and educated labor N_e, in such a way that

$$N_o + N_e = N \tag{1}$$

Under the "normal" assumption that excludes the over-qualification of labor, $(N_o - L_o)$ and $(N_e - L_e)$ indicate respectively the unemployment in the traditional sector and that in the developed sector, in the absence of brain drain. Let us suppose now that brain drain occurs only from the educated labor. In the presence of brain drain equal to Z, $(N_e - Z - L_e)$ then indicates the unemployment in the developed sector.

Wages are fixed as $\bar{w}_o$ and $\bar{w}_e$, and labor is employed to the point of equality with its marginal product, i.e.:

$$F_o'(L_o) = \bar{w}_o \tag{2}$$

$$F_e'(L_e) = \bar{w}_e \tag{3}$$

assuming the international price ratio to be normalized to unity. When $\bar{w}_o$ and $\bar{w}_e$ are given, L_o and L_e will clearly be determined from equations (2) and (3).

People decide whether to educate themselves by comparing the expected wage rate for uneducated labor and that for educated labor. That is, in the absence of any constraints on the expansion of education facilities, and if educational cost is provided by the government, the equality

$$\frac{L_o}{N_o}\bar{w}_o = \frac{L_e}{N_e - Z}\bar{w}_e \tag{4}$$

will determine the amount of educated people. In certain institutional settings discussed below, there will then be permanent excess demand to get educated: in this case, the number of educated people will have to be limited exogenously by governmental fiat.

Let us now turn to the welfare criterion to judge the welfare effect of the brain drain in this economy. We will take the average income of those left behind as the welfare criterion. The resulting formula for welfare change is then readily derived as follows.

The GNP, Y, of the country of emigration can be expressed as:

$$Y = F_o(L_o) + F_e(L_e) - kN_e = G(N-Z) \qquad (5)$$

where k is the constant cost of education, noting again that the international commodity price-ratio is normalized at unity, and GNP is a function of the available labor force. As soon as we shift however to the GNP accruing to those left behind, i.e. Y_d, their income <u>after</u> migration becomes:

$$Y_d = G(N-Z)$$

and, before migration, it is:

$$Y_d = G(N) - vZ$$

where v is the average income that emigrants are receiving prior to the emigration. It follows immediately then that:

$$\frac{dY_d}{dZ} = \frac{1}{N-Z}\left\{v + \frac{dG}{dZ}\right\} \qquad (6)$$

and, evaluated at Z=o, we have:[7]

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[7] This welfare criterion, as Berry and Soligo (1969) noted, is of course different from that which would result if we were comparing, before and after migration, the per-capita incomes (as distinct from the per-capita incomes of those left behind). For the former case, the criterion would modify to:

$$\frac{dY/(N-Z)}{dZ} = \frac{1}{N-Z}\left\{\frac{dG}{dZ} + \frac{Y}{N-Z}\right\}$$

$$\left.\frac{dY_d}{dZ}\right|_{Z=o} = \frac{1}{N}\left\{v + \frac{dG}{dZ}\right\} \qquad (6')$$

Therefore we must look at the value of $(v + \frac{dG}{dZ})$ in order to assess the welfare effect of the brain drain. All that this formula says is that, if the marginal loss due to the reduction of labor is larger than the payment that was received by the marginal emigrant, then those left behind will lose; otherwise they will gain.

We shall not repeat the comparative static analysis of the system of equations (1)-(4) that was developed in our earlier paper.[8] It is necessary to note , however, that if the brain drain results (only) in a rise in the wage of educated labor (thanks to the emulation effect), then the effect on GNP now becomes:

$$\frac{dG}{dZ} = -k\,\frac{L_o\bar{w}_o}{L_e\bar{w}_e + L_o\bar{w}_o} - \left\{\eta_e L_e + \frac{k(1-\eta_e)N_e N_o}{\bar{w}_e N}\right\}\frac{d\bar{w}_e}{dZ}$$

where η_e is the wage elasticity of the demand for educated labor.[9] Having noted this, we now turn to the extension of the analysis to the phenomena of overqualification, internal diffusion and imperfect information.

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[8] Bhagwati and Hamada (1974, Table 2, p. 33). Note merely that there is a minor difference between equation (25) there and equation (4) in this paper, concerning the treatment of Z. But this is for the purpose of simpler exposition and does not affect the substance of our analysis.

[9] See Bhagwati and Hamada (1974, p. 33); the difference in the first term on the RHS comes from our new equation (4) which replaces the Bhagwati-Hamada equation (25).

II: The Overqualification Phenomenon

The labor market may function, in response to excess supply, not by cutting the wage as in the usual neoclassical analysis but rather in the context of a "job ladder" model, with sticky wages, where the excess supply then spills over from the "best" to the "next-best" job. Thus, educated labor, on finding no more employment in the educated-labor category of jobs, can be postulated as moving down the job ladder and taking the jobs which do not require the education. Bhagwati and Srinivasan (1975) further argue that, in this case, a "fairness-in-hiring" principle may also be sociologically invoked whereby employers, faced by excess demand for the no-educational-requirement jobs from both educated and uneducated labor, prefer to hire the educated because they think it is "fair" to reward those who have put in extra effort, as it were. Thus, although both kinds of labor are equally productive in the no-education-requirement jobs, the educated applicants are hired in preference over the uneducated ones.

In the analysis that follows, we then modify our basic model to incorporate this job ladder phenomenon with overqualification (or upgrading of jobs in terms of hiring practice) characterizing the hiring in the sector where educated and uneducated labor have identical productivity. Thus, assume now (as before) that the educated labor may be in excess supply in its market, in the developed sector; however, when the expected wage in this sector is equalized with the wage in the traditional sector, the educated labor spills over into employment in the traditional sector. And, given the number of jobs in the traditional sector at the exogenously-fixed wage therein, we assume that the incidence of unemployment then falls on uneducated labor. Formally, the model then modifies as follows.

Let L_{ee}, L_{eo} and L_{oo} denote respectively the educated labor employed in the developed sector, educated labor employed in the traditional sector, and uneducated labor employed in the traditional sector. Then, by definition, we have:

$$L_{ee} = L_e; \text{ and}$$

$$L_{eo} + L_{oo} = L_o$$

for labor employment in the two sectors. Now, the assumption that everyone will get educated as long as the expected wage to educated labor exceeds that to uneducated labor (since the educational cost is borne by the government and its indirect tax cost not taken into account by atomistic labor), implies that in this modified model there would be an endless incentive to get educated: the expected return to educated labor would always exceed the expected return to uneducated labor. Hence, we must impose an exogenous constraint on how many get educated: i.e. $N_e = \bar{N}_e$ by policy decision.

It is immediately obvious then that, thanks to the constancy of $\bar{w}_e$ (and hence of L_e) and $\bar{N}_e$, the effect of the migration is to create an identical reduction in the unemployment of uneducated labor:

$$dL_{eo} = -dZ \quad \text{and} \quad dL_{oo} = dZ$$

so that we have:

$$\frac{dG}{dZ} = 0 \tag{7}$$

The loss of educated labor is fully offset, at the margin, by unemployed uneducated labor getting employed in their place in the traditional sector, without loss of productivity (as postulated), so that both L_e and L_o, the employment levels in both sectors, and hence the output levels in both

sectors are unaffected.[10] It follows therefore that:

$$\left\{v + \frac{dG}{dZ}\right\} > o \qquad (8)$$

unless we introduce other complexities in the analysis.

Such a complication, for example, is when the wage ($\bar{w}_e$) in the developed sector rises due to the emulation effect, in the presence of migration and the accompanying move towards integration of the labor market for the migrant class of labor. The number being educated will remain constant (at $\bar{N}_e$) again by assumption; however, GNP will now be reduced by the induced fall in L_e (as $\bar{w}_e$ rises) in the developed sector:

$$\frac{dG}{dZ} = - L_e \eta_e \frac{d\bar{w}_e}{dZ} \qquad (9)$$

Yet another complication could be introduced if we were to postulate that the governmental educational policy is aimed at providing a constant educational labor force net of emigration. In this event, the emigration of educated labor would lead to an identical, offsetting expansion of the educated labor force, so that we must modify equation (7) as follows:

$$\frac{dG}{dZ} = -k \qquad (10)$$

because, while output in the two sectors remains constant, the cost of education increases as more get educated to offset the emigrated educated labor. In this case, again, the welfare criterion ($v + \frac{dG}{dZ}$) will become ambiguous unless we postulate (as seems reasonable) that $v > k$.

In conclusion, it would appear that, under the conditions postulated, the overqualification phenomenon tends to mitigate the welfare loss, if

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[10] This argument presupposes, of course, that the magnitude of emigration does not exceed the spillover of educated labor into the traditional sector in the pre-emigration situation.

any, of the brain drain. In fact, if the brain drain is not accompanied by an induced rise in the wage-level in the developed sector or by an offsetting expansion of domestic educational facilities, the brain drain will increase (rather than decrease) the per capita income of those left behind in the country of emigration.

III: The Internal Diffusion Process

The diffusion of the emigrant class of professionals (e.g. doctors) from the urban to the rural areas, from areas of "low" to areas of "high" social marginal product, is a phenomenon that again can be modelled as an extension of our basic framework, leading to the conclusion that the brain drain in the presence of such a diffusion process could harm those left behind.

Suppose now that there are two subsectors in the developed sector, and hence two opportunities for the educated labor therein: urban and rural employment. In the urban occupation, wage $\bar{w}_{eu}$ is paid and is higher than the wage $\bar{w}_{er}$ in the rural occupation; the latter, in turn, is still higher than the wage in the traditional sector $\bar{w}_o$. Educated labor thus chooses between rural and urban occupations such that

$$\bar{w}_{er} = \frac{L_{eu}}{N_e - L_{er} - Z} \bar{w}_{eu} \qquad (11)$$

where L_{er} and L_{eu} indicate employment in rural and in urban occupations respectively. Again, since $\bar{w}_{er} > \bar{w}_o$ and educational costs to individuals are nil, we must contend with excess demand for getting educated. Hence we will assume, as in the preceding section, that the size of the educated

labor force (N_e) is exogenously fixed by the government, consistently with eq. (11).

We further postulate that, in the rural occupation, there is a shortage of educated labor. Formally, the social marginal product in the rural occupation is higher than the wage:

$$F'_{e\gamma}(L_{e\gamma}) > \bar{w}_{e\gamma}$$

while, in the urban occupation, the wage is equal to its marginal product:

$$F'_{eu}(L_{eu}) = \bar{w}_{eu}$$

If emigration occurs now, without any additional emulation-induced effects on the wages in both occupations, then the constancy of N_e implies that:

$$dL_{e\gamma} = -dZ$$

and

$$\frac{dG}{dZ} = - F'_{e\gamma}(L_{e\gamma})$$

Essentially, this means that the educated labor employed in the rural occupation decreases by the amount of the emigration: the emigration raises the expected wage in the urban occupation, pulling the educated labor out of the rural occupation. The welfare criterion then is:

$$v + \frac{dG}{dZ} = v - F'_{e\gamma} \qquad (12)$$

which has a positive sign if $F'_{e\gamma}$ is smaller than v, but can be negative if the social marginal product in the rural occupation is substantially higher than the wage in the rural occupation and further exceeds the wage that was paid to the emigrant.

Introduce now the emulation effect, so that the brain drain induces a rise in $\bar{w}_{eu}$. In this case, clearly the production loss is aggravated. For, in the urban occupation, L_{eu} is reduced by $\frac{\eta_{eu} L_{eu}}{\bar{w}_{eu}} d\bar{w}_{eu}$, where η_{eu} is the elasticity of demand for labor in the urban occupation. On the other hand, the labor shortage is increased in the rural occupation because $L_{e\gamma}$ is reduced as follows:

$$dL_{e\gamma} = - dZ - \frac{L_{eu}(1 - \eta_{eu})}{\bar{w}_{e\gamma}} d\bar{w}_{eu}$$

Therefore, the shortage of educated labor in the rural occupation increases by more than the size of emigration if $\eta_{eu} < 1$. The total production loss is then:

$$\frac{dG}{dZ} = - F'_{e\gamma} \left\{ 1 + \frac{L_{eu}(1 - \eta_{eu})}{\bar{w}_{e\gamma}} \frac{d\bar{w}_{eu}}{dZ} \right\} - L_{eu} \eta_{eu} \frac{d\bar{w}_{eu}}{dZ} \qquad (13)$$

Thus, in spite of the fact that the employment of the urban occupation reduces, the shortage in the rural occupation increases.

If our analysis accurately reflects the reality in some LDC's, then we must consider to be somewhat optimistic the following view of H. Myint (197) on the effects of the brain drain of doctors from large cities in the LDC's:

> The pressure of excess demand from the advanced countries is most likely to affect the doctors in private practice in the bigger towns in the underdeveloped countries. In so far as this is true, the welfare effects are less catastrophic than if the doctors were being taken away from the rural areas and the development effect is probably negligible.

The analysis of this section shows that the effect of the brain drain could be significantly harmful even though the direct source of the emigrants was the urban population.

IV: Brain Drain and the Screening Process

Consider now the question as to who is likely to emigrate. Several "high-level" emigrants are individuals who possess some special skills such as language ability, study and experience in the developed countries. They are therefore likely to be specialists who have some special ability "needed" in the recipient country.[11] Suppose now that these kinds of characteristics or ability are also productive at home. In this case, we have the possibility that the brain drain functions as a screening device of more efficient from less efficient labor.

If these individuals receive their full marginal productivity at home, there is no problem. Or if the fact that a person has a foreign offer for job and emigration results in his getting a correspondingly higher wage, there is no problem either. But does the employer know who possesses differentially higher ability? Or, if he knows this, does he or can he offer higher wages to such people? In other words, if a category of educated labor contains both "emigrable" and "non-emigrable" labor, and if the former is more efficient, does the price mechanism duly take account of the difference?[12] This section therefore deals with the possible imperfection of information in the market of educated labor and the consequences it has for the welfare effects of the brain drain.

The basic Arrow (1973)-Spence (1974) framework for analyzing education as a screening (or, what Arrow also calls, filtering) device eliminates

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[11] The labor certification process which is necessary for "normal" professional immigration in many countries would tend to produce this outcome, of course.

[12] In Japan, for example, all college graduates in a company receive almost the same salary until several years later after the graduation. If somebody is offered a higher-paid position in a foreign country, it does not follow that the company pays him a higher wage.

any productivity effects of, say, the human-capital variety. In our framework, however, we admit the productivity effect but at the same time allow for the possibility that the (domestic) market cannot discriminate between the highly-gifted (and consequently "emigrable") labor and the commonly-educated (and consequently "non-emigrable") labor.

Now let us return to our basic model. Assume again that educated labor works only in the developed sector, but that educated labor consists of two categories: "commonly-educated" labor L_c and "highly-gifted" labor L_h. L_h is λ times more productive than L_c, the difference being of the labor-augumenting type. However, let us assume that employers cannot discriminate between L_c and L_h, so that all the educated labor receives the average marginal productivity. Therefore:

$$\bar{w}_e = \{(1 - p) + p\lambda\} F'_e(L_e), \qquad \lambda > 1 \qquad (3')$$

where p is the ratio of the highly-gifted labor to all the educated labor: $p = L_h/L_e = L_h/(L_c + L_h)$. In other words, p may be regarded as the probability of educated labor turning out to be highly gifted.

Then, in the system of the basic model (1)-(4), with the only modification that (3) is replaced by (3'), we obtain the same qualitative properties for given values of $\bar{w}_o$ and $\bar{w}_e$ as the basic model. The rise in $\bar{w}_e$ also creates the same qualitative impact as in the basic model.

Suppose now that the individuals who emigrate are picked up only from the highly-gifted category. Then, with a given number of educated labor, the marginal loss to the economy is

$$\lambda F'_e(L_e)$$

while the emigrant before emigration was receiving the weighted average:

$$v = \bar{w}_e = \{(1 - p) + \lambda P\} F'_e(L_e)$$

Therefore the direct loss to those who remain behind is given from our welfare criterion as follows:

$$v + \frac{dG}{dZ} = - \lambda F'_e(L_e) + \bar{w}_e = (1 - \lambda)(1 - p)F'_e(L_e) < 0 \qquad (14)$$

assuming that the number of the educated labor is held constant.

Naturally equation (14) indicates only the direct impact. When the marginal outflow of highly-gifted labor occurs, however, the vacancy will be filled with new labor with the expected value of productivity equalling $\bar{w}_e$. Moreover, from (1) and (4), the number of educated labor will then increase by:

$$dN_e = \frac{L_o \bar{w}_o}{L_o \bar{w}_o + L_e \bar{w}_e} \, dZ$$

thus imposing on the economy the education cost: kdN_e. Therefore, the total effect (ruling out other effects such as emulation-induced wage increases) is given by:

$$v + \frac{dG}{dZ} = - \lambda F'_e(L_e) + 2\bar{w}_e - k \frac{L_o \bar{w}_o}{L_o \bar{w}_o + L_e \bar{w}_e}$$

$$= \{1 - (\lambda - 1)(1 - 2P)\} F'_e - k \frac{L_o \bar{w}_o}{L_o \bar{w}_o + L_e \bar{w}_e} \qquad (15)$$

Eq. (15) has no definite sign but it is easy to see that it can quite easily be negative.

It is worth noting that the direct-impact effect in eq. (14) is valid even if we work with a model with flexible wages in both the educated and the uneducated labor markets. Moreover, in an economy equipped with

competitive labor market and the amount of education optimally given by the government, eq. (14) will indicate the <u>total</u> effect of emigration in such an economy. For, if N_e is determined optimally,

$$\frac{dG}{dZ} = \frac{\partial G}{\partial Z}\bigg|_{N_e:\text{const}} + \frac{\partial G}{\partial N_e}\frac{dN_e}{dZ}$$

$$= \frac{\partial G}{\partial Z}\bigg|_{N_e:\text{const}} = (1-\lambda)(1-p)F'_e < 0$$

by the envelope relationship.

So far we have worked with the assumption that the emigrating labor is necessarily from the highly-gifted category. Suppose now instead that the probability of an emigrant being highly-gifted is q. Then the expected value of the direct impact on the economy is:

$$v + \frac{dG}{dZ} = \bar{w}_e - \{(1-q) + \lambda q\} F'_e = (q-p)(1-\lambda)F'_e \qquad (16)$$

which is negative as long as $q > p$. As long as the screening power of brain drain has <u>some</u> informational value, i.e. $q > p$, the impact effect is clearly negative.

We have also assumed so far that the ratio or the probability of highly-gifted labor is independent of the brain drain. Suppose, however, that the probability of an individual turning out to be highly-gifted is related positively to some trait like the high school grade. Then, the probability of turning out highly-gifted for the <u>marginal</u> student who comes itto the educational system because of the emigration will be lower than the <u>average</u> probability for the educated. In this case, p is a decreasing function of Z, and this factor gives rise to yet further welfare-reducing effects.

In conclusion, we may note the possible dynamic externality aspects involved in the emigration of the highly-gifted. It is possible that such emigration affects, via adverse inpact on domestic availability of the highly-gifted (who are not inspired and taught itto full maturity of their talent in the absence of the senior highly-gifted people), the welfare of those left behind by affecting the ratio p adversely. Thus, suppose that it takes one period to educate the younger generation for skilled labor. Suppose also that p(t) depends on the density of the preceding generation p(t-1) such that:

$$p(t) = \alpha + \beta p(t-1) \qquad [\alpha > 0, \quad 0 < \beta < 1]$$

Then it is easy to show that if brain drain is occurring every period affecting p(t) by δ, the stationary value of p will be reduced by $\beta\delta/(1 - \beta)$.[13] Even a once-for-all emigration of highly-gifted labor will have a decaying but enduring effect on the future path of p(t).

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[13] Even without considering the above-mentioned mechanism of reducing p, p will be immediately reduced by emigration of highly-gifted because it takes time to replenish highly-gifted labor in the situation considered here.

V: Brain Drain and Institutional Change

It should be clear by now that the welfare effects of the brain drain differ significantly depending on the institutional setting from which labor is emigrating. If there exists the phenomenon of overqualification, then the brain drain may work to improve the welfare, provided that we exclude the emulation effect on the wage level of the emigrant class of labor. On the other hand, if the domestic market for the labor is characterized by the internal diffusion process, the brain drain will harm those remaining behind, regardless of whether or not the emulation effect leads to a rise in the wage level. Finally, if emigrants are chosen from the highly-gifted category and are not so identified in the domestic market, then the brain drain could cause a welfare loss even with flexible wage rates.

The institutional setting concerning wage levels and changes therein and informational structure differs from country to country. Even within a country, it must surely differ from occupation to occupation. Risking oversimplification, we might argue that overqualification is likely to occur most with social scientists and (for certain countries, chiefly India) with engineers; the internal diffusion process is most serious for doctors and nurses, and imperfect information is pertinent to scholars and researchers. Therefore, depending on which LDC is being discussed, and which occupation is the object of attention, the analysis of the welfare effects of the brain drain is likely to vary; and a generalized analysis could well be misleading. Our analysis should be taken as an attempt to underline the importance of setting out the nature of institutional rigidities or imperfect information in the labor market for emigrant labor prior to analyzing the welfare effects of such emigration.

Note finally that our analysis in this paper has proceeded almost exclusively on the assumption that the institutional distortions in the domestic economy of the LDC of emigration are exogenous to the emigration process. The only exception made was for the Bhagwati-Hamada emulation effect: emigration from a class of skilled labor would raise the (sticky) wage of that labor, thus accentuating the sticky-wage distortion in the labor market.

But we can, and indeed must, ask the question whether the emigration process can be expected to influence, and if so in what direction, each of the market imperfections that we have analyzed in this paper. The analysis of the emulation effect in Bhagwati-Hamada (1974) and in the present paper demonstrates the significance of modelling this kind of linkage into one's theoretical framework. But this can also be seen from at leaat two other areas of international economic analysis. Thus, in tariff theory, it is well-known that while a domestic monopoly is distortionary, it does not compromise the case for free trade since the introduction of free trade itself can be regarded as destroying the monopoly: the free trade policy is distortion-destroying and hence continues to be optimal. To take the other example, the welfare effect of foreign investment by MNC's (multi-national corporations) may be considered in light of its effects on an "imperfect" domestic entrepreneurship: it may inhibit and stunt its growth or it may encourage it to be competitive and efficient.[14]

In the present context, we must eventually ask questions such as the following, distinguishing in each case between the "malign-impact" and the

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[14]For a discussion of these possibilities of "malign impact" and "benign impact" models in analysing MNC's, see Bhagwati (1975).

"benign impact" hypotheses:

(i) Will the brain drain accentuate a domestic distortion such as a sticky wage (that exceeds the shadow wage (as in Bhagwati-Hamada or falls below it as with monopsonistic pricing of a skill such as medicine under a nationalized health service) or will it promote increased flexibility in wage-setting in the country of emigration (as implied by Johnson (1972))?

(ii) Will the brain drain, in the presence of unemployment, reduce the possible subsidy to education or will it lead to greater demands for increasing it?

(iii) Will the screening function exercised in the brain drain process induce the domestic labor market to do better screening in the future or will it demoralize it into indiscriminate escalation of the entire wage level regardless of differential productivity?

These are all yet additional instances of the unsettled debate among development economists whether international integration into the world economy leads to development in the LDC's or to their domestic disintegration.[15] The issues raised here are not purely economic; they neccessarily encompass sociological, political, ethnic and historical facets. Complex as they therefore are, and almost intractable to conventional economic analysis, they are equally necessary to address and resolve if the analysis of the brain drain is to be complete.

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[15]This phrasing is from Oswaldo Sunkel; see, for example, his long essay (1973) on import substitution.

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