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***SKILLED LABOUR AND INTERNATIONAL
SPECIALISATION IN THE CARIBBEAN REGION***

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Skilled Labour and International Specialization in the Caribbean Region

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Abstract

The paper focuses on three issues concerning Caribbean Single Market. They relate to: human capital and industrial location; possibility of Single Market creating advanced sector in the MDC and traditional sector in the LDC and, whether highly skilled workers will become more responsive than other workers to productivity differential when making decision to migrate. The paper argued that the development of human capital and skilled labor would become increasingly important determinants of industrial localization in the new Caribbean Single Market Economy. Countries with high skilled workers will specialize in the advanced sector at the beginning of the Caribbean single market such that they become more similar in terms of per capita income while countries with less skilled workers specialized in traditional sectors lagged. Under the Single market in the Caribbean, we expect both the high skilled and low skilled to be responsive to economic incentives offered by MDC in the early period of the Single Market. In conclusion, if differing rates of investment in human capital in the form of education account for these trends, Caribbean countries should stress the crucial role of domestic educational policies in the areas of technical and scientific subjects needed for industrial growth and development.

Introduction

With Caribbean moving toward single Market and Economy, Owen Arthur (1999) have observed that it is a process requiring “the choice of the best niches for specialization, the forging of the correct relationship with global capital, production systems, trading regimes and the multilateral financial institutions.” Implied here is that Caribbean Single Market and Economy and, global free trade are relative complements. It is also the case that the global market place is now for countries, regions (Single Market and Economy) and companies that produce goods and services that meet world class standards and are competitive. In effect, what are needed are the educational systems, which will produce

the skills needed to produce world-class goods and services. We do recognize that work experience is one characteristic of labor force that enhances return in the form of higher productivity of the workers. In the present paper we shall focus on three Issues: The first relates to whether the development of human capital and skilled labor will become increasingly important determinants of industrial localization in the new Caribbean Single Market Economy? For example, other important factor in industrial localization is reducing the barriers to international investment in order to increase the international mobility of financial capital as well as new technology. Globalization of financial market continues to reduce these barriers to international investment. The second issue relates to whether countries that specialized in the advanced sector at the beginning of the Caribbean single market will become more similar in terms of per capita income while countries specialized in traditional sectors lagged? It is argued that the intensification of international knowledge spillovers due to cross-country interaction may exacerbate within-country region disparities, if regions with different specialization do not benefit evenly from the exchange of knowledge. The third issue is whether highly skilled workers will become more responsive than other workers to productivity differential when making decision to migrate under Caribbean single market? Mobility of labor between Caribbean countries is limited. Caribbean countries do exchange labor through services of labor embodied in traded goods. However, mobility of low skills has increased but migration of high skilled labor is still quite low in the Caribbean. The remainder of the paper is organized as follow. Section 1 presents model for human capital and industrial location. Section 2 contains discussion on specialization in advanced sector and traditional sector. Section 3 provides discussion on specialization, production

differential and decision to migrate. Empirical evidence and conclusions are presented in 4 and 5 respectively.

1. Human capital and industrial location

The development of human capital and skilled labor will become increasingly important determinants of industrial localization in the new Caribbean Single Market Economy.

Let us begin by treating skilled labor as separate factor of production. Other factors of production include: capital, capital equipment, or new investment in capital equipment (CCNC). If we assume that decreasing the barriers to international investment will increase the international mobility of financial capital as well as new technology and other determinants of the competitive advantage of firms, then CCNC will not reveal strong comparative advantage within the region. On the other, if highly skilled labor is completely immobile, then the availability of human capital will reveal comparative advantage in the manufacturing within the region. Consider now that manufacturing within the region requires skilled and unskilled labor. Let us define skilled labor as the level of education that increases the effective labor input of skilled labor by more than that of unskilled labor.

More formally, we consider a set of economies $j = 1, 2, \dots, J$ composed of set of industries $i = 1, 2, \dots, I$, and assume each of the industries uses physical capital (plant and equipment), Unskilled labor, and skilled labor to produce its output. In order to investigate the sources of productivity growth, production can be specified in terms of value added or gross output. With respect to value added, let a firm in industry i at time t has differentiable, constant returns to scale production technology such that in its most general form it is specified as:

$$Y_{it} = A_{it}^* F_i (SA_t^{ep}, L_{it}^s A_t^s, L_{it}^u A_t^u) \quad (1)$$

Where Y_{it} = is the value added, SA_t^{ep} = structure (plant and equipment), $L_{it}^s A_t^s$ = the employment of skilled labor and $L_{it}^u A_t^u$ = the employment of unskilled labor. The increases in the effective input per physical unit are represented by terms multiplying the inputs. For example we can interpret A_t^s as effective input per skilled labor. Identification requires that factors be independent of i and that there be no increases of at least one of the factors. It should be added that production function differs by industry and hence the Hicks-neutral technology shifter A_{it}^* will have both an aggregate and industrial specific component. Next, let the firm be competitive and faces market wages W_t^s and W_t^u , rental prices of Q_t^{ep} , and output prices P_{it} .

For the moment let the firm face the following static optimization problem:

$$\begin{aligned} \text{Max} \quad & P_{it} A_{it}^* F_i (SA_t^{ep}, L_{it}^s A_t^s, L_{it}^u A_t^u) - Q_t^{ep} S_t^{ep} - W_{it}^s L_{it}^s - W_{it}^u L_{it}^u \quad (2) \\ & SA_t^{ep}, L_{it}^s A_t^s, L_{it}^u A_t^u \end{aligned}$$

Consider optimality conditions payments to each input factor equals its marginal revenue products. We then have the following:

$$\begin{aligned} P_{it} A_{it}^* F_{1i} (SA_t^{ep}, L_{it}^s A_t^s, L_{it}^u A_t^u) &= Q_t^{ep} \\ P_{it} A_{it}^* F_{2i} (SA_t^{ep}, L_{it}^s A_t^s, L_{it}^u A_t^u) &= Q_t^e / A_t^e \quad (3) \end{aligned}$$

$$P_{it} A_{it}^* F_{3i} (SA_{it}^{ep} L_{it}^s A_{it}^s, L_{it}^u A_{it}^u) = W_t^s / A_{it}^s$$

$$P_{it} A_{it}^* F_{2i} (SA_{it}^{ep} L_{it}^s A_{it}^s, L_{it}^u A_{it}^u) = W_t^u / A_{it}^u$$

Let α_{it}^h represents the factor shares at any given time, where $h = p, e, s, u$. In this case competition and constant return to scale imply, for example,

$$\alpha_{it}^p = Q_t^p SA_{it}^p / P_{it} Y_{it} = F_{1i}(\cdot) SA_{it}^p / F(\cdot) \quad (4)$$

The variation implied in (4), with regard to these factor shares across industries allow one to decompose productivity growth into skilled labor and the others. In general it is the case that industry's value added TFP growth will depend on its equipment and skilled labor factor intensities. Also, it depends on the extent to which technical progress takes the form of growth in A^*A^e , A^s or A^u . Firms will continue to choose factor proportions optimally across the industry. But growth in A^s for example from our assumption is exogenous event that has differential effects on total factor productivity (TFP) across industries depending on their skilled labor share.

2. Specialization: Advanced versus Traditional Sector.

Consider now where some countries have more A^s than others. Let countries that have more A^s specializes in the advanced sector at the beginning of the Caribbean single market such that they become more similar in terms of per capita income while countries with less A^s specializes in traditional sectors lagged. It is argued that the intensification of

international knowledge spillovers due to cross-country interaction may exacerbate within-country region disparities, if regions with different specialization do not benefit evenly from the exchange of knowledge. Implied here is that we are treating the Caribbean single market as two regions: ϖ = a technologically advanced Countries (MDCs) and ω = the less technologically advanced countries (LDC's). See Caribbean Trade and Investment Report (2000) for the grouping of Caribbean countries into MDC's and LDC's. Other assumptions include the following: MDCs benefit more from international knowledge spillovers than LDC's. If market for skilled labor is pooled within a country, MDC's will produce the high-tech good at a more competitive price in equilibrium compared to LDC's. The two final goods will be produced by perfectly competitive profit maximizing firms and are perfectly tradable between regions as well as between countries. In this case we shall construct two production functions. Let the technology of the traditional sector available in both regions takes a Cobb-Douglas production function with both skilled and unskilled labor:

$$Y_i = (L_i^u)^\alpha (L_i^{*s})^{1-\alpha}, \quad 0 < \alpha < 1, \quad (5)$$

Y_i is the production of the traditional good in region i , L_i^u and L_i^{*s} are respectively, unskilled and skilled labors, required in the traditional sector in country i , and $i \in \{\varpi, \omega\}$.

We may add that total factor productivity in the traditional sector has been normalized to 1.

Similarly, let the second production function represents high-tech sector and also of Cobb-Douglas production type. A given value of the productivity parameter, N :

$$Z = N L_z^\beta L_z^*{}^{1-\beta}, \quad 0 < \beta < 1, \quad (6)$$

Z is the output of the high-tech sector; L_z and L_z^* are respectively, unskilled and skilled labors employed in the sector. The total factor productivity depends on technical knowledge accumulated in a country either from experience or services offered in the country. Let the learning – by -doing process external to firms increases the high-tech sector over time. The dynamics of N can be written as:

$$DN/dt1/N = (1 + \varphi N^*/N) h_z \quad (7)$$

Where $h_z \equiv L_z^*/L_z$ is the ratio of skilled to unskilled labor employed in the high-tech sector, N^* is the level of productivity of foreign's high-tech sector and $\varphi \in \{0, 1\}$ measures the level of interaction and the intensity of international knowledge spillovers. $\varphi = 0$ implied domestic learning-by doing process is not affected by technical knowledge accumulated abroad and $\varphi = 1$ suggest otherwise.

Let both traditional firm and the high-tech firm maximize profits and taking prices and the level of total factor productivity in the high-tech sector as a datum. Then, their profit-maximizing factor demands are:

$$W_L^i = \alpha (L_z^u)^{\alpha-1} (L_z^s)^{1-\alpha}$$

$$W_{L^*}^i = (1-\alpha) (L_z^u)^\alpha (L_z^s)^{-\alpha}, \quad i \in \{\varpi, \omega\},$$

$$W_L^n = p_z N \beta L_z^{\beta-1} L_z^*{}^{1-\beta},$$

$$W_{L^*}^n = p_z N(1-\beta)L_z^\beta L_z^{-\beta}, \quad (8)$$

where W_L^i and $W_{L^*}^i$ are, respectively, wages for unskilled and skilled labor in country i , p_z is the price of the high-tech good, and the price of the traditional good has been normalized.

2.1 Factor Endowments, Labor Mobility and Regional Convergence

Next, consider the factor endowments and the assumptions of labor mobility under the single market. Let supplies of both unskilled labor and skilled labor be fixed and exogenously given in country i . But under the single market, both skilled and unskilled become completely mobile within the region. Due to wage differentials across countries within the region, it is the case that LDC would become completely depopulated in finite time. Further mobility of unskilled workers implies the non-existence of sector-specific factors of production in the LDC. And thus allows productivity of skilled workers in the LDC. to fall to zero. There is no doubt that the assumptions of factor mobility have some implication for cross-country convergence.

Consider the following conditions in equilibrium path of the region under single market.

1. At $t=0$, MDC's production of high-tech is relatively more advanced stage of the learning process than LDC in the high-tech sector or divergence.
2. At $t=0$, MDC's is relatively less advanced stage of the learning process than the foreign or divergence.

In the first condition, convergence is completely ruled out if : there is a wide gap in the initial levels of productivity between MDC and LDC as well as the lack of intensity of knowledge spillovers. In the second condition, convergence/divergence would depend on whether total factor productivity grows faster in MDC than foreign. The skill intensity of the production technique of the high- tech sector will work against convergence in the Caribbean single market if there is convergence between MDC and foreign. Divergence in skill intensity of the production technique will lead to convergence between the MDC and LDC as the high-tech contract in the MDC. Hence within regional inequalities will decrease over time in the Caribbean. Let us now describe the balance growth path with the following Propositions:

Proposition 1 *MDC and LDC will specialized completely in the traditional sector and converge asymptotically to a balanced growth path if there is divergence between MDC and foreign.*

The knowledge spillover or ϕ increases in MDC and Foreign but at different rate. If the productivity gap increases overtime, this may counteract the effect of skill intensity of the production technique. MDC loses the high-tech sector before the productivity gap reaches convergence if the price of the high-tech good decreases to a point.

Proposition 2. If ϕ increases fast enough such that catching-up of productivity levels occurs in finite time between MDC and Foreign, the economy asymptotically converges to a balanced growth part in which MDC specialized in high-tech sector and the LDC in traditional sector.

The knowledge spillovers are strong. Disparities between MDC and LDC increase, as growth of the high-tech sector in the MDC is reinforced by the migration of both Skilled and unskilled workers from the LDC. The assumptions of factor mobility are crucial to the survival of the high-tech sector even when the knowledge spillovers are strong. This would depend on how large the endowment of skilled workers is to guarantee higher skill intensity in the high-tech sector, as well as faster productivity improvement in the MDC. Also the skill acquisition is actually endogenous.

3.Specializaion, Production Differential and Decision to migrate

So far we have assumed that highly skilled workers will become more responsive than other workers to productivity differential when making decision to migrate under Caribbean single market. As of now, mobility of labor between Caribbean countries is limited to unskilled workers. Caribbean countries do exchange labor through services of labor embodied in traded goods. However, mobility of low skills has increased but migration of high skilled labor is still quite low in the Caribbean. Let us now consider some of the implications of a Caribbean Single market increasing migration of skilled workers and, hence *perpetuating regional divergence* by not allowing the marginal productivity to decrease in the MDC. This is based on the argument hat skilled workers are likely to be attracted to MDC than the low skilled workers. Further workers do not migrate exclusively from LDC to MDC or there are no two-way migration flows.

Empirical study of migration within the regional context reveals, that “the countries with the lower income levels are the net exporters of skilled migrants to the region. While regional skill exchange is regarded as good thing, and policies are being developed to facilitate this, there has been reluctance on the part of some governments because of the

disparities in the regional development levels and the imbalance that could occur in the environment of free movement of labor (Thomas-Hope2002)”.

Under the Single Market, it possible to observe two Equilibria: First is the symmetric steady-state equilibrium. It is possible no skilled worker migrates form both regions if he expects that the average skill levels of the workers active in each region are the same. In this case, the total factor productivity in the non-traded sector is the same in both regions as well as equality in both wage and price. Next consider where the Caribbean Single market creates an asymmetric equilibrium condition-most skilled workers migrate to MDC and low skilled workers move to LDC. Implied here is that the highly skilled workers move to the MDC because they benefit more from high skill premia and the low skill move to the LDC because the higher wage in the MDC is not sufficient to compensate for the higher cost of non-traded goods. If the Single market creates asymmetric equilibrium, regional disparities will be reinforced. For example, per capita GDP is higher in the MDC, not only due to the fact that the most productive workers, who receive higher wages are in the MDC. It is also due to the fact that the move of the higher skilled to the MDC increases total factor productivity in the traded goods sector in the MDC and decreases it in the LDC. Whether the Single Market creates Symmetric or asymmetric equilibrium would depend on the distribution of skills in the population. We might observe a situation where more skilled workers migrate from MDC to LDC due to relatively more skilled workers in MDC. It would also depend on the dynamics of migration and convergence i.e. whether MDC has not reached a steady state and LDC is growing slower or LDC is catching up and accumulating capital, and the MDC has already reached the steady state. Finally there is no avoiding the harsh truth that

Caribbean Single Market will create free mobility of labor between MDC and LDC. Such free mobility might create a poverty trap for the LDC if only the most educated and skilled individuals have strong incentives to migrate.

4. Estimation and Empirical evidence

Empirical analysis of the first issue relating to skilled labor or human capital discussed in section 1 should focus on identifying differences in educational standard between Caribbean countries. Also to test if these differences will be reflected in country patterns of trade and specialization under Caribbean Single Market. Skilled labor or human capital can be measured in terms of earnings differences (Kenen, 1965), by education or occupational status (Leamer, 1984; Bowen et al., 1987; Webster, 1993; Maskus et al., 1994 and Lundberg and Wiker, 1997). By defining skilled labor as the level of education that increases the effective labor input of skilled labor by more than that of unskilled labor, we can use two alternative education levels:

- a) University education, four years or more; or
- b) shorter post- secondary (tertiary) education (less than three years).
- c) Data requirements include: i) employment data classified by level of education, for each industry, country and year; ii) an input-output table for each country and year, to obtain total factor requirements; and iii) export and import data for each industry and year.
- d) Such comprehensive data set are not yet available in the Caribbean.

Empirical Results-We can speculate on two contradicting results. The MDC where highly educated labour is abundant will tend to specialize in and export skill intensive goods. This result will support Heckscher - Ohlin theorem, if trade is balanced, a

country will have net exports of the services of its abundant factors, and a net imports of services of its scarce factors Vanek (1968). See Leamer, (1980) for discussion of unbalanced trade and Brecher and Choudhri, (1982) for non- equalization of factor prices. On the other hand, the MDC may become net importer of services of skilled labour from LDC, in spite of its position as having the highest level of educational attainment among its working age population in the case of the U.S.A.

With regard to the second issue that Single Market will create advanced sector in the MDC and traditional sector in the LDC, one can focus on identifying the high-tech sectors through regional specialization. But in the Caribbean sectoral desegregation comprises only three macro-sectors of the economy (agriculture, industry and service). Also, data for measuring the intensity of international knowledge spillovers and documenting when interaction among countries thus increased is not readily available .It is also a gradual process and difficult to measure. Empirical results of this issue have to wait the actual implementation of the Single Market and years beyond.

The third issue is whether highly skilled workers will become more responsive than other workers to productivity differential when making decision to migrate under Caribbean single market. Empirical studies of this issue have found that high skilled workers appear to be responsive to economic incentives and to migrate to the advanced region. On the other hand low skilled workers tend not only to have lower mobility rate but also migrate from the high-growth regions, where wages are higher and the rate of unemployment is lower. This is said to perpetuate regional disparities and hampers convergence. Under the Single market in the Caribbean we expect both

the high skilled and low skilled to be responsive to economic incentives offered by MDC in the early period of the Single Market.

5. Conclusions

The paper raised three issues concerning the CARICM Single Market and Economy. The first relates to human capital and industrial location and argued that the development of human capital and skilled labor will become increasingly important determinants of industrial localization in the new Caribbean Single Market Economy. If differing rates of investment in human capital in the form of education account for these trends, Caribbean countries should stress the crucial role of domestic educational policies in the areas of technical and scientific subjects needed for industrial growth and development. The second issue relate to possibility of Single Market creating advanced sector in the MDC and traditional sector in the LDC. The paper argued that countries with more high skilled workers will specialize in the advanced sector at the beginning of the Caribbean single market such that they become more similar in terms of per capita income while countries with less skilled workers will specializes in traditional sectors lagged. It is argued that the intensification of international knowledge spillovers due to cross-country interaction may exacerbate within-country region disparities, if regions with different specialization do not benefit evenly from the exchange of knowledge. The third relates to whether highly skilled workers will become more responsive than other workers to productivity differential when making decision to migrate under Caribbean single market? Under the Single market in the Caribbean, we expect both the high skilled and low skilled to be responsive to economic incentives offered by MDC in the early period of the Single Market.

References

Bowen, H. P., Leamer, E E. and Sveikauskas, L. (1987) Multicountry, multifactor tests of the factor abundance theory, *American Economic Review*, 77, 791-809.

Borjas, G. J, Bronars, S.G., and Trejo, S.J.(1992). Self_selection and internal migration in the United States, *Journal of Urban Economics* 32, 159_185.

Caribbean trade and investment report.(2000) Caribbean Community Secretariat, Ian Randle Publishers.

Cooper, R. and Haltiwanger, J (2000) Evidence on macroeconomic complementarities. *Review of Economics and Statistics* 78, 78-93.

Brecher, R. A. and Choudhri E. U. (1982) The Leontief paradox, continued, *Journal of Political Economy*, 90, pp. 820-826.

Faini, R, Galli,G, Gennari, P and Rossi, P. (1997) An empirical puzzle: falling migration and growing unemployment differentials among Italian regions. *European Economic Review* 41, 571-579.

Giannetti, M. (2001) the effects of Integration on regional disparities: Convergence, divergence or both, *European Economic Review* 46, pp539-567. Elsevier.

_____ (2002) On the mechanics of migration decisions: skill complementarities and endogenous price differentials, *Journal of Development Economics*, 71 pp329-349.

Kahn, J. A. and Jong-Soo L. (1998) Skilled Labour-Augmenting Technical Progress In U.S. Manufacturing, Federal Reserve Bank of New York

- Kenen, P.B. (1965) Nature, capital and trade, *Journal of political economy*, 73, pp. 437-460.
- Lundberg, L. and P. Wiker.(1997) Skilled labor and International Specialization in OECD Countries, *International Review of Applied Economics*, Vol. 11, No 3, Carfax Publishing Ltd.
- Leamer, E.E. (1984) Sources of International Comparative Advantage. Theory and Evidence, Cambridge MA, The MIT Press.
- Maskus,K.E. (1985) A test of the Heckscher -Ohline- Vanek theorem: the Leontoeff commonplace, *Journal of International Economics*, 19, pp.201-212.
- Thomas_Hope, E. (2002) Skilled labour migration from developing countries: study on the Caribbean region, International migration programme, Geneva.
- Vanek, J. (1968) The factor proportions theory: the n-factor case, *Kyklos*, 4, pp. 749-756.