THE CHANGING PATTERN OF COMPARATIVE ADVANTAGE IN MANUFACTURED GOODS

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THIS paper analyzes the changing pattern of comparative advantage in manufactured goods in the process of accumulation of physical and human capital that characterizes economic development. Section I of the paper describes the model to be estimated while section II defines the explanatory variables employed. The empirical results are presented in section III, and the policy implications of the results are analyzed in section IV.

I.

In investigating the determinants of trade between developed and developing countries, Lary (1968), Kojima (1970), Fels (1972), and Mahfuzer Rahman (1973) considered developing countries as a group. In turn, Hufbauer (1970) attempted to explain differences in the average product characteristics of the exports of individual countries in an intercountry framework, but his sample of 24 countries included only 9 countries that may be considered developing and they were all at the upper end of the distribution in terms of per capita incomes.

Herman and Tinbergen (1970), and subsequently Herman (1975), suggested a scheme of "ideal" export composition allegedly reflecting the physical and human capital endowments of countries classified into 11 groups, but did not subject their scheme to statistical testing. Finally, Hirsch (1974) correlated export performance and value-added per worker in the nonagricultural sector in an intercountry framework for each of 18 industry groups and also correlated export-output ratios with the average product characteristics of the 18 industry groups for each of 29 countries, without however attempting to establish a statistical relationship between the two sets of estimates.

A different approach is followed in the present paper. Thirty-six countries have been chosen for the investigation, of which 18 are developed and 18 developing. For each country, regression equations have been estimated relating their "revealed" comparative advantage in 184 manufactured product categories to the relative capital intensity (capital-labor ratio) of the individual product categories. The regression coefficients thus obtained have in turn been correlated with particular country characteristics in an intercountry framework. In this way, results obtained in "commodity space" have been transposed into "country space," so as to indicate the effects of country characteristics on international specialization in manufacturing goods.

Following earlier work by the author (1965, 1977), a country's relative export performance in individual product categories has been taken to reflect its "revealed" comparative advantage within the manufacturing sector. Relative export performance has been used as an indicator of comparative advantage in preference to export-import ratios or net exports, since intercountry differences in the commodity pattern of imports are greatly influenced by the system of protection applied. This is in particular the case in developing countries, where import barriers are high and vary from commodity to commodity.

The investigation is limited to manufactured goods that play an increasingly important role in domestic production and exports as the accumulation of physical and human capital proceeds. Natural resource products have been excluded, since trade in these products largely depends on the country's resource endowment that cannot be easily quantified. The choice has entailed limiting the sample to countries that export manufactured goods in appreciable quantities.

Relative export performance in individual product categories has been expressed as the ratio of a country's share in the world exports of

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a particular product category to its share in the world exports of all manufactured goods. Thus, a ratio of 1.10 (0.90) means that the country's share in the particular product category is 10% higher (lower) than its share in all manufactured exports.[1]

For each of the 36 countries, ratios of "revealed" comparative advantage, calculated for the individual product categories, have been regressed on variables representing relative capital intensity, defined alternatively using a stock and a flow measure. The regression equations, shown in (1), have been estimated in a double-logarithmic form, so that the value of the β coefficient for country j indicates the percentage change in the country's comparative advantage ratio (x_{ij}) associated with a 1% change in capital intensity (k_i):[2]

$$\log x_{ij} = \log \alpha_j + \beta_j \log k_i. \qquad (1)$$

A positive (negative) β coefficient thus shows that a country has a comparative advantage in capital (labor) intensive products while the numerical magnitude of the β coefficient indicates the extent of the country's comparative advantage in capital (labor) intensive commodities.[3]

Next, we have tested the hypothesis that intercountry differences in the β coefficients can be explained by differences in country characteristics. This test has been carried out by regressing the β coefficients estimated for the individual countries on variables representing their physical and human capital endowments in an intercountry framework. The basic estimating equation used is shown in (2),

$$\beta_j = f(GDICAP_j, HMIND_j), \qquad (2)$$

where *GDICAP* refers to per capita physical capital endowments and *HMIND* to per capita human capital endowments. We have further experimented with explanatory variables representing the level of development.

II.

Capital intensity has been defined as the sum of physical and human capital per worker.[4] Technological variables used in recent work on U.S. comparative advantage (Baldwin, 1971; Morall, 1972; Branson and Junz, 1976; and Goodman and Ceyhun, 1976) have not been introduced in the analysis because of their limited relevance to developing countries that engage in research and development to a small extent, if at all. Rather, investment in research and development has been assumed to be part of physical capital (e.g., laboratories) or human capital (e.g., scientists and engineers engaged in R&D).

Capital intensity has been expressed in terms of stocks (the value of the capital stock plus the discounted value of the difference between the average wage and the unskilled wage, divided by the number of workers) and in terms of flows (value-added per worker). The former approach has been used by Kenen (1965) and, more recently, by Fels (1972) and Branson (1973); the latter approach has been employed by Lary (1968).

The stock measure of capital intensity (k^s) is expressed in (3) for industry i:

$$k_i^s = p_i^s + h_i^s = p_i^s + \frac{\bar{w}_i - w_i^u}{r^h}, \qquad (3)$$

where p_i and h_i, respectively, refer to physical and human capital per worker, $\bar{w}_i$ is the average wage rate, w_i^u the wage of unskilled labor, and r^h the discount rate used in calculating the stock of human capital. In turn, the flow measure of capital intensity (k^f) is expressed in (4),

$$k_i^f = va_i = p_i^f + h_i^f = (va_i - \bar{w}_i) + \bar{w}_i, \qquad (4)$$

[1] An alternative measure would involve relating exports to output in each country. In the absence of output figures, however, this measure could not be utilized in the present study. At any rate, it would require adjusting for country size (Balassa, 1969) while the measure used here does not require such an adjustment.

[2] Since the logarithm of zero is undefined, in the estimating equations an export ratio of 0.001 has been used to represent cases when the exports of a country in a particular product category were nil. We have also experimented with the use of a 0.01 ratio and have obtained practically the same results. Nor are the results materially affected if we drop the zero observations from the regressions. This and other estimates not reported in the paper are available from the author on request.

[3] Alternatively, use may be made of non-parametric tests involving the calculating of the Spearman rank correlation coefficient between the "revealed" comparative advantage ratio and the individual factor intensity measures. This test has the disadvantage, however, that it cannot handle more than one explanatory variable and that it does not permit one to indicate the implications of the intercountry results for a country's future comparative advantage (on the last point, see section IV).

[4] Branson observes that the aggregation of various forms of capital assumes that they are perfect complements or perfect substitutes (1973, p. 11). We have also experimented with separate variables for physical and human capital. The results are available from the author.

where va_i refers to value added per worker. Now, nonwage value added per worker ($va_i - \bar{w}_i$) is taken to represent physical capital intensity and wage value added per worker ($\bar{w}_i$) human capital intensity.

As far as physical capital intensity is concerned, the two measures would give identical rankings in risk-free equilibrium in the event that product, capital, and labor markets were perfect and nonwage value added did not include any items other than capital remuneration. In turn, the stock and the flow measures of human capital would give identical rankings if unskilled wages were the same in every industry.

Both the stock and the flow measures have their advantages and disadvantages. The usefulness of the stock measure would be greatly impaired in an inflationary situation, where historical values of physical capital shown in the accounts differ from replacement values and the magnitude of these differences varies with the age of equipment. And while the benchmark years used for estimating capital intensity (1969 and 1970) are part of a long noninflationary period, error possibilities remain due to interindustry differences in depreciation rates. In turn, the usefulness of the flow measure is limited by reason of the fact that profit rates show considerable variation over time and interindustry differences in profit rates cannot be fully explained by reference to risk factors.

In order to indicate the stability of the results derived under alternative assumptions, we have made estimates by the use of both measures. The necessary data on capital intensity have been obtained from U.S. statistics as data for other countries are not available in a sufficiently detailed commodity breakdown.[5]

For purposes of the investigation, we have used the definition of the manufacturing sector (SIC 19 to 39) in the U.S. Standard Industrial Classification (SIC), excluding foods and beverages (SIC 20), tobacco (SIC 21), and primary nonferrous metals (SIC 333), where the high cost of transportation favors the producers of the basic material, as well as ordinance (SIC 19), for which comparable trade data are not available. Under this definition, the 184 product category classification scheme has been established on the basis of 4-digit SIC categories, with some further aggregation in cases when the economic characteristics of the products in question were judged to be very similar and when comparable data did not exist according to the U.N. Standard International Trade Classification, which has been used to collect trade figures.[6]

Data on the capital stock, employment, value added, and wages used in calculating capital intensity originate from the U.S. Census of Manufacturing. Data for unskilled wages have been taken from the *Monthly Labor Review,* published by the U.S. Bureau of Labor Statistics; they relate to 2-digit industries, thus involving the assumption that unskilled wages are equalized at this level. Finally, the value of human capital under the stock measure has been estimated by discounting differences between the average wage and the unskilled wage for the individual product categories at a rate of 10%.[7]

As noted earlier, the sample of 36 countries used in the investigation is evenly divided between developed and developing countries; countries in the first group had per capita incomes above $1,800 in 1972; incomes per head did not exceed $1,400 (more exactly, $1,407) in the second group. The variability of per capita incomes is 1:3 in the developed country subsample, 1:13 in the developing country subsample, and 1:56 in the entire sample. The distinction between developed and developing countries has been introduced in the econometric analysis through the use of a dummy variable for developed countries.

In the absence of data on the physical capital stock in the individual countries, we have taken the sum of gross fixed investment over the period 1955–71, estimated in constant prices and con-

[5] The use of U.S. data in the investigation will be appropriate if factor substitution elasticities are zero or they are identical for every product category. While these assumptions are not fulfilled in practice, Lary has shown variations to be small in U.S.–U.K., U.S.–Japan, and U.S.–India comparisons as regards the flow measure of capital (1968, Appendix D). For lack of information, similar comparisons could not be made for the stock measure and the further investigation of this question had to be left for future research.

[6] Appendix tables providing information on the capital intensity of the 184 product categories and the SIC and SITC categories corresponding to these product categories are available from the author. In order to reduce the effects of variations due to the business cycle and nonrecurring events, we have used simple averages of data for the two latest years (1969 and 1970) for which information was available.

[7] This is in between the discount rates of 9.0% and 12.7% used by Kenen (1965); the same discount rate was used by Fels (1972) and Branson (1973).

verted into U.S. dollars at 1963 exchange rates, as a proxy for physical capital endowment, reflecting the assumption that physical capital has a life of 16 years.[8] In turn, we have used the Harbison-Myers index of human resource development as a proxy for human capital endowment. While this index is a flow measure,[9] the use of estimates pertaining to 1965 (Harbison, Maruhnic, and Resnick, 1970, pp. 175–176) permits us to provide an indication of a country's general educational level, and thus its human capital base, in 1972, the year for which trade data have been obtained. We have also experimented with the skill ratio (the ratio of professional, technical, and related workers shown in Group 0/1 of the International Standard Classification of Occupations to total employment), which has been employed by Hufbauer (1970). The use of this variable may be objected to, however, on the grounds that Group 0/1 includes personnel in liberal occupations, such as jurists, preachers, artists, and athletes and includes production supervisors, foremen, and skilled workers that are important in the manufacturing sector. Note further that this variable does not give statistically significant results in any of the regressions.

III.

The β coefficients estimated by the use of equation (1) are reported in table 1. It is shown there that, in the regression equations utilizing the stock measure of capital intensity, the β coefficient is statistically significant at the 5% level in the case of 22 countries and at the 10% level for 26 countries. In turn, in regression equations utilizing the flow measure, the β coefficient is significant at the 5% level in the case of 29 countries, with no additional countries included at the 10% level. In interpreting these results, it should be added that coefficient values near to zero have an economic interpretation even if they are not significantly different from zero; they indicate that a country is at the dividing line as far as comparative advantage in capital- and labor-intensive products is concerned.

The β coefficients estimated by using the stock and the flow measures of capital intensity are highly correlated, with a Spearman rank correlation coefficient of 0.96. This finding is in part explained by the relatively high degree of correspondence in the ranking of product categories by the two measures of capital intensity. The Spearman rank correlation coefficient between the two is 0.78.

The results pertaining to the stock and the flow measures of capital intensity are also broadly similar in the second stage of the estimation procedure, where we regress the coefficients on physical and human capital endowment variables in an intercountry framework. Thus, in equation (2), statistically significant results have been obtained for both the physical and the human capital endowment variables, regardless of whether the dependent variable originated in country regressions utilizing the stock or the flow measure of capital intensity.[10] In both regressions, the physical as well as the human capital endowment variables are significant at the 5% confidence level while the coefficient of determination is 0.65 using the stock measure, and 0.78 using the flow measure, of capital intensity (equations 1.1 and 2.1 in table 2).[11]

The level of statistical significance of the regression coefficients for the physical and human capital endowment variables is hardly affected if we introduce a dummy variable (*DUMMY*) representing the level of economic development. At the same time, the dummy variable is not statistically significant and its introduction does not increase the coefficient of determination.

We have further estimated Spearman rank correlation coefficients for pairs of country characteristics in the 36 country sample (table 3). The

[8] The data, derived from *World Tables, 1976*, published by the World Bank, are shown together with other country characteristics in table 1. A similar procedure was employed by Hufbauer (1970), who used data for an earlier and shorter period (1953–64).

[9] It is derived as the secondary school enrollment rate plus five times the university enrollment rate in the respective age cohorts.

[10] Note that, with variations in the standard errors of the β coefficients derived in equation (1), the regression results obtained in equation (2) will be subject to heteroscedasticity, which tends to raise the standard error of the coefficients. However, the estimates are little affected if we weight the estimates for the individual countries by the reciprocals of the standard errors of the β coefficients to reduce heteroscedasticity.

[11] Regressing the rank correlation coefficients calculated as between the "revealed" comparative advantage ratios and the factor intensity measures on factor endowment variables has generally confirmed the reported results, although the level of statistical significance of the coefficients was somewhat lower.

TABLE 1.—COUNTRY CHARACTERISTICS AND REGRESSION COEFFICIENTS OBTAINED IN ESTIMATES FOR INDIVIDUAL COUNTRIES

	Country Characteristics				Regression Coefficients	
	DUMMY	*GNPCAP*	*GDICAP*	*HMIND*	β_j^s	β_j^f
Argentina	0	1139.65	2013.68	122.0	0.32	0.19
Australia	1	3271.69	6675.24	183.3	0.34[b]	0.78[a]
Austria	1	2741.26	5129.79	112.9	−0.31[a]	−0.93[a]
Belgium	1	3701.15	5441.70	140.5	0.11	0.04
Brazil	0	511.27	1016.00	29.3	−0.69[a]	−1.48[a]
Canada	1	4691.51	7970.65	179.9	0.75[a]	0.87[a]
Colombia	0	357.08	751.59	32.3	−1.31[a]	−2.48[a]
Denmark	1	4187.67	6259.56	139.2	−0.40[a]	−0.12
Finland	1	2877.73	6999.27	109.9	−0.26	−0.62[a]
France	1	3841.68	7211.24	138.8	−0.07	−0.08
Germany	1	4218.84	7102.15	114.3	0.20[a]	0.43[a]
Greece	0	1407.20	2196.43	93.7	−0.27	−1.05[a]
Hong Kong	0	1048.88	1370.61	60.7	−2.30[a]	−2.84[a]
India	0	102.03	214.25	50.2	−1.10[a]	−2.30[a]
Ireland	1	1840.20	2701.89	110.7	−0.48[a]	−0.80[a]
Israel	1	2416.28	4280.96	148.9	−0.37[b]	−0.70[a]
Italy	1	2176.52	3366.47	91.3	−0.33[a]	−0.46[a]
Japan	1	2740.95	4765.11	146.2	−0.31[b]	−0.52[a]
Korea	0	301.03	402.89	66.7	−1.67[a]	−3.02[a]
Malaysia	0	408.62	494.56	34.5	−0.88[a]	−2.32[a]
Mexico	0	745.41	1067.02	41.1	−0.91[a]	−1.48[a]
Morocco	0	279.13	293.08	27.9	−1.18[a]	−2.95[a]
Netherlands	1	3466.90	5375.15	158.6	0.28[a]	0.44[a]
Norway	1	3786.91	7806.11	107.4	0.22	0.01
Pakistan	0	104.11	197.76	33.1	−1.56[a]	−3.11[a]
Philippines	0	223.50	448.72	134.2	−1.34[a]	−2.28[a]
Portugal	0	1084.26	1154.43	68.1	−0.81[a]	−2.09[a]
Singapore	0	1354.41	1189.84	97.6	−1.47[a]	−2.35[a]
Spain	0	1333.76	2049.09	63.4	−0.43[a]	−0.56[a]
Sweden	1	5141.10	9452.90	129.6	0.21	0.15
Switzerland	1	4810.02	8852.63	112.6	0.04	−0.10
Taiwan	0	481.94	629.88	103.5	−1.56[a]	−2.61[a]
Turkey	0	431.16	581.22	37.5	−0.42	−1.62[a]
U.K.	1	2765.25	4844.68	136.2	0.13	0.46[a]
U.S.A.	1	5679.47	7616.20	325.0	0.84[a]	1.47[a]
Yugoslavia	0	798.30	1162.06	110.0	−0.47[b]	−1.41[a]

Note: Country Characteristics: *DUMMY* = 1 for developed, 0 for developing countries
GNPCAP = GNP per capita in 1972, $U.S.
GDICAP = Cumulated gross fixed investment per capita, 1955–71, $U.S.
HMIND = Harbison-Myers index.

Regression Coefficients have been obtained by regressing for each country the ratio of "revealed" comparative advantage, estimated for 184 product categories, on measures of capital intensity. Coefficients β^s and β^f have been estimated by regressing the comparative advantage ratio on the stock and the flow measures of capital intensity, respectively.

[a] Significant at the 5% level.
[b] Significant at the 10% level.

TABLE 2.—INTERCOUNTRY REGRESSION EQUATIONS FOR THE TOTAL CAPITAL INTENSITY MEASURE

Dependent Variable	Equation Number	Coefficient of Determination	Explanatory Variables				
			GDICAP	*HMIND*	*DUMMY*	*GNPCAP*	CONSTANT
β_j^s	1.1	.65	1.46 (4.24)	0.34 (1.92)			−1.37 (−8.78)
	1.2	.65	1.39 (2.40)	1.34 (1.83)	0.05 (.15)		−1.36 (−8.44)
	1.3	.65	1.39 (1.20)	0.33 (1.52)		0.14 (.06)	−1.36 (−8.46)
β_j^f	2.1	.78	2.57 (5.37)	0.77 (3.12)			−2.72 (−12.54)
	2.2	.78	2.11 (2.66)	0.74 (2.91)	0.33 (.71)		−2.69 (−12.05)
	2.3	.78	1.79 (1.11)	0.68 (2.25)		1.66 (.51)	−2.70 (−12.06)

Note: For explanation of symbols, see table 1. In the estimating equations, *GDICAP* and *GNPCAP* have been expressed in units of 10,000 dollars and *HMIND* in units of 100; *t*-values are shown in parentheses.

TABLE 3.—SPEARMAN RANK CORRELATION COEFFICIENTS FOR COUNTRY CHARACTERISTICS IN THE 36 COUNTRY SAMPLE

	GNPCAP	*GDICAP*	*HMIND*
GNPCAP	1.000	0.984	0.754
GDICAP	0.984	1.000	0.730
HMIND	0.754	0.730	1.000

Note: For explanation of symbols, see table 1. All coefficients are statistically significant at the 1% level.

correlations between per capita GDI and the Harbison-Myers index, on the one hand, and per capita GNP, on the other, point to the effects of investment in physical and in human capital on incomes per head. The existence of this correlation also explains that the inclusion of all three variables in the regression equation raises the standard error of the coefficients of the physical and human capital endowment variables. Nevertheless, the fact that the level of statistical significance of these two variables much exceeds that for incomes per head can be taken as an indication of the "primacy" of the former (table 2).

IV.

This paper has investigated the changing pattern of comparative advantage in the process of the accumulation of physical and human capital that characterizes economic development. Comparative advantage has been defined in terms of relative export performance, thus neglecting the composition of imports that is greatly affected by the structure of protection.

For each country, export performance has been related to the capital intensity of the individual product categories, using a stock as well as a flow measure of capital, inclusive of physical and human capital. Next, the regression coefficients thus obtained have been correlated with country characteristics, such as physical and human capital endowments and the level of economic development, in an intercountry framework.

The empirical estimates show that intercountry differences in the structure of exports are in a large part explained by differences in physical and human capital endowments. The results lend support to the "stages" approach to comparative advantage, according to which the structure of exports changes with the accumulation of physical and human capital.[12] The approach is also supported by intertemporal comparisons for Japan, which indicate that Japanese exports have become increasingly physical capital and human capital intensive over time (Heller, 1976).

These findings have important policy implications for the developing countries. To begin with, they warn against distorting the system of incentives in favor of products in which the country has a comparative disadvantage. The large differences shown among product categories in terms of their capital intensity point to the fact that there is a substantial penalty for such distortions in the form of the misallocation of productive factors. This will be the case in particular when the system of incentives is biased in favor of import substitution in capital-intensive products and against exports in labor-intensive products.

Possible magnitudes of the economic cost of distortions are shown in table 4. The table provides comparisons for seven capital-intensive and seven labor-intensive products between production costs in the United States and in a hypothetical developing country where unskilled wages are one-third of U.S. wages[13] and the cost of capital is commensurately higher.[14] In the hypothetical developing country, the estimated cost of the capital-intensive products is 15% to 32% higher, and that of the labor-intensive products 38% to 52% lower, than in the United States, so that differences in relative costs between capital and labor-intensive products range from 1.87 to 2.76.[15]

The results can further be utilized to gauge the direction in which a country's comparative advantage is moving. This may be done by substituting projected future values of a country's physical and human capital endowments in the

[12] The expression "stages" is used here to denote changes over time that occur more-or-less continuously rather than discrete, stepwise changes. It is thus unrelated to economic stages described by Marx, the exponents of the German historical school, and Rostow.

[13] In 1974 average wages in manufacturing in Korea were 9%, and in the Philippines 6%, of U.S. wages (ILO, *Yearbook of Labor Statistics*).

[14] The difference in the cost of capital has been estimated at 43.3% under the assumption that average value added in the manufacturing sector was the same in the two cases. It has further been assumed that the absolute difference between skilled and unskilled wages remained the same.

[15] As elsewhere in the paper, the calculations do not allow for factor substitution in response to intercountry differences in factor prices.

TABLE 4.—HYPOTHETICAL PRODUCTION COSTS CALCULATED UNDER ALTERNATIVE ASSUMPTIONS
(U.S. dollars)

Product Category	United States				Developing Country				Ratio of Total Costs
	Physical Capital	Human Capital	Unskilled Labor	Total Costs	Physical Capital	Human Capital	Unskilled Labor	Total Costs	
Capital-Intensive									
1. Petroleum refining & products	37,833	6,563	5,342	49,738	54,215	9,405	1,781	65,401	1.315
2. Wood pulp	26,400	4,747	6,382	37,529	37,831	6,802	2,127	46,760	1.246
3. Organic chemicals	22,635	4,875	6,632	34,142	32,436	6,986	2,211	41,633	1.219
4. Synthetic rubber	20,826	5,121	6,632	32,579	29,844	7,338	2,211	39,393	1.209
5. Carbon black	18,669	3,893	6,632	29,194	26,753	5,579	2,211	34,543	1.183
6. Inorganic chemicals	16,044	3,928	6,632	26,604	22,991	5,629	2,211	30,831	1.159
7. Paper	14,778	3,983	6,382	25,143	21,177	5,707	2,127	29,011	1.154
Labor-Intensive									
8. Games & toys	1,521	359	5,436	7,316	2,180	514	1,812	4,506	0.616
9. Vitreous china food utensils	1,608	186	6,082	7,876	2,304	267	2,027	4,598	0.584
10. Costume jewelry	978	533	5,436	6,947	1,401	764	1,812	3,977	0.572
11. Leather bags & purses	711	311	5,096	6,118	1,019	446	1,699	3,164	0.517
12. Earthenware food utensils	1,056	0	6,082	7,138	1,513	0	2,027	3,540	0.496
13. Woollen yarn & thread	486	160	4,228	4,874	696	229	1,409	2,334	0.479
14. Footwear	660	156	5,450	6,266	946	224	1,817	2,987	0.477
All Categories	6,155	2,828	5,831	14,815	8,818	4,052	1,944	14,815	1.000

Note: U.S. production costs have been calculated by adding 30% of the gross value of physical capital, assumed to reflect pre-tax earnings and depreciation, to observed labor costs. In turn, for the hypothetical developing country it has been assumed that unskilled wages are one-third of U.S. wages and the cost of capital is correspondingly higher. The latter has been estimated to exceed U.S. costs by 43.3% under the assumption that value added in the entire manufacturing sector is the same in the two cases. All data are expressed per worker.

intercountry regressions, so as to estimate the prospective values of the β coefficients.[16] In turn, these coefficients can be used to derive the hypothetical structure of exports corresponding to the country's future physical and human capital endowments. Comparing the projected export structure with the actual structure of exports, one may then indicate prospective changes in export flows.[17]

The stages approach to comparative advantage also permits one to dispel certain misapprehensions as regards the foreign demand constraint for manufactured exports under which developing countries are said to operate. With countries progressing on the comparative advantage scale, their exports can supplant the exports of countries that graduate to a higher level. Now, to the extent that one developing country replaces another in the imports of particular commodities by the developed countries, the problem of adjustment in the latter group of countries does not arise. Rather, the brunt of adjustment will be borne in industries where the products of newly graduating developing countries compete with the products of the developed countries. A case in point is Japan, whose comparative advantage has shifted towards highly capital-intensive exports and is now competing with the United States and European countries in these products.

[16] In line with the stages approach to comparative advantage, this is done on the assumption that new countries exporting manufactured goods continuously enter at the lower end of the spectrum. It is further assumed that the relative importance of capital-intensive goods in world exports will continue to increase over time.

[17] These projections further need to be adjusted in cases when observed values of the β coefficients differ from values estimated from the intercountry regression. The results are also subject to the usual projection error.

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