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FACTOR MOBILITY AND THE DISTRIBUTION OF ECONOMIC ACTIVITY IN INTEGRATED ECONOMIES: EVIDENCE AND IMPLICATIONS*

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Abstract:
Recent research (Bowen, Munandar and Viaene, 2005) shows that for a country who is a member of a fully integrated economy, its shares of the integrated economy's total output and stocks of productive factors (i.e., physical and human capital) will be equal. They label this result the *equal-share relationship*. In this paper, we empirically examine for evidence of the equal-share relationship for alternative economic groups (i.e., US states, EU countries, Developing Countries and a World comprising 55 countries). Our findings indicate that the equal-share relationship holds strongly for US states, less so for EU countries, but does not hold for Developing Countries or the World.

JEL Classification: E13, F15, F21, F22, O57
Keywords: Distribution of production, economic growth, economic convergence, factor mobility, economic integration.

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Factor Mobility and the Distribution of Economic Activity in Integrated Economies: Evidence and Implications

A surge of regional integration agreements over the past two decades have sought to reduce barriers to the exchange of goods, services and, in the extreme, factors of production among subsets of countries.[1] However, the literature dealing with the economic implications of regional integration has mostly dealt with the effects of reducing barriers to the movement of goods. Less attention has been given to the implications of also allowing greater mobility of productive factors among members of an integrated economy. This omission from the literature is important not only because cross-border factor flows are becoming increasingly important, but also the international trade literature has long recognized that goods trade and cross-border factor flows can evidence a substitute or complement relationship.

Recently, Bowen *et al.* (2005) demonstrate theoretically that factor mobility among members of an integrated economy (IE) implies that each member's share of the integrated economy's total output and its shares stocks of productive factors (i.e., physical and human capital) will be equal; they term this theoretical prediction the *equal-share relationship*. As they indicate, this result has several important implications. First, it implies that all IE members will have the same output per efficiency unit of labor. This implication is the essence of the income convergence hypothesis (when interpreted in terms of efficiency units of labor and not per capita) that has been extensively investigated in the growth literature (e.g., see Durlauf and Quah, 1999).

[1] See the WTO website for an updated list of regional trade agreements (RTAs). Some 380 RTAs have been notified to the WTO up to July 2007. Among the best known are the European Union, EFTA, NAFTA, MERCOSUR, etc.

A second important implication concerns the literature that has sought to link capital market integration and economic growth. Specifically, since greater capital market integration is expected to both lower the cost of financial capital and foster a reallocation of capital from capital abundant to capital scarce countries, greater capital market integration may promote technological progress (e.g., venture capital) that can offset decreasing returns to physical capital and hence generate endogenous growth (Greenwood and Jovanovic, 1990). Whereas Levine (1997) found empirical evidence of a cross-country pattern linking domestic growth and domestic financial market integration, later studies such as Edison *et al.*(2002) and Eschenbach (2004) (who also reviews the most recent literature) find weak evidence of a link between capital market integration and per capita income growth. As Bowen *et al*. (2005) note, these mixed findings may reflect the emergence of the equal-share relationship with increased capital market integration (and with increased factor mobility in general) since this relationship places a constraint on the relative growth of IE members that effectively weakens any structural link between (further) capital market integration and relative growth performance across IE members.

Given its potential theoretical and practical importance for key issues regarding economic growth, the existence of the equal-share relationship becomes an important research question. In this paper, we address this question by examining empirically for the existence of the equal-share relationship for different groupings of economic units, including US states and EU countries. Using panel data spanning the period from 1965 to 2000 on the shares of output and stocks of physical and human capital for alternative groupings of countries, we find that the higher the degree of economic integration among a given grouping of countries the more the data fit the theoretical prediction of an equal-share relationship. Importantly, our results indicate that the equal-share relationship is more than a theoretical curiosity and that therefore its implications regarding economic growth consequent to economic integration need to be taken into account in future studies.

I. THEORETICAL BACKGROUND

To derive their equal-share relationship, Bowen *et al.* (2005) assume an integrated economy (IE) comprising N members. At time t, each IE member i possesses stocks of physical capital K_{it} and human capital H_{it} used to produce a single good Y_{it} by means of the same constant return to scale production function. In this setting, costless mobility of physical and human capital within the integrated economy would equalize each factor's rate of return (marginal product) across all IE members. However, if there are instead barriers to factor mobility, or differences in technological between members, then rates of return will only be partially equalized.[2] Assuming mobility barriers between IE members can be represented by a proportional wedge in rates of return to physical and human capital, and allowing for technological differences between IE members, Bowen *et al.* (2005) show that the equalization of factor marginal products implies the following relationship for IE member i:

(1) $$\frac{Y_{it}}{\sum_{j=1}^{N}\tilde{Y}_{jt}} = \frac{H_{it}}{\sum_{j=1}^{N}\tilde{H}_{jt}} = \frac{K_{it}}{\sum_{j=1}^{N}\tilde{K}_{jt}}$$

In this expression, a "~" over a variable indicates that its measured value is adjusted for any technological differences or factor mobility costs across IE members; for each IE member, such adjustment effectively adjusts a variable's measured value for differences in productivity or in its "quality" relative to member i.

[2] Barriers to capital mobility can include sovereign and political risk, capital controls, and tax differences that can hinder cross-border investments. Barriers to human capital mobility include government regulations on immigration and work permits, differences in pension systems and languages between countries.

Equation (1) establishes a link between member *i*'s shares of total IE output, human capital and physical capital, and it nests several equal share relationships that derive from different assumptions about technology and the extent of factor mobility. In particular, if there are no barriers to factor mobility and technologies are identical then equation (1) reduces to:

$$(2) \qquad \frac{Y_{it}}{\sum_{j=1}^{N} Y_{jt}} = \frac{H_{it}}{\sum_{j=1}^{N} H_{jt}} = \frac{K_{it}}{\sum_{j=1}^{N} K_{jt}}$$

Hence, in the absence of barriers to factor mobility and when technologies are identical across IE members, each member's shares of total IE output, human capital and physical capital will be identical. The key difference between (2) and (1) is that the values in the denominator are actual measured values of output, human capital and physical capital.

Finally, the implication of the equal share relationship for the broad topic of output convergence can be derived by noting that if (2) holds then the following two equalities will also hold:

$$(3) \qquad \frac{Y_{it}}{H_{it}} = \frac{\sum_{j=1}^{N} Y_{jt}}{\sum_{j=1}^{N} H_{jt}}$$

$$(4) \qquad \frac{Y_{1t}}{H_{1t}} = \frac{Y_{2t}}{H_{2t}} = \ldots = \frac{Y_{it}}{H_{it}} = \ldots = \frac{Y_{Nt}}{H_{Nt}}$$

Expression (4) states that when the equal-share relationship holds then each member of the integrated economy will have the same output per efficiency unit of labor (i.e., human capital). This implication is the essence of the productivity convergence hypothesis (Baumol, 1986), here interpreted in terms of efficiency units of labor and not per capita.

We now develop a framework to empirically examine and test for the equal-share relationship with respect to alternative economic grouping of countries that may or may not meet the condition that they form a fully integrated economy.

II. EMPIRICAL SPECIFICATION

The equal-share relationship (1) implies the following three bivariate relationships:

(5) $\tilde{y}_i = \tilde{k}_i$

(6) $\tilde{y}_i = \tilde{h}_i$

(7) $\tilde{h}_i = \tilde{k}_i$

The values $\tilde{y}_i, \tilde{k}_i$ and $\tilde{h}_i$ denote member *i*'s share of total IE output, total IE physical capital and total IE human capita when outputs and factors are adjusted for any barriers to factor mobility or technological differences. However these adjustment factors, and hence the theoretical shares given in (5) - (7) are not observable. However, from (1), these adjustment factors only affect the measurement of the denominator of each share. This allows us to transform expressions (5) - (7) into testable propositions that involve observed output and factor shares.

Let y_i, k_i and h_i denote member i's observed shares of output, physical capital and human capital. Similarly, let Y_i, K_i and H_i denote the observed *level* of each variable, and continue to let a "~" over a variable denote its (unobserved) value when adjusted for any technological differences or factor mobility costs. Given this, we can, for example, transform (5) as follows:

$$\tilde{y}_i = \tilde{k}_i$$

$$Y_i \bigg/ \sum_{j=1}^{N} \tilde{Y}_j = K_i \bigg/ \sum_{j=1}^{N} \tilde{K}_j$$

$$Y_j = \left(\sum_{j=1}^{N} \tilde{Y}_j \Big/ \sum_{j=1}^{N} \tilde{K}_j \right) K_i$$

$$Y_i \Big/ \sum_{j=1}^{N} Y_j = \left[\left(\sum_{j=1}^{N} K_j \Big/ \sum_{j=1}^{N} \tilde{K}_j \right) \left(\sum_{j=1}^{N} Y_j \Big/ \sum_{j=1}^{N} \tilde{Y}_j \right) \right] K_i \Big/ \sum_{j=1}^{N} K_j$$

(8) $\quad y_i = \beta_{yk} k_i$

where $\beta_{yk} = \left(\sum_{j=1}^{N} K_j \Big/ \sum_{j=1}^{N} \tilde{K}_j \right) \left(\sum_{j=1}^{N} Y_j \Big/ \sum_{j=1}^{N} \tilde{Y}_j \right)$. If there are identical technologies and no barriers to capital mobility then $\sum_{j=1}^{N} \tilde{Y}_j = \sum_{j=1}^{N} Y_j$ and $\sum_{j=1}^{N} K_j = \sum_{j=1}^{N} \tilde{K}_j$ so that $\beta_{yk} = 1$.[3] Performing a similar transformation for expressions (6) and (7) then yields the following expressions between observed output shares and observed factor shares:

(9) $\quad y_i = \beta_{yh} h_i$

(10) $\quad h_i = \beta_{hk} k_i$.

In (9), we again have $\beta_{yh} = 1$ if there are no differences in technology or barriers to human capital mobility. Treating (8) - (10) as a system of equations implies the across equation restriction $\beta_{hk} = \beta_{yk} / \beta_{yh}$. This implies $\beta_{hk} = 1$ when $\beta_{yk} = \beta_{yh}$.

Our tests for the existence of the equal-share relationship will be based on regression estimates of the parameters in (8) - (10). To conduct these tests it is more convenient to express equations (8) to (10) in the equivalent form:

(11) $\quad \ln(y_i) = \theta_{yk} + \gamma_{yk} \ln(k_i) + u_{iyk}$

(12) $\quad \ln(y_i) = \theta_{yh} + \gamma_{yh} \ln(h_i) + u_{iyh}$

(13) $\quad \ln(h_i) = \theta_{hk} + \gamma_{hk} \ln(k_i) + u_{ihk}$

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[3] This would also be true in the singular case where technology differences exactly offset barriers to factor mobility.

where $\theta_{yk} = \ln(\beta_{yk})$, $\theta_{yh} = \ln(\beta_{yh})$ and $\theta_{hk} = \ln(\beta_{hk})$. The disturbance term ($u$) added to each equation is assumed to have the standard properties. However, it is clear (particularly from (11) and (12)) that these disturbances will be contemporaneously correlated.[4] We will therefore obtain parameter estimates using the Seemingly Unrelated Regression (SUR) procedure.

Except for US states, our data on countries' output and factor shares comprise a series of cross-sections at five-year intervals between 1965 and 2000. For US states, the data are only available for 1990 and 2000. Given the time period spanned by the data, we might expect that for some groups (e.g., the EU) the equal-share relationship may hold in later periods but not in earlier periods. That is, there may be convergence toward the equal-share relationship over time due to increased integration among the members of a given group. To account for this possibility we estimate the equation system (11) to (13) separately using the cross-section data in each year. Subsequent analysis then examines hypotheses regarding coefficient homogeneity over time in order to assess the extent to which the data can instead be pooled over time.[5]

Given estimates of the parameters in (11) to (13), we conduct tests to examine for evidence of the equal-share relationship in each year. Each test, except one, involves the null hypothesis that the equal-share relationship holds, and is tested by testing if the intercept term in each equation is significantly different from zero. This follows since if any beta coefficient (β_{ij}) in (8) to (10) equals one (i.e., the equal-share relationship holds) then the corresponding intercept in (11) - (13) will equal zero.

We first test the simple hypothesis that the intercept term in a given equation equals zero. Failure to reject this hypothesis supports the equal-share relationship with

[4] One would also expect the disturbances in (11) and (12) to be serially correlated in a panel data setting.
[5] Hence, we do not impose *a priori* constraints on the parameter values between time periods, as would be the case if we instead only estimated the equation system using the entire panel across years and countries.

respect to a particular pair of shares. A second test examines if the intercepts across the three equations are jointly equal to zero in each year. In addition to these tests for a zero intercept, we also test if the pseudo slope parameters (γ_{ij}) equal unity, both individually for each equation and jointly across the 3 equations, in each year. Finally, as a check on the integrity of equation system (8) to (10), we test the validity of the cross-equation parameter restriction $\beta_{hk} = \beta_{yk} / \beta_{yh}$. In terms of the equation system (11) - (13), this involves testing the restriction that exp (θ_{hk}) = exp (θ_{yk})/exp (θ_{yh}) or equivalently, that $\theta_{hk} = \theta_{yk} - \theta_{yh}$. Both forms of this cross-equation restriction are tested.[6]

Data Sources and Methods

Here we provide only a brief description of the data used. Bowen *et al.* (2005) provide a more complete description. The grouping "51 US states" comprises the 50 US states plus the District of Columbia. US state output is measured by real gross state product (GSP). State physical capital stocks are estimated by multiplying estimates of the total US physical capital stock per industry with an industry's contribution to the state's total income and then summing across industries. State human capital stocks are measured by the number of persons in the state with at least a secondary education. Since the human capital data is only available for those years in which a US Decennial Census is conducted, data on all three variables (output, physical and human capital) is available only for 1990 and 2000.

In addition to the 51 US states, we also consider three other economic groupings: the EU, consisting of 14 pre-enlargement EU member states (Luxembourg is excluded for lack of data on human capital); Developing Countries, consisting of 30 lower income countries; and the World, consisting of 55 countries for which the necessary data were

[6] We test this restriction using a Wald test. We test both forms of the restriction since equivalent forms of a restriction can give different results when using a Wald test (Greene, 2004).

available.[7] For each country, output is measured by real gross domestic product as reported in the Penn World Tables 6.1 (Heston, Summers and Aten, 2002). Country physical capital stocks from 1965 to 1990 are those reported in the Penn World Tables 5.6 (Heston and Summers, 1991a; 1991b). However, since data on EU country physical capital stocks for the period 1980 to 2000 were also available from Timmer *et al.* (2003),[8] we combined these two data sources to obtain a capital stock series for EU countries covering 1965 to 2000.[9]

Country human capital stocks are measured as the number of persons with at least a secondary education, as reported in Barro and Lee (1993, 1996, and 2000). Since data on rates of educational attainment are available only every 5 years, the data on human capital stocks was limited to five-year intervals from 1960 to 2000. This data constraint meant that we also had to restrict our use of the data on output and physical capital stocks to the same five-year intervals.

III. RESULTS

Tables 1 to 4 report SUR estimates of the three-equation system (11) and (13) for each grouping of countries in each sample year and for the data pooled over all available years. The results for US states (Table 1) indicate a high degree of fit between the output and factor shares: the minimum value of the adjusted R-square over all equations is 0.946. The results further indicate strong support for the equal-share relationship in each year, as

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[7] The 14 EU countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and United Kingdom. The 30 Developing Countries comprise Argentina, Bolivia, Botswana, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Honduras, Hong Kong, India, Iran, Israel, Jamaica, Kenya, Malawi, Mauritius, Panama, Paraguay, Peru, Philippines, Sierra Leone, Sri Lanka, Swaziland, Syria, Taiwan, Thailand, Venezuela, Zambia and Zimbabwe. The World comprises, in addition to the 14 EU countries and 30 developing countries, Australia, Canada, Iceland, Japan, Republic of Korea, Mexico, New Zealand, Switzerland, Turkey, and the United States.

[8] This series forms the source of the OECD productivity database. See e.g., Schreyer *et al.* (2003)

[9] We performed estimation for EU countries for the years in which both sources of data were available (1980, 1985 and 1990) and found no qualitative difference in results. We therefore report only results using the capital stock data from Timmer *et al.* (2003).

well as for the pooled sample.[10] Specifically, the hypothesis that the intercepts are different from zero cannot be rejected when this hypothesis is tested individually for each equation, and when this hypothesis is tested jointly across the three equations in each year. In addition, in no case can we reject the cross-equation restriction on the coefficients. Since US states can be regarded to comprise perhaps the most highly integrated economy, these findings not only indicate strong support for the equal-share hypothesis among US states, they also indicate the overall integrity of the equation system (11) and (13) relating output and factor shares.

Insert Table 1 about here

For the integrated economy comprising 14 EU countries, the yearly cross-section results in Table 2 suggest that the equal-share relationship cannot be rejected, either when testing that the intercepts in each equation are zero in each year or when testing that the intercepts are jointly equal to zero across the three equations in a given year. However, as indicated in the last part of Table 2, when the equations are estimated using the data pooled over all sample years, or pooled for subsets of the sample years, the equal-share relationship is rejected.[11] The different conclusion from the annual versus the pooled sample results likely reflects the small sample size of the annual cross-sections (14 observations).[12] While the equal-share relationship for EU countries is rejected in terms of the joint test that the intercepts are zero, the cross-equation coefficient restriction $\exp(\theta_{hk})$

[10] For each equation we could not reject the hypotheses of homogeneity of the intercepts and of the slopes across years. This means it is legitimate to estimate the three-equation system using the data pooled over time.

[11] As for US states, for each equation we could not reject the hypotheses of homogeneity of the intercepts and of the slopes across years. Hence, it is legitimate to estimate the three-equation system using the data pooled over time.

[12] To examine this, we estimated the equation system using data pooled across different subsets of years. Even for the minimal case of combining two years of data, a pooled sample of 28 observations was sufficient to reject the equal-share relationship.

= $\exp(\theta_{yk}) / \exp(\theta_{yh})$ is not rejected, again indicating the overall integrity of the equation system relating output and factor shares. Given the mixed results, we conclude that technological differences or barriers to factor mobility or both prevent EU countries being as integrated as US states.

Insert Table 2 about here

The results for Developing Countries (Table 3) and the World (Table 4) indicate no support for the equal-share relationship. For each group, the hypothesis that the intercepts equal zero is strongly rejected, in both annual cross-section and pooled samples,[13] whether the hypothesis is tested individually for each equation or tested jointly across the set of equations. However, in almost all cases the cross-equation coefficient restriction cannot be rejected, again indicating support for the basic structure of the equal-share equations. These results cast doubt on the importance of factors such as increasing flows of capital across countries (i.e., greater capital market integration) for creating convergence toward the equal-share relationship for these groupings of countries. Instead, the results suggest that there remain significant barriers to technology transfer and factor flows, as well as goods flows, between our group of developing countries as well as the world as a whole.

Insert Tables 3 and 4 about here

IV. SUMMARY AND CONCLUSIONS

This paper has examined empirically for evidence of the theoretical equal-share relationship derived by Bowen *et al.* (2005). This relationship states that within a fully

[13] For both groups, we could not reject for each equation the hypotheses of homogeneity of the intercepts and of the slopes across years. This means it is legitimate to estimate the three-equation system using the data pooled over time.

integrated economy (IE), in which there is the free exchange of goods and factors and where members share the same production technology, each IE member's shares of total IE output will equal its shares of total IE stocks of productive factors. We examined for the equal-share relationship among alternative economic groupings: US states, 14 EU countries, 30 Developing Countries and a World comprising 55 countries. The results indicated that the integrated economy of US states exhibits full conformity with the predicted equal-share relationship. US states therefore represent a benchmark that can be used to understand the implications of full economic integration.

Less support was found for the equal-share relationship among EU countries, although there was evidence of movement toward this relationship over time. This finding suggests that efforts to more completely integrate EU member states have, as least for the time periods studied, led to a greater level of integration.

The equal-share relationship was strongly rejected for integrated economies comprising Developing Countries and the World. The findings for Developing Countries and the World are perhaps not surprising and, in this sense, the findings serve as a check on the robustness of the empirical methods used to examine for the equal-share relationship.

Though the equal-share relationship is a static characterization of an integrated economy, it raises questions of a dynamic nature. One implication of the equal-share relationship is that the underlying growth mechanism of members of a fully integrated economy can differ markedly from those assumed by the existing growth literature. Specifically, the equal-share relationship puts a constraint on the set of policies that can affect the economic position of one IE member relative to all other IE members. In particular, the more harmonized are the economic policies of IE members the more likely is the relative growth experience of any one member to be a random outcome contingent on particular states of nature. This implies that investment and education policies by any one IE member may not increase that member's relative position within an integrated economy if these policies are rapidly duplicated by other members. Stated differently, investment and education policies can only be expected to increase an IE member's relative position if they are undertaken unilaterally and not quickly imitated. Ireland's independent moves during the 1990s regarding tax and investment policies relative to those of other EU countries, which greatly increased Ireland relative position among EU countries, serves as an example of this principle.

The empirical relevance of the equal-share relationship stresses the interdependence of investment and human capital policy. For example, since foreign direct investment will result in an (independent) increase the host member's share of physical capital, it will also lead to an increase the return to, and accumulation, of human capital with the host member. Similarly, an independent policy (e.g., higher funding for education) that raises a country's share of human capital would be expected to raise the return to physical capital and result in an inflow of external (foreign and/or from another IE member) physical capital, resulting also in an increase the active member's share of output.[14] Of course, much depends on the institutional arrangements that characterize the policy space of IE members. It is hoped that the analysis presented here offers a foundation and convenient framework for conducting further research on issues regarding the impacts of economic integration.

[14] These predictions assume a "closed" integrated economy, that is, one for which there are no flows of goods or resources between IE members and non-IE members. These predictions would therefore certainly apply to the integrated economy comprised of all economies (i.e., the World).

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Table 1 - SUR Estimates of Share Equations: US States

Year (obs.)	Equation (i on j)	Intercept (θ_{ij})	Slope (γ_{ij})	Adj. R^2	Joint Hypothesis *p*-value		
					Intercepts = 0	Slopes = 1	Across Equation Restriction§
1990 (n = 51)	y on k	-0.053 (0.092)	0.989 (0.020)	0.974	0.9368	0.9539	0.9517
	y on h	-0.045 (0.092)	1.000 (0.019)	0.946			
	h on k	-0.010 (0.102)	0.989 (0.022)	0.961			
2000 (n = 51)	y on k	-0.128 (0.076)	0.963 (0.016)$^{+}$	0.985	0.2868	0.0344	0.9065
	y on h	0.052 (0.089)	1.025 (0.019)	0.957			
	h on k	-0.178 (0.101)	0.939 (0.021)$^{++}$	0.956			
1990 & 2000 (n = 102)	y on k	-0.097 (0.062)	0.975 (0.013)	0.979	0.4259	0.1095	0.9842
	y on h	0.003 (0.064)	1.012 (0.014)	0.952			
	h on k	-0.101 (0.073)	0.963 (0.016)$^{+}$	0.957			

Notes: y = output share; k = physical capital share; h = human capital share; standard error in parentheses.
$^{+}$ reject hypothesis that coefficient is unity at 5% level;
$^{++}$ reject hypothesis that coefficient is unity at 1% level.
§ Test of across equation restriction $\exp(\theta_{hk}) = \exp(\theta_{yk})/\exp(\theta_{yh})$.

Table 2 - SUR Estimates of Share Equations: EU Countries

Year(s) (obs.)	Equation (i on j)	Intercept (θ_{ij})	Slope (γ_{ij})	Adj. R^2	Joint Hypothesis *p*-value: Intercepts = 0	Slopes = 1	Across Equation Restriction§
1965 (n =14)	y on k	-0.279 (0.200)	0.899 (0.057)	0.941	0.3411	0.0231	0.6813
	y on h	-0.670 (0.464)	0.688 (0.110)$^{+}$	0.421			
	h on k	0.177 (0.681)	1.188 (0.189)	0.454			
1970 (n =14)	y on k	-0.218 (0.185)	0.915 (0.053)	0.949	0.5701	0.1533	0.8552
	y on h	-0.395 (0.363)	0.814 (0.093)	0.647			
	h on k	0.126 (0.444)	1.096 (0.123)	0.689			
1975 (n =14)	y on k	-0.277 (0.173)	0.879 (0.048)$^{+}$	0.945	0.4113	0.0841	0.7998
	y on h	-0.257 (0.382)	0.872 (0.102)	0.636			
	h on k	-0.082 (0.353)	0.990 (0.097)	0.754			
1980 (n =14)	y on k	-0.288 (0.277)	0.921 (0.082)	0.885	0.7161	0.5346	0.8071
	y on h	-0.130 (0.181)	0.940 (0.047)	0.875			
	h on k	-0.177 (0.317)	0.977 (0.093)	0.831			
1985 (n =14)	y on k	-0.206 (0.212)	0.942 (0.063)	0.926	0.8111	0.7684	0.8596
	y on h	-0.044 (0.187)	0.962 (0.049)	0.882			
	h on k	-0.174 (0.238)	0.978 (0.070)	0.896			
1990 (n =14)	y on k	-0.324 (0.186)	0.891 (0.053)	0.929	0.1102	0.0242	0.9146
	y on h	0.083 (0.280)	1.048 (0.081)	0.802			
	h on k	-0.396 (0.197)	0.848 (0.056)$^{+}$	0.896			
1995 (n=14)	y on k	-0.358 (0.213)	0.871 (0.061)	0.919	0.2601	0.0648	0.9946
	y on h	0.073 (0.320)	1.053 (0.093)	0.751			
	h on k	-0.433 (0.266)	0.820 (0.075)$^{+}$	0.806			
2000 (n=14)	y on k	-0.403 (0.173)*	0.848 (0.050)$^{++}$	0.942	0.0851	0.0087	0.8936
	y on h	-0.012 (0.326)	1.014 (0.097)	0.732			
	h on k	-0.414 (0.267)	0.828 (0.075)$^{+}$	0.794			
1965-2000 (n = 112)	y on k	-0.312 (0.076)**	0.890 (0.022)$^{++}$	0.932	0.0003	0.0000	0.3901
	y on h	-0.303 (0.126)**	0.876 (0.034)$^{++}$	0.683			
	h on k	-0.084 (0.140)	0.993 (0.040)	0.720			
1980-2000 (n = 70)	y on k	-0.323 (0.100)**	0.892 (0.029)$^{++}$	0.922	0.0102	0.0020	0.7436
	y on h	-0.027 (0.117)	0.996 (0.033)	0.818			
	h on k	-0.313 (0.123)*	0.891 (0.035)$^{++}$	0.837			
1990-2000 (n = 42)	y on k	-0.364 (0.112)**	0.869 (0.032)$^{++}$	0.932	0.0019	0.0000	0.9707
	y on h	0.048 (0.178)	1.038 (0.052)	0.775			
	h on k	-0.415 (0.142)**	0.832 (0.040)$^{++}$	0.841			

Notes: y = output share; k = physical capital share; h = human capital share; standard error in parentheses; The 14 EU countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and United Kingdom.

* reject hypothesis that coefficient is zero at 5% level; ** reject hypothesis that coefficient is zero at 1% level;
+ reject hypothesis that coefficient is unity at 5% level; ++ reject hypothesis that coefficient is unity at 1% level.

§ Test of across equation restriction $\exp(\theta_{hk}) = \exp(\theta_{yk})/\exp(\theta_{yh})$.

Table 3 - SUR Estimates of Share Equations: Developing Countries

Year(s) (obs.)	Equation (i on j)	Intercept (θ_{ij})	Slope (γ_{ij})	Adj. R^2	Joint Hypothesis *p*-value		
					Intercepts = 0	Slopes = 1	Across Equation Restriction§
1965 (n = 30)	y on k	-1.634 (0.305)**	0.620 (0.060)++	0.778	0.0000	0.0000	0.1523
	y on h	-1.242 (0.252)**	0.707 (0.045)++	0.709			
	h on k	-0.680 (0.503)	0.849 (0.097)	0.575			
1970 (n = 30)	y on k	-1.459 (0.308)**	0.670 (0.061)++	0.800	0.0000	0.0000	0.3519
	y on h	-1.625 (0.326)**	0.609 (0.057)++	0.551			
	h on k	-0.181 (0.690)	1.003 (0.135)	0.419			
1975 (n = 30)	y on k	-1.287 (0.285)**	0.696 (0.058)++	0.825	0.0000	0.0000	0.2845
	y on h	-1.022 (0.271) **	0.729 (0.049)++	0.700			
	h on k	-0.499 (0.487)	0.926 (0.097)	0.602			
1980 (n = 30)	y on k	-1.155 (0.270)**	0.715 (0.055)++	0.846	0.0000	0.0000	0.3019
	y on h	-0.929 (0.226) **	0.678 (0.037)++	0.778			
	h on k	-0.419 (0.486)	1.036 (0.097)	0.671			
1985 (n = 30)	y on k	-1.179 (0.250)**	0.707 (0.050)++	0.865	0.0000	0.0000	0.1510
	y on h	-0.669 (0.246)*	0.751 (0.043)++	0.771			
	h on k	-0.754 (0.418)	0.925 (0.082)	0.690			
1990 (n = 30)	y on k	-1.217 (0.248)**	0.696 (0.049)++	0.863	0.0000	0.0000	0.0815
	y on h	-0.557 (0.212)*	0.792 (0.037)++	0.818			
	h on k	-0.867 (0.356)*	0.872 (0.069)	0.764			
1965-1990 (n = 180)	y on k	-1.337 (0.115)**	0.681 (0.023)++	0.832	0.0000	0.0000	0.0045
	y on h	-1.065 (0.111)**	0.700 (0.019)++	0.705			
	h on k	-0.536 (0.207)*	0.941 (0.041)	0.606			

Notes: y = output share; k = physical capital share; h = human capital share; standard error in parentheses; The set of 30 Developing Countries comprises Argentina, Bolivia, Botswana, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Honduras, Hong Kong, India, Iran, Israel, Jamaica, Kenya, Malawi, Mauritius, Panama, Paraguay, Peru, Philippines, Sierra Leone, Sri Lanka, Swaziland, Syria, Taiwan, Thailand, Venezuela, Zambia and Zimbabwe.

* reject hypothesis that coefficient is zero at 5% level; ** reject hypothesis that coefficient is zero at 1% level;
\+ reject hypothesis that coefficient is unity at 5% level; ++reject hypothesis that coefficient is unity at 1% level.
§ Test of across equation restriction $\exp(\theta_{hk}) = \exp(\theta_{yk})/\exp(\theta_{yh})$.

Table 4 - SUR Estimates of Share Equations: the World

Year (obs.)	Equation (i on j)	Intercept (θ_{ij})	Slope (γ_{ij})	Adj. R^2	Joint Hypothesis *p*-value		
					Intercepts = 0	Slopes = 1	Across Equation Restriction§
1965 (n = 55)	y on k	-1.171 (0.225)**	0.764 (0.037)++	0.885			
	y on h	-0.768 (0.220)**	0.798 (0.032) ++	0.793	0.0000	0.0000	0.2113
	h on k	-0.582 (0.360)	0.944 (0.058)	0.724			
1970 (n = 55)	y on k	-0.951 (0.213)**	0.803 (0.035)++	0.904			
	y on h	-0.842 (0.210)**	0.806 (0.031)++	0.808	0.0000	0.0000	0.5095
	h on k	-0.200 (0.346)	0.986 (0.055)	0.754			
1975 (n = 55)	y on k	-0.905 (0.192)**	0.802 (0.032)++	0.918			
	y on h	-0.607 (0.211)**	0.861 (0.033)++	0.815	0.0000	0.0000	0.4184
	h on k	-0.397 (0.299)	0.923 (0.048)	0.780			
1980 (n = 55)	y on k	-0.879 (0.184)**	0.811 (0.031)++	0.925			
	y on h	-0.652 (0.182)**	0.818 (0.027)++	0.852	0.0000	0.0000	0.4041
	h on k	-0.314 (0.294)	0.985 (0.048)	0.809			
1985 (n = 55)	y on k	-0.909 (0.175)**	0.805 (0.029)++	0.931			
	y on h	-0.444 (0.181)*	0.887 (0.028)++	0.863	0.0000	0.0000	0.3366
	h on k	-0.552 (0.257)*	0.903 (0.042)+	0.826			
1990 (n = 55)	y on k	-0.966 (0.176)**	0.790 (0.029) ++	0.927			
	y on h	-0.471 (0.168)**	0.916 (0.027) ++	0.873	0.0000	0.0000	0.3929
	h on k	-0.559 (0.231)*	0.859 (0.037) ++	0.852			
1965-1990 (n = 330)	y on k	-0.965 (0.080)**	0.796 (0.013) ++	0.915			
	y on h	-0.665 (0.083)**	0.840 (0.013) ++	0.792	0.0000	0.0000	0.0279
	h on k	-0.406 (0.125)**	0.938 (0.020) ++	0.742			

Notes: y = output share; k = physical capital share; h = human capital share; standard error in parentheses; The World comprises Argentina, Australia, Austria, Belgium, Bolivia, Botswana, Canada, Chile, Colombia, Denmark, Dominican Republic, Ecuador, Finland, France, Germany, Greece, Guatemala, Honduras, Hong Kong, Iceland, India, Iran, Ireland, Israel, Italy, Jamaica, Japan, Kenya, Republic of Korea, Malawi, Mauritius, Mexico, Netherlands, New Zealand, Norway, Panama, Paraguay, Peru, Philippines, Portugal, Sierra Leone, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Syria, Taiwan, Thailand, Turkey, United Kingdom, United States, Venezuela, Zambia and Zimbabwe.

* reject hypothesis that coefficient is zero at 5% level;

** reject hypothesis that coefficient is zero at 1% level;

+ reject hypothesis that coefficient is unity at 5% level;

++ reject hypothesis that coefficient is unity at 1% level;

§ Test of across equation restriction $\exp(\theta_{hk}) = \exp(\theta_{yk})/\exp(\theta_{yh})$.