DISCUSSION PAPER SERIES

IZA DP No. 2140

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May 2006

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Discussion Paper No. 2140
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ABSTRACT

Does the Liberalization of Trade Advance Gender Equality in Schooling and Health?*

This paper assesses the empirical relationship between the liberalization of international trade and the economic status of women. Although historically globalization is not generally linked to the advancement of women, several recent country studies find export led growth in middle and low income countries is associated with improvements in women's employment opportunities. Does intercountry empirical evidence confirm this association across a wider range of countries, and suggest the mechanisms by which it operates? Measures of wages for men and women are an unreliable basis for study of gender inequality in many low income countries, and thus schooling and health are analyzed here as indicators of productivity and welfare and gender gaps. For a sample of 70 countries observed at five year intervals from 1965 to 1980, tariff, quota, and foreign exchange restrictions are found to be inversely associated with trade, and with the levels of education and health, especially for women. Natural resource exports, although providing foreign exchange for imports, appear to reduce investments in schooling and health, and delay the equalization of these human capital investments between men and women. Liberalization of trade policy is consequently linked in the cross section to increased trade, to greater accumulation of human capital, and to increased gender equality.

JEL Classification: FO2, I12, J16, I21

Keywords: trade liberalization, schooling, health, gender equality

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* European Society of Population Economists meeting in Bergen, Norway, June 10-12, 2004. Earlier version presented at "The Future of Globalization: Explorations in light of recent turbulence" a conference by the Yale Center for the Study of Globalization and the World Bank, October 10-11, 2003. I appreciate the assistance of Jeremy Magruder in collecting the data reported herein, the comments and editorial assistance of Sarah Cattan, and acknowledge the research support of the Rockefeller Foundation and the Center for Study of Globalization.

1. Introduction

Since 1945 modern economic growth and the demographic transition have progressed beyond Europe, Japan, North America and Oceania, and these economic and demographic changes are closely related to the advances of women's schooling (Schultz, 1995, 1997, 1998). This paper explores the following questions: are these advances in educational status of women reflected in other indicators of women's improved well being, such as longevity and child health? Are the features of globalization in this period – policies which opened domestic economies to international trade and fostered an increase in exports and imports as a share of income – associated with increases in schooling and health and with advances in gender equality expressed in terms of these forms of human capital?

The twentieth century is unprecedented in its acceleration and collapse of population growth, due to first an increase in child survival rates, and then to more than offsetting declines in fertility. World population growth rates increased until 1960-65, and thereafter slowly declined, while the absolute size of some European populations in Europe were contracting by the end of the century. Both the decline in mortality and then fertility occurred earlier in those countries which made earlier progress in educating girls as well as boys (Schultz, 1997). School enrollment rates and the length of school years have increased, raising the educational attainment of youth entering the labor force, increasing the productivity and wages of workers, and raising the opportunity costs of childbearing which appear to have contributed to the decline in fertility. But the schooling of women lags behind that of men in many countries of South and West Asia, and in most of Africa (Schultz, 1995). Inequalities between rich and poor countries in the average years of education attained and life expectancy at birth have diminished, more rapidly than inequalities in personal incomes, which began to decline in the 1970s, after the rate of per capita

growth in income in China started to exceed growth in the high-income countries (Schultz, 1998). The objective of this paper is to explore the hypothesis that the liberalization of trade contributed to the diffusion of education and health, and more specifically to the advance in gender equality in these increasingly important forms of human capital.

2. Hypotheses Linking Globalization and Women's Status

The literature dealing with women and development is primeval; it is far too extensive for me to summarize here (e.g. United Nations, 1999). The monograph by Ester Boserup on Woman's Role in Economic Development (1970) is a rich early source of hypotheses in this area. She documents that women compared with men occupied very different occupational specializations in the economy in different regions of the world. It is, therefore, not surprising that women were affected in diverse ways, positively and negatively, by the impact of colonial regulations and trading regimes of the 19th century, by the opening of domestic economies to specialization spurred by international trade, and by the roles assigned to the state and to markets in the allocation of economic resources, both within the developing countries and between them and the rest of the world.

Boserup was not optimistic that colonial development and trade-motivated specialization improved women's productivity and economic status. In Africa she recognized that women played a central role in producing staples for their families, and cash crops used for exports and taxed by governments were produced primarily by men. Therefore, men might be expected to gain more from early specialization and trade than would women, if any local group gained. The role of women as relatively self supporting agriculturist in many African contexts allowed the state to rely on men as migratory labor to meet the needs of new agricultural plantations, and concentrated industries, such as mining. But in areas of Asia where monsoon agriculture dictated

the use of the plow in agriculture, the dependence on plow technology reserved a specialized physically demanding role for male workers in the agricultural production cycle, and migration for development was constrained by the cost of moving entire families. In some of these agricultural activities, such as tea in India or cacao in Ghana, women emerged as a beneficiary of the expansion of a cash crop for export. Thus, the consequences of trade induced specialization in agricultural development may have had varied effects on the relative economic productivity of men and women, but the dominant pattern was for cash crops to employ mostly men. The case remains open whether this outcome occurred because men were initially better educated than women and thus able to coordinate the production, marketing, and credit often required for the new crops, or men were more firmly in control of economic and cultural connections to benefit from promising new lines of production, or men were less risk averse, or men were more mobile without child care responsibilities, or men were initially less fully-employed than women.[1]

Boserup also did not think the pursuit of import substitution policies by more independent post-colonial developing countries would benefit women, as these policies tended to raise the cost of consumer goods women required for their families and to expand the derived demand for labor in industrial sectors protected by tariffs and quantitative restrictions on imports. The consensus is that these import substituting sectors and those exporting mineral and natural resources employed predominantly men in the low-income countries. Therefore, North-South trade until the 1970s may not have expanded the demands for female labor relative to male labor, and thus may not

[1] Boserup noted some government institutions, such as agricultural extension services, employed predominantly men, and were therefore more effective in promoting change in farming practices among farmers who were male, than among the majority of farmers who were female. This insight of Boserup was subsequently confirmed by survey research, and some international agricultural research was redirected to focus on enhancing “female” staple crops and to monitor extension activity to better serve the needs of female farmers.

have enhanced the economic productivity or status of women compared to men. In the last couple of decades evidence has accumulated that liberalization of international trading regimes has begun to benefit women in many parts of the world, and possibly benefit women more than men, although there is surprisingly little systematic study of this question.[2] International coordination of trade liberalization policy has reduced tariff and quantitative restrictions on imports, weakened earlier import-substitution policies, fostered more convertible currencies, and gradually reduced regulations on long-term capital movements to encourage more foreign direct investment. These multifaceted changes in trade policy have presumably brought domestic prices on tradeable goods and services into closer alignment across countries.

The conventional economic wisdom, as formalized in the Hecksher-Ohlin-Stolper-Samuelson (1941) model of foreign trade and domestic goods and factor price equalization, suggests that trade liberalization encourages countries to specialize in the production of goods for which they have a comparative advantage, or in other words, countries should export goods which make intensive use of a country's relatively abundant factor endowments, and import goods which embody more of a country's relatively scarce factor endowments. This framework assumes that all countries have access to the same production technologies, and relative factors intensities within a sector do not reverse in a country as output changes. The empirical question remains, however, do low-income countries actually export unskilled labor intensive commodities -- using their abundant factor endowment -- and import relatively more skilled- and educated-labor intensive commodities? The "Leontief Paradox" documented in an early postwar analysis

[2] For example, a recent survey of the literature on trade, growth and poverty does not explore the consequences of trade liberalization for women status but only for poverty head counts (Berg and Krueger, 2003).

of trade flows that the United States imported capital-intensive goods and exported labor-intensive goods. This finding seemed to challenge the comparative advantage theory of trade if production requires only two homogeneous factors : labor and capital. But as the heterogeneity of labor was gradually recognized, the accumulation of human capital became a central feature in development theories for modern economic growth. The Leontief paradox was seemingly resolved by attributing the human capital intensive composition of U.S. trade to the relative abundance of highly educated labor in the United States.

Wage differentials between skilled and unskilled workers are expected to diminish as the barriers to international trade decreased. But skill wage differentials in middle income countries such as Chile and Mexico have instead increased in the 1980s and 1990s with trade liberalization (Robbins, 1994; Ravenga, 1997 ; Kanbur and Lustig, 1999). For example, in Mexico, Hanson (2003) examined the 1990 and 2000 censuses, before and after trade barriers were reduced under NAFTA, and concluded that wage gains were proportionately larger for better educated workers in Mexico, but the percentage wage gains for women exceeded those for men with the same education.[3] Technical change emanating from high-income countries may be designed to use intensively skilled labor and benefit from the scale of markets, contributing to a skill-bias in available technologies even when they are introduced into low-income countries (Acemoglu, 1998). The growth in wage inequality at "middle-skill" levels in low income countries could also be due to the conceptual limitations of the commonly employed two-country and two-factor framework for studying the consequences of trade; very low-income countries, such as China,

[3] For example, real wages for women with 13-15 years of schooling increased by 26 percent whereas wages of comparably educated men gained 11 percent, while wages for women with only 5-8 years of schooling rose only 4 percent and wages for comparable men fell by 23 percent (Hanson, 2003: Table 5).

have greatly increased their exports of unskilled-labor intensive goods, forcing middle income countries such as Mexico and Chile to specialize in the export of "middle-skilled" manufactured goods and specialized agricultural products. These sectors tend to employ disproportionately female workers. What does skill intensity of a sector imply about its use of female relative to male labor? Are women employed predominantly in relatively unskilled jobs, or does that depend on the sector and vary according to the wage gap between women and men with the same education? The wage gap between women and men tends to be wider in less developed countries than in the industrially advanced countries. Reductions in the barriers to trade in the less developed countries may thus create more job opportunities for women than for men and encourage families and society to invest more in women's human capital to prepare them to work outside of their household.

3. Empirical Studies of Trade and Women's Employment Opportunities

Can this factor-endowment model of trade account for how the opening of an economy to trade impacts the gender gap in employment and wages? In a high wage country, such as the United States, when imports increase as a share of domestic consumption in a sector, the factor-endowment hypothesis suggest that more trade ({exports + imports}/ GDP) will reduce wages of the less skilled workers, because imports will be intensive in unskilled labor and may thereby depress the wages of women relative to men.

Trade may also impact market structure and foster a more competitive product market with possible ramifications for the profits and behavior of employers. Becker (1957) argued that discrimination is unprofitable for a competitive firm, and therefore the practice of discrimination is more likely to persist in product markets in which firms have power and profit due to downward sloping demand curves, compared with a competitive market where profit margins are

controlled by free entry of firms. A gender gap in wages due to preexisting discrimination might then be reduced by increased pressures from imports due to liberalization of trade, and the change in the gender gap would be more pronounced within a concentrated monopolistic industry compared within an initially competitive industry.

Opening of the economy to trade can thus have two offsetting effects on the gender wage gap in a highly-skilled developed country. Lowering the barriers to trade according to Stolper-Samuelson (1941) model of factor price equalization would increase the relative wages of skilled workers, due to both new opportunities to export and increased pressure of imports. Any rise in the relative wage for the abundant factor-- skilled labor -- is expected to widen the gender wage gap, if women are generally observed to be employed in low-wage sectors or occupations. Conversely, trade liberalization could reduce the gender wage gap in import-competing sectors due to a reduction in the capacity of monopolistic firms to discriminate against female workers. The theoretical sign of the net effect of trade liberalization on the gender wage gap is, therefore, ambiguous in high-income countries because of the conflicting effects of the trade and discrimination models. Nonetheless, empirical studies in the United States generally find that increases in the share of imports to output in a sector increases the wage gap between skilled and unskilled workers and also increases the wage gap between men and women (Murphy and Welch, 1991; Wood, 1994; Borjas and Ramey, 1995; Black and Brainerd, 2002). One interpretation of this empirical evidence is that the effect of the factor-endowment trade model outweighs the effect of any reduction in gender discrimination. In sum, the employment opportunities of women in high income countries may not have benefitted relative to men from the recent growth in world trade .

The comparative advantage effects will be reversed when this hybrid framework is

applied to a low-income country, with a relatively abundant supply of unskilled labor, and in which the gender gap in education and wages tends to be larger (Schultz, 1995). The effects of comparative advantage will now reinforce the anti-discrimination impact of liberalized trade, and both forces are expected to reduce the gender wage gap in import-competing sectors. To the extent that discrimination by gender in the labor market is strengthened by the concentration of producers, the additional competitive pressure to reduce the gender wage gap should be greater in initially concentrated import-competing sectors. Of course, other policies than trade openness could encourage competitive markets, such as anti-trust policy or privatization (Ozler, 2000). Several country studies confirm that women's employment has improved relative to men's in low income countries that were opening their economies to international trade. For example, this phenomenon was documented in Turkey (Ozler, 2003), Chile (Levinsohn, 1999), and Mexico (Hanson, 2003).

4. Problems in Assessing the Determinants of Women's Productive Opportunities

In addition to openness to trade, other features of an economy are related to women's relative employment opportunities. Some of these features, such as women's share of employment within sectors, may themselves respond to the structure of the trade regime and are thus not exogenous. Other features of employment opportunities, such as the share of employment in the public/private sectors, are linked to women's advances, but cannot always be measured consistently across countries and are also probably determined simultaneously with trade policies. In Latin America, for example, wages tend to be higher in the public sector than in the private sector, and this public sector wage premium tends to be larger for women than for men, controlling for observed productive characteristics of the workers, such as their schooling

and post-schooling potential experience (Psacharopoulos and Tzannatos, 1992; Panizza, 2003).[4] Unfortunately, I have only found comparable estimates of the size of the public sector in Latin America and the OECD countries, thus making this hypothesis impossible to test in this study across a more representative sample of countries in the world.

Overall wage inequality and labor market institutions, such as unionization and minimum wage policies, may also affect the relative wage status of disadvantaged groups such as women. If increased wage inequality in a national economy has the impact of lowering the relative wage position of low wage racial, ethnic, and gender groups, including women (Blau and Kahn, 1996, 1997), then recent increases in aggregate wage inequality within many countries could contribute to increasing the gender gap in wages in these countries, other things being equal. [5] But existing measures of income and wage inequality are not comparable across countries, some being derived from survey questions on household consumption whereas others are derived from a question on individual earnings, which makes it difficult to combine both sources of data on inequality

[4] Part of this public sector wage premium is associated with the preponderance of women in the informal private sector of Latin America, where women's wages are especially low compared with men's. When the public-private wage comparisons are restricted to private wage earners in only the formal sector, the public wage premium is reduced by a third, from about 30 percent to about 20 percent across 17 Latin American countries in the 1980s and 1990s (Panizza, 2003). This public sector gender gap favoring women's wages tends to be larger for less educated workers. It may be expected, therefore, that if the public sector sheds workers during recessions, this retrenchment of public sector employment would have contributed to a deterioration in women's wages relative to men in Latin America during the 1980s.

[5] The relative inequality in wages (i.e. standard deviation of the log of wage rates) was lower in the centrally planned economies (e.g. Schultz, 1998; Freeman and Oostendorp, 2000) than in the market economies. Many of the indicators of trade regimes examined in this paper cannot be calculated for centrally planned economies, and thus important dimensions of global integration as the centrally planned economies were drawn into the world economy, cannot be analyzed here. Skill-biased technical change can also cause institutional change, such as the decline in the union share of the labor force (Acemoglu and Robinson, 2000)

(Schultz, 1998). Legislated regulations on the labor market, such as minimum wages, are determined in light of prevailing labor market conditions, and thus tend to be "adjusted for inflation" at intervals when unemployment tends to be unusually low, implying that variation in these wage policies across countries and overtime cannot be treated as exogenous to macroeconomic conditions. More generally, measured wage rates and rates of labor force employment of women and men are determined simultaneously by the labor market restrictions, such as minimum wage legislation, as well as by other conditions affecting the aggregate supply of and derived demand for female and male labor.

5. Measuring the Potential Productivity of Women and Men by Their Human Capital

When wages of men and women are compared, the wages may not represent the productivity of the average man and woman, because they are conditional on the proportion and composition of those who report a wage (Heckman, 1979). Correcting for this sample selection bias and controlling for omitted productive characteristics of men and women is methodologically difficult even with good household survey data, as may be available from some high income and Latin American countries. To consider a broader sample of countries for which even rudimentary gender-specific wage data are not available, I adopt the empirical strategy of approximating gender equality by the gap between men's and women's schooling and health. There is some empirical evidence to support the simplifying assumption that measured differences in years of schooling and health human capital among workers are associated with similar proportionate gains in the wage opportunities of all women and men. However, this comparability of private wage "returns" to schooling and health of men and women should not be interpreted as indicating that the gender wage gap would disappear if these human capital stocks could be equalized

between men and women.[6]

Gender differences in investments in human capital might arise from two sources. First, there is investment of private family resources in the health, nutrition, and schooling of children and other household members, which may favor one sex over the other. Second, there is investment of public resources allocated toward infrastructure and services required to provide schooling and public health services to the local population. Differentials in human capital investments between boys and girls appear to arise primarily because of choices made at the family level, and gender discrimination in the organization of public service institutions (i.e. schools and health clinics) is probably of secondary importance for explaining these gender differences in human capital.

The family investments in human capital may be influenced by many factors. On the one hand, market derived demand for different types of labor can enhance the productive opportunities for male and female family members to engage in work outside of the family. Changes in home production technology and the relative price of other home inputs can alter the productivity of family labor in home production. Convergence across countries in international relative prices due to trade and factor mobility may thus affect labor productivity in home production that is consumed by the family, as well as affect the output of family labor that is

[6] When wage functions are estimated for selected countries correcting for sample selection bias based on plausible identification restrictions and on assumed distributions of errors, the percentage wage returns to schooling of men and women are generally of comparable magnitudes. There are few estimates reported on the wage returns to health human capital, but they also suggest broadly similar wage returns to men and women (Schultz, 1995; Schultz and Tansel, 1997; Savedoff and Schultz, 2000).

exchanged in the market, or modify market wage opportunities outside of the family.[7] Although some scholars assume that increased labor force participation of women improves women's bargaining power and status, female participation in the market labor force by itself is an unsatisfactory indicator of women's welfare or status, because it can decrease with the advancement of women, or increase with economic crises penalizing women. For example, in Thailand, where economic development and urbanization have proceeded rapidly from 1960 to 1990, fertility fell from six to two children per woman, but women's participation in the labor force declined over this time. Alternatively, as Argentina has suffered chronic economic recessions in recent years, female labor force participation has increased to help sustain household market income. Before describing in more detail the data used to measure schooling and health of men and women, features of trade liberalization policy, and openness of the domestic economy to trade, the next section proposes how these variables may be expected to interact and how these relationships will be subsequently estimated.

6. Conceptual Framework and Issues in Econometric Estimation

The "trade liberalization process" is expected to increase exports and imports as a share of

[7] For example, in some settings the income gains for the household due to globalization might motivate more male members to work in the wage labor force, and for more female members to substitute their time in non-wage work. The observed market wage for women might increase because of the reduce supply of women working, although the productive opportunities for the average female worker might decline or not change. Thus, a rise in the market wage may be attributed to either or both shifts in demand and supply factors, and cannot be assumed to represent a net improvement in the productivity of all women or even the average woman. Of course, if the productive ordering of all women did not change, and both the wages of women and their participation rate in wage employment increased, it would be clear that the average wage of women increased. But to compare the movement in wages of women to that of men and relate them to the globalization induced changes in the demand for labor, male and female wage functions would have to be estimated, both of which should be corrected for potential sample selection bias.

GDP. What is less often studied is the impact of trade liberalization on the derived demands for male and female labor, and its effect on wage differentials by education level, which could motivate families and society to invest in schooling and health, and potentially change gender differences in these forms of human capital. The first step is to assess whether international trade outcomes (T) facilitated by a trade liberalization regime (R) are in fact associated with the level and gender composition of human capital (HC)? Human capital is measured by the education of men (E_m) and women (E_f) and by their longevity (H_m and H_f), which may be influenced by trade liberalization, controlling for certain exogenous background variables (Z1) that could otherwise affect trade outcomes, such as (a) the natural resource endowment exports (minus imports) as a percent of GDP [8], (b) population size, which could reduce the benefits from trade specialization[9] , and (c) a linear time trend to capture unmeasured changes occurring over time.

In cross country comparisons of this form, the demand for female and male labor may also

[8] The largest natural resource export is oil and gas, but other categories of fossil fuel and metallic and nonmetallic natural resources are also dominant sources of national wealth and exports in many countries. The net balance of exports minus imports of all of these natural resource commodities as a share of GDP, expressed in purchasing power parity, is the variable analyzed here as a control variable (Z1). This variable is expected to increase a country's trade by definition, and to weaken national incentives to invest in human capital given its income, and to reduce the likelihood that women will receive an equal share of human capital and participate in the labor force outside of the home, and will consequently reduce gender equality.

[9] The size (and geographic placement) of states is likely to affect the trade share of income as an indicator of openness or efficient integration into the global economy. Larger countries, in terms of population, are expected to be more self sufficient because more inter-regional trade would occur within the boundaries of a larger country. For example, India in 2001 has an openness fraction of .20 , and Korea of .69, (World Bank, 2003: Appendix Tables 3,4), which might be due to India's relatively larger size, or to its greater barriers to trade, or to both. Many other features of an economy could be responsible for its degree of integration into the world economy. For example, access to year round ocean ports reduces the cost of transportation to and from the rest of the world and thus increases the optimal ratio of trade to income. See Sachs and Warner, 1995; Bloom and Sachs, 1998; Acemoglu et al, 2002.

be associated with a variety of structural features of development (Z2), such as, (d) the average income of adults, (e) the share of employment in services and (f) the share of employment in industry. Because schooling is valued as a consumption good as well as an investment in future productivity, families demand more schooling for their children as household income increases. The composition of goods and services shifts with development from primary commodities to industrial goods, and finally to services. It has been noted in a variety of countries that service sectors tend to employ a larger fraction of women than in the rest of the economy, strengthening the incentive for women to become better schooled and healthier. In contrast, industrial jobs are more frequently filled by men, which may correspondingly enhance the returns to male specific human capital. [10] However, these income and labor demand variables (Z2) may be both determinants and consequences of human capital investments and trade liberalization. Therefore, the relationship between Z2 and HC or T are not readily interpreted as causal effects. The preferred empirical specification of the model estimated here therefore controls only for Z1.[11]

Trade (T) outcomes are specified in three alternative ways: (1) the separate share of exports in GDP, and the share of imports in GDP; (2) the openness of the economy defined conventionally as the sum of export and import shares to GDP, or (3) the trade balance (surplus), which is the difference between share of exports and imports to GDP.[12] Government policies

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[10] Agricultural employment varies in its gender composition in different regions of the world, and is more difficult to measure in a consistent fashion across developing countries, and is treated as a residual category here (Durand, 1975).

[11] The income and labor composition variables, Z2, are added to the list of presumably exogenous conditioning variables in an alternative model specification reported in Schultz, 2003.

[12] If the coefficients on exports and imports in equations determining human capital investments were the same, the openness specification (1) would be consistent with the unrestricted (2) specification, whereas if the coefficients on exports and imports were of opposite

determine the extent to which a national economy is integrated into the world economy by reducing barriers to international trade, exposing its producers and consumers to competitive pressures and world market-priced opportunities for exchange of tradeable goods and services. Three variables summarize the restrictiveness of the trade policy regime (R) and are assumed to be exogenous to human capital investments : (1) proportion of tariffs in the value of imports, (2) proportion of imports restricted by quotas weighted by their values, and (3) the black market premium as a proportion of the official foreign exchange rate.[13] Many unobserved variables may affect both trade (T) and the formation of human capital (HC). To distinguish how trading relationships might affect human capital, trading outcomes (T) are hypothesized to depend on common background conditions (Z1) and the trade policy regime (R), where the key exclusion restriction assumes that the trade regime does not directly affect schooling and health, except as it operates through its impact on trade outcomes (T).[14]

The model outlined above may be fitted empirically to data in two ways (1) estimating

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signs and equal absolute magnitude the trade balance (3) would parsimoniously represent the pattern captured in (1).

[13] Berg and Krueger (2003) survey the evidence of these variables affecting static and dynamic efficiency and thereby the growth of countries in recent decades. They note that it would be preferable to focus on resource distortions caused by trade restrictions, which might assign more emphasis to the variance in effective protection provided different sectors and firms in the economy as a cause for slower growth rather than simply the overall level of protection and foreign exchange distortion. But they show that the level of protection and variance in protection across sectors are positively related across countries, which may justify the neglect here of the variance in protection across sectors.

[14] More specifically, the tariff and quota barriers and black market premium for foreign exchange which suggests distortions in the exchange market (R) are treated as instruments to identify the impact of a trade policy regime on trading outcomes (T) which are expected to impact the incentives to invest in schooling and health of women and men, in hypothetically differential ways.

reduced-form equations for determinants of human capital (HC) and trade (T) outcomes in terms of variables assumed to be exogenous to the development process (R and Z1), or (2) estimating structural relationships in which trade outcomes (T) are treated as endogenous but identified by the exclusion of trade policies (R) from directly affecting schooling and health outcomes(HC). First, reduced-form equations are estimated by ordinary least squares (OLS), in which HC and T are assumed to be a linear function of background conditions (Z1) and trade regime (R), where lower case letters represent estimated parameters and disturbances, and subscripts for country/year observations are omitted for simplicity :[15]

$$HC = a + b\,Z1 + c\,R + e \quad , \qquad (1)$$

$$T = f + g\,Z1 + h\,R + v \quad . \qquad (2)$$

Second, if the variables in R are jointly significant in explaining the alternative measures of T in equation (2), then two stage least squares (2SLS) can be used to estimate the determinants of HC as a function of Z1 and T, where now T is treated as endogenous and identified by the exclusion of R from equation (3) :

$$HC = i + j\,Z1 + k\,T + u \qquad (3)$$

The estimated residual, v, from the equation (2) , can then be added to the 2SLS estimates of equation (3). If the residual is a significant explanatory variable, this Durbin-Wu-Hausman specification test suggests that the OLS estimates of equation (3), based on the assumption that T is exogenous, differs significantly from the 2SLS estimates of (3), based on the assumption that T

[15] Because Z2 is likely to be endogenous to HC and T, or correlated with the disturbances e and v, controlling for Z2 in equation (1) and (2) would tend to bias estimates of the partial effects of Z1 and R on the outcome variables. For example, Acemoglu (2003: Figure 1) recognizes the endogenous interdependency between income and democracy and fiscal policy, and summarizes the three way relationship by expressing democracy and tax/GDP as residuals from a regression on log GDP per capita.

is endogenous and identified by R. A significant coefficient on v leads to a rejection of the null hypothesis that R is exogenous and confirms the specification in which T is treated as endogenous. The 2SLS estimates of (3) are then preferred because they are thought to be consistent, while the OLS estimates are not.

7. Empirical Specification of the Model, Data Sources and Limitations

Census and household surveys ask adults their education, and different cross tabulations of these data are used to approximate the years of schooling completed by men and women, subject to a variety of working assumptions. Alternatively, schools report the number of students enrolled, and together with population censuses, gross enrollment rates are derived. Enrollment rates are then summed and weighted by the duration in years of each school level, to obtain a "synthetic cohort" measure of the "expected years of enrollment" for an average youth (Schultz, 1987). These two measures of education are thus derived from different data sources, they describe educational experiences of different birth cohorts, and have different shortcomings and strengths for the purposes of estimating a lifetime stock of human capital.[16]

Although there is no necessity that a year of schooling, thus measured, in a representative survey is associated with the same percentage increases in wages for men and women, this is

[16] Gross enrollment rates by school level are reported by UNESCO , whereas and educational attainment by discrete school levels for persons age 15 or over are estimated by Barro and Lee (1993). Measure of relative educational status of men and women depends on how their status is affected by schooling. One may focus on the difference between average female and male years of schooling, or the ratio of female to male schooling. For example, assume an additional year of schooling increases the wages of men and of women by a similar percentage, say by ten percent. Then a difference in two years of schooling between men and women could suggest a 20 percent difference in the wage productivity of men and women, one measure of relative status. As the average schooling of the population increases from 3 years to 7, holding constant the gender gap in years of schooling, the ratio measure of female to male education implies the gender gap closes from .50 (2/4) to .75 (6/8), even though the two year absolute gap in schooling suggests women continue to receive wages 20 percent lower than men.

often approximately what we observe (Schultz, 1988 , 1995). If the derived demand for female labor is increased due to trade liberalization, productive opportunities and welfare for women would increase, and families and individuals would be more inclined to invest private resources in the schooling of females, other things being equal.

Several pathways may link the productive opportunities of women and men to investments in their health human capital. Increased derived demand for a group's labor indicates its increased productivity, and this should be associated with an increase of the returns to health human capital, adding to potential years of working lifetime, reducing the disutility of work, and increasing current labor supply if the substitution effect dominates the income effect of the trade stimulated change in factor demands (Schultz and Tansel, 1997; Savedoff and Schultz, 2000).[17] Intergenerational benefits may also be realized as better educated women contribute to improving the health of members of their families. Household surveys have generally found that the education of a mother is significantly related to the health and survival of her children (Schultz, 1981, 1988, 2001). If trade liberalization increases the demand for female labor and causes female schooling to rise, this should reduce child mortality within a decade or two. The gap between the education of women and men in low-income countries has attracted widespread interest (Boserup, 1970; Joekes, 1987; King and Hill, 1993; Schultz, 1995; King and Mason, 2001), but empirical analysis of these gender differences in school attainment at the national or

[17] However, much of the increase in length of life in the last century is due to the decline in infant and early childhood mortality, which occurs before children start school, and thus cannot directly enhance the returns to schooling, unless the improved survival rates also signal gains in physical development and cognitive performance which enhance returns to schooling among survivors. But even the more modest gains in life expectancy accruing from age 15 to 65 would boost expected lifetime returns to schooling by 10 to 20 percent in recent decades in some low-income countries (Ram and Schultz, 1979).

family level has begun only recently (Schultz, 1978 ; Tansel, 1997; Holmes, 2003; Eloundou-Enyegue and DaVanzo, 2003).[18] Life expectancy at birth is consulted as a summary indicator of health status.[19] The gender differences in the expectation of life at birth were less than a couple of years in the 19th century, when reliable sex-specific life tables were first constructed for some higher income countries (e.g. www.mortality.com). Today, these differences are larger, between 4 and 8 years in high-income countries (i.e. favoring women, probably for both biological and economic reasons), although they have remained zero or even negative until recently in some countries of South Asia, such as India, Bangladesh, and Nepal (World Bank, 2003). A second indicator of health status analyzed here is the child survival rates per 1000 live births to a child's fifth birthday, for which the improvements were substantial in high income countries from about 1900 until the 1970s and were very large in low income countries after about 1945.[20]

Measures of Effective Protection and Openness to International Trade

A country is open to global economic opportunities and competitive pressures if its barriers

[18] The educational disadvantage of women compared with men was less substantial in Latin America than elsewhere in the developing world at the end of the Second World War. The gender gap in education (with the exception of indigenous (Indian) minorities) continued to close in most parts of the region, and in some countries, such as Mexico, Colombia and Brazil, women today obtain more years of schooling than do men. In East and South East Asia the more rapid expansion of primary and secondary education reached most segments of the population in the 1960s including both girls and boys, and the initially large gender gap in education closed quickly.

[19] But this indicator of health status can only be constructed for large populations for which deaths are registered and population censuses are collected accurately by age and sex. International agencies report estimates for virtually all countries in recent years, but without the prerequisite data the accuracy of these imputed gender differences in mortality is unclear. In high income countries today women's life expectancy has increased to 4-8 years longer than men's, whereas in a few countries in South Asia, such as India, Bangladesh and Nepal male life expectancy remains greater than female (World Bank, 2003).

[20] The mortality data are drawn from the United Nations Population Division database.

to trade are negligible and the movement of physical capital and labor is unrestrained. Most countries, of course, exercise controls over immigration, while foreign exchange and capital markets are extensively regulated by governments. There is no consensus on how to measure capital markets liberalization, as the amount of foreign direct investments responds to investment opportunities as well as the barriers to trade, regulations on the repatriation of earnings, and capital movements. Even import restrictions are typically not transparent, because they may combine laws, which are interpreted by unpredictable judicial institutions and enforced by corruptible bureaucracies.

To circumvent the difficulties of measuring in comparable terms the economic impact of these tariffs, taxes, subsidies, preferences, and quantitative restrictions to trade, Corden (1966) and Balassa (1965) defined an index of "effective protection", which estimated how domestic relative prices differed from international prices of a sector's outputs minus the effect of domestic-international price differences of a sector's inputs. Holding constant a sector's technological efficiency, greater effective protection should raise the profitability of domestic production in that sector, compared with a "benchmark" sector that could trade freely inputs and outputs at international prices. Sector-specific effective protection in a country has been positively related to wages of workers across sectors, controlling for the worker's age, education and sex (Schultz, 1982). Consistent with Boserup's (1970) observations, effective protection tends to be greater in sectors that employ a larger fraction of educated workers and also in sectors that employ a larger fraction of male workers (Wood, 1995). Estimates of effective protection are available for only a handful of countries, because their construction requires detailed price surveys and input-output tables, finely disaggregated by import-competing and export sectors. Relatively crude summary measures of the distorting effects of tariffs, quotas, and foreign

exchange interventions are therefore relied upon in this paper.

Tariffs are a major policy instrument determining effective protection. UNCTAD data are used to measure the average tariff on imports of intermediate and capital goods in 80 countries in 1985-88 , where the tariff on each commodity is weighted by the value of these imports for that specific country. But quantitative restrictions, quotas, licensing, or prohibitions on many imports are also a commonly used means of protection, which are also weighted by the country's imports of these intermediate and capital goods for the same period. A third policy indicator of price distortions affecting trade outcomes is the black market premium on foreign exchange. It measures the tax on foreign exchange earned by exporters compared with the free market value of the foreign exchange to potential importers. There are obvious problems in measuring prices in an illegal market. Yet it complements the import tariff and quota restrictions to distinguish the degree of government intervention in the allocation of foreign exchange among importers, and suggests the incentive for rent-seeking behavior, or for corruption, in the public sector (Krueger, 1974). These three indicators of the restrictiveness of a country's trade regime (R) are used extensively in the literature comparing growth across countries (Sachs and Warner, 1995).

Country case studies document how recent trade liberalization and export promotion policies are frequently associated with increased output in sectors where women gain incremental jobs, such as textiles, apparel, and fabrication of electronics (Ozler, 2003; Wood, 1995). Others have observed that liberalization of trading regimes contributes to more flexible labor markets, thus reducing the barriers to hiring and firing and allowing firms to substitute female workers for male workers, perhaps at a lower wage. Flexible labor markets, which are associated with liberalized trade regimes, may thus increase the share of female workers, but could also reduce average wages in these more competitive sectors (Standing, 1989, 1999). Some observers view

this development with alarm and suggest that as women gain jobs in export sectors, the wages benefits, and working conditions deteriorate for men. If the progress of women into the labor force reduces the wage of some men, the net welfare effects could be complex. With little systematic empirical evidence on these relationships, this study examines the cross country patterns between trade barriers, the level of trade, and gender differences in human capital.

Export Promotion Policies, Natural Resources and Employment Opportunities

Although export-oriented growth generally appears to favor women's employment in recent years, the governments' implementation of export-oriented growth can affect which industries and firms becomes exporters and thereby influence the gender composition of new jobs. In both Korea and Taiwan the government encouraged export-led growth. In Taiwan, export industries developed throughout the countryside absorbing low wage labor from agricultural rural households and providing many jobs to women and often to married women. This expansion of rural industries in Taiwan weakened the incentives for the rural population to migrate to the cities, reduced the need for investments in urban infrastructure such as housing, and moderated the rural-urban gap in household income. In contrast, the government of Korea was involved in the selection of large firms who received credit to produce exports; as a result, Korea's capital intensity of export production was greater, and the size of export firms was larger than in Taiwan. The Korean export sector became more concentrated around the major industrial urban areas than in Taiwan, and the Korean sector employed relatively fewer women and fewer married women than in Taiwan (Brinton, et al, 1995). Although I would like to incorporate in my analysis these features of industrialization and trade policy as they change the gender and skill composition of the resulting derived demands for labor, I have not found any comparable data across countries with which to analyze this issue.

In an analysis of gender differences in employment opportunities, it is crucial to distinguish the significance of natural resource exports. First, natural resources exports tend to be capital intensive. They are also sometimes relatively skill intensive as in petroleum or, as in the case of mining, intensive at hiring male workers. Second, natural resource exports are largely determined by the fortuitous placement of these mineral endowments, and the development of these exports is not much affected by factor endowments at the national level which underlies the comparative advantage theory of trade. Historically, countries that are not particularly well-endowed with natural resources have been among those that have growth rapidly, such as in Japan, Taiwan, and Korea, in Asia, or Netherlands, Switzerland, Sweden, in Europe. Political economy theories explain this phenomenon by postulating that states have an incentive to expropriate, nationalize, or tax natural resources to extract rents for the government, reducing the political incentives to invest public resources in schooling and health, or to extend civil, property, or voting rights to women (e.g. Acemoglu and Robinson, 2000). Natural resource exports are expected to weaken incentives for governments (1) to diversify their base of power in the economy, (2) to invest efficiently in the human capital of women and men, (3) to encourage women to work outside of the home and facilitate efficient social arrangements that weaken gender segregation in the workplace. In other words, natural resource exports allow governments more leeway to discriminate in favor of men, because governments thereby control exceptional rents.

Data Sources and Limitations

The sample of countries and of years analyzed in this paper is limited by the availability of data, and there are insufficient observations per country to estimate the model within countries, by allowing for country fixed effects. GDP per adult is expressed in purchasing power parity in

1995 dollars based on the Penn World Tables 6.1. Population size is from the UN database. The gender-specific gross school enrollment rates, which are summed over primary, secondary, and tertiary school levels to estimate the expected years enrolled for today's youth, are from the World Bank Development Indicators in 2003. Schooling attainments are reported in surveys for adults by UNESCO and are converted by Barro and Lee (1993) to averages for all adult men and women over the age of 15. The two measures of gender specific survival are constructed from the World Bank data and the three trade policy variables are from Sachs and Warner (1995), while exports minus imports of natural resources, as well as GNP shares of various combinations of exports and imports, are from the IMF database as of 2003. A total of 218 to 230 observations, depending on the dependent variable examined, are available from 70 countries, of which 17 are high-income OECD members. The number of observations in the basic sample available for 1965, 1970, 1975, and 1980, increases from 48 to 53, 59 , 66 countries, in the respective four years. The tariff and quota data are only available for a single time period, 1985-88, but the other information varies over time. The basic sample of 226 observations is listed with sample statistics and variable definitions in the Appendix Tables A-1.

8. Empirical Findings

The zero order correlations between all pairs of the two education and two health variables by gender and log GDP per adult are reported in Table 1 for the common sample of 220 observations. The expectation is that the different measures of education and health should be highly correlated within sexes, and positively related to the logarithm of income per adult. The ratio of female to male education and survival are also added to this correlation matrix to explore how the relative gender gaps in these four forms of human capital vary with log of income. The two independently derived measures of adult educational attainment and youth expected

enrollment are correlated with each other for females at .91 and for males .87. Adult educational attainment of males and females are correlated at .95 , whereas the youth expected years of enrollment are correlated at .93 . Both measures of female education are more highly correlated with the life expectation at birth of males or females than are the male education measures. This is consistent with women's education being more protective of health than men's education, as is commonly found in household survey analyses of child mortality and husband health. For example, in Table 1, the correlations between female enrollments and female and male life expectation are both .87, whereas the correlations between male enrollment and female and male life expectation are both .80. Life expectancy and child survival are almost perfectly correlated between males and females (.99) implying that these World Bank estimates of survival for males and females vary together within a country.

As often graphically portrayed in international comparative studies of education, health, and development, there is a strong intercountry positive relationship between income and schooling, and income and health, as typically measured by survival rates; the fit of income to these human capital indicators is even closer if incomes are expressed proportionately in logarithms. In this case, real GDP is expressed in purchasing power parity per adult over age 15 to approximate adult productivity and economic well-being for the country. This choice of income per adult instead of income per capita avoids including in this measure of economic welfare an inverse effect due to the recent level of fertility, which is reflected in the portion of the population under age 15. In the bottom row of Table 1, adult years of educational attainment is correlated with lnGDP/adult at .73 for males and at .80 for females, whereas expected years of youth enrollment is more highly correlated with the income at .74 for males and .83 for females. The correlation between life expectancy and the income variable is even stronger than that

between education and income, and it is higher for females at .89 than for males at .86 [21]. One exceptional pattern is the negative correlation between the ratio of female-to-male child survival and income (-.45) and the fact that this ratio also decreases with the level of all of the education and survival variables. This may be explained by the much more frequent deaths in infancy for males than females in countries with very low income levels. The greater vulnerability of males compared to females in childhood declines as income increases (Preston and Weed, 1976). These correlations confirm that: (1) this cluster of education and survival variables improve together for both genders as national income increases with development across countries, and (2) these measures of women's human capital tend to increase faster relative to men's except for child survival when biological vulnerability dominates socioeconomic differences in the conditions of females and males. The objective of this paper is to assess whether openness of the economy to trade is associated with improvements in these human capital measures of economic productivity and welfare, holding constant for natural resource exports, population, and time, and whether the gender gap in human capital is systematically related to trade.

The reduced form estimates by ordinary least squares (OLS) represent the association between the various dependent variables measuring education expressed for females, males, the difference between females and males, and the ratio of females to males - 1) current expected years of enrollment, 2) years of adult attainment for those age 15 and over - and the explanatory variables are 1) population size, 2) natural resource exports, 3) tariffs, 4) quotas, 5) black market premium, and 6) a time trend. The last four regressions in Table 3 explain the trade shares of

[21] This is consistent with empirical studies which find the household income elasticity of enrollment rates for girls tends to be larger than the income elasticity for boy's enrollment (Schultz, 1987).

GDP. Table 3 reports the reduced-form estimates for the two survival outcomes by gender. At the bottom of Tables 2 and 3 the joint significance of the three trade policy variables is shown, which are highly significant for all 16 education and health dependent variables, and least statistically significant for imports, where they are only jointly significant at the 7% level in column (10), but are jointly significant at the .3 percent level for exports in column (9). Individually, the black market premium is generally associated with lower levels of male and female school enrollment and attainment and survival, and lower exports, imports, and openness. Tariffs and quotas also are associated with lower levels of education and survival, with the single exception that the association with male life expectancy is not individually significant at the conventional 5 percent level. The association between tariffs and quotas and the trade outcomes, however, are not generally statistically significant individually.

The control variables perform as expected. Countries with larger populations tend to have smaller trade shares of income. A larger share of income from natural resource exports minus imports is associated with larger exports, more openness, and a larger positive trade balance. There is no prediction for the direction of the effect of population size on the education and health variables, though in this reduced-form specification it is positive on the levels for males and females. The time trends in trade shares are upward over time, which is consistent with globalization, and the time trends in schooling are positive and larger for women than for men (i.e. gender convergence). The same is true for life expectancy, although for child survival the advance is approximately equal for males and females holding constant for the other included variables. Of particular interest are the strong negative associations of natural resource exports with both education and survival, and the fact that in all four variables the coefficient on natural resource exports has a larger negative value for the female human capital than for male. In other

words, a greater reliance on natural resources for exports is associated with greater gender inequality, in either differenced or ratio form, in terms of both education and survival.

Tables 4 and 5 report the two stage least squares estimates (2SLS) of the structural equation determinants of education and health, including the share of exports and imports of GDP as endogenous explanatory variables, identified by the exclusion of the three trade policy variables from these structural equations. The Durbin-Wu-Hausman specification tests reported in the bottom panels of Tables 4 and 5 reject strongly the exogeneity of the export and import shares of income in all 16 education and survival equations, leading to the acceptance of the 2SLS estimates over the OLS estimates that treat exports and imports as exogenous. The effect of exports and import shares is more pronounced if they are associated with the observed three trade policy variables (Table 2, columns 9 and 10). The effects of exports on the education variables are positive, while those of imports are negative. The effects of exports are larger in absolute value on female than on male education (columns 4 and 8 in Table 4), and the effects of both exports and imports are higher on female life expectancy than on male (i.e. the differences in column 3 or ratios in column 4 of Table 5). Population size and time trends are statistically insignificant in these structural estimates, while natural resource exports minus imports as a share of GDP continue to be associated with lower levels of schooling and life expectancy for both sexes, and penalize the accumulation of human capital among females more than among males, as noted in the reduced-forms in Table 2.

To assess the magnitudes of the estimates reported in Tables 4 and 5, let us assume a country had export and import shares of GDP that are one standard deviation greater than the sample average. In other words, the export share of GDP is 14 percentage points larger than the sample mean of 24 percent, and the import share is 15 percentage points larger than the sample

mean of 28 percent. The estimates in Table 4 imply that in such a country, females school enrollment would be 2.6 years (i.e. 1.01* 14 - .771* 15) longer than the sample average of 8.0 years. In this country male school enrollment would tend to be 1.4 years longer (i.e. .831*14 - .681*15) . Thus a country with the specified greater involvement in trade due to its tariff, quota, and foreign exchange policies would tend to have a gender gap in schooling of 1.2 years (2.6 - 1.4) smaller than the sample mean. For illustrative purposes of this simulation, assume an additional year of schooling increased a woman's wage opportunities by 15 percent. Then this extra measure of openness linked to trade liberalization policies would contribute to advancing women's wages relative to men's by almost a fifth (i.e. 1.2* .15). Adding one standard deviation in openness to international trade to that same country would increase female life expectancy by 9.3 years, compared to the sample mean of 64.5 years, and male life expectancy by 6.8 years, compared to a mean of 59.9, thus adding to women's relative advantage by 2.5 years. These are large gains in economic status for women compared with men based on a standard deviation variation in export and import shares associated with trade liberalization.

How large a change in trade policy is directly associated in the reduced-form equations with these advances in schooling and health? A standard deviation decrease in the three trade policy variables would represent a decrease of .19 in the average tariffs, a decrease of .25 in the proportion of imports subject to quotas, and a .86 decline in the black market proportional premium for foreign exchange. According to Table 2 columns 9 and 10, a policy of trade liberalization that would accomplish these changes in the trade policy variables would be associated with an increase in the export share of GDP of 4.7 percent (i.e. (-4.41*-.19)+(-5.58*-.25)+(-2.77*-.86)), and an increase in the import share of 2.4 percent. According to Table 4 column 1, such a liberalization of trade on exports and imports is associated with a gain of 2.9

years of female enrollment (1.01*4.7 -.771*2.4). Alternatively, the estimated impact of the trade liberalization package on female enrollment could also be directly inferred from the reduced form estimates in Table 2 column 1, where they are expected to be associated with a gain of 2.9 years in enrollment {(-8.51*-.19)+(- 2.81*-.25)+(- .66*-.86)}. From these regression linearized decompositions of policy effects implied by the reduced-form estimates, it appears that more than half of the effect of the trade liberalization on female enrollments stems from the decline in tariffs, whereas a fourth and a fifth of the enrollment gain can be attributed to the reduction in quotas and to the decline in black market premia on foreign exchange, respectively.

The same decomposition exercise can be used to describe the effects of trade liberalization on female life expectation. From Table 3 column 1, a simulated standard deviation decline in the three trade restrictions would be associated in the estimated reduced-form equation with an increase in female life expectation by 9.7 years {(-30.9*-.19)+(-6.86*-.25)+(-2.5*-.86)}, which suggests a gain of 9.6 years according to the two-stage estimates drawn from Tables 2 and 5. As in the case of female enrollment, three-fifths of the trade liberalization effect on this measure of female health is related to the standard deviation decline in tariffs, whereas the remaining 18 and 22 percent of the effect is associated with the decline in quotas and black market foreign exchange premium, respectively.

9. Questions for further Study

Evidence has been presented that countries that relied more heavily on tariffs and quotas in the 1980s, and for which the black market premium in their foreign exchange markets was larger were less open to imports and less inclined to export their national output into the global market. However, one must be careful to distinguish exports that are derived from natural resource endowments, as they reflect largely a fortuitous geographical distribution of

economically extractable mineral deposits and are not thought to be strongly related to public policies toward trade liberalization.[22] Countries with exports of natural resource endowments are open in the sense of exploiting these resources for the world economy, but their governments are consequently less dependent on other investment opportunities offered by global markets. Natural-resource-determined specialization does not depend sensitively on adjusting domestic prices on tradeable goods to international levels. Women's and men's educational attainment and enrollments are distinctly lower in countries where natural resource exports are a larger fraction of income, and longevity is significantly lower in these settings for both men and women.[23]

The three trade restriction policy variables which are used in this paper to describe trade liberalization-- tariffs, quotas, and foreign exchange distortions-- are associated with women and, to a lesser extent, with men receiving less schooling. Life expectation and child survival rates, which proxy for health human capital, are also lower in circumstances where countries are

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[22] It would be attractive to deduct the value-added associated with the net exports of natural resources from each country's value of exports rather than as I have done here including the full market value of exports. It is possible that a dollar's worth of oil can be raised for export in Saudi Arabia for a small fraction of the cost in Venezuela, and thus provides more rent to its owner after covering replacement costs. The resource costs of exporting a dollar's worth of copper (including replacement costs) from Chile or aluminum from Ghana may also be a larger fraction of its export value than in the case of oil. The pure rents from natural resource exports would facilitate an assessment of how these rents affect countries. Some of these problems would diminish when enough good data becomes available to estimate models such as this from panel data, in which fixed effects could be introduced for countries, as well as include country-specific Increased exports other than natural resources is strongly associated with higher levels of education and health. time trends.

[23] Many studies suggest that the education of women is a critical input to improving health of both men and women, because women are the managers of health production in the home, controlling the allocation of traditional health inputs such as nutrition, hygiene, and care, and deciding when modern health inputs are required. Just as men may make the majority of agricultural management decisions in South Asia, women are linked to improvements in the production of health, and their education is critical for this task in all regions.

pursuing trade policies that are likely to otherwise decrease their export shares of national income. More broadly, economic development increases the share of employment in the service sectors. But these modern developments are also potentially endogenous and partially dependent on human capital investments, and should not therefore be treated as exogenous to the increased schooling of women, which is expected to facilitate women's increased participation in wage employment (outside of their family), and strengthen their economic empowerment in the household, community, and nation. Increased exports other than natural resources are strongly associated with higher levels of education and health. Unfortunately, the common measure of openness of the economy, which combines the shares of imports and exports relative to GDP, does not allow me to distinguish the differential effect of exports and imports on human capital accumulation or the gender inequalities in this process.

The regrettably loose connection between economic and social theories and empirical evidence in applied analyses of this form would probably be strengthened if it could be reformulated into a more realistic dynamic framework and fit to panel data on the same group of countries over time. Changes in trade policy should then be linked to the opening of the domestic economy to international trade, which modifies incentives for further reforms, first in private tradeable goods and services, and then with increased competitive pressures for privatization and greater flexibility in labor market policies which are generally associated with enhanced employment opportunities especially for women. Cross-country empirical regularities, as reported in this paper, do however suggest a plausible path for trade liberalization and globalization to spillover and increase the derived demand for female labor. In turn, this would provide stronger incentives for women's education and health relative to that for men's in countries that have adopted a more open trade regime by fostering exports, lowering barriers to imports, and

establishing more competitive markets for foreign exchange.

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Table 1
Zero Order Correlations Among Human Capital and Income Variables

	Adult Educational Attainment			Expected Enrollment			Life Expectation at Birth			Child Survival to Age Five		
	Female	Male	Ratio	Female	Male	Ratio	Female	Male	Ratio	Female	Male	Ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Attainment Female	1.0											
2. Attainment Male	.95	1.0										
3. Female to Male Ratio	.77	.59	1.0									
4. Enrollment Female	.91	.89	.73	1.0								
5. Enrollment Male	.83	.87	.51	.93	1.0							
6. Female to Male Ratio	.66	.55	.84	.75	.47	1.0						
7. Life Expectation Female	.84	.78	.77	.89	.80	.73	1.0					
8. Life Expectation Male	.81	.76	.74	.87	.80	.66	.99	1.0				
9. Female to Male Ratio	.42	.35	.45	.39	.24	.47	.38	.23	1.0			
10. Child Survival Female	.80	.76	.72	.87	.80	.70	.98	.96	.38	1.0		
11. Child Survival Male	.80	.76	.72	.87	.80	.70	.98	.97	.33	.99	1.0	
12. Female to Male Ratio	-.38	-.39	-.19	-.43	-.51	-.08	-.50	-.56	.21	-.44	-.55	1.0
13. Log GDP/Adult	.80	.73	.74	.83	.74	.67	.89	.86	.44	.84	.84	-.45
Sample Size	220											

Table 2
Reduced-Form Ordinary Least Squares Estimates of Education and Trade Outcomes

Explanatory Variables:	Years Expected Enrollment				Years Adult Attainment				Percent Trade GDP			
	Female	Male	Difference	Ratio	Female	Male	Difference	Ratio	Exports	Imports	Openness	Trade Balance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Population Size (Millions)	13.7 (5.27)	16.2 (7.14)	2.48 (2.43)	.371 (.25)	10.2 (4.29)	10.2 (5.00)	.0096 (.01)	.257 (1.35)	-42.8 (3.01)	-71.9 (4.59)	-115. (3.97)	29.1 (3.72)
2. Natural Resource Exports (Percent of GDP)	-.0130 (2.55)	-.00486 (1.09)	-.00814 (3.62)	.000746 (2.40)	-.0164 (3.91)	-.0115 (3.06)	-.00487 (2.98)	-.00144 (3.04)	.0648 (2.56)	.0236 (.85)	.0884 (1.72)	.0412 (2.96)
3. Tariffs (Percent of GDP)	-8.51 (5.95)	-7.72 (6.58)	-.795 (1.42)	-.239 (2.55)	-6.93 (5.92)	-5.82 (5.79)	-1.11 (3.29)	-.447 (4.06)	-4.41 (.65)	4.57 (.62)	.165 (.01)	-8.98 (2.43)
4. Quotas	-2.81 (3.56)	-1.77 (2.48)	-1.04 (3.01)	-1.04 (2.01)	-2.51 (4.70)	-2.43 (5.35)	-.0835 (.39)	-.1116 (1.78)	-5.88 (1.61)	-3.47 (.86)	-9.35 (1.26)	-2.41 (1.20)
5. Black Market Premium	-.658 (1.88)	-.450 (1.35)	-.208 (3.44)	-.0305 (2.68)	-.528 (2.08)	-.395 (1.42)	-.133 (2.73)	-.0589 (2.74)	-2.77 (2.82)	-2.82 (2.60)	-5.59 (2.80)	.0408 (.08)
6. Calendar Year	.136 (4.53)	.108 (4.17)	.0278 (2.08)	.0045 (2.45)	.0617 (2.33)	.0789 (3.27)	-.0172 (1.84)	.00022 (.09)	.653 (4.40)	.917 (5.61)	1.57 (5.21)	-.264 (3.24)
Constant	-.0562 (.03)	2.47 (1.31)	-2.52 (2.59)	.604 (4.43)	1.34 (.69)	.721 (.41)	.620 (.90)	.860 (4.61)	-19.6 (1.81)	-35.8 (2.99)	-55.4 (2.51)	16.2 (2.72)
R^2	.394	.350	.244	.206	.395	.365	.174	.276	.215	.253	.232	.108
Dependent Variable Mean Standard Deviation	8.05 (3.14)	9.10 (2.62)	-1.06 (1.21)	.861 (.169)	4.25 (2.68)	5.18 (2.38)	-.925 (.827)	.757 (.239)	24.5 (13.9)	28.2 (15.4)	52.7 (28.5)	-3.76 (7.06)
Joint F test of variables 3,4, and 5 being zero (Prob >F (3,n-k-1)	36.8 (.0000)	28.6 (.0000)	11.7 (.0000)	13.3 (.0000)	36.1 (.0000)	35.6 (.0000)	8.67 (.0000)	19.3 (.0000)	4.72 (.0033)	2.49 (.0612)	3.48 (.0168)	3.80 (.0111)

Table 3
Reduced-Form Ordinary Least Squares Estimates of Health Outcomes

Explanatory Variables	Life Expectancy at Birth				Child Survival to Age 5 per 1000			
	Female	Male	Difference	Ratio	Female	Male	Difference	Ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Population Size (millions)	35.6 (4.04)	34.7 (4.26)	.895 (.55)	-.0532 (1.89)	206. (3.58)	269. (4.28)	-62.9 (5.27)	-.0747 (5.22)
2. Natural Resource Exports (Percent of GDP)	-.0808 (4.19)	-.0678 (3.92)	-.130 (3.61)	-.00013 (2.17)	-.503 (3.70)	-.554 (3.73)	.0506 (2.09)	00007 (2.15)
3. Tariffs (Percent of GDP)	-30.9 (6.57)	-26.5 (6.21)	-4.43 (4.73)	-.0378 (2.36)	-182. (5.47)	-206. (5.94)	23.6 (3.87)	.0274 (3.66)
4. Quotas	-6.86 (2.31)	-4.02 (1.48)	-2.84 (5.84)	-.0461 (5.61)	-60.3 (2.58)	-59.8 (2.38)	-.984 (.29)	-.00081 (.19)
5. Black Market Premiums	-2.50 (2.09)	-2.19 (2.06)	-.307 (2.14)	-.00279 (1.91)	-17.1 (1.99)	-17.8 (1.99)	.667 (1.02)	.00092 (1.06)
6. Calendar Year	.393 (3.75)	.336 (3.46)	.0574 (3.12)	.00054 (1.74)	2.79 (3.67)	2.87 (3.56)	-.0804 (.62)	-.00015 (.90)
Constant	42.4 (5.52)	40.5 (5.69)	1.92 (1.45)	1.056 (46.9)	746. (13.3)	733. (12.3)	13.0 (1.34)	1.019 (84.2)
R^2	.423	.367	.458	.343	.376	.378	.162	.159
Sample Size (n)	228	228	228	228	228	228	228	228
Dependent Variable Mean Standard Variable	64.5 (11.1)	59.8 (9.85)	4.62 (2.12)	1.076 (.0332)	905. (77.1)	896. (82.4)	9.21 (12.0)	1.011 (.0148)
Joint F test of Variables 3,4, and 5 being zero (Prob >F (3,n-k-1)	34.8 (.0000)	28.4 (.0000)	45.0 (.0000)	30.3 (.0000)	31.3 (.0000)	32.5 (.0000)	8.19 (.0000)	7.81 (.0001)

Table 4
Two-Stage Least Squares Estimates of Education Outcomes

Explanatory Variables:	Years Expected Enrollment				Years Adult Attainment			
	Female	Male	Difference	Ratio	Female	Male	Difference	Ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Population Size (Millions)	.865 (.09)	1.95 (.24)	-1.08 (.40)	.0809 (.22)	2.06 (.21)	2.04 (.27)	.0150 (.01)	.204 (.33)
2. Natural Resources Exports (Percent of GDP)	-.0606 (3.98)	-.0437 (3.44)	-.0169 (4.22)	-.00229 (4.13)	-.0579 (4.46)	-.0476 (4.08)	-.0104 (4.10)	-.00408 (4.33)
3. Exports (Percent of GDP)*	1.01 (4.56)	.831 (4.57)	.176 (2.58)	.0310 (3.42)	.853 (4.18)	.761 (4.22)	.0926 (2.12)	.0479 (3.21)
4. Imports (Percent of GDP)*	-.771 (2.82)	-.680 (2.95)	-.0907 (1.16)	-.0199 (1.86)	-.691 (2.52)	-.643 (2.74)	-.0482 (.75)	-.0280 (1.53)
5. Calendar Year	.185 (1.30)	.188 (1.56)	-.0036 (.09)	.0026 (.47)	.151 (1.00)	.183 (1.52)	-.0329 (.82)	-.0050 (.52)
Constant	-7.87 (1.10)	-5.52 (.91)	-2.35 (1.14)	.498 (1.73)	-7.83 (1.06)	-8.48 (1.39)	.652 (.35)	.759 (1.51)
F Statistics (Prob > F (5, n-6)	7.36 (.0000)	6.46 (.0000)	6.35 (.0000)	6.73 (.0000)	3.16 (.0151)	7.23 (.0000)	5.49 (.0001)	6.46 (.0000)
Sample Size (n)	226	226	226	226	221	221	221	221
Durbin-Wu-Hausman Test of Exogeneity								
Export Residual	-.899 (8.83)	-.761 (7.96)	-.138 (3.14)	-.0247 (4.26)	-.752 (7.78)	-.671 (7.82)	-.0809 (2.70)	-.0399 (4.66)
Import Residual	.693 (4.48)	.643 (4.44)	.0511 (.99)	.0144 (1.94)	.611 (4.35)	.584 (4.12)	.0267 (.64)	.0200 (1.63)
Both Residuals Zero (Prob >F (2, n-k-1)	46.5 (.0000)	35.5 (.0000)	12.3 (.0000)	15.8 (.0000)	41.0 (.0000)	38.0 (.0000)	7.57 (.0007)	22.2 (.0000)

*Estimated as endogenous and identified by exclusion of tariff, quota, and black market premium from human capital equations, but included in equations predicting Exports and Imports as reported in Table 2, columns 9 and 10.

Table 5
Two-Stage Least Squares Estimates of Health Outcomes

Explanatory Variables	Life Expectance at Birth				Child Survival to Age 5 per 1000			
	Female	Male	Difference	Ratio	Female	Male	Difference	Ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Population Size (Millions)	-5.08 (.17)	1.72 (.07)	-8.06 (1.23)	.143 (1.69)	27.0 (.15)	19.8 (.10)	7.16 (.23)	-.0128 (.35)
2. Natural Resource Exports (Percent of GDP)	-.240 (4.83)	-.203 (5.22)	-.0435 (4.01)	-.00047 (3.30)	-1.58 (4.85)	-1.73 (4.98)	.139 (4.49)	.00017 (4.72)
3. Exports (Percent of GDP)*	3.30 (4.75)	2.63 (4.87)	.664 (4.37)	.00794 (3.89)	21.5 (4.82)	23.4 (4.94)	-1.86 (3.44)	-.0022 (3.49)
4. Imports (Percent of GDP)*	-2.46 (2.88)	-2.00 (2.93)	-.534 (2.83)	-.00634 (2.51)	-15.9 (2.92)	-17.7 (3.01)	1.78 (2.32)	.0021 (2.29)
5. Calendar Year	.496 (1.09)	.412 (1.10)	.106 (1.06)	.0011 (.83)	3.01 (1.07)	3.49 (1.12)	-.484 (1.09)	.0006 (1.11)
Constant	19.1 (.83)	23.3 (1.23)	-3.72 (.75)	.989 (14.7)	.620 (4.24)	.581 (3.66)	38.9 (1.88)	1.05 (43.0)
F Statistic Prob > F(5, 200)	9.55 (.0000)	9.33 (.0000)	15.2 (.0000)	16.9 (.0000)	9.70 (.0000)	9.81 (.0000)	7.09 (.0000)	8.11 (.0000)
Sample Size (n)	226	226	226	226	226	226	226	226
Durbin-Wu-Hausman Test of Exogeneity								
Export Residual	-2.88 (8.49)	-2.25 (7.40)	-.616 (9.67)	-.00767 (7.68)	-18.5 (8.01)	-20.0 (8.08)	1.52 (3.37)	.00173 (3.17)
Import Residual	2.12 (4.38)	1.68 (3.98)	.479 (5.54)	.00593 (4.46)	13.4 (3.96)	15.0 (4.24)	-1.55 (2.70)	-.00171 (2.43)
Both Residuals Zero (Prob >F (2, n-k-1)	44.1 (.0000)	34.7 (.0000)	54.6 (.0000)	35.1 (.0000)	37.6 (.0000)	38.2 (.0000)	5.89 (.0032)	5.34 (.0054)

*Estimated as endogenous and identified by exclusion of tariff, quota, and black market premium from human capital equations, but included in equations predicting Exports and Imports as reported in Table 2, columns 9 and 10.

Appendix Table A-1

Sample Statistics for Variables Used In Regressions on Education, Survival and Trade

Dependent Variables:	Sample Size	Mean	Standard Deviation
1. Expected Years of Enrollment Females	226	8.05	3.14
2. Expected Years of Enrollment Males	226	9.10	2.62
3. Difference of Female and Male Enrollment	226	-1.06	1.21
4. Ratio of Female to Male Enrollment	226	.861	.168
5. Years of Adult Educational Attainment (persons age 15 and over)	221	4.25	2.68
6. Years of Adult Educational Attainment (persons age 15 and over)	221	5.17	2.38
7. Difference of Female and Male Adult Education	221	-.949	.827
8. Ratio of Female to Male Adult Education	221	.757	.239
9. Life Expectation in Years of Females at Birth	228	64.5	11.2
10. Life Expectation in Years of Males at Birth	228	59.9	9.85
11. Difference of Female and Male Life Expectation	228	4.62	2.12
12. Ratio of Female to Male Life Expectation	228	1.076	.0332
13. Survival Rate from Birth to Fifth Birthday per 1000, for females	228	905.	77.1
14. Survival Rate from Birth to Fifth Birthday per 1000, for males	228	896.	82.4
15. Difference of Female and Male Child Survival	228	9.21	12.0
16. Ratio of Female to Male Child Survival From Birth to Fifth Birthday	228	1.011	.0149
17. Openness = (Exports & Imports)*100/GDP	228	52.3	28.3
18. Trade Balance = (Exports - imports) x 100/GDP	226	-3.78	7.09
19. Exports as percent of GDP	226	24.3	13.8
20. Imports as percent of GDP	226	28.0	15.3

Exogenous Variables:			
21. Population Size in Millions (United Nations)	226	35.6	84.1
22. Natural resource exports-imports as a percent of GDP (World Bank)	226	7.25	33.8
23. Log GDP Per Person age 15 or more Measured in 1995 US dollars and in purchasing power parity (Penn World Tables 6.1)	226	8.82	.842
24. Percent of Labor Force Employed in Services	226	35.0	15.1
25. Percent of Labor Force Employed in Industry	226	23.2	11.8
26. Tariffs as a proportion of imports (UNCTAD 1985-1988)	226	.168	.190
27. Share of Imports Subject to Quantitative Restrictions (UNCTAD 1985-88)	226	.212	.250
28. Black Market Premium For Foreign Exchange (proportion)	226	.323	.862
29. Terms of Trade (Price Change in Exports-Imports)	226	-.00257	.0437
30. Calendar Year (last two digits)	226	73.0	5.56

Sample : Unless otherwise specified, observations are available for 1965, 1970, 1975, and 1980:

Algeria; Argentina; Austria; Bangladesh, 1975-80; Belgium; Benin, 1965-70, 1980; Bolivia; Brazil; Cameroon; Canada; Central African Republic, 1970; Chile; Columbia; Congo; Costa Rica; Cyprus, 1975-80; Denmark; Ecuador; Egypt; El Salvador; Finland; France; Ghana; Greece; Guatemala; Guyana, 1980; Hong Kong, 1975-1980; India; Indonesia; Iran, 1975-80; Ireland; Italy; Jamaica; Japan; Jordan, 1980; Kenya, 1970-80; Korea; Malawi, 1970-80; Malaysia; Mauritius, 1980; Mexico; Mozambique, 1980; Netherlands; Nicaragua; Norway; Pakistan, 1970-80; Paraguay; 1975; Philippines; Portugal, 1975-80; Rwanda, 1980; Senegal; Sierra Leone, 1980; Spain; Sri Lanka, 1975-80; Sweden; Switzerland; Syria; Thailand; Trinidad and Tobago, 1980; Tunisia; Turkey, 1975-80; Uganda, 1980; UK; USA; Uruguay, 1970-80; Venezuela; Zaire; Zambia; Zimbabwe, 1980.