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The Export Skill Content, Learning By Exporting and Economic Growth

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AND
ECONOMIC GROWTH

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Abstract

We empirically investigate whether countries' export mix influences their economic growth. Using panel data from 86 countries covering the period between 1970 and 1990, we identify a statistically significant positive relationship between export skill content and economic growth. The evidence supports the idea that, after controlling for the levels of GDP per capita, education, openness to foreign trade, and political and macroeconomic stability, a higher export content of skill-intensive goods generates higher per-capita GDP growth rates.

Keywords: learning-by-doing, human capital, trade.
JEL Classification Numbers: I20, J24, O11, O31, O40.

1. Introduction

The empirical literature on the role of foreign trade in long-run economic performance mostly focuses on the relationship between openness and the subsequent rates per-capita GDP growth[1]. A salient feature of these cross-country empirical studies is the emphasis on openness to foreign trade, however broadly that may be defined.[2]

In contrast, the relevant theoretical literature identifies various *explicit* channels through which international trade influences economic growth. Specifically, there exist a number of papers that emphasize how the ability to produce and export goods with higher skill content supports long-run economic performance. For instance, Young (1991) develops a dynamic model of bounded learning by doing in which production of goods that still have a scope for learning contributes to productivity increases in other goods. According to his model, the country that tends to specialize in high-technology, skill-intensive goods experiences rapid technological progress and growth at the expense of a country that tends to specialize in low-technology goods.[3] Chuang (1997) emphasizes the importance of learning by exporting. According to his framework, the skill-content of exports influences the degree to which exports augment learning and help to sustain higher rates of economic growth. An and Iyigun (forthcoming) find empirical evidence to support the notion that the skill/technology content of exports are influenced by learning by exporting.

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[1] For a comprehensive survey, see Harrison (1991).
[2] The standard definitions of openness to foreign trade emphasize the volume of trade and indices of trade liberalization or exchange rate based price distortions.
[3] Stokey (1991) also comes to a similar conclusion: "If the industries in which the less-developed country has a static comparative advantage are industries in which there are limited opportunities for learning, then the effect of free trade is to speed up learning in the more-developed country and to slow it down in the less-developed one."

2. The Data, Estimation Strategy, and Empirical Results

Our empirical estimates of the effect of the export skill content on economic growth is obtained by estimating the following equation with panel data:

$$GROWTH_{j,t} = \beta_1 + \beta_2\,EXPORTS_{j,t-1} + \beta_3\,GDPCAP_{j,t-1} + \beta_4\,PRIM_{j,t-1}$$

$$+ \beta_5\,SECM_{j,t-1} + \beta_6\,INVSHR_{j,t-1} + \beta_7\,OPEN_{j,t-1} + \beta_8\,INVPP_{j,t-1}$$

$$+ \beta_9\,GOV_{j,t-1} + \beta_{10}\,REV_{j,t-1} + \sigma_j + \lambda_t + \epsilon_{j,t} \qquad (1)$$

The variables in equation (1) are defined as follows:

$GROWTH_{j,t}$: the average growth rate of country j's per capita GDP,

$EXPORTS_{j,t-1}$: country j's skill content of exports at the beginning of each period (as measured below),

$INVSHR_{j,t-1}$: investment to GDP ratio,

$PRIM_{j,t-1}$: percentage of "primary school complete" in the male population,

$SECM_{j,t-1}$: percentage of "secondary school complete" in the male population,

$GDPCAP_{j,t-1}$: country j's per-capita income at the beginning of each period,

$OPEN_{j,t-1}$: openness to foreign trade (as measured by the ratio of exports plus imports to GDP),

$INVPP_{j,t-1}$: the price level of investment, as measured by the average over the previous period,[5]

$GOV_{j,t-1}$: the average ratio of government expenditures to GDP over the previous period,

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[5] As in Barro (1991), we include this variable to proxy for the extent to which market distortions generate artificially high or artificially low investment prices.

$REV_{j,t}$: the number of revolutions over each period (as a proxy for political and

                         social stability),

σ_j : country-specific effect,[6]

λ_t : time specific effect.

We assume that the error term $_{j,t}$ is uncorrelated with the regressors and that it is

distributed normally with a mean of zero and a variance of $_{j,t}$[7].

As a proxy for the skill content of exports, *EXPORTS*, we rely on The National

Science Foundation (NSF) data on the U. S. industry-wide R&D spending as a share of

gross sales revenue.[8] We use the U. S. as the benchmark with which to determine the skill

content of industries based on the idea that, regardless of local R&D, exporting goods

that are skill intensive in the frontier advanced economies helps to enhance learning and

promote growth.[9] Then using industry-wide exports as weights, we aggregate to

determine the average skill content of a country's exports:

$$EXPORTS_{j,t} = {}_i[(R\&D/Sales)_i\, e_i]\,_j\, , \qquad\qquad (2)$$

where i denotes the manufacturing industry index and $e_i,\ e_i = EXP_i/\,_iEXP_i$, represents the

share of industry i's exports in country j's total manufacturing exports.

Our panel spans the years 1970 to 1990, and we divide it into four sub-periods: 1970-1974, 1975-1979, 1980-1984, 1985-1990. [10] The data we use to estimate (1) come predominantly from Summers and Heston Penn World Tables, Mark 5.6. Those for *EXPORTS* are constructed from Feenstra, Lipsey, and Bowen (1997) and those for *PRIM* and *SECM* are from the Barro and Lee (1993) data set. Table 1 presents the summary statistics of our sample.

Table 2 presents our main findings. Columns (1), (4) and (7) show the most parsimonious specification in which we include the independent variables *EXPORTS*, *GDPCAP* and education variables *PRIM* and *SECM*. Columns (2), (5) and (8) add controls for foreign trade exposure *OPEN* and *PPP*. And columns (3), (6) and (9) also control for the share of government spending, *GOV*, and the degree of social and political stability, *REV*.

In all specifications, the skill content of exports has a positive and significant effect on subsequent rates of per-capita GDP growth. The impact of exporting products with higher skill content is quite large: for instance, exporting products that are manufactured by industries with one percentage point higher R&D to sales ratio leads to growth rates that are on average a half percentage higher per year. In addition, most of the other control variables that we include have significant and plausible effects on economic growth: ceteris paribus, countries with higher secondary enrollment rates and more open economies grew faster, while those that were rich initially, had larger governments, and those that had more social and political instability grew more slowly.

These results suggest that the skill content of exports influences subsequent economic performance, but there are at least three issues related to empirical robustness:

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[10] The time span can be extended to cover 1995, albeit at the cost of reducing the country sample size.

First, it is important to establish that these results are not artifacts of a few outliers. To this end, we employ robust regression techniques to help deal with concerns that results might be heavily influenced by an individual country or an observation in our data.[11] As shown in columns (7), (8) and (9) of Table 2, outliers do not heavily influence our main results. Second, it is plausible that countries that grow faster tend to export more skill-

4. References

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Table 1. Descriptive Statistics

Correlation Matrix

	Mean	S.D.	GROWTH	EXPORTS	LGDP	INVEST	PRIM	SECM	OPEN	PPP	TOT	GOV	REVOL
GROWTH	0.0146	0.0356											

Table 2.Main Results

Dependent Variable: Real per-capita GDP Growth (1970 – 1990, p.a.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Robust Errors			Robust Regressions			Anderson-Hsiao Estimation		
$EXPORTS_{j,t-1}$	0.00690*	0.00708*	0.01568**	0.00533**	0.00658*	0.02151*	0.03583*	0.03054*	0.02444**
	(0.00273)	(0.00258)	(0.00821)	(0.00286)	(0.00273)	(0.00627)	(0.01397)	(0.01447)	(0.01295)
$LGDP_{j,t-1}$	-0.04480*	-0.04127*	-0.06445*	-0.02504*	-0.03375*	-0.06193*	-0.28007*	-0.26919*	-0.25956*
	(0.01098)	(0.01119)	(0.01587)	(0.00902)	(0.00963)	(0.01065)	(0.07671)	(0.07469)	(0.06675)
$PRIM_{j,t-1}$	-0.00004	-0.00007	-0.00009	-0.00017	-0.00039	-0.00035	0.00036	0.00071	0.00065
	(0.00026)	(0.00031)	(0.00049)	(0.00024)	(0.00026)	(0.00034)	(0.00067)	(0.00065)	(0.00062)
$SECM_{j,t-1}$	0.00070*	0.00073*	0.00053	0.00035	0.00026	0.00019	0.00119	0.00117	0.00098
	(0.00033)	(0.00032)	(0.00044)	(0.00044)	(0.00041)	(0.00044)	(0.00100)	(0.00092)	(0.00082)
$OPEN_{j,t-1}$	..	0.00001	-0.00001	..	0.00006	0.00016	..	0.00060*	0.00064**
		(0.00015)	(0.00021)		(0.00013)	(0.00013)		(0.00037)	(0.00035)
$PPP_{j,t-1}$	..	-0.02293*	-0.01358	..	-0.02326*	-0.00653			
		(0.00807)	(0.00993)		(0.00740)	(0.0020.7013 Tm(-0.00653)TjETEMC/P ɛ3c300618 8 0 268.0ETEMC2l

Table 3. Reverse Causality

Dependent Variable: Skill Content of Exports (1970-1990)

	(1)	(2)
	Robust Errors	Robust Regressions
$GROWTH_{j,t-1}$	-0.014 (0.011)	-0.003 (0.004)
$LGDP_{j,t-1}$	0.623* (0.211)	0.314* (0.077)
$PRIM_{j,t-1}$	-0.002 (0.004)	0.003 (0.002)
$SECM_{j,t-1}$	-0.005 (0.006)	0.001 (0.003)
$OPEN_{j,t}$	0.002 (0.003)	0.001 (0.001)
$PPP_{j,t-1}$	-0.333** (0.169)	-0.138* (0.044)
$TOT_{j,t}$	-0.139 (0.394)	0.235** (0.133)
$INVEST_{j,t-1}$	0.001 (0.008)	0.001 (0.003)
$GOV_{j,t-1}$	-0.007 (0.005)	-0.005 (0.003)
$REV_{j,t}$	0.107 (0.099)	0.087* (0.041)
Observations	247	247
Adjusted R-	0.90	.98

squared		

Note: Standard errors in parentheses.
* significant at the 5 percent level; ** significant at the 10 percent level.
Country-specific and time-specific fixed effects estimate.