

Kim, Sangho; Lim, Hyunjoon; Park, Donghyun

Working Paper

Could Imports be Beneficial for Economic Growth? Some Evidence from Republic of Korea

ERD Working Paper Series, No. 103

Provided in Cooperation with:

Asian Development Bank (ADB), Manila

Suggested Citation: Kim, Sangho; Lim, Hyunjoon; Park, Donghyun (2007) : Could Imports be Beneficial for Economic Growth? Some Evidence from Republic of Korea, ERD Working Paper Series, No. 103, Asian Development Bank (ADB), Manila, <https://hdl.handle.net/11540/1864>

This Version is available at:

<https://hdl.handle.net/10419/109303>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<http://creativecommons.org/licenses/by/3.0/igo>

Could Imports be Beneficial for Economic Growth: Some Evidence from Republic of Korea

Sangho Kim, Hyunjoon Lim,
and Donghyun Park

October 2007

Asian Development Bank



ERD Working Paper No. 103

COULD IMPORTS BE BENEFICIAL FOR ECONOMIC GROWTH? SOME EVIDENCE FROM REPUBLIC OF KOREA

SANGHO KIM, HYUNJOON LIM, AND DONGHYUN PARK

OCTOBER 2007

Sangho Kim is Professor, College of Business, Honam University, Republic of Korea; Hyunjoon Lim is a graduate student at the Department of Economics, University of Rochester, New York; and Donghyun PARK is Senior Economist, Macroeconomics and Finance Research Division, Economics and Research Department, Asian Development Bank.

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org/economics

©2007 by Asian Development Bank
October 2007
ISSN 1655-5252

The views expressed in this paper
are those of the author(s) and do not
necessarily reflect the views or policies
of the Asian Development Bank.

FOREWORD

The ERD Working Paper Series is a forum for ongoing and recently completed research and policy studies undertaken in the Asian Development Bank or on its behalf. The Series is a quick-disseminating, informal publication meant to stimulate discussion and elicit feedback. Papers published under this Series could subsequently be revised for publication as articles in professional journals or chapters in books.

CONTENTS

Abstract	vii
I. Introduction	1
II. Literature Review	2
III. Empirical Analysis and Results	4
A. Variables	4
B. Causality between Trade and Productivity	8
C. Effects of Different Import Components on Productivity	12
IV. Concluding Remarks	17
Appendix	19
References	20

ABSTRACT

The Republic of Korea is widely seen as a classical example of East Asia's export-driven economic growth. The focus in the literature on exports in the economy's growth has led to an almost complete neglect of the role of imports. This study investigates the relationship between exports, imports, and economic growth using quarterly data from 1980 to 2003. Results indicate that imports have a significant positive effect on productivity growth but exports do not. Furthermore, the evidence reveals that the productivity-enhancing impact of imports is due to competitive pressures arising from consumer good imports and technological transfers embodied in capital good imports from developed countries. Most of the study's results still hold using gross domestic product growth rather than productivity growth as the measure of economic growth. The evidence implies that under certain circumstances, import liberalization can make a positive and significant contribution to growth and development.

I. INTRODUCTION

Many economists view the export-driven growth strategy as the cornerstone of East Asia's remarkable economic resurgence during the second half of the 20th century. Exports contributed to growth by facilitating labor mobilization and capital accumulation. Just as importantly, exposure to the fiercely competitive global marketplace forced the region's firms to become more efficient. In *The East Asian Miracle*, the World Bank (1993) suggested that exports and export-promoting policies had been instrumental in East Asia's adoption of frontier technologies, which enhanced the productivity of exporting firms and the economy in general, thus accelerating economic growth. In addition, many studies provide empirical support for the export-led growth hypothesis by showing that exports had a significant positive effect on Asia's productivity and economic growth.¹

An integral part of East Asia's export-driven growth strategy was to protect domestic markets with trade barriers so as to enable domestic firms to grow from infancy to international competitiveness. This has left a legacy of viewing exports as beneficial and imports as harmful among the region's policymakers as well as general public. However, as Lawrence and Weinstein (1999) point out, World Bank (1993) and the supportive empirical literature focus only on the export-growth relationship, ignoring the role of imports in promoting productivity and growth. In the case of Japan, Lawrence and Weinstein found that protectionism was actually harmful to productivity, and exports did not enhance productivity whereas imports did. This suggests that learning, innovation, and competitive pressures resulting from foreign imports may be important channels for enhancing productivity at the firm level as well as the economy as a whole.

This study uses data from the Republic of Korea (henceforth Korea), a classic example of East Asia's export-driven economic growth, to empirically investigate the relationship between imports and productivity growth. First, the paper investigates the direction of causality between trade variables and productivity growth using a vector error correction model (VECM). Second, in order to identify the specific nature of the import-productivity relationship, equations are empirically estimated to explain productivity in relation to exports, imports, and other variables. Results from the two interrelated empirical exercises indicate that imports, not exports, are a significant determinant of productivity. Furthermore, the beneficial impact of imports stems not only from the competitive pressures arising from imports of consumer goods, but also from technological transfers embodied in imports of capital goods from developed countries.

Previous empirical studies on the relationship between trade and economic growth in Korea and other East Asian countries almost invariably define trade as exports. As such, those studies focus exclusively on the relationship between exports and growth, and ignore the role of imports in growth. This is not surprising in light of the central role of export-oriented industrialization in the East Asian miracle. However, the almost complete neglect of imports is still rather surprising since economic intuition and theory suggest that imports may serve as an important channel for

¹ For surveys of the debates on productivity growth and trade in East Asia, see Chen (1997) and Edwards (1993), respectively.

technological transfer, productivity growth, and economic growth. Such neglect is also unfortunate because it helps to reinforce the deep-seated regional bias against imports. This study attempts to promote a more balanced and comprehensive approach to the analysis of trade and economic growth in Korea and East Asia which, in turn will help to better understand the potential contribution of imports to the region's growth and development.

II. LITERATURE REVIEW

In theory, there is a two-way causal relationship between trade and productivity, although advocates of export-led growth generally contend that exports enhance productivity growth.² These economists argue that firms tend to learn advanced technologies through exports and must adopt them to compete in the foreign marketplace.³ Firms also learn by doing, and emulate foreign rivals through trial and error inherent in the production and sale of export goods.⁴ Furthermore, the expansion in production resulting from exports reduces unit production prices, thus increasing productivity.⁵ In addition to these effects, exports also provide a country with foreign exchange, which is often scarce in the early stages of economic development, enabling a country to import capital and intermediate goods. Thus, for a variety of reasons, exports increase productivity growth.⁶ The reverse causation from productivity growth to exports is also intuitively straightforward. Productivity growth improves a country's international competitiveness in price and quality, and thereby boosts its exports.

An extensive empirical literature exists on the relationship between exports and growth, largely because of its bidirectionality. In fact, much of the empirical literature on trade and productivity defines trade as exports rather than imports. Empirical studies have tried to determine whether exports cause productivity to increase.⁷ However, results in this regard seem to depend on both the sample periods and the countries examined. Some studies find unidirectional causality running from exports to productivity while others find reverse causality between the two variables.⁸ Clerides et al. (1998) argue that only relatively efficient firms engage in exports, and that exports do not bring down unit production costs. The basic thrust of all these works is a unidirectional causality from productivity growth to exports.⁹ In their studies of firms in the United States (US), Bernard and Jensen (1999a and 1999b) also find that firms with high productivity usually export their products, and exporting firms do not experience productivity and wage increases greater than those of nonexporting firms. On the other hand, a number of studies find either bidirectional causality or absence of causality between exports and productivity.¹⁰ For Korea, some studies support the export-led growth hypothesis, whereas other studies either fail to find causality from growth to

² See, for example, Baldwin (2003), Bonelli (1992), Haddad, De Melo and Horton (1996), Weinhold and Rauch (1997), Yean (1997), and Sjoeholm (1999).

³ Please refer to Balassa (1978), Krueger (1980) and Nishimizu and Robinson (1982).

⁴ See Grossman and Helpman (1991).

⁵ See Helpman and Krugman (1985).

⁶ See McKinnon (1964).

⁷ For a literature survey, see Greenaway and Sapsford (1994).

⁸ Haddad et al. (1996) is an example of the former while Pavcnik (2000) is an example of the latter.

⁹ Shan and Sun (1998), for example, fail to find unidirectional causality from exports to output and thus reject the export-led growth hypothesis for the People's Republic of China.

¹⁰ These include Hsiao (1987), Kunst and Marin (1989), and Jin and Yu (1996).

exports, or find bidirectional causality.¹¹ The evidence on the direction of the causality between exports and growth in Korea is thus ambiguous at best, despite the widespread presumption of the validity of the export-led growth hypothesis.

The theoretical relationship between imports and productivity tends to be more complicated than that between exports and productivity. Increased imports of consumer products encourage domestic import-substituting firms to innovate and restructure themselves in order to compete with foreign rivals; therefore, imports enhance productive efficiency. Under perfect competition in the neoclassical model, an industry reduces factor usage in the short run when trade barriers are removed and the market is opened up to imports. In the long run, however, the industry becomes more productive and competitive, and expands its investments in new technology, resulting in a rightward shift of the industry supply curve.¹² In general, the effect on productivity of opening the market depends on both market structure and institutional factors. Under imperfect competition, an import-substituting domestic market shrinks as imports increase, causing investment to fall and thereby productivity to eventually fall.¹³ Furthermore, higher future expected profits lead to more active research and development (R&D) investment and innovation efforts, and such R&D may be greater for exporting firms than for import-substituting firms in light of the large impact of market opening. Imports of capital goods and intermediate goods that cannot be produced domestically enable domestic firms to diversify and specialize, further enhancing their productivity.¹⁴ Finally, there are also theoretical grounds for both positive and negative causality from productivity to imports.¹⁵

Relative to the empirical literature on exports and productivity, the number of empirical studies on the relationship between imports and productivity is quite limited. In particular, as pointed out earlier, the only study to empirically examine the relationship for Korea—Lawrence and Weinstein (1999)—does so only very briefly and focuses on Japan. Their main finding is that imports contributed to total factor productivity (TFP) growth for a panel data set of Japanese manufacturing industries, mainly through competition effects. A preliminary analysis in the same study fails to yield any systematic evidence that greater levels of protection improved productivity in Korea and the US. Lawrence (1999) shows empirically that import competition brought about TFP growth in US industries. Muendler (2004) finds that in the Brazilian manufacturing sector, the competitive effects of imports on competition are large even though the effect of intermediate imports on labor productivity is small.¹⁶

To summarize, the above review of the existing literature reveals two key trends in the ongoing debate about the trade–growth relationship. First, empirical tests of the export-led growth hypothesis

¹¹ Jung and Marshall (1985), Xu (1996), and Choi (2002) support the export-led growth hypothesis. Darrat (1986), Hsiao (1987), Dodaro (1993), and Dutt and Ghosh (1996) fail to find causality from growth to exports. Finally, Hsiao (1987), Chow (1987), Bahmani-Oskooee and Shabsigh (1991), Bahmani-Oskooee and Alse (1993), and Jin (1995) find bidirectional causality.

¹² See Haddad et al. (1996) for a more comprehensive discussion. The basic argument is that market competition awakens firms from the laziness and comfort of a monopoly market and provides incentives for innovation.

¹³ See Tybout (2000) for an extended discussion. Schumpeter, however, suggested that a certain level of monopoly in the market provides firms with excess profits with which to make R&D investments, thus promoting productivity.

¹⁴ See Grossman and Helpman (1991), Sjoeholm (1999), and Tybout (2000).

¹⁵ Productivity growth triggers economic growth and increases income, which in turn stimulates imports. On the other hand, increased productivity in an import-substituting industry crowds out imports from the domestic market and thus has a negative impact.

¹⁶ Additional studies on imports and productivity include Gokcekus (1997), who finds that protectionism reduces technical progress.

have produced mixed results. Second, with respect to the role of imports in growth, the empirical literature has lagged behind the theoretical literature. This study extends previous research on the relationship between trade and productivity in several directions. First, it hopes to contribute to the limited empirical literature on the imports–growth nexus by taking an in-depth look at the impact of imports on Korean TFP. It is a particularly interesting to explore the role of imports in Korea since the country's economic success has become a byword for export-led growth. Second, imports are disaggregated into various components in order to more clearly understand the channels through which imports affect productivity in Korea. Third, the cyclical effects that co-move with business cycles are eliminated from the productivity measures in order to control for spurious relation due to cyclical biases. Finally, the data set is updated up to 2003 and a TFP equation is estimated to investigate the macroeconomic relationship between trade and productivity.

III. EMPIRICAL ANALYSIS AND RESULTS

This section discusses the empirical analysis of the relationship between trade and TFP in Korea. It also reports the main empirical results and their implications about the role of trade in Korean productivity growth.

A. Variables

Many existing studies on the trade–productivity nexus use labor productivity as the productivity measure, but this partial measure does not allow for consideration of the effect of factor substitution between capital and labor. This effect is especially important for the Korean economy, which has continuously experienced capital deepening and adoption of new production technologies. Measures of labor productivity generally include the effects of capital deepening, along with technological progress and structural efficiency changes that determine TFP. It has recently been argued that Korean economic growth was driven mostly by factor accumulation rather than by productivity growth. Therefore, TFP, rather than capital deepening or labor productivity growth resulting from trade-induced economies-of-scale, is used as the measure of productivity in order to measure the effects of trade on structural and technological changes.

Data on TFP were sourced from various sources in the Bank of Korea database. Quarterly data estimate Solow residuals for the period 1985Q1–2002Q4. The capital stock is taken to be the real amount of tangible fixed assets, adjusted for the capital utilization rate. In addition, labor input is proxied by the number of work hours, with gross domestic product (GDP) as the measure of output.¹⁷ All variables are converted into constant 1995 prices. The measured Solow residual is generally not a good measure of productivity growth in the absence of perfect competition, constant returns to scale, and full employment of labor and capital. This implies that the measured Solow residual may be affected by demand-side variables.¹⁸ In the case of Korea, Kim and Lim (2004) find that the Solow residual is not a strictly exogenous variable but instead co-moves with demand shocks.

If measured productivities are indeed influenced by cyclical movements, an empirical correlation between trade and productivity may be spurious in the sense that it is driven by a correlation between trade and business cycles. For this reason, it is desirable to control for cyclical bias in the productivity measure. To address this, the study follows the method suggested by Basu and

¹⁷ For capital, the paper used the perpetual inventory method to expand the capital estimated by Pyo (2003).

¹⁸ See Mankiw (1989) and Hall (1989) for more comprehensive discussions.

Kimball (1997) and Ball and Moffitt (2001). This first step in this method is to regress the log difference of the measured Solow residual on the log difference of the capital utilization rate, which is a proxy for business cycles. The next step is to adjust the average of the regression error term so that it equals the original productivity measure when the productivity measure is adjusted for cyclical factors.

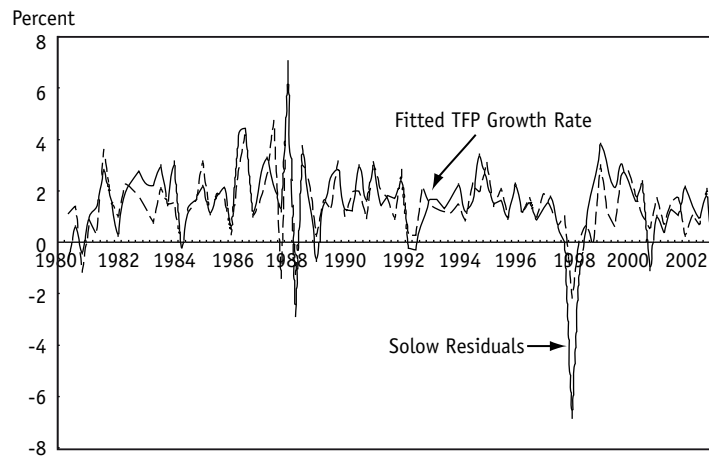
The estimation results indicate that the effect of the business cycle on the measured Solow residual is significant.¹⁹ The estimation results are shown in (1) below, where CU denotes the capital utilization rate and where t-statistics are inside the parentheses.²⁰ Results show that removing cyclical effects from the measured Solow residual does not affect its overall movement but considerably reduces its variation.²¹

$$\Delta \log(TFP)_t = 0.02 + 0.26 \Delta \log(CU)_{t-1},$$

(8.11) (3.89) $\bar{R}^2 = 0.16$ D.W. = 2.20 (1)

Figure 1 shows the growth rates of the measured Solow residual, and the TFP estimates obtained after eliminating the cyclical effects from the residual. TFP increased steeply after the mid-1980s but slowed somewhat in the 1990s, then fell sharply during the financial crisis of 1997–1998. TFP recovered shortly after the crisis but then fell again after 2000.

FIGURE 1
GROWTH OF THE SOLOW RESIDUAL AND TFP WITH CYCLICAL ADJUSTMENT
FOR THE KOREAN ECONOMY, 1980–2003



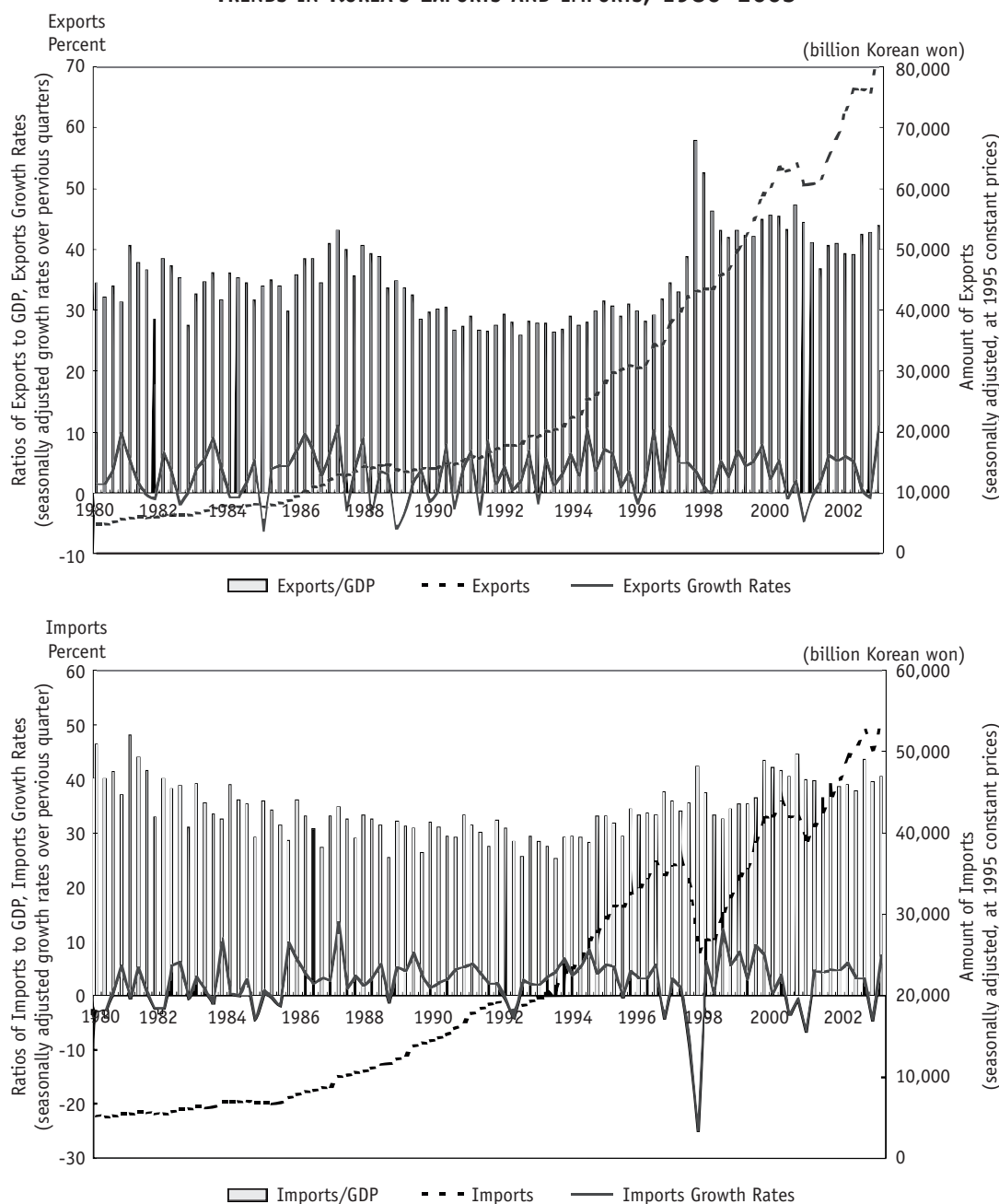
¹⁹ Labor productivity not being affected by the capital utilization rate is a well-established result in real business cycle theory. Other proxies for business cycles such as military spending, oil shocks, and political dummies have been suggested. However, a complete treatment is beyond the scope of this paper.

²⁰ While the business cycle can affect productivity, productivity can also affect business cycles. To eliminate this endogeneity problem, only lagged values of the capital utilization rate are included as explanatory variables in the regression.

²¹ The purpose of adjusting TFP is to eliminate any error that may exist in the Solow residual as a productivity measure, i.e., to identify the part of the Solow residual that represents pure productivity. While the cyclical movement of the adjusted TFP is still smaller than the residual, the adjustment is not intended to completely eliminate the correlation between TFP and business cycles. The causality from TFP to business cycles is well-established in real business cycle theory, while the reverse effect from business cycles to productivity should be eliminated to prevent a spurious relationship. Therefore, it is quite natural to have a high correlation after adjustment.

Figure 2 illustrates recent trends in Korea's imports and exports. International trade accounts for a substantial share of the Korean economy. The ratio of exports (EXP) to GDP fell below 30% during the late 1980s and mid-1990s but was about 40% or more during other periods. Imports (IMP) showed a great deal of cyclical fluctuation, but their share in GDP ranged between 30% and 40%. Overall, the share of imports declined in the early 1980s but bounced back since the early 1990s.

FIGURE 2
TRENDS IN KOREA'S EXPORTS AND IMPORTS, 1980–2003



Before performing the empirical analysis, augmented Dickey-Fuller (ADF); Phillips-Peron (PP); and Kwiatkowski, Phillips, Schmidt and Shin (KPSS 1992) unit root tests were carried out to examine whether the time-series of the variables follow stochastic trends. Table 1 reports the test results for both levels and first differences. The tests unambiguously suggest the existence of one unit root for every variable, indicating that the time-series are integrated of order 1, I(1).

TABLE 1
UNIT ROOT TESTS OF THE VARIABLES FOR THE RELATIONSHIP BETWEEN TRADE
AND PRODUCTIVITY GROWTH FOR KOREA, 1980Q1–2003Q3

	ADF		PP		KPSS	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
LIMP	-2.18	-5.59*	-2.52	-8.36*	0.16**	0.06
LEXP	-1.96	-4.53*	-2.15	-9.58*	0.18**	0.04
LTFP	0.15	-4.53*	-0.32	-12.19*	0.28*	0.13***

*, ** and *** denote rejection of the null hypothesis at the 1, 5, and 10% significance level, respectively.

LIMP means log of imports, LEXP means log of exports, LTFP means log of total factor productivity.

Note: Test regressions contain a constant and a linear time trend, and lags of the dependent variable are chosen by Akaike Information Criteria. The null hypothesis is the existence of unit root for augmented Dickey-Fuller and Phillips-Peron tests, and the nonexistence of unit root for Kwiatkowski, Phillips, Schmidt and Shin test.

To address this problem, the existence of long-run relationships among the variables is checked. It is possible to derive a long-run equilibrium that does not suffer from spurious regression. Table 2 presents the maximum-likelihood ratio statistics, which indicate the number of long-run relationships and thus the number of cointegration vectors in the parameter matrix. Johansen's cointegration test is performed on the log values of three sets of variables, namely (1) exports (LEXP) and TFP (LTFP); (2) imports (LIMP) and TFP (LTFP); and (3) exports, imports, and TFP. The test results indicate that a restricted constant, which allows a non-zero drift in the unit root process, is included in the multivariate system of equations. The lag values of the VECMs are set equal to two. The null hypothesis of $r=0$ is rejected at the one-percent level but the null hypothesis of $r=1$ cannot be rejected.²² Consequently, the estimated likelihood ratio tests indicate the presence of a cointegration vector and a long-run relationship in the underlying data-generating process of the time-series variables.

²² See Osterwald-Lenum (1992) for critical values.

TABLE 2
JOHANSEN'S LOG LIKELIHOOD TEST FOR COINTEGRATION OF THE VARIABLES FOR THE RELATIONSHIP BETWEEN
TRADE AND PRODUCTIVITY GROWTH FOR KOREA, 1980Q1–2003Q3

$H_0 : \text{RANK}=R$	EIGENVALUE	MAX-EIGEN STAT	5% CRITICAL	TRACE STAT.	5% CRITICAL
LTFP, LEXP					
None	0.134	13.31	14.26	17.19**	15.49
R•1	0.041	3.877**	3.841	3.877**	3.841
LTFP, LEXP					
None	0.298	32.63**	15.89	34.85**	20.26
R•1	0.023	2.223	9.164	2.223	9.164
LTFP, LIMP, LEXP					
None	0.354	40.30**	22.29	56.35**	35.19
R•1	0.139	13.86	15.89	16.04	20.26

, and * denote rejection of the hypothesis at the 5 and 10% significance level, respectively.

LTFP means log of total factor productivity, LEXP means log of exports, LIMP means log of imports.

Note: Test regression includes a constant and a linear deterministic trend in the data. The test indicates 1 cointegrating equation at the 5% significance level for every set of variables.

B. Causality between Trade and Productivity

Based on the test results of the previous section, a vector error correction model (VECM) is estimated and tested for Granger causality on the basis of the coefficient estimates of the model. A VECM model consisting of the variables of IMP, EXP, and TFP may be written as follows:

$$y_t = \sum_{i=1}^p \Phi_i y_{t-i} + \varepsilon_t, \quad \Delta y_t = \alpha \beta' y_{t-1} + \sum_{j=1}^{p-1} \Phi_j^* \Delta y_{t-j} + Z_t + w_t, \quad (2)$$

where $\Phi_i^* = -\sum_{j=i+1}^p \Phi_j$, $\alpha \beta' = -\Phi(1) = -I_k + \Phi_1 + \Phi_2 + \dots + \Phi_p$,
 $w_t \sim N(0, \Sigma)$, and Σ is a nondiagonal symmetric matrix.

In a VECM, all variables included in y_t must satisfy $I(1)$, and residuals from a long-run cointegrating relationship are used as lagged error correction terms in a VAR. If $\beta' y_t = c$ represents a long-run cointegrating relationship and there is a deviation from long-run equilibrium, the error $\beta' y_t - c$ is removed to restore equilibrium at adjustment speed α .

The VECM models consist of two variables (IMP and TFP or EXP and TFP) and three variables (IMP, EXP, and TFP). The chosen ordering of variables is EXP, TFP and IMP, TFP for the bivariate models; and EXP, IMP, and TFP for the trivariate model. This ordering reflects the degree of exogeneity of the variables. However, changes in the order of these variables do not significantly affect the estimation results. Thus, $y_t' = [\text{LEXP (LIMP), LTFP}]$ or $y_t' = [\text{LEXP, LIMP, LTFP}]$, depending on the number of variables considered. To consider the effects of the Asian crisis and to eliminate any spurious correlation between trade and productivity growth, a dummy for the period 1998Q1–1998Q3 is included as the exogenous variable (Z_t) in (2) above. VECM systems with a lag length of two are estimated, and these lags are chosen to minimize the Akaike Information Criteria (AIC); however, changes in the lag length do not affect the results.

Table 3 below reports the VECM parameter estimates of the three variables, along with VAR

model estimates. Although an autoregressive unit root characterizes every variable in the system, the VAR model is also estimated to avoid any possible loss of valuable information owing to differencing.²³ In particular, it can be expected that VAR will elucidate the long-run relationship among the variables. Qualitatively, there are few differences between the VECM and VAR coefficient estimates. The most salient result of both models is that imports have a significant positive impact on TFP but exports do not.

TABLE 3
COEFFICIENT ESTIMATES OF THE VECM FOR THE RELATIONSHIP
BETWEEN TRADE AND PRODUCTIVITY GROWTH FOR KOREA, 1980Q1–2003Q3

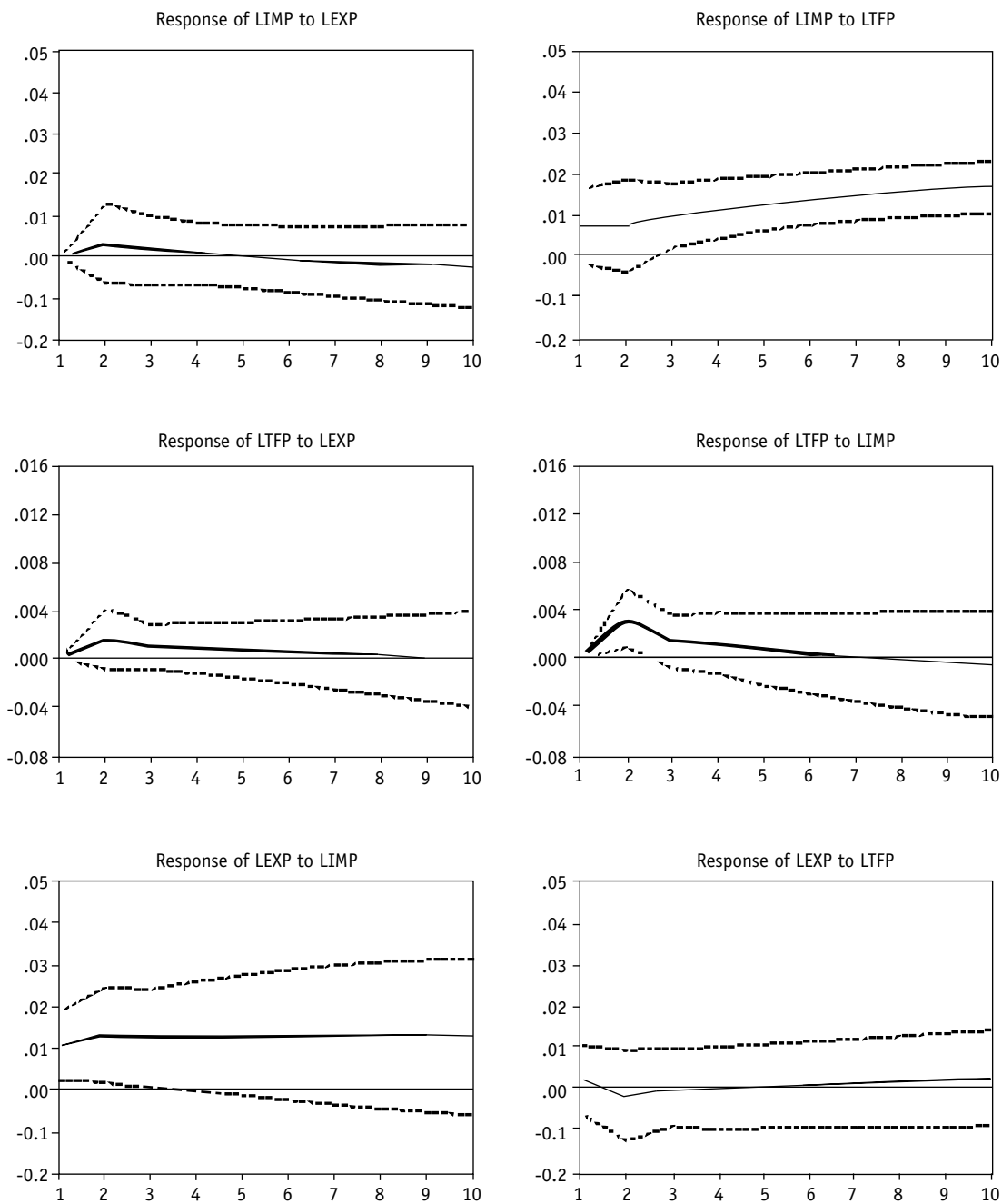
INDEPENDENT VARIABLES	VECTOR ERROR CORRECTION MODEL			VECTOR AUTO REGRESSION MODEL		
	LTFP	LIMP	LEXP	LTFP	LIMP	LEXP
Error correction (-1)	-0.001 (0.038)	0.493 (3.985)	0.028 (0.254)			
LTFP(-1)	-0.330 (2.987)	-0.627 (1.500)	-0.664 (1.737)	0.602 (6.139)	0.090 (0.237)	-0.389 (1.119)
LTFP(-2)	0.113 (1.085)	-0.482 (1.215)	-0.354 (0.976)	0.413 (4.201)	0.360 (0.941)	0.393 (1.127)
LIMP(-1)	0.064 (2.253)	0.068 (0.635)	0.102 (1.044)	0.066 (2.338)	0.825 (7.426)	0.073 (0.730)
LIMP(-2)	-0.016 (0.526)	0.005 (0.044)	0.209 (1.933)	-0.074 (2.696)	-0.052 (0.491)	-0.046 (0.483)
LEXP(-1)	0.047 (1.400)	0.120 (0.940)	-0.063 (0.542)	0.043 (1.322)	0.086 (0.679)	0.955 (8.225)
LEXP(-2)	-0.022 (0.663)	0.205 (1.606)	0.014 (0.121)	-0.047 (1.451)	-0.111 (0.868)	0.018 (0.161)
Constant	0.016 (5.701)	0.036 (3.299)	0.038 (3.815)	0.060 (1.523)	0.524 (3.400)	0.004 (0.030)
Dummy	-0.015 (2.223)	-0.114 (4.433)	0.013 (0.564)	-0.013 (2.326)	-0.103 (4.491)	-0.004 (0.210)
R_2	0.276	0.313	0.066	0.999	0.996	0.997

LTFP means log of total factor productivity, LIMP means log of imports, LEXP means log of exports.
Note: For VECM, all variables are first differenced for estimation. T-statistics are inside parentheses.

Figure 3 reports the impulse response functions in the VAR model, which are the simulated responses of TFP to the trade variables. The responses allow for investigation into the long-run relationships between TFP and the trade variables. The impulse response function extends over 10 quarters and is measured in terms of standard deviations. The effect of a one-standard-deviation shock to imports on TFP is initially positive and significant, and subsequently diminishes to zero. The effect of a shock to exports on TFP is positive but insignificant over the whole period. The responses of TFP to import and export shocks imply that TFP is correlated with imports but not with exports.

²³ See Sims (1980) for a fuller discussion.

FIGURE 3
IMPULSE RESPONSE FUNCTIONS IN A VAR MODEL OF
IMPORTS, EXPORTS, AND TOTAL FACTOR PRODUCTIVITY FOR KOREA, 1980–2003



LEXP means log of exports, LIMP means log of imports.

Table 4 reports Granger-causality tests based on the coefficient estimates of three different models. The estimated models consist of two-variable VECMs, a three-variable VECM, and a three-variable VAR model. All the results indicate that there is no causality between exports and TFP growth. On the other hand, all the results indicate that imports Granger-cause TFP growth. In addition, the VAR model also indicates reverse causation from TFP growth to imports. The finding of no correlation between exports and productivity growth in Korea is consistent with the earlier findings of Darrat (1986), Hsiao (1987), Dodaro (1993), and Dutt and Ghosh (1996). The most striking feature of the results is the correlation between imports and productivity. The specific mechanism underlying the import–productivity nexus can be investigated by decomposing imports into their various components, such as consumer goods versus capital goods, an issue addressed in the next section.

TABLE 4
GRANGER CAUSALITY TESTS FOR THE RELATIONSHIP
BETWEEN TRADE AND TOTAL FACTOR PRODUCTIVITY GROWTH FOR KOREA, 1980Q1–2003Q3

NULL HYPOTHESIS (H_0)	TEST STATISTICS (χ^2)	PROBABILITY	RESULTS
Bi-variate (VECM)			
•LIMP \nrightarrow •LTFP	18.04*	0.0001	Reject
•LTFP \nrightarrow •LIMP	1.176	0.555	Do not reject
•LEXP \nrightarrow •LTFP	4.088	0.129	Do not reject
•LTFP \nrightarrow •LEXP	1.366	0.505	Do not reject
Tri-variate (VECM)			
•LIMP \nrightarrow •LTFP	5.987*	0.050	Reject
•LEXP \nrightarrow •LTFP	2.595	0.273	Do not reject
•LTFP \nrightarrow •LIMP	2.765	0.250	Do not reject
•LEXP \nrightarrow •LIMP	3.213	0.200	Do not reject
•LTFP \nrightarrow •LEXP	3.154	0.206	Do not reject
•LIMP \nrightarrow •LEXP	4.235	0.120	Do not reject
Tri-variate (VAR)			
LIMP \nrightarrow LTFP	7.282*	0.026	Reject
LEXP \nrightarrow LTFP	2.228	0.328	Do not reject
LTFP \nrightarrow LIMP	12.84*	0.001	Reject
LEXP \nrightarrow LIMP	1.199	0.548	Do not reject
LTFP \nrightarrow LEXP	1.299	0.522	Do not reject
LIMP \nrightarrow LEXP	0.595	0.742	Do not reject

LIMP means log of imports. LTFP means log of total factor productivity, LEXP means log of exports.

Note: Test statistics are Wald statistics, and test results refer to the rejection of the null hypothesis at the 1% significance level.

Finally, as discussed in the literature, productivity growth has opposing effects on imports and may cancel each other out. Productivity growth raises imports by raising income but also reduces imports by increasing domestically produced import substitutes. The finding that Granger causality from productivity to imports is significant only in the VAR model may reflect this ambiguity.

To check for the sensitivity of the results to the specification of economic growth, TFP growth is substituted with GDP growth in the VECM and VAR models, and the same tests are performed. Table A1 in the Appendix reports the Granger-causality tests based on the coefficient estimates

of these models.²⁴ The test results for GDP are qualitatively identical to the results for TFP, i.e., no causality exists between exports and GDP, and imports Granger-cause GDP growth in every model. Similarly, reverse causation from GDP growth to imports is also found in the VAR model. The empirical results are thus robust in the sense that they are not sensitive to the specification of economic growth. This evidence again fails to directly support the export-led growth hypothesis for Korea during 1980–2003.

C. Effects of Different Import Components on Productivity

The empirical results of the previous section suggest that causality runs from productivity growth to inflation. Based on these results, imports are disaggregated into various components and included in a productivity determination equation for the purpose of investigating the import–TFP relationship in more detail. To determine the short-run dynamics of productivity determination, TFP growth is regressed against import components, exports, and other variables such as government size and R&D investments. The TFP equation may be written as:

$$\Delta LTFP_t = \beta_0 + \sum_{i=0}^l \beta_{1i} \Delta LIMP_{t-i} + \sum_{i=0}^m \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LGOV_{t-i} + \sum_{i=0}^p \beta_{4i} \Delta LRD_{t-i} + \varepsilon_t \quad (3)$$

As additional explanatory variables, government size (GOV) and R&D investments (R&D), which have been widely considered in the productivity literature, are used to represent institutional and technological factors, respectively. Government consumption expenditure is used as a proxy for GOV to capture the inefficiencies arising from government failure. The number of patents registered in the US is used as the measure of R&D. GOV and R&D are included in addition to the trade variables in estimating the dynamic impact of trade variables on productivity. Imports according to country-of-origin are disaggregated into imports from developed G7 countries (DIMP) and imports from other countries (OIMP). Developed countries in general and the G7 countries in particular are the global technological leaders. As such, imports from the G7 countries are more likely to embody advanced technology than imports from elsewhere. Imports according to processing stages are also disaggregated into imports of raw materials (RIMP), capital goods (KIMP), and consumer products (CIMP). In particular, the critical distinction is between imported consumer goods and imported capital goods. In contrast to consumer goods, capital goods such as machines are used to produce other goods. Therefore, while the main effect of consumer good imports is to intensify competition in the market for consumer goods, the main effect of capital good imports is to import the technology embodied in the good, thus bringing about a more efficient production of other goods. The data on the five import components just defined are available from Korea Trade Information Services only after 1988Q1.

Seasonality is eliminated from the variables by means of an X12-ARIMA, and unit root tests are performed on the variables. Since every variable is integrated of order 1, I(1), first differences are used in the actual estimation. Lags of the explanatory variables are chosen by means of the “general-to-specific” method, in which the most insignificant lagged variable is eliminated iteratively from a set of lagged variables. In addition, the AIC criteria are applied in selecting the appropriate number of lags. To incorporate the effects of the Asian crisis, the period 1998Q1–Q3 is represented with a dummy and included in the estimation.

²⁴ The coefficient estimates are not reported here but available from the authors upon request.

Table 5 presents the coefficient estimates for equation (3) for each of the models. Prior to estimation, an examination of the correlation among the import variables is made. The different import components are found to be strongly correlated with each other. The correlation between (RIMP, KIMP); (RIMP, CIMP); (KIMP, CIMP); and (DIMP, OIMP) is 0.965, 0.888, 0.916 and 0.966. The high correlation between the import components causes multicollinearity, and the significance of all import variables thus disappears when they are regressed together. Therefore, the different import variables are not simultaneously included in the estimation.

TABLE 5
COEFFICIENT ESTIMATES OF TOTAL FACTOR PRODUCTIVITY GROWTH EQUATION FOR KOREA, 1988Q1–2003Q3

INDEPENDENT VARIABLES	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
Intercept	0.013 (6.603)*	0.013 (6.113)*	0.013 (6.161)*	0.013 (6.092)*	0.013 (6.645)*	0.013 (6.337)*
•LIMP	0.079 (3.420)*					
•LRIMP		0.012 (0.562)				
•LKIMP			0.042 (1.855)***			
•LCIMP				0.042 (2.045)**		
•LDIMP					0.058 (1.983)***	
•LOIMP						0.045 (1.644)
•LEXP	-0.012 (0.398)	0.020 (0.617)	-0.002 (0.954)	0.004 (0.136)	-0.012 (0.352)	-0.006 (0.184)
•LGOV	-0.130 (2.509)**	-0.085 (1.502)	-0.074 (1.352)	-0.079 (1.505)	-0.075 (1.395)	-0.085 (1.617)
•LR&D	0.036 (1.956)***	0.039 (1.870)***	0.040 (1.993)***	0.036 (1.787)***	0.037 (1.858)***	0.041 (2.033)**
Dummy	-0.009 (2.216)*	-0.015 (3.564)*	-0.013 (3.098)*	-0.013 (3.051)*	-0.013 (2.891)*	-0.014 (3.059)*
\bar{R}^2	0.381	0.254	0.283	0.287	0.286	0.275
D.W.	2.467	2.456	2.506	2.403	2.489	2.487

*, ** and *** are statistically significant at the 1, 5 and 10% significance level, respectively.

DIMP means imports from developed G7 countries; OIMP means imports from other countries; RIMP means imports of raw materials; KIMP means capital goods; CIMP means consumer products; GOV means government consumption expenditure.

Note: Absolute values of t-statistics are in parentheses.

The empirical results indicate that exports do not have a significant effect on TFP growth. Furthermore, their coefficients are all negative except for Model 2. These results fail to directly support the export-led growth hypothesis with respect to TFP growth in Korea. However, these results do not imply that exports are not beneficial for developing economies since exports may improve

economic performance through channels other than TFP growth. For example, exports allow for the realization of economies of scale and provide foreign exchange, thereby speeding up economic growth through capital deepening. This issue is discussed in more detail later.

The coefficients on government size (GOV) are all negative but insignificant, except in the case of Model 1, implying that increases in government spending may slow down TFP growth. TFP is a measure that captures productivity, which is based partly on institutional factors. Increased government spending may create inefficiency in the form of new regulations and bureaucracies. However, in light of GOV's overall insignificance, one should be careful about drawing such conclusions. All of the coefficient estimates on R&D are positive and significant. Those findings suggest that R&D promotes innovation and technical progress, and thus promotes TFP growth.

All import component coefficients are positive, but their significance depends on both product type and country of origin. Imports of capital goods (KIMP) and consumer goods (CIMP) have positive and significant effects on TFP, but raw material imports (RIMP) do not have any insignificant effect. In addition, the coefficient estimates on imports from developed G7 countries (DIMP) are positive and significant, but those from other countries (OIMP) are insignificant. Among the various import components, consumer imports (CIMP) are the most significant and imports from developed countries have the largest coefficients. The significant coefficient magnitudes of import components range from 0.042 to 0.058, suggesting that imports have a strong impact on TFP growth.

The empirical findings suggest that increased imports of consumer goods intensify market competition in Korea. Greater competition from imports forces import-substituting Korean firms to become more competitive by improving quality, cutting costs, or both. Examples of specific competitiveness-enhancing activities include adopting more efficient production techniques, engaging in innovation, and pursuing cost-cutting restructuring. Our findings also suggest that imports of capital goods help Korean firms to improve their productivity. If certain capital goods are domestically unavailable, their availability through imports may enable a firm to use them to improve the quality or reduce the costs of their products. Those imports can also enable a firm to produce a wider range of products. Capital goods often embody advanced technology and thus serve as powerful mechanisms for transferring technology to the importing firm. The results also imply that technology transfer from developed countries has a significant positive effect on the efficiency of Korean firms. An important channel for importing superior technology is by importing goods that embody superior technology. Developed countries in general and the large G7 economies in particular are the global technological leaders. Therefore, imports from those countries are much more likely to embody advanced technology, in particular technology unavailable to Korean firms, than imports from other countries. In short, imports of consumer goods, capital goods, and goods from developed countries have all contributed to Korean productivity growth. The contribution of consumer goods is largely through competitive effects while the contribution of capital goods and imports from developed countries is largely through technology transfer effects.

The intuition behind why competition should improve firms' productivity is straightforward and plausible. Competition pushes down prices and hence costs, reduces slack and misallocation of resources, provides incentives for organizing production more efficiently, and may even potentially promote innovation. There are also more formal theoretical explanations for a positive relationship between competition and productivity.²⁵ For example, an increase in the number of firms will

²⁵ See Okada (2005) for an overview of the theoretical literature.

lead to sharper managerial incentives and thus improve managerial effort.²⁶ This is due to greater opportunities for comparing managerial performance. Alternatively, greater competition may make profits more sensitive to managerial effort.²⁷ A number of empirical studies provide support for the notion that competition promotes productivity.²⁸ Therefore, there are solid theoretical and empirical foundations for why we observe a significant positive impact of consumer good imports on Korean productivity.

Griliches (1992) offers a theoretical basis for the paper's finding of significant positive TFP effects of imports of capital goods and imports from developed countries. Griliches introduces the distinction between embodied and disembodied technological spillovers. Embodied technological spillovers refer to knowledge and technology flows that arise directly from flows of goods and services between firms. Griliches argues that such spillovers can arise from either some kind of learning—pure spillovers—or the ability to reap the rents derived by the technological activities of other firms—rent spillovers. More specifically, rent spillovers are positive externalities that arise when the value of inputs exceeds the cost of inputs. The buying firm thus captures some of the rent associated with the technology of the imported good. Pure spillovers are positive externalities that arise from the dissemination of various competencies as well as knowledge in general. Technological spillovers are by no means limited to a specific country and can spread across borders. Indeed a number of empirical studies confirm the importance of international technological spillovers as a source of TFP growth.²⁹ The findings for Korea lend further support to such evidence.

With regard to the trade-growth nexus, the broad thrust of the results from the TFP growth equations is that exports do not cause growth but imports have a significant positive impact on growth. To check for the sensitivity of the empirical results to the specification of economic growth, TFP growth is replaced with GDP growth. Although the results for the TFP growth regression indicate that exports do not contribute significantly to TFP growth, this does not necessarily mean that exports are not beneficial for a developing country, as pointed out earlier. In particular, exports allow an economy to realize economies of scale and provide it with foreign exchange, both of which act as catalysts for capital accumulation and thus more rapid economic growth. That is, exports may contribute to growth through capital deepening in East Asia. This is in fact the viewpoint of the accumulationists, who assert that East Asian growth was mostly input-driven rather than productivity-driven. In short, exports may not cause TFP growth but nonetheless bring about economic growth through capital deepening. Therefore, it is worthwhile to run GDP growth regressions to examine the role of exports in the Korean economy.

Table 6 reports the coefficient estimates for the GDP growth regressions. The results of the GDP and TFP growth regressions are broad. In particular, they both indicate that imports in general and consumer imports in particular benefit growth. Imports as a whole (IMP) and consumer-goods imports (CIMP) have a significant positive impact on GDP growth. In addition, all import components have positive effects on GDP growth, but their significances falls in two cases. Specifically, imports from developed countries (DIMP) and capital-goods imports (KIMP) become insignificant. Thus, the technological transfer effects of imports are not as strong for GDP growth as they are for TFP growth. The overall impact of exports seems to be greater for GDP growth than for TFP growth since all export coefficient signs become positive except in Model 10. However, the export coefficients are

²⁶ See, for example, Nalebuff and Stiglitz (1983).

²⁷ See, for example, Willig (1987).

²⁸ See Okada (2005), Nickel (1996), and Nickel et al. (1997), among others.

²⁹ Such studies include Coe and Helpman (1995), Keller (2000), Grunfeld (2002), and Chuang and Hsu (2004).

still all insignificant except in Model 8. The results thus still fail to directly support the export-led growth hypothesis. All the R&D coefficients are insignificant for GDP growth, although they were significant for TFP growth. Finally, all the government spending coefficients are insignificant and negative except in Model 9.

TABLE 6
COEFFICIENT ESTIMATES OF GDP GROWTH EQUATION FOR KOREA, 1988Q1–2003Q3

INDEPENDENT VARIABLES	MODEL 7	MODEL 8	MODEL 9	MODEL 10	MODEL 11	MODEL 12
Intercept	0.010 (4.304)*	0.012 (2.657)*	0.012 (3.705)*	0.014 (3.096)*	0.013 (2.914)*	0.013 (2.911)*
LIMP	0.202 (7.216)*					
LRIMP		0.021 (0.884)				
LKIMP			0.041 (1.723)			
LCIMP				0.129 (3.212)*		
LDIMP					0.043 (1.342)	
LOIMP						0.041 (1.378)
LEXP	0.026 (0.684)	0.109 (2.044) **	0.077 (1.445)	−0.038 (0.695)	0.085 (1.533)	0.087 (1.586)
LGOV	−0.098 (1.559)	−0.013 (0.100)	0.039 (0.467)	−0.030 (0.228)	−0.012 (0.095)	−0.037 (0.279)
LR&D	0.021 (0.955)	0.030 (0.917)	0.024 (0.789)	0.021 (0.670)	0.022 (0.550)	0.024 (0.597)
Dummy	−0.015 (3.041)*	−0.032 (4.677)*	−0.029 (4.367)*	−0.024 (3.351)*	−0.030 (4.209)*	−0.030 (4.416)*
\bar{R}^2	0.674	0.376	0.399	0.413	0.384	0.385
D.W.	2.089	1.839	1.971	1.987	1.923	1.878

*, ** and *** are statistically significant at the 1, 5 and 10% significance level, respectively.

DIMP means imports from developed G7 countries; OIMP means imports from other countries; RIMP means imports of raw materials; KIMP means capital goods; CIMP means consumer products; GOV means government consumption expenditure.

Note: Absolute values of t-statistics are in parentheses.

IV. CONCLUDING REMARKS

The existing empirical literature on the relationship between trade and economic growth in Korea focuses almost exclusively on the relationship between exports and growth. This is hardly surprising in light of the fact that Korea is very much part of the East Asian miracle, which was driven by export-oriented industrialization. The consequent neglect of the growth-promoting role of imports in the literature on East Asian growth is unfortunate because it reinforces a widespread prejudice among policymakers and general public that exports are beneficial and imports are harmful. Although such prejudice is global, it is perhaps stronger in the region, which has relied heavily on export-oriented industrialization to power its rapid growth.

At a broader level, the central empirical result is that imports have a significant positive effect on TFP. At a narrower level, the imports of consumer goods and capital goods have a significant positive impact on productivity whereas raw material imports do not. Imports from the developed G7 countries have a significant positive effect on productivity but imports from all other countries do not. These findings imply that the beneficial impact of imports stems not only from competitive pressures arising from the imports of consumer goods, but also from technological transfers embodied in the imports of capital goods from developed countries. The results significantly strengthen the case for why empirical analysis of the relationship between trade and growth should incorporate imports as well as exports, rather than just exports.

The paper's failure to find a significant positive effect of exports on productivity does not disprove the export-led growth hypothesis. Nevertheless, the apparent absence of an effect is puzzling given the central role of export-led industrialization in the East Asian miracle. To investigate the possibility that exports contribute to economic growth primarily by mobilizing capital and labor rather than by promoting productivity, TFP growth is replaced with GDP growth as the measure of economic growth, still, no effects were found for exports. However, it is possible that the effect of imports on productivity partly reflects the effect of exports on productivity, i.e., competing in foreign markets forces firms to become more efficient. Two important means of becoming more efficient are competing with foreign imports in domestic markets and absorbing advanced technology embodied in imported capital goods. That is, imports may enhance international competitiveness and hence export capacity.

The empirical findings have significant implications for policymakers. There is still a widespread philosophical tendency in Korea and East Asia to view exports as beneficial and imports as harmful. However, the findings clearly show that the notion of desirable exports and undesirable imports may be misguided and counterproductive. In the case of Korea, imports have a significant positive impact on productivity growth and hence economic growth. Imports can promote productivity by promoting both competition and adoption of advanced technology. The unmistakable implication for policymakers is that import liberalization can stimulate institutional and technological progress conducive to productivity growth. In light of this evidence from Korea, it is possible that import liberalization will bring about substantial benefits in the form of higher productivity and economic growth for other East Asian economies as well.

The two main limitations of the study stem from data limitations. First, industry-specific effects of trade on productivity could not be examined due to lack of Korean industry data. In fact, such data limitations prevented Lawrence and Weinstein (1999) from analyzing the imports–productivity relationship in Korean industries. This is unfortunate since imports influence an economy’s productivity through their impact on the productivity of firms and industries. Second, unavailability of pre-1980 data limits the analysis to the post-1980 period. Korea’s rapid growth and industrialization began well before 1980 and thus the analysis does not cover Korea’s transition from a low-income to a medium-income economy. This reduces somewhat the applicability of the policy implications for low-income economies.³⁰ An exciting area of future research is to examine the impact of imports on productivity in other East Asian countries so as to clarify the role of trade in the East Asian miracle.³¹

³⁰ On the other hand, intuitively there is no obvious reason why import-induced competition and technological progress should be any less beneficial for productivity in low-income economies.

³¹ Thangavelu and Rajaguru (2004) find that imports have a significant positive effect on labor productivity in a number of Asian economies.

APPENDIX

**GRANGER CAUSALITY TESTS FOR THE RELATIONSHIP BETWEEN
TRADE AND GDP GROWTH FOR KOREA, 1980Q1–2003Q3**

NULL HYPOTHESIS (H_0)	TEST STATISTICS (χ^2)	PROBABILITY	RESULTS
Bi-variate (VECM)			
•LIMP \nRightarrow •LGDP	13.36*	0.001	Reject
•LGDP \nRightarrow •LIMP	0.204	0.902	Do not reject
•LEXP \nRightarrow •LGDP	0.224	0.893	Do not reject
•LGDP \nRightarrow •LEXP	0.016	0.992	Do not reject
Tri-variate (VECM)			
•LIMP \nRightarrow •LGDP	11.68*	0.002	Reject
•LEXP \nRightarrow •LGDP	0.397	0.819	Do not reject
•LGDP \nRightarrow •LIMP	1.179	0.554	Do not reject
•LEXP \nRightarrow •LIMP	1.626	0.443	Do not reject
•LGDP \nRightarrow •LEXP	0.866	0.648	Do not reject
•LIMP \nRightarrow •LEXP	3.330	0.189	Do not reject
Tri-variate (VAR)			
LIMP \nRightarrow LGDP	16.98*	0.000	Reject
LEXP \nRightarrow LGDP	0.056	0.972	Do not reject
LGDP \nRightarrow LIMP	7.611*	0.022	Reject
LEXP \nRightarrow LIMP	0.787	0.674	Do not reject
LGDP \nRightarrow LEXP	0.123	0.940	Do not reject
LIMP \nRightarrow LEXP	0.865	0.648	Do not reject

LGDP means log of GDP, LEXP means log of exports, LIMP means log of imports.

Note: Test statistics are Wald statistics, and test results denote if the test rejects the null at the 5% significance level.

REFERENCES

- Bahmani-Oskooee, M., and J. Alse. 1993. "Export Growth and Economic Growth: An Application of Cointegration and Error Correction Modeling." *Journal of Developing Areas* 27:535–32.
- Bahmani-Oskooee, M., and G. Shabsigh. 1991. "Exports, Growth and Causality in LDCs: A Re-Examination." *Journal of Development Economics* 36:405–15.
- Balassa, B. 1978. "Exports and Economic Growth." *Journal of Development Economics* 23:181–89.
- Baldwin, R. 2003. Openness and Growth: What's the Empirical Relationship? NBER Working Paper No. 9578, National Bureau of Economic Research, Cambridge.
- Ball, L., and R. Moffitt. 2001. Productivity Growth and the Phillips Curve. NBER Working Paper No. 8421, National Bureau of Economic Research, Cambridge.
- Basu, S., and M. Kimball. 1997. Cyclical Productivity with Unobserved Input Variation. NBER Working Paper No. 5915, National Bureau of Economic Research, Cambridge.
- Bernard, A., and J. Jensen. 1999a. "Exceptional Exporter Performance: Cause, Effect or Both?" *Journal of International Economics* 47:1–26.
- _____. 1999b. "Exporting and Productivity." Yale University. Processed.
- Bonelli, R. 1992. "Growth and Productivity in Brazilian Industries: Impacts of Trade Orientation." *Journal of Development Economics* 39:85–109.
- Chen, E. 1997. "The Total Factor Productivity Debate: Determinants of Economic Growth in East Asia." *Asian-Pacific Economic Literature* 10:18–38.
- Choi, Y. 2002. "Exports and Growth: An Empirical Investigation in Korea." *Quarterly Economic Analysis* 8:3–75.
- Chow, P. 1987. "Causality between Export Growth and Industrial Development: Empirical Evidence from the NICs." *Journal of Development Economics* 26:55–63.
- Chuang, Y., and P. Hsu. 2004. "FDI, Trade and Spillover Efficiency: Evidence from China's Manufacturing Sector." *Applied Economics* 36:1103–15.
- Clerides, S., S. Lach, and J. Tybout. 1998. "Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico and Morocco." *Quarterly Journal of Economics* 103:903–47.
- Coe, D., and E. Helpman. 1995. "International R&D Spillovers." *European Economic Review* 39:859–87.
- Darrat, A. 1986. "Trade and Development: The Asian Experience." *Cato Journal* 6:695–99.
- Dodaro, S. 1993. "Exports and Growth: A Reconsideration of Causality." *Journal of Development Economics* 27:227–44.
- Dutt, S., and D. Ghosh. 1996. "The Export Growth-Economic Growth Nexus: A Causality Analysis." *Journal of Developing Areas* 30:167–81.
- Edwards, S. 1993. "Openness, Trade Liberalization and Growth in Developing Countries." *Journal of Economic Literature* 31:1358–93.
- Gokcekus, O. 1997. "Trade Liberalization and Productivity Growth: New Evidence from the Turkish Rubber Industry." *Applied Economics* 29:639–45.
- Greenaway, D., and D. Sapsford. 1994. "What Does Liberalization Do for Exports and Growth?" *Weltwirtschaftliches Archiv* 130:152–74.
- Griliches, Z. 1992. "The Search for R&D Spillovers." *Scandinavian Journal of Economics* 94s:29s–47s.
- Grossman, G., and E. Helpman. 1991. *Innovation and Growth in the Global Economy*. Cambridge: MIT Press.
- Grunfeld, L. 2002. International R&D Spillovers and the Effect of Absorptive Capacity: An Empirical Study. NUI Working Paper No.630, Norwegian Institute of International Affairs, Oslo.
- Haddad, M., J. De Melo, and B. Horton. 1996. "Trade Liberalization, Exports and Industrial Performance." In M. Roberts and J. Tybout, eds., *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity and Market Structure*. Washington, DC: Oxford University Press.
- Hall, R. 1989. Temporal Agglomeration. NBER Working Paper No. 3143, National Bureau of Economic Research, Cambridge.

- Helpman, E., and P. Krugman. 1985. *Market Structure and Foreign Trade*. Cambridge: MIT Press.
- Hsiao, M. 1987. "Tests of Causality and Exogeneity between Exports and Economic Growth: The Case of Asian NICs." *Journal of Economic Development* 12:143–59.
- Jin, J. 1995. "Export-Led Growth and the Four Little Dragons." *Journal of International Trade and Economic Development* 4:203–15.
- Jin, J., and E. Yu. 1996. "Export-led Growth and the U.S. Economy: Another Look." *Applied Economic Letters* 3:341–44.
- Jung, W., and P. Marshall. 1985. "Exports, Growth and Causality in Developing Countries." *Journal of Development Economics* 18:1–12.
- Keller, W. 2000. "Do Trade Patterns and Technology Flows Affect Productivity Growth?" *World Bank Economic Review* 14:17–47.
- Kim, S., and H. Lim. 2004. "Does Solow Residual for Korea Reflect Pure Technology Shocks?" Paper presented at the Far Eastern Meeting of the Econometric Society (FEMES), 1 July, Seoul.
- Krueger, A. 1980. "Trade Policy as an Input to Development." *American Economic Review* 70(2):288–92.
- Kunst, R., and D. Marin. 1989. "On Exports and Productivity: A Causal Analysis Study." *Review of Economics and Statistics* 71:699–703.
- Kwiatkowski, D., P. Phillips, P. Schmidt, and Y. Shin, 1992. "Testing the Null Hypothesis of Stationarity against the Alternative of Unit Root: How Sure are We that Economic Time Series have a Unit Root?" *Journal of Econometrics* 54(3):159–78.
- Lawrence, R. 1999. "Does a Kick in the Pants Get You Going or Does It just Hurt? The Impact of International Competition on Technological Change in US Manufacturing." In R. Feenstra, ed., *Globalization and Wages*. Chicago: University of Chicago Press.
- Lawrence, R., and D. Weinstein. 1999. Trade and Growth: Import-led or Export-led? Evidence from Japan and Korea. NBER Working Paper No. 7264, National Bureau of Economic Research, Cambridge.
- Mankiw, G. 1989. "Real Business Cycles: A New Keynesian Perspective." *Journal of Economic Perspectives* 3:79–90.
- McKinnon, R. 1964. "Foreign Exchange Constraint in Economic Development and Efficient Aid Allocation." *Economic Journal* 74:388–409.
- Muendler, M. A. 2004. Trade, Technology and Productivity: A Study of Brazilian Manufacturers 1986–98. CESIFO Working Paper No. 1148, Ifo Institute for Economic Research, Munich.
- Nalebuff, B., and J. Stiglitz. 1983. "Prizes and Incentives: Towards a General Theory of Compensation and Competition." *Bell Journal of Economics* 14:21–43.
- Nickel, S. 1996. "Competition and Corporate Performance." *Journal of Political Economy* 104:724–46.
- Nickel, S., D. Nicolitsas, and N. Dryden. 1997. "What Makes Firms Perform Well?" *European Economic Review* 41:783–96.
- Nishimizu, M., and S. Robinson. 1982. "Trade Policies and Productivity Change in Semi-Industrialized Countries." *Journal of Development Economics* 16:177–206.
- Okada, Y. 2005. Competition and Productivity in Japanese Manufacturing Industries. NBER Working Paper No. 11540, National Bureau of Economic Research, Cambridge.
- Osterwald-Lenum, M. 1992. "A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Rank Test Statistics." *Oxford Bulletin of Economics and Statistics* 54:461–71.
- Pavcnik, N. 2000. Trade Liberalization, Exit and Productivity Improvement: Evidence from Chilean Plants. NBER Working Paper No. 7852, National Bureau of Economic Research, Cambridge.
- Pyo, H. 2003. "Estimates of Capital Stock by Industries and Types of Goods in Korea (1953–2000)." *Panel for Korean Economic Analysis* 9:203–74.
- Shan, J., and F. Sun. 1998. "On the Export-Led Growth Hypothesis: The Econometric Evidence from China." *Applied Economics* 30:1055–65.
- Sims, C. A. 1980. "Macroeconomics and Reality." *Econometrica* 48:1–48.
- Sjoeholm, F. 1999. "Exports, Imports and Productivity: Results from Indonesian Establishment Data." *World Development* 27:705–15.

- Thangavelu, S., and G. Rajaguru. 2004. "Is There an Export or Import-Led Productivity Growth in Rapidly Developing Asian Countries? A Multivariate VAR Analysis." *Applied Economics* 36:1083–93.
- Tybout, J. 2000. "Manufacturing Firms in Developing Countries." *Journal of Economic Literature* 38:11–44.
- Weinhold, D., and J. Rauch. 1997. Openness, Specialization and Productivity Growth in Less Developed Countries. NBER Working Paper No. 6131, National Bureau of Economic Research, Cambridge.
- Willig, R. 1987. "Corporate Governance and Market Structure." In A. Razin and E. Sadka, eds., *Economic Policy in Theory and Practice*. London: Macmillan.
- World Bank. 1993. *The East Asian Miracle, Economic Growth and Public Policy*. New York: Oxford University Press.
- Xu, Z. 1996. "On the Causality between Export Growth and GDP Growth: An Empirical Reinvestigation." *Review of International Economics* 4:172–84.
- Yean, T. 1997. "Determinants of Productivity Growth in the Malaysian Manufacturing Sector." *ASEAN Economic Bulletin* 13:333–43.

About the Paper

Sangho Kim, Hyunjoon Lim, and Donghyun Park write that while exports have long been recognized as an integral ingredient of the East Asian miracle, there has been a notable lack of research on the growth-promoting potential of imports. Empirical evidence from Republic of Korea suggests that under certain circumstances imports can promote economic growth by fostering total factor productivity growth. The analysis implies that imports seem to have contributed to higher productivity by unleashing competitive pressures in domestic markets as well as by expanding the access of domestic producers to advanced technology from industrialized countries.

About the Asian Development Bank

ADB aims to improve the welfare of the people in the Asia and Pacific region, particularly the nearly 1.9 billion who live on less than \$2 a day. Despite many success stories, the region remains home to two thirds of the world's poor. ADB is a multilateral development finance institution owned by 67 members, 48 from the region and 19 from other parts of the globe. ADB's vision is a region free of poverty. Its mission is to help its developing member countries reduce poverty and improve their quality of life.

ADB's main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance. ADB's annual lending volume is typically about \$6 billion, with technical assistance usually totaling about \$180 million a year.

ADB's headquarters is in Manila. It has 26 offices around the world and more than 2,000 employees from over 50 countries.

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org/economics
ISSN: 1655-5252
Publication Stock No. 100607



Printed in the Philippines