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Does International Trade Cause Economic Growth? A Survey

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1. INTRODUCTION

THE effects of international trade on economic growth remain an area of protracted controversy in both theoretical and empirical research. The contemporary paradigms of theory have been characterised by a lack of consensus: the 'neoclassical trade' theory supports, while the 'neoclassical growth' theory does not recognise; and the 'new trade' theory is dubious, while the 'new growth' theory supports the positive effects of trade on output and growth. Mixed support is reinforced by mixed empirical evidence. The time-series models testing non-causality, and cross-section and panel data models examining the macroeconomic cross-country and microeconomic firm (industry) level effects commonly support positive and significant effects of trade on output and growth; the evidence is, however, not unambiguous. Rodriguez and Rodrik (2000) raise sceptical concerns on the strength of the argument for the beneficial effects of trade. An archival analysis and the historical evidence suggest that trade openness and growth were not correlated during the interwar period; were negatively correlated a century ago (Foreman-Peck, 1995; O'Rourke and Williamson, 1999; Vamvakidis, 2002); and became significantly correlated only in recent decades (Vamvakidis, 2002; Clemens and Williamson, 2004).

Emerging evidence pioneered by Rose (2004a, 2004b; 2005a, 2005b), casts a dubious note on the efficacy of GATT/WTO in promoting world trade and reducing trade volatility. It suggests that the insiders trade at no higher levels than the outsiders. Such evidence in the wake of avowed recognition for the contributions of GATT/WTO in spurring multilateral free trade marks a puzzle in open economy macroeconomics. While a few studies have attempted to

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resolve the 'Rose Paradox' and support the significant role of GATT/WTO in spurring world trade (Subramanian and Shang-Jin, 2007; Tomz et al., 2007), the controversy remains unsettled. Rose (2007) argues that the preferential trade agreements and protectionist tariffs still hamper any real progress by the WTO to foster free trade. The GATT/WTO remains surrounded by a multitude of preferential trade agreements (PTAs) that are non-discriminatory for members, but discriminatory against non-members. The PTAs have proliferated exponentially and spurred several studies evaluating binary choices and examining their effects on the trade and welfare of non-members of the bloc, level of Pareto-efficient multilateral free trade and welfare, and the enforcement of WTO agreements. An issue that remains centre stage is whether the PTAs supplement or supplant the multilateral trading system and, thus, have the 'trade creation' and 'building block' or the 'trade diversion' and 'stumbling block' effects. While several studies support the 'trade creation' and 'building block' effects (Baldwin, 1993, 1995; Ethier, 1998; Laird, 1999; Clausing, 2001; Glick and Rose, 2002; Lee et al., 2008), a parallel counterstrand raises apprehensive concerns and contrarily postulates the 'trade diversion' and 'stumbling block' effects of PTAs (Bhagwati, 1991; Panagariya, 1996; Bagwell and Staiger, 1998; Bhagwati et al., 1998; Karacaovali and Limão, 2008).

Several factors seem catalytic to the variance in empirical findings and unresolved controversies on the gains of trade, the role of GATT/WTO in world trade, and the effects of PTAs on multilateral cooperation and trade, such as the differences in the sample periods and sample countries covered, frequency of data used, measures of trade openness employed, model specifications estimated, and the test statistics used for testing the null. The estimating econometric methodology has itself been evolving and so have been the conclusions of empirical research. A number of studies have reviewed the trade–growth empirics and assessed the associated methodological and measurement issues (Edwards, 1993, 1998; Girma et al., 2004; Lopez, 2005; Greenaway and Kneller, 2007a; Wagner, 2007). While the studies by Edwards (1993, 1998) asymmetrically focus on the macroeconomic aspects of the trade–growth nexus and pre-date the microeconomic research that spurted since the mid-1990s, the studies by Girma et al. (2004), Greenaway and Kneller (2007a) and Wagner (2007) provide a distinctively exclusive focus on the microeconomic aspects of the effects of trade on firm-level efficiency and productivity. The study by Lopez (2005) attempts to reconcile the microeconomic and macroeconomic evidence, but it bypasses the analysis of several methodological issues concerning the trade–growth relationship. Temple (1999) provides a more generic review of the macroeconomic sources of growth, and dwells very sparsely on the specific issues surrounding the trade–growth empirics.

This study surveys the literature on the relationship between trade and growth and differs from previous research on two counts. First, it provides an extensive account of the macroeconomic and microeconomic evidence, and distils the debate on the gains of trade from a comprehensively wider and diverse domain. The review of empirical evidence is juxtaposed with the policy issues concerning protectionism versus trade liberalisation, and an analytical account is undertaken of the role of GATT/WTO in spurring multilateral trade. Second, the study undertakes an in-depth analysis of the methodological and measurement issues. Such an analysis is particularly essential to gauge the depth of empirical support and determine the strength of the argument for the gains of trade. The study is organised as follows. Section 2 reviews the macroeconomic and microeconomic evidence. Section 3 dwells on the policy debate on protectionism versus trade liberalisation, and examines the role of the GATT/WTO in fostering free trade. Section 4 presents a critical account of the methodological and measurement issues surrounding the trade–growth empirics. Section 5 sums up the conclusions emerging from the study.

2. TRADE AND GROWTH: THE EMPIRICAL EVIDENCE

The empirical literature on trade–growth relationships can be classified into two broad strands of studies: one using time-series models and assessing mainly the demand-driven effects, and the second estimating cross-section and panel data models and examining mostly the supply-induced investment and productivity effects of trade on output and economic growth.

a. Trade–Growth Non-causality: The Time-series Models: The testing of non-causality and the implied 'export-led growth' versus 'growth-led export' hypothesis marks one of the major areas of time-series research on trade and growth. Most studies conducted in the 1960s and 1970s performed unconditional correlation and static regression analyses (Emery, 1967; Maizels, 1968; Kravis, 1970; Voivodas, 1973), and examined the demand-driven role of trade in affecting income and growth. Nurkse (1961) postulated that trade served as the 'engine of growth' for a number of developed countries in the nineteenth century, but he was pessimistic about its similar role for the developing countries in the twentieth century. Kravis (1970) examines growth in the nineteenth century and for the 1950s and the 1960s for the developing countries, and raises concerns about Nurkse's argument. He instead asserts that growth was mainly the consequence of favourable internal factors, and the external demand represented an added stimulus, which varied in importance from country to country and period

to period.[1] Kravis (1970) postulates that a more generally applicable metaphor would be to describe trade expansion as the 'handmaiden' of successful growth, rather than as an autonomous 'engine of growth'. The unconditional correlation and static regression analyses of the 1950s and 1960s are beset with several snags and limitations. The correlation does not imply causality and it does not control for the effects of several conditioning factors on growth. Similarly, the standard regression models assume all regressors to be exogenous, and predict unidirectional causality from trade to income and growth. These models, *a priori*, preclude the possibility of feedback effects and do not provide any information on the plausible reverse-causation from growth to trade. The development of non-causality tests since the late 1960s (Granger, 1969; Sims, 1980) facilitated the analysis of feedback effects, and spurred several studies testing non-causality and assessing the 'export-led growth' versus 'growth-led export' hypothesis.

The conventional strand of research estimating static models in levels, and the dynamic models in (normally) first-differences remained dominant until the late 1980s (Michaely, 1977; Balassa, 1978; Heller and Porter, 1978; Jung and Marshall, 1985; Chow, 1987). The *ex post* recognition of the limitations of time-series econometric models (since the 1980s) suggests that the studies estimating the long-run models in levels did not test stationarity and I(d), where $d > 0$, properties of the model series, while those estimating the dynamic models in first-differences ignored the possible long-run relationship among the level variables. It is likely that some or all of the variables in a model are individually I(d) and, in such cases, regressing an I(d) variable on one or more I(d) variables leads to a 'spurious regression' problem and complicates the statistical inference.[2] The

[1] Kravis (1970) argues that trade is one among many factors affecting growth and, as such, it is unlikely to be a dominant variable in many instances. The exaggeration of the past role of trade has often served to heighten the contrast drawn with allegedly less favourable world markets, and, thus, to minimise the potential role of trade for the developing countries. The term 'engine of growth' is not generally descriptive and involves expectations which cannot be fulfilled by trade alone (Kravis, 1970).

[2] The classical econometrics indeed suggests differencing the I(d) variables d times to make them I(0) and stationary. The difference-stationary variables can be used to estimate the model and the standard asymptotic distribution can be used to draw statistical inferences. The differencing of data, however, results in a loss of long-run information and it precludes the possibility of estimating a steady-state relationship among the level variables. While the models estimated on I(0) series did resolve the problem of non-stationarity, these models could capture only the short-run and ignored the possible long-run relationship relevant for the steady-state analysis of economic growth. The causality in these models could arise from purely short-run dynamics. Granger (1988) shows that in a cointegrated I(1) process, the simple dynamic model suffers from a misspecification problem and the standard causality tests are not valid. The exclusion of error correction terms from the dynamic model results in a model misspecification. The failure of classical methodology to provide statistical inference in the models estimated on non-stationary data in levels and that to model long-run relationship in the models estimated on stationary data in differences, led to a paradigm shift in estimating methodology marked by the development of cointegration estimators and error correction models (ECMs) since the late 1980s.

strand of studies testing non-causality based on dynamic models with I(0) series did not unequivocally differentiate between the 'short'- and 'long'-run relationship and thus ended-up assessing mainly the short-run business cycle, rather than the long-run steady-state, relationship between trade and growth.

The late 1980s marked the development of more efficient cointegration estimators and error correction models (ECMs), which fashioned a new approach to the analysis of the trade–growth nexus. The ECMs resolve the 'spurious regression' problem without losing long-run information, and are useful for distinguishing between the steady-state equilibrium and short-run dynamic relationship between trade and growth. Most studies conducted since the 1990s have used the cointegration estimators and estimated ECMs to re-assess the relationship between trade and growth (Table 1). The methodological evolution and the shifting paradigms of econometric modelling have been two of the key factors catalytic to the variance in empirical findings and unresolved controversies: some studies support the 'export-led growth' hypothesis (Emery, 1967; Maizels, 1968; Voivodas, 1973; Michaely, 1977; Balassa, 1978; Heller and Porter, 1978; Williamson, 1978; Fajana, 1979; Tyler, 1981; Feder, 1982; Balassa, 1984; Kavoussi, 1984; Jung and Marshall, 1985; Ram, 1987; Moschos, 1989; Greenaway and Sapsford, 1994; Bodman, 1996; Henriques and Sadorsky, 1996); some provide only limited support to the 'export-led growth' hypothesis (Chow, 1987; Chen, 1990; Kugler, 1991; Boltho, 1996); and yet some others yield mixed results (Nishimizu and Robinson, 1984; Kunst and Marin, 1989; Tybout, 1992; Oxley, 1993).

b. Productivity Effects of Trade on Growth: The Cross-section and Panel Data Models

(i) Macroeconomic cross-country models

The time-series studies testing non-causality mainly focus on the Keynesian demand-driven role of trade in affecting income and growth. A parallel strand of studies using a cross-section, and more recently panel data (since the 1990s), approach examines the productivity and supply-side effects of trade on output and growth, traversing through the accumulation of capital and TFP parameter of production technology. Krueger (1978) and Bhagwati (1978, 1988) postulate the productivity effects of trade and argue that the liberal trade regimes encourage specialisation in industries having scale economies and lead to an increase in efficiency and productivity in the long run. In the case of non-OPEC and middle-income developing countries, Tyler (1981) shows that an increase in manufacturing exports leads to the increase in technological progress. Feder (1982) estimates separate production functions for the export and non-export sectors and finds a significant externality effect and high factor productivity differentials. He argues that the productivity differentials across

sectors can be due to various factors including a more competitive environment in which the export sector operates. The studies using Feder's model show the positive and significant relationship between exports and growth (Balassa, 1985; Ram, 1987). Chenery (1983) conducts a comprehensive study covering Western European and North American countries with high growth of TFP relative to growth of factor inputs, East Asian semi-industrialised countries with outward-orientation and high growth of both productivity and factor inputs, and middle-income developing countries with more inward-orientation and low growth of productivity relative to growth of factor inputs. He finds that the higher productivity growth observed in the East Asian semi-industrialised countries reinforces the favourable effects of outward orientation on productivity. Nishimizu and Robinson (1984) find similar evidence for Japan, Korea, Turkey and Yugoslavia, and suggest that export expansion leads to higher TFP growth through economies of scale and competitive incentives, while import substitution leads to lower TFP growth.

The post-neoclassical endogenous theory of economic growth (Romer, 1986, 1990; Lucas, 1988) provided a more nuanced focus on the productivity effects of trade, and added an additional dimension examining trade-induced convergence in income per capita and growth across countries. Several studies have since suggested positive and significant effects of trade on productivity and growth, and shown that openness to trade induces convergence in income per capita and TFP across countries (Dollar, 1992; Ben-David, 1993, 1996; Sachs and Warner, 1995; Harrison, 1996; Edwards, 1998; Vamvakidis, 1999; Alcala and Ciccone, 2004). Ben-David (1996) shows that trade reduces the income gaps among countries; a majority of trade-based country groups witness significant convergence. The trade leads to an increase in productivity and growth by providing a wider range of intermediate inputs (Grossman and Helpman, 1991; Rivera-Batiz and Romer, 1991a, 1991b) and facilitating an international diffusion of technology (Benhabib and Spiegel, 1994; Parente and Prescott, 1994; Coe and Helpman, 1995; Eaton and Kortum, 1994, 1996). Alcala and Ciccone (2004) show the economically significant and statistically robust positive effects of trade on TFP. The technology is developed and produced in the inventing country and is then exported and diffused for use as an intermediate input in other countries (Coe and Helpman, 1995). Eaton and Kortum (1996) develop a model of innovations and international diffusion of technology to explain the relative productivity and growth among the OECD countries. Relative productivity depends on the ability of a country to innovate or adopt a new technology, and they predict that each country will eventually grow at the same rate.

TFP in developed countries is higher than that in the developing countries, and the barriers to trade reduce TFP (Parente and Prescott, 1999; Schor, 2004; Berthold and Teixeira, 2005; Schmitz, 2005). Parente and Prescott (1999) argue that insider groups in developing countries have stronger monopoly rights than

TABLE 1
Effects of International Trade on Productivity and Economic Growth: Macroeconomic Evidence

Author (Year)	*Data and Sample*	*Economic Growth*	*Openness*	*Other Variables*	*Methodology and Estimators*	*Main Results and Conclusions*
Emery (1967)	Cross-section, 50 countries (average of 1953–63).	GNP.	Exports.	Current account.	OLS.	Support for export growth hypothesis.
Maizels (1968)	Time-series, 1950–62, 9 countries.	GDP.	Exports.	None.	OLS.	Support for export growth hypothesis.
Voivodas (1973)	Cross-section, 22 countries; 1956–67.	GDP growth.	Export share.	Country dummies.	OLS.	Support for export growth hypothesis.
Michaely (1977)	Cross-section, 41 countries (average of 1950–73).	Per capita GNP growth.	Growth in export share.	None.	Rank correlation.	Support for export growth hypothesis. Threshold effect.
Balassa (1978)	Cross-section, 11 countries; (average of 1960–66 and 1966–73).	GNP growth.	Export growth, Real export growth.	Labour force, Domestic investment and Foreign investment/ output.	Rank correlation, OLS, Production function.	Support for export growth hypothesis.
Heller and Porter (1978)	Cross-section, 41 countries (average of 1950–73).	Per capita GNP growth.	Growth in export share.	None.	Rank correlation.	Support for export growth hypothesis. Threshold effect.
Williamson (1978)	Cross-section, 22 countries (average of 1960–74).	Change in GDP.	Lagged exports.	Country dummies, Direct investment, Other foreign capital.	OLS, Linear models.	Support for export growth hypothesis.
Fajana (1979)	Time-series, 1954–74, 1 country.	GDP growth.	Export share, Export change/ output.	Trade balance, Current account.	OLS.	Support for export growth hypothesis.
Tyler (1981)	Cross-section, 55 countries.	GDP growth.	Export growth.	Labour force, Investment growth.	OLS, Production function.	Support for export growth hypothesis. Threshold effect.
Feder (1982)	Cross-section, 31 semi-industrialised countries; 1964–73 (average).	GDP growth.	Export growth, Export change/ output.	Labour force, Investment/ Output.	OLS.	Support for export growth hypothesis. Positive externality from export sector to non-export sector.
Balassa (1984)	Cross-section, 10 countries.	GNP growth.	Export growth.	Labour force growth, Ratio of output to domestic investment.	OLS, Production function.	Support for export growth hypothesis.
Kavoussi (1984)	Cross-section, 73 countries.	GDP growth.	Export growth.	Labour growth rate, Capital growth rate.	Rank correlation, OLS, Production function.	Support for export growth hypothesis. Threshold effect.
Nishimizu and Robinson (1984)	4 countries, Annual data; Korea (1960–77); Turkey (1963–76); Yugoslavia (1965–78); Japan (1955–73). Industry-based analysis.	TFP growth by industry (manufacturing industries).	Output growth allocated to export expansion; Output growth allocated to import substitution.	–	OLS.	Import substitution regimes seem to be negatively correlated with TFP change, whereas export expansion regimes are positively correlated with TFP change.

TABLE 1 Continued

Balassa (1985)	Cross-section, 43 developing countries; Annual data: 1973–79 (after oil shock).	GNP growth.	Export growth, Ratio of exports to GNP, Share of manufactured goods in total exports (all in real terms).	Labour force growth, Saving rate, GNP per capita, Current account balances as a percentage of GNP, Investment.	OLS.	Significant positive effects of trade orientation on economic growth.
Jung and Marshall (1985)	Time-series, 1950–81, 37 countries.	Real GNP (or GDP) growth.	Lagged real export growth.	Lagged GNP (GDP) growth.	Maximum-likelihood simultaneous linear functions, granger-causality test.	Limited support for export growth causing economic growth.
Chow (1987)	Cross-section and Time series, Annual data: 1960–84, 8 Asian NICs.	Growth rate of manufacturing output.	Growth rate of manufacturing exports.	None.	Sims-causality test.	No causality for Argentina, uni-directional causality for Mexico, and bidirectional causality for remaining sample.
Ram (1987)	Time-series and Cross-section, 73 countries, 1960–72 (before oil shock) and 1973–82 (after oil shock).	Real GDP growth.	Real export growth.	Labour force growth, Investment growth.	Production function, OLS, Test for hetero-scedasticity and specification bias.	Support for export growth hypothesis. Threshold effect.
Kohli and Singh (1989)	30 countries (same sample as in Feder (1982) excluding Taiwan), 1960–70 and 1970–81 (averages).	Growth rate of GDP.	Growth rate of exports, Growth rate of exports multiplied by the share of exports in GDP.	Share of Investment in GDP, Growth rate of labour.	OLS.	Support for positive and significant effects of exports on growth.
Kunst and Marin (1989)	Time-series, 1965.2–85.4, 1 country (Austria).	GDP of OECD.	Manufactured exports.	Productivity (output per employee in manufacturing sector), Terms of trade.	Unrestricted VAR and Subset Model Autoregression.	Support for productivity growth causes exports.
Moschos (1989)	Cross-section.	Real GDP growth.	Real export growth.	Labour force growth, Real domestic investment growth.	OLS, Production function.	Support for export growth hypothesis. Threshold effect.
Chen (1990)	Time-series, 1968–82, 1 country (Taiwan).	Growth in TFP and growth in output in manufacturing sector.	Growth in exports in manufacturing sector.	None.	Correlation, Rank correlation, OLS regression.	Limited support for the effect of export growth on productivity growth.
Kugler (1991)	Time-series, quarterly data: 1970–1987; 6 countries.	Real GDP.	Real exports.	Total private consumption, Gross fixed business investment.	Johansen Cointegration test.	Weak support for export-led growth hypothesis: in two countries. In remaining four, no cointegrating relationship.

TABLE 1 Continued

Bonelli (1992)	1 country, Cross-section, 1975–85; Sectoral annual data for 22 industries.	Total factor productivity.	Export, Import.	None.	Cross-section regressions, OLS, Demand-side decomposition of growth.	Positive association between export expansion and TFP growth. TFP growth is explained by variables related to export expansion and import change.
Dollar (1992)	95 LDCs, 1976–85.	Per capita GDP growth.	Index of openness based on weighted average of distortions and variability of real exchange rate.	Investment rate, Real exchange rate variability, Index of real exchange rate distortion.	OLS, Cross-section regressions.	Trade increases per capita GDP growth. Outward-orientation is highly correlated with per capita GDP growth. Significant, negative relationship between distortion in real exchange rate and growth of per capita GDP.
Edwards (1992)	Cross-section, developing countries and developed and developing countries; 1960–82.	Growth of real GDP per capita.	Deviation from predicted trade, Nine indicators of trade orientation.	Ratio of gross investment to GDP, Proxies for knowledge gap, Human capital, Government expenditure, Political instability.	OLS, Production function.	Significant positive effects of trade on growth. More open economies tend to grow faster than economies with trade distortions.
Marin (1992)	4 OECD industrialised countries; Time series: 1960:1 to 1987:2.	Labour productivity (manufacturing output per employee).	Export of manufacturing goods.	Terms of trade for manufacturing goods, OECD output at constant prices.	VAR model, Cointegration tests, Error correction model; Granger-causality tests.	Support for export-led growth hypothesis. Exports Granger-cause productivity in all four countries.
Tybout (1992)	4 countries; 1976–88.	TFP.	Import substitution.	–	Cross-section, Production function.	Trade orientation affects productivity. No clear link between trade policies and patterns of entry and exit.
Knight et al. (1993)	Panel data: 98 countries comprising 22 industrial OECD countries and 76 developing countries; 1960–85.	Real GDP per worker.	'Closedness' proxied by weighted average of tariff rates.	Real GDP per worker, Average growth rate of working-age population. Technological progress and real investment to real GDP, Human capital investment to GDP, Public infrastructure.	Panel data estimation, Seemingly Unrelated Regressions estimator.	A high tariff structure discourages imports of capital goods and leads to less technology transfer. Coefficient on 'Closedness' is negative and highly significant.

TABLE 1 Continued

Lee (1993)	Cross-section: 1960–85 and 81 countries, 21 industrial and 60 developing.	Growth of real GDP per capita.	Import-weighted average tariff rate, Black market exchange rate premium, Share of total imports in GDP and estimate of openness.	Secondary school enrolment rate, Ratio of real domestic investment to real GDP.	OLS, Neoclassical model, Cross-country regressions.	Trade distortions generate cross-country divergences in growth rates and per capita income. Tariff rates and black market premia interacting with estimated share of imports, have significant negative effects on the growth rate of per capita income.
Oxley (1993)	Time-series, Annual data: 1833–85, 1 country: Portugal.	Real GDP (at 1914 prices).	Real exports (at 1914 prices).	None.	Granger-causality tests, Johansen Cointegration tests and Error correction model.	No support for export-led growth hypothesis. Evidence of reverse causality.
Greenaway and Sapsford (1994)	Time-series (1957–85) and Cross-section (1960–88), 104 countries, 1960–88.	Real GDP growth, Real GDP per capita and Real GDP per worker.	Growth rates of export shares in GDP, i.e. Ratio of exports to GDP.	None.	OLS regression, DF and ADF Unit root tests, White test, CUSUM and CUSUMSQ.	Statistically significant effect of export share growth on real per capita GDP growth. Threshold effect.
Harrison (1994)	Côte d'Ivoire. Time-series and Cross-section, Annual data: Sample firms aggregated into 9 sectors; 1979–87.	Firm-level capital productivity and Total factor productivity.	Tariff rates, Import penetration, and TFP comparison before and after trade reforms (1985).	Market power across sector as measured by price–cost margins.	OLS, Instrumental variable (IV) estimator; Generalised Least Squares, TFP growth.	Positive association between trade policies and higher productivity growth. Productivity growth four times higher in less protected sectors.
Harrison and Revenga (1995)	United States; Four-digit manufacturing sub-sector; Annual data: 1958 and 1984.	Sector-specific real output.	Import competition, Export shares.	Labour, Material inputs, Energy consumption, Capital stock, R&D expenditure, Rate of Unionisation.	Modified production function.	Higher import competition associated with productivity increases. Export activity positively associated with productivity growth. No significant association between import competition and productivity growth.

TABLE 1 Continued

Sachs and Warner (1995)	135 countries, 1970–89; Sub-sample: 117, 81, 79, 78 and 33 countries.	Real annual per capita growth in GDP over 1970–89.	Openness dummies; using: Average tariff, Non-tariff barriers, State monopoly on major exports, and Black market premiums.	Real GDP per capita, School enrolment rate, Ratio of government consumption to GDP, Deviation of investment price level from cross-country mean, and political and social factors.	Cross-section regressions, OLS.	High and robust coefficient on openness dummy in growth regression. Protectionist trade policies reduce overall growth. Openness raises investment to GDP ratio.
Bodman (1996)	Time-series: Quarterly data: 1960:1–1995:4; 2 countries: Australia and Canada.	Labour productivity.	Exports.	None.	Cointegration and Granger-causality tests.	Support for export-led growth hypothesis. Reverse causality from productivity to exports is rejected for both countries.
Boltho (1996)	Time-series: Japan, Annual data, 1885–1913: (i) 1913–37; (ii) 1952–73; and (iii) 1973–1990. Macroeconomic and Microeconomic analysis.	GDP growth and Output growth.	Export growth and Shares of import and export.	None.	Granger-causality, OLS regression.	No support for export-led growth hypothesis. Support for growth-led export hypothesis.
Eaton and Kortum (1996)	Cross-section, 19 OECD countries; 1986–88 (average).	Technology diffusion: Productivity measured in terms of real GDP per worker.	Share of imports in GDP.	Human capital, Distance between countries, Dummy to capture country differences, Research efforts.	OLS, 2SLS, NLLS and Generalised Non-linear Least Squares.	Each country will grow at the same rate, with relative productivity determined by ability to adopt new inventions. Ability to tap into the sources of invention depends on human capital, trade relationships and proximity to sources of innovation.
Frankel and Romer (1996)	Cross-country, 150 countries and a sub-sample of 98 countries; 1985.	Per capita income.	Exports plus Imports as a ratio to GDP.	Population, Area, Real investment to GDP; Working-age population in secondary school, Initial per capita income.	Cross-country income regressions; OLS, IV estimator.	Significant effect of trade on income. Openness to trade raises income.

TABLE 1 Continued

Harrison (1996)	Cross-section and Panel data. Countries vary from 17 to 51. 1960–87 and 1978–88. Annual data.	Real GDP growth, Share of investment in GDP.	Seven different proxies for trade openness and policy.	Capital stock, Years of primary and secondary education, Labour, Human capital, Land.	General production function, Spearman rank correlation, OLS, Cross-section and Panel data models.	Half of the measures do exhibit a robust relationship with GDP growth. The choice of time period is critical. A generally positive association between growth and different measures of openness. Bidirectional causality between openness and growth.
Henriques and Sadorsky (1996)	Time-series, (i) 1877–1945; (ii) 1946–91; and (iii) 1877–1991; Canada.	Real GDP.	Real exports.	Real terms of trade.	VAR, Cointegration and Granger-causality tests.	Support for growth-led export hypothesis. No evidence for export-led growth hypothesis.
Riezman et al. (1996)	Time-series, 126 countries; 1950–90.	Real GDP.	Exports, Imports.	Human capital growth, Investment growth.	Granger-causality, Forecast Error Variance Decomposition.	Unidirectional causality from exports growth to income growth in 30 countries and from income growth to exports growth in 25 countries. Bidirectional causality in 65 countries.
Edwards (1998)	Panel data for 1960–90; 93 advanced and developing countries.	Total factor productivity growth.	Nine indices of trade policy.	Initial GDP per capita, Initial human capital.	Weighted least squares, Instrumental weighted least squares.	More open countries experience faster productivity growth.
Frankel and Romer (1999)	Cross-section: 150 countries. 1985. Sub-sample: 98 countries (averages).	Income per person.	Actual trade share, Constructed trade share. Distance, Relative country size, Dummies for a common border and being landlocked.	Two country size measures: Population and Land area.	OLS, IV estimator.	Statistically and economically significant relationship between trade and income.
O'Rourke (2000)	10 developed countries, 1875–1914.	Growth of real GDP per capita.	Average tariff rate.	Saving rate, School enrolment. Population. Change of capital–labour and land–labour ratios. Deviation of output. Country and time dummies.	Conditional and Unconditional convergence models, Factor accumulation models, Panel data estimation.	Tariffs were positively correlated with growth during 1875–1914. Tariffs boosted late nineteenth century growth.

TABLE 1 Continued

Rodriguez and Rodrik (2000)	Review of Key studies	Growth of real GDP per capita: 1970–89 and 1976–85; TFP growth: 1980–90; Income per person in 1985.	Openness indicators with alternative definitions and weighting.	Same as used in the reviewed studies and some additional variables.	OLS, 2SLS, Weighted least squares, IV estimator, Sensitivity analysis.	Sceptical concerns on the strength of beneficial effects of trade on growth, and contend the view that integration into the world economy is such a potent force for economic growth.
Easterly and Levine (2001)	Panel data: 73 countries; 1960–95.	Real per capita GDP growth.	Ratio of exports plus imports to GDP.	Initial income per capita, Years of schooling, Inflation, Government consumption, Black market exchange rate premium, Financial intermediary credit.	Generalised Method of Moments (GMM) Dynamic panel estimator.	TFP residual, rather than factor accumulation, accounts for most of the cross-country and cross-time variations in income and growth. Openness and black market exchange rate premium significantly correlated with economic growth.
Lane (2001)	Cross-section: 71 low- and middle-income debtor countries; 1970–95.	Net resource inflows, to GDP.	Trade ratio adjusted for cross-country differences in trade policies; geography-based measure of natural openness.	Initial GDP per capita, Government consumption, Country size (population), Trade shocks, Inflation rate.	Numerical simulations and Empirical estimates. Cross-section regressions, OLS.	Open economies exhibit greater debt to output ratios. External liabilities to output positively associated with trade openness. Trade not only has direct effects on allocation and growth, but also promotes convergence.
Wacziarg (2001; 1998)	Panel data: 57 countries; 1970–89.	Per capita GDP growth.	Two trade policy indices.	Price distortions, Government consumption, Manufactured exports, Investment rate, FDI, Macro policy quality.	Correlation, Simultaneous equation model, 3SLS, Seemingly Unrelated Regressions estimator.	Positive impact of openness on growth. Enhanced technology transmission and improvements in macroeconomic policy account for smaller effects.
Irwin and Tervio (2002)	Pre-World War I, Inter-war, Great Depression, Early Post-war, Later Post-war. Countries vary each year.	GDP per capita.	Trade to GDP ratio. Bilateral trade.	Distance, Population, Area.	OLS, 2SLS, IV estimator.	Positive effects of trade on growth. Countries that trade more as a proportion of their GDP have higher incomes even after controlling for the endogeneity of trade.

TABLE 1 Continued

Vamvakidis (2002)	Historical data: Countries vary in different time periods.	Growth of GDP per capita.	Six proxies for openness to trade.	Investment to GDP, School enrolment, Population, Inflation, Black market premium, Illiteracy rate.	Cross-country growth regressions, OLS, Spearman rank correlation.	No correlation between openness and growth between 1870 and 1970, with the exception of the interwar period. Positive correlation between openness and growth during 1970–90.
Awokuse (2003)	Time-series, Canada; Quarterly data: 1960:1 to 2000:4.	Real GDP.	Real exports.	Real terms of trade, manufacturing employment, capital formation, industrial production.	Johansen Cointegration test, Granger-causality with VECM.	Long-run relationship among model variables, and unidirectional Granger-causality from exports to GDP. Support for export-led growth hypothesis in both short run and long run.
Dollar and Kraay (2003)	Cross-country: Number of countries vary; 1970s to the 1990s.	Growth of real GDP per capita.	Share of trade in GDP, Decadal changes in trade volume.	Measures of institutional quality and market size.	Cross-section regressions, OLS, IV estimator.	Joint role of trade and institutions in the long run, larger role for trade over shorter horizons. Both trade and institutions are important in differences in growth rates in the very long run.
Alcala and Ciccone (2004)	Cross-section: 138 countries.	GDP per worker in PPP US$; TFP.	Imports plus exports relative to purchasing power parity GDP.	Population, Area, Institutional quality.	OLS, 2SLS.	Trade has a significant and robust positive effect on productivity.
Clemens and Williamson (2004)	35 countries, 1865–1996. Sample sizes vary depending on the years.	Growth in real GDP per capita.	Average tariff rate.	School enrolment, Railway density, Primary products exports, Energy consumption, Average trading partner tariff and real GDP growth, Distance to trading partners.	Panel data estimation, Cross-section regressions, OLS, IV estimator.	High tariffs associated with fast growth before World War II, and associated with slow growth thereafter. Increase in own tariffs after 1950 hurt or at least did not help growth.

TABLE 1 Continued

Dollar and Kraay (2004)	Approximately 100 countries; 1980s and 1990s.	Per capita income in bottom quintile, Annual growth of per capita GDP (average).	Ratio of exports plus imports to GDP.	Initial income, Contract-intensive money, Government consumption, Inflation, Revolutions, Commercial bank assets, Rule of law.	Panel data estimation, OLS, IV estimator.	No relationship between changes in trade volumes and changes in inequality. Increase in growth rates that accompanies expanded trade, translates into proportionate increases in income of the poor. Open trade regimes lead to faster growth and poverty reduction.
Lee et al. (2004)	Approximately 100 countries; 1961–2000.	Growth of real GDP per capita.	Imports and exports to GDP, Tariff index, Black market premium.	Initial GDP per capita, Investment to GDP, Inflation, M2 to GDP, Population, Education, Age dependency.	Panel data estimation, Identification through hetero-scedasticity, GMM, OLS.	Openness has a positive effect on growth, even when controlling for the effect from growth to openness.
Rodrik et al. (2004)	Cross-section, 137 countries.	GDP per capita in 1995 on PPP basis.	Integration, Predicted trade share.	Geography, Settler mortality, Institutions, English and any European language, Regional dummies. Land area, Population.	OLS, IV estimator, Sensitivity analysis.	Quality of institutions 'trumps' everything. Once institutions are controlled for, conventional measures of geography have at best weak direct effects: trade is almost always insignificant.
Felbermayr (2005)	Panel data: 108 countries; 1960–99 (five-year averages).	Per capita output.	Trade share.	Lagged output, Secondary schooling, Investment, Population.	OLS, IV estimator, Pooled 2SLS regression, System-GMM estimator.	Support for strong effect of trade on income.
Konya (2006)	24 OECD countries; Annual data: 1960–97.	Real GDP.	Real exports of goods and services, Openness.	None.	Panel-data based on SUR systems, Bivariate and Trivariate Granger- causality tests.	Support for: one-way causality from exports to GDP in some; one-way causality from GDP to exports in others; two-way causality between exports and growth in a few; and no causality in either direction for a few.
Awokuse (2007)	Time-series, Three Transition economies; Quarterly data.	Real GDP, Real GDP growth.	Real exports, Real imports.	Gross capital formation, Labour force.	Johansen Cointegration test, ECM, Granger-causality test.	Support for both export-led growth and growth-led export.

TABLE 1 Continued

Awokuse and Christopoulos (2009)	Time series, 5 industrialised countries.	Real GDP growth. Real exports.	Real terms of trade, manufacturing employment, gross capital formation, and industrial production index.	Causality tests Linear VAR model and Non-linear multivariate STAR (LSTAR and ESTAR) estimations.	Non-linear Granger-causality tests provide support for the validity of 'export-led growth' in some, and growth-led export hypothesis in others.

Notes:
GDP stands for Gross Domestic Product; GNP: Gross National Product; Govt.: Government; TFP: Total Factor Productivity; R&D: Research and Development expenditure; FDI: Foreign Direct Investment; PPP: Purchasing Power Parity; DCs: Developed Countries; LDCs: Less Developed Countries; SICs: Semi-industrialised Countries; NICs: Newly Industrialised Countries; OECD: Organisation for Economic Co-operation and Development; EC: European Community; OLS: Ordinary Least Squares; 2SLS: Two-stage Least Squares; IV: Instrumental Variables; 3SLS: Three-stage Least Squares; NLLS: Non-linear Least Squares; SUR: Seemingly Unrelated Regressions; DF: Dickey–Fuller; ADF: Augmented Dickey–Fuller; VAR: Vector Autoregression; ECM: Error Correction Model; VECM: Vector Error Correction Model; GMM: Generalised Method of Moments; STAR: Smooth Transition Autoregression; ESTAR: Exponential Smooth Transition Autoregression; and LSTAR: and Logistic Smooth Transition Autoregression.

those in developed countries, and these reduce TFP. Schor (2004) shows that tariffs on inputs have a negative marginal effect on productivity and that, along with higher competition, new access to better inputs contributes to productivity gains after liberalisation. Berthold and Teixeira (2005) examine the effects of trade barriers on TFP in the presence of insider groups and monopoly rights in import-competing industries, and show that these industries use inefficient technology which adversely affects efficiency and productivity. Low productivity in developing countries affects product quality and reduces competitiveness in international markets. Frankel and Romer (1996) show significant effects of trade on income and argue that openness raises income both by inducing factor accumulation and increasing output. Landlocked countries and regions are geographically disadvantaged and likely to trade less, compared to countries and regions with their own seaports. Frankel and Romer (1999) re-assess the issue and examine the effects of geography using a gravity model. They find a statistically and economically significant relationship between trade and income.

Empirical evidence could be sensitive to the measures of openness. Some studies use multi-measures of openness (Levine and Renelt, 1992; Lee, 1993, 1995; Sachs and Warner, 1995; Baldwin and Seghezza, 1996; Harrison, 1996; Edwards, 1998; Wacziarg, 2001; Vamvakidis, 2002; Lee et al., 2004; Rodrik et al., 2004) (Table 1). Levine and Renelt (1992) use trade volumes, black market premium, real exchange rate index and the Leamer index, and find no robust and consistent evidence for the positive relationship between openness and long-run growth. They instead find a positive and robust correlation between growth and share of investment in GDP, and between investment share and ratio of trade to GDP. This implies that the favourable effects of trade traverse through capital

accumulation, rather than a more efficient allocation of resources. Trade policies are important insofar as these policies facilitate the access to investment goods and encourage the accumulation of capital.

Several studies have shown that trade fosters growth through its favourable effects on investment and capital stock (Lee, 1995; Baldwin and Seghezza, 1996; Frankel and Romer, 1996; Wacziarg, 2001). Baldwin and Seghezza (1996) argue that trade induces investment, as the traded goods sector is relatively more capital intensive than the non-traded sector, investment goods require imported intermediate inputs, and competition in international markets lowers the price of capital. Wacziarg (2001) finds that the rate of physical capital accumulation explains 46 to 63 per cent of the impact of trade policy on growth, and openness affects growth mainly by raising the ratio of domestic investment to GDP. Harrison and Revenga (1995) use three measures of trade orientation – export plus import as a share of GDP, average level of tariffs, and adjusted dollar index – to capture the extent of distortions in a country's relative prices of tradables. They examine the link between trade policies and foreign investment flows, and argue that trade reforms have been accompanied by significant increases in investment inflows. Harrison (1996) uses seven measures of openness and finds that only one positively affects growth when cross-section data are employed; three reveal a positive association with growth when data are averaged over five-year periods; and six measures are significant. Greenaway et al. (1998) use several measures of liberalisation and find liberalisation and openness do impact favourably on growth of GDP per capita. Edwards (1998) uses a set of nine indices of trade policy and finds that more open countries experience faster productivity growth; the results are robust to the use of openness indicator, estimation technique, time period, and functional form.

An archival analysis and historical evidence suggest that openness and growth were not correlated during the interwar period; were negatively correlated a century ago (Foreman-Peck, 1995; O'Rourke and Williamson, 1999; Vamvakidis, 2002); and became significantly correlated only in recent decades (Vamvakidis, 2002; Clemens and Williamson, 2004). Foreman-Peck (1995) examines the effect of tariffs on the level of output per capita for 18 European countries (1860–1910), and finds that tariffs were negatively related to output per capita. O'Rourke (2000) uses a different sample and shows tariffs were instead positively correlated with growth during 1875–1914. Clemens and Williamson (2001) find that the positive relationship between openness and growth was reversed for a number of countries in the period prior to 1950. Irwin (2002) examines the correlation between tariffs and growth in the late nineteenth century and argues that correlation does not establish a causal relationship. Vamvakidis (2002) uses data from 1870 onwards and employs six proxies of openness, and finds no support for a positive growth–openness

connection before 1970; in fact, the correlation is negative for the period 1920–40. He argues that the positive correlation between openness and growth is only a recent phenomenon.

(ii) Microeconomic firm-level models

The strand of studies following the microeconomic approach examine the effects of trade on the firm- or industry-level X-efficiency and productivity. While a number of studies show favourable effects (Condon et al., 1985; Chen, 1990), some find little or no correlation between openness measures (exports, imports, tariffs and quotas) and productivity (Tybout and Westbrook, 1995). Katrak (1997) finds a positive, though weak, relationship between technology imports and firm-level R&D. The degree and extent to which foreign technology imports encourage domestic R&D depends on the availability of technological skills and infrastructure in the domestic economy. Keller (2000) uses industry-level data for machinery goods imports and productivity for eight OECD countries (1970–91), and finds that countries benefit more from domestic R&D than from the R&D of the average foreign country.[3] Keller (2002) further reinforces these results and shows strong productivity effects from both own R&D spending and R&D conducted elsewhere. The R&D in industry itself contributes about 50 per cent, R&D in other domestic industries about 30 per cent, and R&D in foreign industries about 20 per cent of the increase in productivity. Singh (2003) examines the effects of exports on productivity and growth and tests the export-induced convergence in 10 manufacturing industries in India. The effects of exports on TFP are significant in half of the sample industries, while in the remaining half these are statistically insignificant.

The mid-1990s marked the development of a distinct strand of research based on micro-theoretic models, and provided new dimensions to the transmission channels. These models draw on the industry dynamics models, which show a systematic relationship between 'entry and exit' and firm-level productivity differentials (Jovanovic, 1982; Hopenhayn, 1992; Ericson and Pakes, 1995). The micro-theoretic models disregard the assumption of representative firms underlying most traditional models based on the Heckscher–Ohlin framework, and instead consider intra-sectoral heterogeneity in productivity and export behaviour as arising from the 'entry and exit' decisions of firms in the export market. The plant-level heterogeneity within the same industry potentially induces the reshuffling of resources and reallocation of market shares from less efficient to more efficient firms, and leads to the improvements in productivity. These studies use longitudinal data and test two mutually-reinforcing hypotheses to explain the

[3] The import composition of a country matters only if it is strongly biased toward or away from technological leaders. The differences in technology inflows related to the pattern of imports explain about 20 per cent of the total variations in productivity growth.

higher productivity and X-efficiency of exporters as compared to non-exporters: *self-selection* or *market-selection* hypothesis and the *learning-by-exporting* hypothesis. The *self-selection* hypothesis suggests the causal effects of firm-level productivity on exports, while the *learning-by-exporting* hypothesis shows the feedback and learning effects of exports on firm-level productivity.

The *self-selection* hypothesis postulates that the firms with exogenously determined high levels of productivity self-select themselves into the export markets, and this hypothesis builds on two propositions. First, the firms entering the export market incur higher irreversible sunk costs as compared to firms operating in the domestic market and, therefore, the initial productivity levels for the export-oriented firms need to be higher than the domestic-oriented firms (Roberts and Tybout, 1997; Bernard and Jensen, 1999; Bernard and Wagner, 1997, 2001; Isgut, 2001; Delgado et al., 2002; Melitz, 2003).[4] Second, firms entering a foreign market are exposed to more intense competition than firms in a domestic market. Such competition in export markets provides fewer opportunities to inefficient firms (Aw and Hwang, 1995; Delgado et al., 2002).[5] The export markets, thus, select the most productive and efficient firms from among potential entrants. It is only the productive and above-average firms that are likely to cope with sunk costs and face fierce competition abroad, and self-select themselves into the foreign export market. The patterns of entry, survival and exit in the export market are related to the firm-level productivity differentials. Melitz (2003) uses a dynamic industry model with heterogeneous firms and shows that the exposure to trade will induce only more productive firms to enter export markets (while some less productive firms continue to produce only for domestic markets) and will simultaneously force the least productive firms to exit.[6] Feenstra (2006) argues that the gains from trade in monopolistic competition models arise from three sources: (i) price reductions due to increasing returns to scale; (ii) increased product variety available to consumers; and (iii) self-selection of firms with only the most efficient firms surviving after liberalisation.

The *learning-by-exporting* hypothesis, which is analogous to the *learning-by-doing* model of Arrow (1962), suggests that internationalisation is a catalytic

[4] Tybout (2000) argues that in developing countries: (i) markets tolerate inefficient firms, so the cross-firm productivity dispersion is high; (ii) small groups of entrenched oligopolists exploit monopoly power in product markets; and (iii) many small firms are unable or unwilling to grow, so important scale economies go unexploited. He draws on firm-level studies to assess these conjectures and finds none to be systematically supported.

[5] Even if the competitive pressures in domestic and export markets are similar, the differences in sunk entry costs explain the productivity differentials between exporters and domestic-oriented firms (Delgado et al., 2002).

[6] Melitz (2003) argues that the firms with different productivity levels co-exist in an industry because each firm faces an initial uncertainty concerning its productivity before making an irreversible investment to enter the industry. Entry into export markets is also costly, but the firm's decision to export occurs after it gains the knowledge of its productivity.

source of technological innovations and managerial inputs for the exporting firms.[7] Several studies find support for the learning effects of exports, such as Clerides et al. (1998) for Colombia, Mexico and Morocco; Kraay (1999) for China; Aw et al. (2000) for Taiwan (but not for South Korea); Castellani (2002) for Italy; Delgado et al. (2002) for Spain; Mengistae and Patillo (2004) for Kenya, Ghana and Ethiopia; Bigsten et al. (2004) for four Sub-Saharan African countries; and Girma et al. (2004) for Great Britain. Clerides et al. (1998) find strong evidence for the self-selection mechanism, but no evidence for learning effects from exporting in Colombia, Mexico and Morocco. Aw et al. (2000) find support for learning-by-exporting in Taiwan, but not in South Korea. The newly exporting firms in Taiwan outperform the non-exporting firms before entry into the export market and, in some industries, the exporting firms show productivity improvements after their entry into the export market. In the case of Korea, the correlation between exporting and firm productivity is somewhat weak. Delgado et al. (2002) examine the TFP differences between exporting and non-exporting Spanish manufacturing firms (1991–96).[8] They find significant evidence for self-selection, but insignificant evidence for learning effects; the learning effects become significant only when the sample is restricted to young firms. For German manufacturing firms, Arnold and Hussinger (2005) show Granger-causality from TFP to exporting and not vice versa. Castellani (2002) observes that only the firms with very high exposure to export markets experience learning effects and not the firms below this threshold export intensity. Van Biesebroeck (2005) supports both self-selection and learning-by-exporting hypotheses in nine African countries. A study conducted by the International Study Group on Exports and Productivity (2008) for 14 countries finds that the exporters are more productive than non-exporters when observed and unobserved heterogeneity is controlled for, and these exporter productivity premia tend to increase with the share of exports in total sales.

The learning effects are likely to be more pronounced in trade between countries with wider technological gaps (such as trade between developed and developing countries), rather than in trade between countries with similar technologies (such as trade among developed countries or among developing countries). In self-selection hypothesis, the exporting firms are exogenously more

[7] The interaction of export-oriented domestic firms with foreign clients and competitors engenders positive learning effects. The exporting firms accumulate experience and knowledge and are systematically more productive and close to the efficiency frontier than the domestic-oriented non-exporting firms. The exporting is viewed as a learning process and it improves the productivity premium of exporting firms.

[8] Delgado et al. (2002) argue that the productivity distribution of exporters should stochastically dominate the productivity distribution of non-exporters in the period prior to their entry into the export market. On the exit side of the export market, the productivity distribution of continuing exporters stochastically dominates the distribution of exiting exporters. In the presence of learning-by-exporting effects, the differences between productivity levels for exporting and non-exporting firms should increase after the entry of exporters in the export market.

productive from the outset, and exporting contributes to productivity only when the productivity premium of already productive firms improves after their entry into the export market. The studies supporting the *self-selection* hypothesis numerically overwhelm the studies supporting the *learning-by-exporting* hypothesis, and this implicitly provides a stronger support for the effects of productivity and growth on trade as compared to the effects of trade on productivity and growth (Table 2). Rodriguez and Rodrik (2000) review the studies by Dollar (1992), Ben-David (1993), Lee (1993), Sachs and Warner (1995), Harrison (1996), Edwards (1998), Frankel and Romer (1999) and Wacziarg (2001; 1998), and raise sceptical concerns on the strength of the argument for the beneficial effects of trade. They argue that 'these papers … find little evidence that firms derive technological or other benefits from exporting per se; the more common pattern is that efficient producers tend to self-select into export markets. In other words, causality seems to go from productivity to exports, not vice versa' (Rodriguez and Rodrik, 2000, p. 317).

3. PROTECTIONISM VERSUS TRADE LIBERALISATION: A TALE OF TWO PARADIGMS

a. Protectionism and Barriers to Trade: Recognition for the 'gains of trade' paradoxically co-exists with the preferences for 'barriers to trade' and passion for protectionism. Developing countries, until the 1980s, have been sceptical about the gains of free trade, and many pursued protectionist and import-substituting industrialisation policies. Several factors seem catalytic to the support for trade barriers, such as: (i) infant-industry protection; (ii) export-pessimism arising from the apprehensions of adverse terms of trade in the developing countries (Singer, 1950; Nurkse, 1958; Prebisch, 1959);[9] (iii) disbelief in the market mechanism that stemmed from the Great Depression and failure of the *laissez-faire* system; (iv) concerns regarding the decline in real wages and displacement of workers from jobs due to the increased foreign competition engendered by trade liberalisation (Krueger, 2004); and (v) the plausible adverse effects of trade on environmental quality.

[9] Singer (1950), Nurkse (1958) and Prebisch (1959) provide a theoretical and generalised argument for the poor export performance of the developing countries, and suggest that, as a result of the low income and price elasticities of demand for primary commodities, the developing countries specialising in the production and export of these commodities have experienced steady and long-run deterioration in terms of trade. In conjunction with low demand elasticities, the increased supplies lead to the reduction in prices of primary commodities relative to the prices of manufactured goods imported by the developing countries. Nurkse (1958) argues that, as a result of both relatively low income elasticities of demand and the increased substitution of synthetic material for raw material in the production of manufactured goods in the developed countries, the primary exports are confronted with a stagnant world demand.

TABLE 2
Effects of International Trade on Productivity and Economic Growth: Microeconomic Evidence

Author (Year)	*Country*	*Sample*	*Methodology and Estimators*	*Main Results and Conclusions*
Aw and Hwang (1995)	Taiwan	2,832 Firms, 1986.	Translog production function, Cross-section.	Support for SS; Higher productivity of exporters; No support for LE.
Bernard and Wagner (1997)	Germany	7,624 Firms, 1978–92.	Panel data.	Support for SS. Exporting firms have higher productivity.
Roberts and Tybout (1997)	Colombia	Manufacturing plants in four major exporting industries.	Panel data, Dynamic Probit Model, Method of Simulated Moments and Maximum-Likelihood.	Sunk costs are significant, and prior export experience increases the probability of exporting. Plants that are large, old and owned by corporations are all more likely to export.
Clerides et al. (1998)	Colombia, Mexico and Morocco	2,800 Firms; 1981–91, 1986–90 and 1984–91.	FIML of cost function; Panel data.	Exporting firms are more efficient; Quitters are less productive; No support for LE in Colombia and Mexico; Support for SS and LE in some Moroccan industries; Spillover effects from exporters to non-exporters.
Bernard and Jensen (1999)	USA	50,000–60,000 Firms; 1984–92. Sub-samples: 1984–88 and 1989–92.	Panel data.	Support for SS. Exporting firms have higher productivity. No support for LE.
Kraay (1999)	China	2,105 Firms; 1988–92.	Dynamic panel data.	Exporting firms have higher productivity; Support for LE in established exporters.
Aw et al. (2000)	Korea, Taiwan (China)	Korea: 39,022 to 88,864 Firms. Taiwan: 88,000 to 100,000 Firms.	Cross-section.	Support for SS; No support for LE in Korea. LE in some Taiwanese industries. Productivity is correlated less strongly with export market participation in Korea than in Taiwan.
Aw et al. (2001)	Taiwan	80,000 to 100,000 Firms; Sample period: 1981, 1986 and 1991.	Panel data.	More productive firms, on average, survive and, in many cases, their productivity converges to older incumbents. Exiting firms are less productive than survivors. Productivity differential between entering and exiting firms is an important source of industry-level productivity growth.
Isgut (2001)	Colombia	6,454 Plants; 1981–91.	Panel data.	Support for SS. Does not rule out possibility that successful exporters learn from participation in export markets.
Castellani (2002)	Italy	2,898 Firms; 1989–94.	Cross-section.	Support for SS; LE in plants with high export orientation. Exporting firms have higher productivity.
Delgado et al. (2002)	Spain	1,766 Firms; 1991–96.	Non-parametric method.	Support for self-selection. Higher levels of productivity of exporting firms than non-exporting firms; Inconclusive evidence on LE.
Pavcnik (2002)	Chile	4,379 Plants; 1979–86.	Semi-parametric method; Panel data.	Within-plant productivity improvements can be attributed to liberalised trade in import-competing sector. In many cases, aggregate productivity improvements stem from reshuffling of resources from less to more efficient producers.
Wagner (2002)	Germany	353 Firms; 1978–89.	Panel data; Matching approach.	No support for LE. Support for positive effects of starting to export on growth of employment and wages; weaker evidence for a positive effect on labour productivity.

TABLE 2 Continued

Baldwin and Gu (2003)	Canada	236 Manufacturing industries (at four-digit 1980 SIC level); Four periods: 1974–79; 1979–84; 1984–90; and 1990–96.	Panel data, GMM; System GMM estimator.	Support for SS and LE. Among non-exporters, more productive ones and those whose productivity has recently been growing more rapidly expand into export markets and less productive remain non-exporters.
Girma et al. (2003)	UK	2,989 Firms; 1991–97.	Difference-in- Differences based on Matched Firms.	Temporary negative contemporaneous impact of exit on TFP, but more persistent and sizeable negative effects on output and employment trajectories.
Head and Ries (2003)	Japan	1,070 Firms; 1977–89.	Ordered regression.	Firms that invest abroad and export are more productive than firms that just export. Firms that export are larger than firms that serve domestic market, but both are smaller than firms that invest abroad as well as export.
Baldwin and Gu (2004)	Canada	19,142 Plants; 1984–90 and 1990–96.	Survey data and Difference regressions.	Support for SS and LE. Exporters tend to be the more innovative firms. Plants that enter into export markets increase investments in R&D and training. Entry into export market leads to an increase in number of advanced technologies, increases in foreign sourcing, and improvements in information available.
Bernard and Jensen (2004a)	USA	50,000–60,000 Plants; 1983–92.	Panel data: Unbalanced panel.	Support for SS. Exporting is associated with reallocation of resources from less to more efficient plants. Reallocation effects account for over 40 per cent of total TFP growth.
Bernard and Jensen (2004b)	USA	13,550 Plants; 1984–92.	Panel data; GMM estimator.	Entry and exit in export market is substantial, past exporters are apt to re-enter, and plants are likely to export in consecutive years. Entry costs are significant and spillovers from export activity negligible.
Bigsten et al. (2004)	Cameroon, Ghana, Kenya and Zimbabwe	289 Firms: (1991/93–1994/95).	Panel data; Maximum-likelihood and GMM.	Support for LE. Significant efficiency gains from exporting. Little direct evidence for self-selection.
Criscuolo et al. (2004)	UK	1980–2000.	Cross-section.	Productivity growth increased due to entry and exit. Share of productivity growth accounted for by entry and exit increased considerably from 1980s to 1990s. Globalisation and increased information and communication technology contribute to productivity growth.
Girma et al. (2004)	UK	8,992 Firms; 1988–99.	Panel data; Matching approach.	Support for SS and LE; Exporting involves sunk costs. Exporters are more productive and exporting further increases firm productivity.
Greenaway and Kneller (2004)	UK	11,225 Firms; 1989–2002.	Probit model.	Support for SS. Sunk costs are important, and firms have to become more productive to enter the export market. LE only in unmatched and not in matched sample.

TABLE 2 Continued

Greenaway et al. (2004)	UK	3,662 Firms; 1992–96.	Panel data.	Positive spillover effects from multinational enterprises on the decision to export and export propensity. Probability of domestic firms exporting positively influenced by intensity of foreign R&D expenditure, and relative importance of production and export activities of multinational enterprises.
Hansson and Lundin (2004)	Sweden	3,275 Firms; 1990–99.	Matching and Difference-in-Differences Analysis.	No TFP growth differentials for entrants into the export market.
Schor (2004)	Brazil	4,484 Firms; 1986–98.	Panel data.	Tariffs on inputs have negative effect on productivity. Higher competition, access to better inputs contributes to productivity gains.
Alvarez and López (2005)	Chile	Manufacturing Plants with 10 or more workers; 1990–96.	Probit Model, Panel data Model.	Plants that enter international markets show superior initial performance, consistent with self-selection. Existence of learning-by-exporting for entrants, but not for those that export continuously.
Arnold and Hussinger (2005)	Germany	389 Firms; 1999–2000.	Panel data, Probit model, Granger-causality, Matching.	Support for SS. No support for LE.
Greenaway et al. (2005)	Sweden	3,570 Firms; 1980–97.	Matching and Difference-in-Differences; Panel data.	No evidence of pre- or post-entry differences in firm-level productivity. Performance characteristics of exporters and non-exporters remarkably similar.
Ruane and Sutherland (2005)	Ireland	2,854 Firms; 1991–98.	Panel data.	Support for SS. Superior characteristics of exporters relative to non-exporters. No evidence that enterprises improve their performance after entry.
Van Biesebroeck (2005)	9 African countries	1,916 Firms, with approximately 200 in each country; 1992–96.	Panel data; GMM estimator.	Support for SS and LE. Exporting firms have higher productivity.
Bernard et al. (2006)	USA	Approximately 210,000 Plants in 337 manufacturing industries; 1987–97.	Panel data; OLS and Logistic Regressions.	Reallocation of economic activity towards high-productivity firms as trade costs fall. Evidence for productivity growth within firms in response to decreases in industry-level trade costs.
Fernandes (2007)	Colombia	Average of 6,474 Plants per year; 1977–91.	Panel data; OLS; GMM.	Liberalisation has positive impact on plant productivity. Impact is stronger for large plants and for plants in industries with less domestic competition.
Greenaway and Kneller (2007b)	UK	12,875 observations on domestic manufacturing firms.	Probit Model, Panel Difference-in-Differences.	Post-entry productivity growth of new export firms faster than non-export firms. Potential for learning varies across industries, depending upon the extent to which they are already exposed to international competition and where R&D intensity is already high.

TABLE 2 Continued

Greenaway et al. (2007c)	UK	9,292 manufacturing firms (total 51,668 annual observations); Of the 9,292 firms, 5,461 are continuous exporters (58.77 per cent) and 2,798 never exported (30.11 per cent); and 434 are starters (4.67 per cent); 1993–2003.	Pooled Probit Model, Random-effects Probit, Fixed effects, GMM, Dynamic Random-effects Probit and Dynamic GMM.	Exporters exhibit better financial health than non-exporters. Starters generally display low liquidity and high leverage. No evidence that firms enjoying better *ex ante* financial health are more likely to export, and strong evidence that participation in export markets improves firms' *ex post* financial health.
Alvarez and López (2008)	Chile	Manufacturing plants with 10 or more workers; 1990–99.	Olley and Pakes (1996) method to estimate productivity. Pooled regressions with OLS and IV estimators.	Domestic as well as foreign-owned exporting plants improve productivity of local suppliers. Higher exporting activity increases productivity of plants in domestic sector. No evidence of spillovers from exporters. Foreign-owned exporters generate positive productivity spillovers. Support for backward spillover effects from domestic exporters.
Andersson et al. (2008)	Sweden	Manufacturing firms with at least 10 employees. 56,957 firm-level observations; 1997–2004.	Panel data Model; GLS, IV and GMM estimations.	Support for selection operating from market to market. Productivity premiums increase in number of markets and number of products. Firms that both export and import are more productive.
Bellone et al. (2008)	France	23,000 Manufacturing firms with at least 20 employees; 1990–2002.	Non-parametric methodology to compute TFP, Pooled Regression.	Support for U-shaped productivity dynamics of new exporters. Pattern more pronounced for intensively exporting firms and firms operating in capital-intensive or high-technology sectors. Both self-selection and learning-to-export mechanisms prevail during the pre-entry period.
Fryges and Wagner (2008)	Germany	All establishments from mining and manufacturing industries that employ at least 20 persons or in company that owns the unit; 1995–2005.	Propensity Score, Dose–Response functions and Fractional Logit model; Pooled Regressions.	Support for causal effect exports on labour productivity growth, but only within a sub-interval of the range of firms' export–sales ratios. Evidence for time-varying causal relationship between labour productivity growth and the export–sales ratio.
Girma et al. (2008)	Great Britain and the Republic of Ireland	UK firms with fixed or current assets in excess of £150,000; 1996–2003. Irish Manufacturing plants with at least 10 employees; 2000–03.	Bivariate Probit Model; Maximum-likelihood and 3SLS estimators.	Previous exporting experience enhances innovative capacity of Irish firms and positive LE effects. No strong evidence for such direct effects for British firms.

TABLE 2 Continued

Greenaway and Kneller (2008a)	UK	11,225 manufacturing firms. Taking 1995 as representative, 66 per cent of firms exported; 1989–2002.	Probit Model, Propensity Score-matching and Difference-in-Differences.	Spillovers associated with agglomeration raise probability of export entry. Survival is driven partly by size and TFP and partly by industry characteristics. Exporters larger and have higher productivity. Regional and industry agglomeration relevant to successful entry. Firms receive a significant boost to productivity in the year they enter. Firms that exit are more likely to do so due to loss of market share than loss of productivity. Having a sales mix with a larger share of exports and being in activities with differentiated products offer some protection against exit.
Greenaway et al. (2008b)	Sweden	3,570 manufacturing firms with more than 50 employees; 1980–96.	TFP estimated using Olley and Pakes and Levinsohn and Petrin methodology, Multinominal Logit Regression.	Higher levels of international competition increase probability of exit by merger and closedown. If trade is more intra-industry in character, effect of import penetration on exit is less. Probability of exit by switching is higher in revealed comparative disadvantage industries. The geographical source of international competition is important. Structure of international competition matters indirectly as well directly.
International Study Group on Exports and Productivity (ISGEP) (2008)	14 countries	Sample varies across countries.	Country-by-Country Analysis using identically specified and estimated models; Pooled Regressions; Meta-Regression Analysis.	Exporters are more productive than non-exporters and exporter productivity premia tend to increase with the share of exports in total sales. Support for SS for less developed countries and for all European Union countries. Support for LE for only one out of 14 countries.
Serti and Tomasi (2008)	Italy	38,771 Manufacturing firms with employment of 20 units or more; 1989–97.	Semi-parametric technique to estimate productivity; Panel data model, OLS, Propensity Score Matching and Difference-in-Differences.	Support for self-selection and exporters outperform non-exporters. Firms serving foreign markets have higher productivity and are larger, more capital and skilled labour intensive, and more (labour) cost competitive. Heterogeneous post-entry effects with respect to characteristics.

Notes:
SS stands for self-selection or market-selection hypothesis; LE: learning-by-exporting hypothesis; R&D: Research and Development; SIC: Standard Industrial Classification; TFP: Total Factor Productivity; OLS: Ordinary Least Squares; 3SLS: Three-stage Least Squares; GLS: Generalised Least Squares; IV: Instrumental Variables; GMM: Generalised Method of Moments; and FIML: Full Information Maximum-likelihood.

A parallel counter-strand postulates protectionism as a myopically short-term development strategy in that it encourages X-inefficiency and leads to reduction in productivity and growth and rise in costs and prices. The *immiserising growth* model (Bhagwati, 1958, 1968) shows the possibilities of immiserising tariffs, where import protection leads to negative real growth. Krueger (2004) asserts that the job protection case for protectionism comes at the cost of increased inefficiency and higher prices for consumers, arising from the tariff and non-tariff

barriers. In contrast, trade liberalisation and free trade lead to the rapid and sustainable growth, rise in living standards and reduction in poverty (Krueger, 2004). Greenaway (2004) postulates that infrastructure investment and trade liberalisation, which reduce natural and man-made barriers, respectively, are good for growth. Copeland and Taylor (2004) review the literature on the effects of trade and growth on environment, and assert there is now a great deal of evidence supporting the view that rising incomes affect environmental quality in a positive way. The 'Environmental Kuznets Curve' hypothesises an inverse-U-shaped relationship between a country's per capita income and its level of environmental quality: increased incomes are associated with an increase in pollution in poor countries, but a decline in pollution in rich countries. If environmental quality is a normal good, then the increases in income brought about by trade or growth will both increase the demand for environmental quality and increase the ability of the governments to afford costly investments in environmental protection (Copeland and Taylor, 2004). Frankel and Rose (2005) examine the effects of trade on environment, and assert that there is little evidence that trade has a detrimental effect on environment.

b. Multilateral Trade Liberalisation and the Preferential Trade Agreements: The protectionism of the 1920s and 1930s and failure of multilateral attempts to foster a cooperative trade-policy environment led to the formation of the GATT in 1947, which was subsequently transformed into the WTO in January 1995. GATT/WTO emphasises the reduction or removal of tariff and non-tariff barriers to foster multilateral free trade in goods, services and capital. The World Bank and the IMF have the lending powers and, thus, are in a position to enforce liberalisation in (developing) countries seeking financial assistance, as compared to GATT/WTO that works on the principles of most favoured nations (MFNs) and reciprocal liberalisation. Irwin (1995) argues that the World Bank and IMF are the autonomous institutions that use lending power to affect economic policies of the member countries, as compared to GATT that has no autonomous power, independent leverage or financial sanction. Trade liberalisation remains a characteristic feature of the IMF loan conditionality for (developing) countries seeking financial assistance.

(i) GATT/WTO and the world trading system

The GATT/WTO prescribes the rules that govern the trade policy of the member countries and help foster multilateral free trade by: (i) facilitating the reduction or removal of trade restrictions;[10] (ii) resolving the *prisoners' dilemma*

[10] The 'prisoners' dilemma' problem in repeated Nash games on tariff agreements suggests that it is individually rational to impose and collectively rational to remove the tariffs.

that may arise in unilateral trade (tariff) policy in response to the adverse terms-of-trade (Bagwell and Staiger, 1999, 2002; Tomz et al., 2007), (iii) eliminating tariff wars and protectionism; (iv) resolving hegemonic and power asymmetries across negotiating partners; and (v) helping countries to coordinate on efficient outcomes. In Nash equilibrium, tariffs too high and trade volumes too low, and hence a trade agreement that facilitates a reciprocal reduction in Nash tariffs would be mutually beneficial (Bagwell and Staiger, 2002). The reciprocal reduction in trade barriers spurs higher trade, and MFN principle forbids member countries from pursuing discriminatory trade policies against one another (Panagariya, 1999). The rules-based approach reduces uncertainty and provides a guaranteed market access. It also helps alleviate *time-inconsistency* problems and policy reversals (Staiger and Tabellini, 1987; Maggi and Rodriguez-Clare, 1998; Tomz et al., 2007). Irwin (1995) argues that in spite of its small size and uncertain place as an economic institution, GATT's long-run impact on the world economy has been more significant than either that of the World Bank or the IMF.

While there has been a long-standing recognition and widely-held consensus on the substantive contributions of GATT/WTO to the promotion of world trade, the emerging evidence pioneered by Rose (2004a, 2004b; 2005a, 2005b) casts a sceptical note. It suggests that insiders trade at no higher levels than outsiders.[11] Rose (2004a) uses a gravity model of bilateral merchandise trade and a large panel dataset covering over 50 years and 175 countries, and estimates the effects of multilateral trade agreements – GATT/WTO and Generalised System of Preferences – on trade. He finds little evidence that the countries joining or belonging to GATT/WTO have different trade patterns from the outsiders. Using a comprehensive set of over 60 measures of trade policy, Rose (2004b) finds no support for the significant differentials in terms of tariff rates and other measures of trade policy between members and outsiders. Rose (2005a) then compares the effects of three multilateral organisations on trade: GATT/WTO, IMF and the Organisation for Economic Co-operation and Development (OECD) and its predecessor, the Organisation for European Economic Co-operation (OEEC). He finds that the membership in the OECD is consistently associated with a strong positive effect on trade, while the comparable evidence is weaker for GATT/WTO and especially the IMF.[12] Rose

[11] The GATT conducted eight 'rounds' of multilateral trade negotiations before it was subsumed by the World Trade Organization in 1995: Geneva (concluded in 1947), Annecy (1949), Torquay (1951), Geneva (1956), Dillon (1961), Kennedy (1967), Tokyo (1979), and Uruguay (1994) (Rose, 2004a).

[12] The effects of both IMF and GATT/WTO membership on trade are usually quite small (indeed, often negative). The exception is that the effects of GATT/WTO membership are positive when a fixed-effects estimator is employed: that is, *joining* the GATT/WTO is associated with a trade-creating effect, though simply *belonging* to it is not. The OECD, on the other hand, has a robustly positive effect on trade that is both economically and statistically significant (Rose, 2005a).

(2005b) further examines the effects of GATT/WTO on the stability and predictability of trade flows, and finds little evidence that membership in GATT/WTO has a significant dampening effect on the volatility.

The Rose evidence marks a puzzle in open economy macroeconomics. A few studies have attempted to resolve the 'Rose Paradox' and support the significant role of GATT/WTO in spurring world trade (Subramanian and Shang-Jin, 2007; Tomz et al., 2007). Subramanian and Shang-Jin (2007) argue that the GATT/WTO has served to increase world imports substantially, possibly by about 120 per cent of world trade. Tomz et al. (2007) suggest that grouping non-member participants with non-participants causes a substantial downward bias in the estimated effects of GATT membership. They argue that, when this misclassification is corrected, the agreement proved beneficial for both formal members and non-member participants, which traded at higher levels than the countries outside GATT. The GATT exerted a positive effect on trade in nearly all time periods and for most groups of countries (Tomz et al., 2007).

(ii) Preferential trade agreements (PTAs): The system of GATT/WTO remains surrounded by a multitude of economic integration and preferential trade agreements that are non-discriminatory for members, but discriminatory against non-members.[13] The formation of economic unions and PTAs has proliferated exponentially in that these have come to constitute a numerically massive magnitude and encompass a predominant proportion of the globe.[14] Panagariya (1999) argues that the aggressive race between the European Union and United States on the promotion of Free Trade Areas (Agreements) led to the renewal of efforts for PTAs by and among smaller countries of Africa, Latin America, South and Central Asia, Central and Eastern Europe and the

[13] The GATT's Article XXIV permits preferential agreements, provided that member countries eliminate tariffs on substantially all trade between them in a reasonable period of time (Bagwell and Staiger, 1998). This exception to the principle of non-discrimination was controversial in its inception and has met with renewed controversy recently, as many GATT members have increasingly exercised their rights under this article to negotiate preferential trading agreements. These agreements may take either of two forms. When countries form a *free trade area*, they eliminate barriers to internal trade, but maintain independent external trade policies. Under a *customs union*, member countries also agree to harmonise their external trade policies, and create a common external-tariff-setting authority (Bagwell and Staiger, 1998).

[14] A common characteristic of Free Trade Agreements (FTAs), Preferential Trade Agreements (PTAs) and the Regional Trade Agreements (RTAs) is that these Agreements (Areas) are non-discriminatory for members, but discriminatory against non-members. The terms FTAs, PTAs and RTAs are, therefore, used interchangeably throughout the study.

Baltic Republic. The only region which has, so far, remained firmly committed to the MFN approach to liberalisation is East Asia (Panagariya, 1999).[15]

The proliferation of PTAs has spurred several concerns and numerous studies evaluating binary choices and the effects of PTAs on the trade and welfare of non-members of the bloc, level of multilateral free trade and welfare, and the enforcement of WTO agreements. An issue that remains centre stage is whether PTAs supplement or supplant the multilateral trading system and, thus, have the 'trade creation' and 'building block' or 'trade diversion' and 'stumbling block' effects.[16] A number of studies have supported the 'building block' effects (Baldwin, 1993, 1995; Ethier, 1998; Laird, 1999; Clausing, 2001; Glick and Rose, 2002; Lee et al., 2008). Krugman (1991, 1993) envisions that the PTAs among the 'natural' trading partners are likely to generate positive effects, as the gains from trade creation would outweigh the losses from trade diversion.[17] The process of coalition formation and PTA configuration could lead to two possible outcomes: First, as per the Vinerian static analysis, the expansion of existing PTAs would raise intra-bloc, but reduce inter-bloc trade, and also trade with non-members. The emergence of several PTAs would lead to inter-bloc trade discrimination and tariff barriers and, thus, would cripple multilateral cooperation and impede global free trade. Second, as per the post-Vinerian dynamic analysis, higher intra-bloc trade would lead to higher income and growth of the member countries, which, in turn, would lead to expansion of market size and creation of trade and investment opportunities for non-member countries. These growth externalities and spillover effects would transform PTAs into the 'building blocks' of global free trade (Baldwin, 1993, 1995; Laird, 1999; Lee, 2008).

The domino theory of Baldwin (1993, 1995, 1997) postulates that increased integration among a subset of countries would provide incentives for outsiders to seek accession, thereby expanding the trading blocs and fostering trade liberalisation. Baldwin (1997) asserts that the 'idiosyncratic incidents of regionalism triggered a multiplier effect that knocked down bilateral import barriers like a

[15] Panagariya (1999) provides a description of the three key concepts used by the academic and policy literature: Preferential Trade Area (PTA), Free Trade Area (FTA) and the Customs Union (CU). A PTA is a union between two or more countries in which goods produced within the union are subject to lower trade barriers than the goods produced outside the union. An FTA is a PTA in which member countries do not impose *any* trade barriers on the goods produced within the union, but do so on those produced outside the union. A CU is an FTA in which member countries apply a common external tariff (CET) on a good imported from outside countries. The CET can differ across goods, but not across union partners. In policy documents and debates, the acronym FTA is often used to refer to a Free Trade *Agreement* or Free Trade *Arrangement*, rather than Free Trade *Area* (Panagariya, 1999). For a review of literature on the preferential trade liberalisation, see Panagariya (2000).

[16] Bhagwati (1991) coins the 'building block' and 'stumbling block' effects of PTAs.

[17] The countries that trade substantially and disproportionately more with each other are termed as the 'natural' trading partners.

row of dominos' (Baldwin, 1997, p. 877). He asserts that almost all empirical studies of the European and North American arrangements find the positive impacts of PTA's on the living standards of members. Egger et al. (2008) postulate that the likelihood of new RTA membership is influenced by economic fundamentals, such as the country size, factor endowments, and trade and investment costs. They find strong effects of endogenous PTAs on intra-industry trade in a sample of country-pairs covering mainly the OECD countries. They argue that the PTA-induced increase in trade volumes can be mainly attributed to an associated growth in intra-industry trade, at least in developed economies. Ethier (1998) suggests that the new regionalism is a direct result of the success of multilateral liberalisation, as well as being the means by which new countries trying to enter the multilateral system compete among themselves for direct investment. By internalising an important externality, regionalism plays an important role in expanding and preserving liberal trading order (Ethier, 1998). Laird (1999) argues that the quantitative estimates tend to show that trade creation effects outweigh trade diversion effects and hence are overall welfare-enhancing. Clausing (2001) finds that the Canada–United States FTA had substantial trade creation effects, with little evidence of trade diversion. Glick and Rose (2002) examine the effects of currency union on trade, using a comprehensive panel dataset of over 200 countries (1948–97). They find that a pair of countries which joined (left) a currency union experienced near-doubling (halving) of bilateral trade. Lee et al. (2008) use a panel dataset of 175 countries (1948–99) and examine the effects of regional trading blocs on global trade. They conclude that on average, they increase global trade by raising intra-bloc trade, without damaging the extra-bloc trade.

While several studies support the 'building block' effects, a parallel counterstrand raises concerns and postulates 'stumbling block' effects (Bhagwati, 1991; Panagariya, 1996; Bhagwati et al., 1998; Romalis, 2007). These arrangements not only reduce the incentives for MTL, but could also lead to retaliatory and periodic tariff wars. While an infinite extension of a trading bloc in that it would encompass the globe and map multilateral free trade seems a theoretical possibility and is unlikely to materialise, the finite extensions are as likely to strengthen the retaliatory power of a trading bloc against non-bloc members and lead to higher bloc-lateral trade barriers, as could induce the removal of bilateral trade barriers and incite the liberalisation of trade as envisioned in the domino theory. Krugman (1991) asserts that the enlargement of trading blocs leads to more retaliatory power for each, which, in a non-cooperative environment, could lead to higher inter-bloc trade barriers; the welfare reaches the minimum in a world with two or three CUs. Bhagwati et al. (1998) assert that the formation of PTAs multiplies by imitation; one PTA leads to another and so on and so forth, and eventually Gresham's Law takes over. Panagariya (1996) argues that when trade liberalisation is discriminatory, as in

FTA, within the Vinerian framework, the effects of freer trade have a strong mercantilist bias: a country gains from the liberalisation by the partner, but loses from its own liberalisation.[18] Romalis (2007) finds that the North American Free Trade Agreement (NAFTA) had a substantial impact on international trade volumes, but a modest effect on prices and welfare. The NAFTA increased North American output and prices in many highly protected sectors by driving out imports from non-member countries.

4. METHODOLOGICAL AND MEASUREMENT ISSUES

The above discussion suggests the evidence is not unambiguous. Several factors, such as differences in sample periods and countries, estimators and econometric methodologies employed, frequency of data used, measures of trade openness employed, model specifications estimated, and test statistics used for testing the null have a bearing on this. This section explores methodological and measurement issues that surround the trade–growth empirics.

a. Solow and Stochastic Residuals: A Generated Regressand: The findings of the studies examining the productivity effects of trade are contingent on the quality of data on productivity, commonly represented by TFP and is computed as the residual difference between output and weighted contribution of factor inputs to output or as the ratio of output to (weighted) factor inputs as,

$$TFP(t) = A(t) = \left[\frac{Y(t)}{K(t)^{\alpha}L(t)^{\beta}}\right]; \qquad t \in [1, ..., T]. \tag{1}$$

A major problem in computing *TFP* in (1) is that the aggregate data on the incomes accruing to capital, $K(t)$, and labour, $L(t)$, are commonly beset with measurement problems in developing economies with large informal sectors. Consistent time-series data are, in fact, not available in many cases. In the absence of actual data on factor income shares, α and β, a commonly used alternative is to use a regression analogue of growth accounting, and estimate the Cobb–Douglas production technology with unity restriction, $\alpha + \beta = 1$, imposed on its parameters,

[18] Panagariya (1996) argues that a country benefits from *receiving* a preferential (or discriminatory) access to the partner's market and is hurt by *giving* the partner a similar access to its own market. When the country gives access to the partner on a preferential basis, it loses the tariff revenue collected on the imports from the partner. The revenue goes to boost the terms of trade of the latter. The reverse happens when the country receives a preferential access from the partner. On balance, the country which liberalises the most, is likely to lose (Panagariya, 1996).

$$\ln Y(t) = \ln A(t) + \alpha \ln K(t) + \beta \ln L(t) + \varepsilon(t). \quad (2)$$

In (2), $\varepsilon(t) = \mu(t) + v(t)$ with $\text{cov}[\mu(t), v(t)] = 0$. The estimated parameters, α and β, from (2) are used to mimic the income shares of capital and labour in output, and derive the TFP in levels as,

$$\ln TFP(t) = [\ln A(t) + \varepsilon(t)] = \ln Y(t) - \hat{\alpha} \ln K(t) - \hat{\beta} \ln L(t). \quad (3)$$

Some of the limitations of computing TFP based on production technology are as follows. First, since the intercept term in (3) is constant, productivity is virtually represented by the stochastic residual term of the production technology. All the estimation problems (such as omitted variables bias, functional-form misspecification bias, sample-selection bias and simultaneity bias) and the errors-in-variables bias (such as measurement of capital stock and total employment in the economy) get reflected in the residuals, $\varepsilon(t)$, and, thus, embodied in the TFP.

Second, the TFP derived using parameter estimates obtained from the production technology is apparently a 'generated' series with the possibility of itself containing the standard errors. The use of TFP as a regressand or regressor in the model is likely to compound the standard errors of the estimated parameters, and provide a misleading statistical inference. It is likely to commit a Type I (Type II) error and erroneously overstate (understate) the relationship between trade and TFP.

Third, the regression or TFP residuals in (3) represent a linear combination of (normally) non-stationary series of factor inputs, $K(t)$ and $L(t)$, and the output $Y(t)$. If the TFP residuals are non-stationary and I(d), then it implies a lack of cointegrating and equilibrium relationship between factor inputs and output and, thus, 'spurious estimates' of the production technology parameters used to proxy the factor income shares and estimate the TFP. In contrast, if the TFP residuals are stationary and I(0), then it is difficult to regress TFP on its possibly I(d) determinants such as trade. A first-difference transformation of the I(d) determinants of TFP (such as trade) to make them synchronous with I(0) TFP would result in a loss of long-run information. The short-run model, based on I(0) variables, loses its relevance for the long-run analysis of economic growth.

Fourth, the OLS parameters, $\hat{\alpha}$ and $\hat{\beta}$, are by definition constants and thus, do not account for possible yearly (quarterly) variations that may occur in the actual income shares of capital and labour. Besides, the OLS estimates of α and β and implied TFP are likely to be biased and inconsistent, given simultaneity between inputs and unobserved productivity.[19]

[19] Van Biesebroeck (2007) asserts that estimating a production function by ordinary least squares (OLS) is generally not advisable. He argues that the GMM system estimator provides the most robust productivity level and growth estimates. The disadvantages of OLS are, however, less acute for productivity growth than for productivity levels. For a review and discussion on the econometric estimators to estimate productivity, see Van Biesebroeck (2007).

b. Estimates of GDP and Measures of Trade Openness: The estimates of GDP in developing countries with a large unorganised sector are beset with numerous measurement problems (Heston, 1994).[20] The differences in the magnitudes of the informal sector, definitions and coverage of items, and the timings of revisions commonly characterise the cross-country dispersion in GDP. Such differentials weaken the conclusions drawn from cross-country growth models that use a heterogeneous mix of GDP estimates. As regards the measures of trade openness, the most commonly used measures based on trade volumes and trade ratios are not perfect proxies for trade policy and access to international markets. The developed countries with higher trade volumes generally have smaller trade shares, and the trade ratios in these countries may not differ discernibly from those in the developing countries with lower trade volumes.[21] Measures of openness based on trade policy have been used relatively sparsely, possibly due to the lack of consistent time-series and cross-section data. Leamer (1988) argues that in the absence of direct measures of trade barriers, it is impossible to determine the degree of openness for most countries, as does Edwards (1997, 1998). Temple (1999) argues that the measures which are most defensible on theoretical grounds, such as the effective rates of protection, can be difficult to calculate for a sufficiently large number of countries. Typically, researchers fall back on simple proxies, such as trade shares in GDP or a black market exchange rate premium, meant to give some indication of openness (Temple, 1999).

A major problem concerns the aggregation of tariff and non-tariff barriers into a single trade policy index (Harrison, 1996; Edwards, 1998; Dollar and Kraay, 2003). Rodriguez and Rodrik (2000) argue that the simple trade-weighted tariff averages or non-tariff coverage ratios – which I believe to be the most direct indicators of trade restrictions – are misleading as indicators of the stance of trade policy. Dollar and Kraay (2003) argue that the most immediate candidates of trade policy (average tariff rates and non-tariff barrier coverage ratios) have obvious drawbacks, and it is not possible to construct very convincing measures of overall trade policy. Rose (2004b) asserts that all tariff measures are affected by the well-known fact that tariff revenues divided by total imports is a downward-biased measure of tariff rates, since highly taxed imports tend not to be imported. The coverage of non-tariff barriers (NTBs) in terms of total imports is another measure of trade policy. It is, however, widely recognised that the presence of NTBs is a potentially poor substitute for the importance or intensity of the NTBs; hence this measure of trade policy is cer-

[20] Heston (1994) argues that the data on per capita GDP are prone to fewer errors as compared to the data on aggregate GDP, as some of the errors in the estimates of GDP are counterbalanced by the errors in the estimates of population.

[21] Harrison and Revenga (1995) suggest that the large countries generally have smaller trade shares, and no independent measure of openness is free of methodological problems.

tainly measured with error (Rose, 2004b).[22] Different measures reflect different aspects of trade policy and have differential effects on growth. Pritchett (1996) argues that different measures could be uncorrelated or weakly correlated among themselves and, thus, different dimensions of trade policy would have different effects on growth.[23] Historically, many tariffs were raised for revenue purposes and were not necessarily directly protective, though even these revenue tariffs could have some general equilibrium impact on the economy (O'Rourke, 2000).

Another commonly used measure has been the deviations of actual from predicted trade flows (Balassa, 1985; Leamer, 1988; Syrquin and Chenery, 1989; Edwards, 1992, 1998; Wacziarg, 2001). This, however, basically represents the stochastic residual term of the model estimated for trade flows, and is likely to contain omitted variables model misspecification bias. It not only measures restrictiveness, but also encompasses the unobserved effects of all the factors omitted from the model for trade flows. Some studies use a black market premium on foreign exchange to surrogate the efficiency of price system and capture the effects of economic and policy distortions on growth (Lee, 1993; Barro and Sala-i-Martin, 1995; Sachs and Warner, 1995; Rodriguez and Rodrik, 2000; Wacziarg, 2001; Vamvakidis, 2002; Lee et al., 2004). Such a premium reflects the controlled market for foreign exchange and measures the expectations for the depreciation of exchange rate (Fischer, 1993). The black market premium, however, captures only a narrow (foreign exchange) dimension of the macroeconomic and policy distortions, as compared to the distortions inflicted by tariff and non-tariff barriers to trade.

It is also difficult to disentangle the effects of trade policies from those of other macroeconomic policies and unequivocally interpret the observed correlations between trade policies and economic growth. IMF-supported structural adjustment programmes commonly begin with a devaluation, which results in high, albeit exceptional, performance of domestic exports. These programmes are closely followed by stabilisation programmes and the adoption of several macroeconomic measures to sustain the effects and avoid policy reversals. The improvements in productivity and growth that are commonly ascribed to trade liberalisation, in fact, arise from the conglomerate effects of comprehensive and wide-ranging economic reforms undertaken in almost all the real and

[22] Rodriguez and Rodrik (2000) argue that no papers that document the existence of serious biases in these direct indicators, much less establish that an alternative indicator performs better (in the relevant sense of calibrating the restrictiveness of trade regimes).

[23] Irwin (2002) argues that high tariff measures are imperfect indicators of trade-policy orientation and may not always reflect protectionist policies. Winters (2004) suggests that the fiscal consequences of tariff revenue losses are far from inevitable, especially if non-tariff barriers are converted into tariffs (exemptions are reduced and collections improved); but they can pose a problem for poorer countries in which trade taxes account for large proportions of total revenue.

financial sectors of the economy; trade liberalisation is only one segment in the whole spectrum of reforms. Rodrik (1995) argues that the trade-regime indicators are measured very badly, and trade openness in the sense of a lack of trade restrictions is often confused with the macroeconomic aspects of policy regimes.

c. Model Specification, Estimators and Endogeneity: The problem of endogeneity and non-orthogonality of regressors remains unresolved in the time-series models and least addressed in the cross-section and panel data models (Trefler, 1993; Rodrik, 1995; Harrison, 1996; Edwards, 1993, 1998; Frankel and Romer, 1999; Temple, 1999; Pritchett, 2000; Wacziarg, 2001; Irwin and Terviö, 2002; Lee et al., 2004; Winters, 2004; Felbermayr, 2005; Frankel and Rose, 2005; Alvarez and López, 2008). The openness to trade and trade policies may not be determined exogenously, and these may themselves be a function of productivity and growth. Exports and imports vary with the level of production and are determined jointly within the system. The endogeneity between trade (exports) and productivity is reinforced more conspicuously in the microeconomic self-selection models, which suggest that the firms with exogenously determined high levels of productivity self-select themselves into the export market. The trade policy-based measures of openness, such as tariffs, could be affected by growth and are not completely immune from simultaneity. In a low growth and recessionary phase, tariff rates may be raised to export domestic recession and revive economic growth. Since most studies perform partial equilibrium analysis and use single-equation models, the problem of endogeneity remains a serious concern for the conclusions drawn from these studies. The non-orthogonality of regressors to the residual process makes the least squares estimates biased and inconsistent. Trefler (1993) shows that the US import flows are 10 times higher than previously estimated, partly because the previous studies have ignored the simultaneity of trade policy and import flows.

A commonly used measure to alleviate reverse-causation and possible sources of endogeneity has been to use some of the lagged regressors as instruments and estimate the model using an instrumental variables (IV) estimator. The efficiency of an IV estimator, however, hinges heavily on the quality and validity of instruments. Besides, when several regressors in a model are instrumented, then validity requirements for instruments (used for endogenous regressors) become even more stringent (Staiger and Stock, 1997). It is difficult to find appropriate instruments that are strongly correlated with endogenous regressors, but uncorrelated with Gaussian disturbances. Temple (1999) argues that some studies use initial values, such as regressing growth over 1960–85 on the 1960 secondary school enrolment rate, to avoid simultaneity. This is not quite as watertight as the

researchers seem to think: even if the endogeneity problem is solved, perhaps some omitted variables affect both growth and initial level of the variables like schooling.

The microeconomic firm-level models commonly use matching and semi-parametric estimators, such as the estimator developed by Olley and Pakes (1996), to alleviate endogeneity (Pavcnik, 2002; Bernard and Jensen, 2004a; Schor, 2004; Van Biesebroeck, 2005; Fernandes, 2007). These account for unobserved plant heterogeneity by using observable firm characteristics, and are robust to endogeneity and simultaneity-bias arising from endogenous input and exit choices.[24] Greenaway and Kneller (2007a), however, argue that matching attempts to reduce heterogeneity have the disadvantage of removing observations from the dataset and requiring specific assumptions about the non-observable factors, such as managerial ability. These estimators, by design, have remained restricted to only the microeconomic models estimating productivity in the manufacturing sector, and have not been extended to the economy-wide macroeconomic models. Temple (1991) argues that the micro studies often miss the economy-wide resource allocation effects that may be central to understanding the effects of trade policy.

Model misspecification bias impinges on the robustness of results and yields misleading statistical inference. The commonly used bivariate models testing 'export-led growth' versus 'growth-led export' hypotheses do not control for the effects of various other conditioning factors on growth. The studies testing 'export-led growth' hypotheses commonly provide a solo focus on the role of exports and erroneously ignore the role of imports (and other factors such as investment). The goods embody technical know-how, and the imports play a catalytic role in the transfer and diffusion of foreign technology. An incomplete analysis aside, this leads not only to omitted variables model misspecification bias and serial correlation problems, but also to the endogeneity of trade, as the unobserved factors and several unknowns that affect economic growth could also contemporaneously affect the orientation to trade. The use of simultaneous-equation models has recently been uncommon, albeit virtually abandoned, possibly due to the identification and estimational problems associated with a large system. The commonly used single-equation models (which assume all regressors as exogenous) need to be appropriately specified and instrumented, so as to draw statistically robust and economically meaningful interpretations.

[24] Pavcnik (2002) argues that the selection-bias induced by plant closings and the simultaneity-bias induced by plant dynamics significantly affect the magnitude of the capital coefficient in the production function, and that Olley and Pakes's semi-parametric methodology provides a useful alternative to the techniques used in previous studies.

Most studies do not perform model misspecification tests and examine robustness to the inclusion of additional regressors. Levine and Renelt (1992) use a variant of extreme bounds analysis from Leamer (1988) and conduct a sensitivity analysis. The statistical significance of a majority of regressors is shown to be sensitive to model specification, and it disappears if the set of regressors is altered; they find that almost all results are fragile. They suggest that it is important to provide a formal sensitivity test by systematically varying the right-hand variables to ensure the robustness of results to variations in the model specification. Harrison (1996) finds that when three macro variables are included in the model, the statistical significance of openness measures disappears in half the cases. Rodriguez and Rodrik (2000) and Irwin and Terviö (2002) examine the sensitivity of the Frankel and Romer (1999) results. The effect of trade disappears with the inclusion of geographical latitude (distance from equator) in the model (Rodriguez and Rodrik, 2000), and the sensitivity of results holds for different sets of historical data (Irwin and Terviö, 2002).

5. CONCLUSIONS

This study has surveyed the literature on the relationship between international trade and economic growth, and reviewed the role of GATT/WTO in fostering free trade. Most studies support the gains of trade and recognise the substantive contributions of GATT/WTO in fostering free trade; the evidence is, however, not ubiquitously unambiguous. The macroeconomic evidence provides dominant support for the positive and significant effects of trade on output and growth, while the microeconomic evidence lends larger support to the exogenous effects of productivity on trade, as compared to the effects of trade on productivity. The studies supporting the self-selection hypothesis overwhelm the studies supporting the learning-by-exporting hypothesis. The rounds of the GATT/WTO trade negotiations could not vanquish the support for trade barriers and passion for protectionism. The globally Pareto-efficient multilateral free trade system of GATT/WTO remains surrounded by locally-efficient preferential (free and regional) trade agreements (areas). The strength of the argument for the gains of trade needs to be evaluated in juxtaposition with several methodological and measurement issues surrounding the trade–growth empirics, such as the estimation of TFP, measurement of trade openness, quality of data, frequency of data, possible structural breaks and regime-switches in the model series, construction of trade policy indices, specification of an econometric model, endogeneity of trade, netting of exports and imports from GDP, disentanglement of the effects of trade policy from those of other macroeconomic policies, and the decomposition of the effects of trade into short-run transitory and long-run permanent components. The econometric methodology that is central to the

empirical evidence has itself been evolving and so have been the estimates and statistical evidence on the relationship between trade and growth.

The most commonly used measures of trade openness based on trade volumes are highly endogenous, while those based on trade policy are characterised by several measurement problems and have been used relatively sparsely. The different measures represent different aspects of trade openness, and have differential effects on growth. Most studies focus on the partial equilibrium analysis of trade policy, and ignore the general equilibrium aspects of macroeconomic policy. It is difficult to disentangle the effects of trade policies from those of other macroeconomic policies and unequivocally interpret the observed correlations between trade policies and economic growth. The productivity improvements that are commonly ascribed to trade liberalisation in the developing countries, in fact, arise from the conglomerate effects of comprehensive and wide-ranging economic reforms undertaken in almost all the real and financial sectors of the economy. Trade is one of the several catalysts of productivity and growth and hence its contribution is contingent on its weight in the aggregate economic activity. The hitherto unresolved methodological and measurement issues characterise a challenging agenda for future research. Future research needs to resolve these issues and unambiguously determine and crystallise the strength and robustness of the argument for the gains of trade.

REFERENCES

Alcala, F. and A. Ciccone (2004), 'Trade and Productivity', *Quarterly Journal of Economics*, **119**, 2, 613–46.

Alvarez, R. and R. A. López (2005), 'Exporting and Performance: Evidence from Chilean Plants', *Canadian Journal of Economics*, **38**, 4, 1384–400.

Alvarez, R. and R. A. López (2008), 'Is Exporting a Source of Productivity Spillovers?', *Review of World Economics*, **144**, 4, 723–49.

Andersson, M., H. Lööf and S. Johansson (2008), 'Productivity and International Trade: Firm Level Evidence from a Small Open Economy', *Review of World Economics*, **144**, 4, 774–801.

Arnold, J. M. and K. Hussinger (2005), 'Export Behaviour and Firm Productivity in German Manufacturing: A Firm-level Analysis', *Review of World Economics*, **141**, 2, 219–43.

Arrow, K. J. (1962), 'The Economic Implications of Learning by Doing', *Review of Economic Studies*, **29**, 3, 155–73.

Aw, B. Y. and A. R. Hwang (1995), 'Productivity and the Export Market: A Firm-level Analysis', *Journal of Development Economics*, **47**, 2, 313–32.

Aw, B. Y., S. Chung and M. J. Roberts (2000), 'Productivity and Turnover in the Export Market: Micro-level Evidence from the Republic of Korea and Taiwan (China)', *World Bank Economic Review*, **14**, 1, 65–90.

Aw, B. Y., X. Chen and M. J. Roberts (2001), 'Firm-level Evidence on Productivity Differentials and Turnover in Taiwanese Manufacturing', *Journal of Development Economics*, **66**, 1, 51–86.

Awokuse, T. O. (2003), 'Is the Export-led Growth Hypothesis Valid for Canada?', *Canadian Journal of Economics*, **36**, 1, 126–36.

Awokuse, T. O. (2007), 'Causality between Exports, Imports, and Economic Growth: Evidence from Transition Economies', *Economics Letters*, **94**, 3, 389–95.
Awokuse, T. O. and D. K. Christopoulos (2009), 'Nonlinear Dynamics and the Exports–Output Growth Nexus', *Economic Modelling*, **26**, 1, 184–90.
Bagwell, K. and R. W. Staiger (1998), 'Will Preferential Agreements Undermine the Multilateral Trading System?', *Economic Journal*, **108**, 449, 1162–82.
Bagwell, K. and R. W. Staiger (1999), 'An Economic Theory of GATT', *American Economic Review*, **89**, 1, 214–48.
Bagwell, K. and R. W. Staiger (2002), 'Economic Theory and the Interpretation of GATT/WTO', *American Economist*, **46**, 2, 3–19.
Balassa, B. (1978), 'Exports and Economic Growth: Further Evidence', *Journal of Development Economics*, **5**, 2, 181–89.
Balassa, B. (1984), 'Adjustment to External Shocks in Developing Economies', World Bank Staff Working Paper No. 472 (Washington, DC: World Bank).
Balassa, B. (1985), 'Exports, Policy Choices, and Economic Growth in Developing Countries After the 1973 Oil Shock', *Journal of Development Economics*, **18**, 1, 23–35.
Baldwin, J. R. and W. Gu (2003), 'Export-market Participation and Productivity Performance in Canadian Manufacturing', *Canadian Journal of Economics*, **36**, 3, 634–57.
Baldwin, J. R. and W. Gu (2004), 'Trade Liberalization, Export-market Participation, Productivity Growth and Innovation', *Oxford Review of Economic Policy*, **20**, 3, 372–92.
Baldwin, R. (1993), 'A Domino Theory of Regionalism', National Bureau of Economic Research Working Paper No. 4465, Cambridge, MA: NBER.
Baldwin, R. (1995), 'A Domino Theory of Regionalism', in R. Baldwin, P. Haarparanta and J. Kianden (eds.), *Expanding Membership of the European Union* (Cambridge: Cambridge University Press).
Baldwin, R. E. (1997), 'The Causes of Regionalism', *The World Economy*, **20**, 7, 865–88.
Baldwin, R. E. and E. Seghezza (1996), 'Trade-induced Investment-led Growth', Working Paper No. 5582, Cambridge, MA: National Bureau of Economic Research.
Barro, R. J. and X. Sala-i-Martin (1995), *Economic Growth* (New York: McGraw-Hill).
Bellone, F., P. Musso, L. Nesta and M. Quere (2008), 'The U-Shaped Productivity Dynamics of French Exporters', *Review of World Economics*, **144**, 4, 636–59.
Ben-David, D. (1993), 'Equalizing Exchange: Trade Liberalization and Income Convergence', *Quarterly Journal of Economics*, **108**, 3, 653–79.
Ben-David, D. (1996), 'Trade and Convergence among Countries', *Journal of International Economics*, **40**, 3/4, 279–98.
Ben-David, D. and D. H. Papell (1997), 'International Trade and Structural Change', *Journal of International Economics*, **43**, 3/4, 513–23.
Benhabib, J. and M. M. Spiegel (1994), 'The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-country Data', *Journal of Monetary Economics*, **34**, 2, 143–73.
Bernard, A. B. and J. Wagner (1997), 'Exports and Success in German Manufacturing', *Weltwirtschaftliches Archiv*, **133**, 1, 134–57.
Bernard, A. B. and J. Wagner (2001), 'Export Entry and Exit by German Firms', *Review of World Economics/Weltwirtschaftliches Archiv*, **137**, 1, 105–23.
Bernard, A. B. and J. B. Jensen (1999), 'Exceptional Exporter Performance: Cause, Effect, or Both?', *Journal of International Economics*, **47**, 1, 1–25.
Bernard, A. B. and J. B. Jensen (2004a), 'Exporting and Productivity in the USA', *Oxford Review of Economic Policy*, **20**, 3, 343–57.
Bernard, A. B. and J. B. Jensen (2004b), 'Why Some Firms Export', *Review of Economics and Statistics*, **86**, 2, 561–69.
Bernard, A. B., J. B. Jensen and P. K. Schott (2006), 'Trade Costs, Firms and Productivity', *Journal of Monetary Economics*, **53**, 5, 917–37.
Berthold, H. and A. Teixeira (2005), 'How Barriers to International Trade affect TFP', *Review of Economic Dynamics*, **8**, 4, 866–76.

Bhagwati, J. (1958), 'Immiserizing Growth: A Geometrical Note', *Review of Economic Studies*, **25**, 3, 201–05.
Bhagwati, J. (1991), *The World Trading System at Risk* (Princeton, NJ: Princeton University Press).
Bhagwati, J., D. Greenaway and A. Panagariya (1998), 'Trading Preferentially: Theory and Policy', *Economic Journal*, **108**, 449, 1128–48.
Bhagwati, J. N. (1968), 'Distortions and Immiserizing Growth: A Generalization', *Review of Economic Studies*, **35**, 4, 481–85.
Bhagwati, J. N. (1978), *Foreign Trade Regimes and Economic Development: Anatomy and Consequences of Exchange Control Regimes* (Cambridge, MA: Ballinger).
Bhagwati, J. N. (1988), 'Export-promoting Trade Strategy: Issues and Evidence', *World Bank Research Observer*, **3**, 1, 27–57.
Bigsten, A., P. Collier, S. Dercon, M. Fafchamps, B. Gauthier, J. W. Gunning, A. Oduro, R. Oostendorp, C. Pattillo, M. Söderbom, F. Teal and A. Zeufack (2004), 'Do African Manufacturing Firms Learn from Exporting?', *Journal of Development Studies*, **40**, 3, 115–41.
Bodman, P. M. (1996), 'On Export-led Growth in Australia and Canada: Cointegration, Causality and Structural Stability', *Australian Economic Papers*, **35**, 67, 282–99.
Boltho, A. (1996), 'Was Japanese Growth Export-led?', *Oxford Economic Papers*, **48**, 3, 415–32.
Bonelli, R. (1992), 'Growth and Productivity in Brazilian Industries: Impacts of Trade Orientation', *Journal of Development Economics*, **39**, 1, 85–109.
Bound, J., D. Jaeger and R. Baker (1995), 'Problems with Instrumental Variables Estimation when the Correlation between the Instruments and the Endogenous Explanatory Variable is Weak', *Journal of the American Statistical Association*, **90**, 430, 443–50.
Castellani, D. (2002), 'Export Behaviour and Productivity Growth: Evidence from Italian Manufacturing Firms', *Review of World Economics/Weltwirtschaftliches Archiv*, **138**, 4, 605–28.
Chen, T. J. (1990), 'Export Performance and Productivity Growth: The Case of Taiwan', *Economic Development and Cultural Change*, **38**, 3, 577–85.
Chenery, H. B. (1983), 'Interaction between Theory and Observation in Development', *World Development*, **11**, 10, 853–61.
Chow, P. C. Y. (1987), 'Causality between Export Growth and Industrial Development: Empirical Evidence from the NICs', *Journal of Development Economics*, **26**, 1, 55–63.
Clausing, K. A. (2001), 'Trade Creation and Trade Diversion in the Canada–United States Free Trade Agreement', *Canadian Journal of Economics*, **34**, 3, 677–96.
Clemens, M. A. and J. G. Williamson (2001), 'A Tariff–Growth Paradox? Protection's Impact the World Around 1875–1997', Working Paper No. 8459, Cambridge, MA: National Bureau of Economic Research.
Clemens, M. A. and J. G. Williamson (2004), 'Why Did the Tariff–Growth Correlation Change After 1950?', *Journal of Economic Growth*, **9**, 1, 5–46.
Clerides, S. K., S. Lach and J. R. Tybout (1998), 'Is Learning by Exporting Important? Micro-dynamic Evidence from Colombia, Mexico, and Morocco', *Quarterly Journal of Economics*, **113**, 3, 903–47.
Coe, D. T. and E. Helpman (1995), 'International R&D Spillovers', *European Economic Review*, **39**, 5, 859–87.
Condon, T., V. Corbo and J. de Melo (1985), 'Productivity Growth, External Shocks, and Capital Inflows in Chile: A General Equilibrium Analysis', *Journal of Policy Modeling*, **7**, 3, 379–405.
Copeland, B. R. and M. S. Taylor (2004), 'Trade, Growth, and the Environment', *Journal of Economic Literature*, **42**, 1, 7–71.
Criscuolo, C., J. Haskel and R. Martin (2004), 'Import Competition, Productivity, and Restructuring in UK Manufacturing', *Oxford Review of Economic Policy*, **20**, 3, 393–408.
Delgado, M., J. C. Farinas and S. Ruano (2002), 'Firm Productivity and Export Markets: A Non-parametric Approach', *Journal of International Economics*, **57**, 2, 397–422.

Dollar, D. (1992), 'Outward-oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976–1985', *Economic Development and Cultural Change*, **40**, 3, 523–44.
Dollar, D. and A. Kraay (2003), 'Institutions, Trade, and Growth', *Journal of Monetary Economics*, **50**, 1, 133–62.
Dollar, D. and A. Kraay (2004), 'Trade, Growth, and Poverty', *Economic Journal*, **114**, 493, F42–49.
Easterly, W. and R. Levine (2001), 'What Have We Learned from a Decade of Empirical Research on Growth? It's Not Factor Accumulation: Stylized Facts and Growth Models', *World Bank Economic Review*, **15**, 2, 177–219.
Eaton, J. and S. Kortum (1994), 'International Patenting and Technology Diffusion', Working Paper No. 4931, Cambridge, MA: National Bureau of Economic Research.
Eaton, J. and S. Kortum (1996), 'Trade in Ideas: Patenting and Productivity in the OECD', *Journal of International Economics*, **40**, 3/4, 251–78.
Edwards, S. (1992), 'Trade Orientation, Distortions and Growth in Developing Countries', *Journal of Development Economics*, **39**, 1, 31–57.
Edwards, S. (1993), 'Openness, Trade Liberalization, and Growth in Developing Countries', *Journal of Economic Literature*, **31**, 3, 1358–93.
Edwards, S. (1997), 'Trade Policy, Growth, and Income Distribution', *American Economic Review*, **87**, 2, 205–10.
Edwards, S. (1998), 'Openness, Productivity and Growth: What Do We Really Know?', *Economic Journal*, **108**, 447, 383–98.
Egger, H., P. Egger and D. Greenaway (2008), 'The Trade Structure Effects of Endogenous Regional Trade Agreements', *Journal of International Economics*, **74**, 2, 278–98.
Emery, R. F. (1967), 'The Relation of Exports and Economic Growth', *KYKLOS*, **20**, 470–86.
Ericson, R. and A. Pakes (1995), 'Markov-perfect Industry Dynamics: A Framework for Empirical Work', *Review of Economic Studies*, **62**, 1, 53–82.
Ethier, W. J. (1998), 'The New Regionalism', *Economic Journal*, **108**, 449, 1149–61.
Fajana, O. (1979), 'Trade and Growth: The Nigerian Experience', *World Development*, **7**, 1, 73–78.
Feder, G. (1982), 'On Exports and Economic Growth', *Journal of Development Economics*, **12**, 1/2, 59–73.
Feenstra, R. C. (2006), 'New Evidence on the Gains from Trade', *Review of World Economics*, **142**, 4, 617–41.
Felbermayr, G. J. (2005), 'Dynamic Panel Data Evidence on the Trade–Income Relation', *Review of World Economics*, **141**, 4, 583–611.
Fernandes, A. M. (2007), 'Trade Policy, Trade Volumes and Plant-level Productivity in Colombian Manufacturing Industries', *Journal of International Economics*, **71**, 1, 52–71.
Fischer, S. (1993), 'The Role of Macroeconomic Factors in Growth', *Journal of Monetary Economics*, **32**, 3, 485–512.
Foreman-Peck, J. (1995), 'A Model of Later Nineteenth Century European Economic Development', *Revista de Historia Economica*, **13**, 3, 441–71.
Frankel, J. A. and A. K. Rose (2005), 'Is Trade Good or Bad for the Environment? Sorting Out the Causality', *Review of Economics and Statistics*, **87**, 1, 85–913.
Frankel, J. A. and D. Romer (1996), 'Trade and Growth: An Empirical Investigation', Working Paper No. 5476, Cambridge, MA: National Bureau of Economic Research.
Frankel, J. A. and D. Romer (1999), 'Does Trade Cause Growth?', *American Economic Review*, **89**, 3, 379–99.
Fryges, H. and J. Wagner (2008), 'Exports and Productivity Growth: First Evidence from a Continuous Treatment Approach', *Review of World Economics*, **144**, 4, 695–722.
Girma, S., D. Greenaway and R. Kneller (2003), 'Export Market Exit and Performance Dynamics: A Causality Analysis of Matched Firms', *Economics Letters*, **80**, 2, 181–87.
Girma, S., D. Greenaway and R. Kneller (2004), 'Does Exporting Increase Productivity? A Microeconometric Analysis of Matched Firms', *Review of International Economics*, **12**, 5, 855–66.

Girma, S., H. Görg and A. Hanley (2008), 'R&D and Exporting: A Comparison of British and Irish Firms', *Review of World Economics*, **144**, 4, 750–73.
Glick, R. and A. K. Rose (2002), 'Does a Currency Union Affect Trade? The Time-series Evidence', *European Economic Review*, **46**, 6, 1125–51.
Granger, C. W. J. (1969), 'Investigating Causal Relations by Econometric Models and Cross-spectral Methods', *Econometrica*, **37**, 3, 424–38.
Granger, C. W. J. (1988), 'Some Recent Development in a Concept of Causality', *Journal of Econometrics*, **39**, 1/2, 199–211.
Greenaway, D. (2004), 'The Assessment: Firm-level Adjustment to Globalization', *Oxford Review of Economic Policy*, **20**, 3, 335–42.
Greenaway, D. and D. Sapsford (1994), 'Exports, Growth, and Liberalization: An Evaluation', *Journal of Policy Modeling*, **16**, 2, 165–86.
Greenaway, D. and R. Kneller (2004), 'Exporting and Productivity in the United Kingdom', *Oxford Review of Economic Policy*, **20**, 3, 358–71.
Greenaway, D. and R. Kneller (2007a), 'Firm Heterogeneity, Exporting and Foreign Direct Investment', *Economic Journal*, **117**, 517, F134–61.
Greenaway, D. and R. Kneller (2007b), 'Industry Differences in the Effect of Export Market Entry: Learning by Exporting?', *Review of World Economics*, **143**, 3, 416–32.
Greenaway, D. and R. Kneller (2008), 'Exporting, Productivity and Agglomeration', *European Economic Review*, **52**, 5, 919–39.
Greenaway, D., A. Guariglia and R. Kneller (2007), 'Financial Factors and Exporting Decisions', *Journal of International Economics*, **73**, 2, 377–95.
Greenaway, D., J. Gullstrand and R. Kneller (2005), 'Exporting May Not Always Boost Firm Productivity', *Review of World Economics*, **141**, 4, 561–82.
Greenaway, D., J. Gullstrand and R. Kneller (2008), 'Surviving Globalisation', *Journal of International Economics*, **74**, 2, 264–77.
Greenaway, D., N. Sousa and K. Wakelin (2004), 'Do Domestic Firms Learn to Export from Multinationals?', *European Journal of Political Economy*, **20**, 4, 1027–43.
Greenaway, D., W. Morgan and P. Wright (1998), 'Trade Reform, Adjustment and Growth: What Does the Evidence Tell Us?', *Economic Journal*, **108**, 450, 1547–61.
Grossman, G. M. and E. Helpman (1991), *Innovation and Growth in the Global Economy* (Cambridge, MA: MIT Press).
Hansson, P. and N. Lundin (2004), 'Exports as an Indicator on or Promoter of Successful Swedish Manufacturing Firms in the 1990s', *Review of World Economics*, **140**, 3, 415–45.
Harrison, A. E. (1994), 'Productivity, Imperfect Competition and Trade Reform: Theory and Evidence', *Journal of International Economics*, **36**, 1/2, 53–73.
Harrison, A. E. (1996), 'Openness and Growth: A Time-series, Cross-country Analysis for Developing Countries', *Journal of Development Economics*, **48**, 2, 419–47.
Harrison, A. E. and A. Revenga (1995), 'The Effects of Trade Policy Reform: What Do We Really Know?', Working Paper No. 5225, Cambridge, MA: National Bureau of Economic Research.
Head, K. and J. Ries (2003), 'Heterogeneity and the FDI versus Export Decision of Japanese Manufacturers', *Journal of the Japanese and International Economies*, **17**, 4, 448–67.
Heller, P. S. and R. C. Porter (1978), 'Exports and Growth: An Empirical Re–investigation', *Journal of Development Economics*, **5**, 2, 191–93.
Henriques, I. and P. Sadorsky (1996), 'Export-led Growth or Growth Driven Exports? The Canadian Case', *Canadian Journal of Economics*, **29**, 3, 541–55.
Heston, A. (1994), 'A Brief Review of Some Problems in Using National Accounts Data in Level of Output Comparisons and Growth Studies', *Journal of Development Economics*, **44**, 1, 29–52.
Hopenhayn, H. A. (1992), 'Entry, Exit, and Firm Dynamics in Long Run Equilibrium', *Econometrica*, **60**, 5, 1127–50.
Hwa, E. C. (1988), 'The Contribution of Agriculture to Economic Growth: Some Empirical Evidence', *World Development*, **16**, 11, 1329–39.

International Study Group on Exports and Productivity (2008), 'Understanding Cross-country Differences in Exporter Premia: Comparable Evidence for 14 Countries', *Review of World Economics*, **144**, 4, 596–635.
Irwin, D. (1995), 'The GATT in Historical Perspective', *American Economic Review*, **85**, 2, 323–28.
Irwin, D. A. (2002), 'Interpreting the Tariff–Growth Correlation of the Late 19th Century', *American Economic Review*, **92**, 2, 165–69.
Irwin, D. A. and M. Terviö (2002), 'Does Trade Raise Income? Evidence from the Twentieth Century', *Journal of International Economics*, **58**, 1, 1–18.
Isgut, A. E. (2001), 'What's Different about Exporters? Evidence from Colombian Manufacturing', *Journal of Development Studies*, **37**, 5, 57–82.
Jovanovic, B. (1982), 'Selection and the Evolution of Industry', *Econometrica*, **50**, 3, 649–70.
Jung, W. S. and P. J. Marshall (1985), 'Exports, Growth and Causality in Developing Countries', *Journal of Development Economics*, **18**, 1, 1–12.
Karacaovali, B. and N. Limão (2008), 'The Clash of Liberalizations: Preferential vs. Multilateral Trade Liberalization in the European Union', *Journal of International Economics*, **74**, 2, 299–327.
Katrak, H. (1997), 'Developing Countries' Imports of Technology, In-house Technological Capabilities and Efforts: An Analysis of the Indian Experience', *Journal of Development Economics*, **53**, 1, 67–83.
Kavoussi, R. M. (1984), 'Export Expansion and Economic Growth: Further Empirical Evidence', *Journal of Development Economics*, **14**, 1/2, 241–50.
Keller, W. (2000), 'Do Trade Patterns and Technology Flows Affect Productivity Growth?', *World Bank Economic Review*, **14**, 1, 17–47.
Keller, W. (2002), 'Trade and the Transmission of Technology', *Journal of Economic Growth*, **7**, 1, 5–24.
Knight, M., N. Loayza and D. Villanueva (1993), 'Testing the Neoclassical Theory of Economic Growth: A Panel Data Approach', *International Monetary Fund Staff Papers*, **40**, 3, 512–41.
Kohli, I. and N. Singh (1989), 'Exports and Growth: Critical Minimum Effort and Diminishing Returns', *Journal of Development Economics*, **30**, 2, 391–400.
Kónya, L. (2006), 'Exports and Growth: Granger Causality Analysis on OECD Countries with a Panel Data Approach', *Economic Modelling*, **23**, 6, 978–92.
Kraay, A. (1999), 'Exportations et performances economiques: etude d'un panel d'entreprises chinoises', *Revue d'Economie du Developpement*, **7**, 1/2, 183–207.
Kravis, I. B. (1970), 'Trade as a Handmaiden of Growth: Similarities between the Nineteenth and Twentieth Centuries', *Economic Journal*, **80**, 320, 850–72.
Krueger, A. O. (1978), *Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences* (Cambridge, MA: Ballinger).
Krueger, A. O. (2004), 'Wilful Ignorance: The Struggle to Convince the Free Trade Skeptics', *World Trade Review*, **3**, 3, 483–93.
Krugman, P. (1993), Regionalism versus Multilateralism: Analytic Notes', in J. de Melo and A. Panagariya (eds.), *New Dimensions in Regional Integration* (Cambridge: Cambridge University Press for CEPR).
Krugman, P. R. (1991), 'Is Bilateralism Bad?', in E. Helpman and A. Razin (eds.), *International Trade and Trade Policy* (Cambridge, MA: MIT Press), 9–23.
Kugler, P. (1991), 'Growth, Exports and Cointegration: An Empirical Investigation', *Weltwirtschaftliches Archiv*, **127**, 1, 73–82.
Kunst, R. M. and D. Marin (1989), 'On Exports and Productivity: A Causal Analysis', *Review of Economics and Statistics*, **71**, 4, 699–703.
Laird, S. (1999), 'Regional Trade Agreements: Dangerous Liaisons?', *The World Economy*, **22**, 9, 1179–200.
Lane, P. R. (2001), 'International Trade and Economic Convergence: The Credit Channel', *Oxford Economic Papers*, **53**, 2, 221–40.

Leamer, E. (1988), 'Measures of Openness', in R. E. Baldwin (ed.), *Trade Policy and Empirical Analysis* (Chicago: University of Chicago Press).
Lee, H. Y., L. A. Ricci and R. Rigobon (2004), 'Once Again, Is Openness Good for Growth?', *Journal of Development Economics*, **75**, 2, 451–72.
Lee, J. W. (1993), 'International Trade, Distortions, and Long-run Economic Growth', *International Monetary Fund Staff Papers*, **40**, 2, 299–328.
Lee, J. W. (1995), 'Capital Goods Imports and Long-run Growth', *Journal of Development Economics*, **48**, 1, 91–110.
Lee, J. W., I. Park and K. Shin (2008), 'Proliferating Regional Trade Arrangements: Why and Whither?', *The World Economy*, **31**, 12, 1525–57.
Levine, R. and D. Renelt (1992), 'A Sensitivity Analysis of Cross-country Growth Regressions', *American Economic Review*, **82**, 4, 942–63.
Levinsohn, J. and A. Petrin (2003), 'Estimating Production Functions using Inputs to Control for Unobservables', *Review of Economic Studies*, **70**, 243, 317–41.
Lopez, R. A. (2005), 'Trade and Growth: Reconciling the Macroeconomic and Microeconomic Evidence', *Journal of Economic Surveys*, **19**, 4, 623–48.
Lucas Jr., R. E. (1988), 'On the Mechanics of Economic Development', *Journal of Monetary Economics*, **22**, 1, 3–42.
Maggi, G. and A. Rodriguez-Clare (1998), 'The Value of Trade Agreements in the Presence of Political Pressures', *Journal of Political Economy*, **106**, 3, 574–601.
Maizels, A. (1968), *Exports and Growth in Developing Countries* (London: Cambridge University Press).
Marin, D. (1992), 'Is the Export-led Growth Hypothesis Valid for Industrialized Countries?', *Review of Economics and Statistics*, **74**, 4, 678–88.
Melitz, M. J. (2003), 'The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity', *Econometrica*, **71**, 6, 1695–725.
Mengistae, T. and C. Pattillo (2004), 'Export Orientation and Productivity in Sub-Saharan Africa', *International Monetary Fund Staff Papers*, **51**, 2, 327–53.
Michaely, M. (1977), 'Exports and Growth: An Empirical Investigation', *Journal of Development Economics*, **4**, 1, 49–53.
Michaely, M. (1979), 'Exports and Growth: A Reply', *Journal of Development Economics*, **6**, 1, 141–43.
Moschos, D. (1989), 'Export Expansion, Growth and the Level of Economic Development: An Empirical Analysis', *Journal of Development Economics*, **30**, 1, 93–102.
Nishimizu, M. and S. Robinson (1984), 'Trade Policies and Productivity Change in Semi-industrialized Countries', *Journal of Development Economics*, **16**, 1/2, 177–206.
Nurkse, R. (1958), 'Trade Fluctuations and Buffer Policies of Low-income Countries', *KYKLOS*, **11**, 2, 141–54.
Nurkse, R. (1961), 'Patterns of Trade and Development', in G. Haberler and R. M. Stern (eds.), *Equilibrium and Growth in the World Economy* (Cambridge, MA: Harvard University Press), 282–304.
O'Rourke, K. H. (2000), 'Tariffs and Growth in the Late 19th Century', *The Economic Journal*, **110**, 463, 456–83.
O'Rourke, K. H. and J. G. Williamson (1999), *Globalization and History: The Evolution of a 19th Century Atlantic Economy* (Cambridge, MA: MIT Press).
Olley, G. S. and A. Pakes (1996), 'The Dynamics of Productivity in the Telecommunications Equipment Industry', *Econometrica*, **64**, 6, 1263–97.
Oxley, L. (1993), 'Cointegration, Causality and Export-led Growth in Portugal, 1865–1985', *Economics Letters*, **43**, 2, 163–66.
Pagan, A. (1984), 'Econometric Issues in the Analysis of Regressions with Generated Regressors', *International Economic Review*, **25**, 1, 221–47.
Panagariya, A. (1996), 'The Free Trade Area of the Americas: Good for Latin America?', *The World Economy*, **19**, 5, 485–515.

Panagariya, A. (1999), 'The Regionalism Debate: An Overview', *The World Economy*, **22**, 4, 455–76.
Panagariya, A. (2000), 'Preferential Trade Liberalization: The Traditional Theory and New Developments', *Journal of Economic Literature*, **38**, 2, 287–331.
Parente, S. L. and E. C. Prescott (1994), 'Barriers to Technology Adoption and Development', *Journal of Political Economy*, **102**, 2, 298–321.
Parente, S. L. and E. C. Prescott (1999), 'Monopoly Rights: A Barrier to Riches', *American Economic Review*, **89**, 5, 1216–33.
Pavcnik, N. (2002), 'Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants', *Review of Economic Studies*, **69**, 1, 245–76.
Prebisch, R. (1959), 'Commercial Policy in the Underdeveloped Countries', *American Economic Review*, **49**, 2, 251–73.
Pritchett, L. (1996), 'Measuring Outward Orientation in LDCs: Can It Be Done?', *Journal of Development Economics*, **49**, 2, 307–35.
Pritchett, L. (2000), 'Understanding Patterns of Economic Growth: Searching for Hills among Plateaus, Mountains, and Plains', *World Bank Economic Review*, **14**, 2, 221–50.
Ram, R. (1987), 'Exports and Economic Growth in Developing Countries: Evidence from Time Series and Cross-section Data', *Economic Development and Cultural Change*, **36**, 1, 50–72.
Riezman, R. G., C. H. Whiteman and P. M. Summers (1996), 'The Engine of Growth or Its Handmaiden? A Time-series Assessment of Export-led Growth', *Empirical Economics*, **21**, 77–110.
Rivera-Batiz, L. A. and P. M. Romer (1991a), 'International Trade with Endogenous Technological Change', *European Economic Review*, **35**, 4, 971–1001.
Rivera-Batiz, L. A. and P. M. Romer (1991b), 'Economic Integration and Endogenous Growth', *Quarterly Journal of Economics*, **106**, 2, 531–55.
Roberts, M. J. and J. R. Tybout (1997), 'The Decision to Export in Columbia: An Empirical Model of Entry with Sunk Costs', *American Economic Review*, **87**, 4, 545–64.
Rodriguez, C. A. and D. Rodrik (2000), 'Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-national Evidence', in B. S. Bernanke and K. Rogoff (eds.), *NBER Macroeconomics Annual 2000* (Cambridge, MA: National Bureau of Economic Research).
Rodrik, D. (1995), 'Trade Policy and Industrial Policy Reform', in J. Behrman and T. N. Srinivasan (eds.), *Handbook of Development Economics*, Vol. 3B (Amsterdam: North-Holland).
Rodrik, D., A. Subramanian and F. Trebbi (2004), 'Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development', *Journal of Economic Growth*, **9**, 2, 131–65.
Romalis, J. (2007), 'NAFTA's and CUSFTA's Impact on International Trade', *Review of Economics and Statistics*, **89**, 3, 416–35.
Romer, P. M. (1986), 'Increasing Returns and Long-run Growth', *Journal of Political Economy*, **94**, 5, 1002–37.
Romer, P. M. (1990), 'Endogenous Technical Change', *Journal of Political Economy*, **98**, 5, S71–102.
Rose, A. K. (2004a), 'Do We Really Know that the WTO Increases Trade?', *American Economic Review*, **94**, 1, 98–114.
Rose, A. K. (2004b), 'Do WTO Members Have More Liberal Trade Policy?', *Journal of International Economics*, **63**, 2, 209–35.
Rose, A. K. (2005a), 'Which International Institutions Promote International Trade?', *Review of International Economics*, **13**, 4, 682–98.
Rose, A. K. (2005b), 'Does the WTO Make Trade More Stable?', *Open Economies Review*, **16**, 1, 7–22.
Rose, A. K (2007), 'Do We Really Know that the WTO Increases Trade? Reply', *American Economic Review*, **97**, 5, 2019–25.
Ruane, F. and J. Sutherland (2005), 'Export Performance and Destination Characteristics of Irish Manufacturing Industry', *Review of World Economics*, **141**, 3, 442–59.

Sachs, J. D. and A. Warner (1995), 'Economic Reform and the Process of Global Integration', *Brookings Papers on Economic Activity*, **1**, 1–118.
Schmitz Jr., J. A. (2005), 'What Determines Labor Productivity? Lessons from the Dramatic Recovery of US and Canadian Iron-ore Industries Following Their Early 1980s Crisis', *Journal of Political Economy*, **113**, 3, 582–625.
Schor, A. (2004), 'Heterogeneous Productivity Response to Tariff Reduction: Evidence from Brazilian Manufacturing Firms', *Journal of Development Economics*, **75**, 2, 373–96.
Serti, F. and C. Tomasi (2008), 'Self-selection and Post-entry Effects of Exports: Evidence from Italian Manufacturing Firms', *Review of World Economics*, **144**, 4, 660–94.
Sims, C. A. (1980), 'Macroeconomics and Reality', *Econometrica*, **48**, 1, 1–48.
Singer, H. W. (1950), 'The Distribution of Gains between Investing and Borrowing Countries', *American Economic Review*, **40**, 2, 473–85.
Singh, T. (2003), 'Effects of Exports on Productivity and Growth in India: An Industry-based Analysis', *Applied Economics*, **35**, 7, 741–49.
Solow, R. M. (2001), 'What Have We Learned from a Decade of Empirical Research on Growth? Applying Growth Theory across Countries', *World Bank Economic Review*, **15**, 2, 283–88.
Staiger, D. and J. H. Stock (1997), 'Instrumental Variables Regression with Weak Instruments', *Econometrica*, **65**, 3, 557–86.
Staiger, R. W. and G. Tabellini (1987), 'Discretionary Trade Policy and Excessive Pretection', *American Economic Review*, **77**, 5, 823–37.
Subramanian, A. and W. Shang-Jin (2007), 'The WTO Promotes Trade, Strongly but Unevenly', *Journal of International Economics*, **72**, 1, 151–75.
Syrquin, M. and H. Chenery (1989), 'Three Decades of Industrialization', *World Bank Economic Review*, **3**, 2, 145–81.
Temple, J. (1999), 'The New Growth Evidence', *Journal of Economic Literature*, **37**, 1, 112–56.
Tinbergen, J. (1962), *Shaping the World Economy* (New York: Twentieth Century Fund).
Tomz, M., J. Goldstein and D. Rivers (2007), 'Do We Really Know that the WTO Increases Trade? Comment', *American Economic Review*, **97**, 5, 2005–18.
Trefler, D. (1993), 'Trade Liberalization and the Theory of Endogenous Protection: An Econometric Study of U.S. Import Policy', *Journal of Political Economy*, **101**, 1, 138–60.
Tybout, J. R. (1992), 'Linking Trade and Productivity: New Research Directions', *World Bank Economic Review*, **6**, 2, 189–211.
Tybout, J. (2000), 'Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?', *Journal of Economic Literature*, **38**, 1, 11–44.
Tybout, J., J. de Melo and V. Corbo (1991), 'The Effects of Trade Reforms on Scale and Technical Efficiency: New Evidence from Chile', *Journal of International Economics*, **31**, 3/4, 231–50.
Tybout, J. R. and M. D. Westbrook (1995), 'Trade Liberalization and the Dimensions of Efficiency change in Mexican Manufacturing Industries', *Journal of International Economics*, **39**, 1/2, 53–78.
Tyler, W. G. (1981), 'Growth and Export Expansion in Developing Countries: Some Empirical Evidence', *Journal of Development Economics*, **9**, 1, 121–30.
Vamvakidis, A. (1999), 'Regional Trade Agreements or Broad Liberalization: Which Path Leads to Faster Growth?', *International Monetary Fund Staff Papers*, **46**, 1, 42–68.
Vamvakidis, A. (2002), 'How Robust is the Growth–Openness Connection? Historical Evidence', *Journal of Economic Growth*, **7**, 1, 57–80.
Van Biesebroeck, J. (2005), 'Exporting Raises Productivity in Sub-Saharan African Manufacturing Firms', *Journal of International Economics*, **67**, 2, 373–91.
Van Biesebroeck, J. (2007), 'Robustness of Productivity Estimates', *Journal of Industrial Economics*, **55**, 3, 529–69.
Viner, J. (1950), *The Customs Union Issue* (New York: Carnegie Endowment for International Peace).
Voivodas, C. S. (1973), 'Exports, Foreign Capital Inflow and Economic Growth', *Journal of International Economics*, **3**, 4, 337–49.

Wacziarg, R. (1998), 'Measuring the Dynamic Gains from Trade', *World Bank Policy Research Working Paper No. WPS200I* (Washington, DC: World Bank).
Wacziarg, R. (2001), 'Measuring the Dynamic Gains from Trade', *World Bank Economic Review*, **15**, 3, 393–429.
Wagner, J. (2002), 'The Causal Effects of Exports on Firm Size and Labor Productivity: First Evidence from a Matching Approach', *Economics Letters*, **77**, 2, 287–92.
Wagner, J. (2007), 'Exports and Productivity: A Survey of the Evidence from Firm-level Data', *The World Economy*, **30**, 1, 60–82.
Williamson, R. (1978), 'The Role of Exports and Foreign Capital in Latin American Economic Growth', *Southern Economic Journal*, **45**, 2, 410–20.
Winters, L. A. (2004), 'Trade Liberalisation and Economic Performance: An Overview', *Economic Journal*, **114**, 493, F4–21.