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Do Lagging Regions Benefit from Trade?

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After decades of post-imperial stagnation, South Asia has experienced impressive growth in recent years. From 1990 to 2005, the region's gross domestic product (GDP) grew at about 6 per cent annually—nearly twice the rate of the world economy. This acceleration in output growth took place in the context of a parallel increase in international trade—itself driven by a combination of declining trade barriers and transportation costs as well as technological changes. Between 1990 and 2005, South Asia's largest economy, India (accounting for nearly 75 per cent of regional GDP), more than doubled its trade-to-GDP ratio (from about 15 per cent to 35 per cent). Other countries in the region, including Bangladesh and Sri Lanka, also experienced impressive increases in their international trade. Greater international trade in the region, however, has raised some basic questions regarding the gains from trade: Who benefits from trade? Will greater international trade result in an increase in income inequality and poverty? Should we expect the benefits from trade to be uniformly distributed across lagging and leading regions within a country?

Basic international trade theory predicts that trade will increase the returns to the abundant factors in an economy: For the unskilled, labour abundant countries of South Asia, this is good news—the implication is that trade will raise the incomes of low-skilled workers, thus generating a reduction in poverty. It has, however, been argued that the benefits of

trade may not spread uniformly across different regions within a country for a number of practical reasons. First, different regions may have different levels of access to international trade—lagging regions may not benefit from trade because transportation and other trade costs may be too high for these regions to interact with international markets. As the World Development Report (WDR, World Bank: 2009a) notes:

> ... for trade in goods and services, distance from markets implies time and monetary costs. The placement and quality of transport infrastructure and the availability of transport can dramatically affect the economic distance between any two areas ... two villages may have the same straight-line distance to a city, but one could be near a national highway, the other on an unpaved rural road.

Thus, the type and quality of roads and other transport infrastructure may affect the ability of lagging regions to benefit from trade.

Second, an important source of the gains from trade is the improvement in the allocation of productive resources in the economy. To achieve this improvement in production efficiency, however, it is important that factors of production, such as labour, are mobile and that labour markets are flexible to enable mobility. However, markets, in practice, are often characterized by a variety of rigidities. Importantly, the extent of labour market inflexibility also varies across countries. As Ramaswamy (2003) notes:

> In India, firms employing more than 100 workers need to take prior permission from the government before retrenching a worker. In Sri Lanka, all firms employing more than 15 workers need consent of the Commissioner of Labor before dismissing a worker with more than one year of service. In Pakistan, permission from the labor courts is required for all firms with more than ten workers to close or to retrench more than 50 per cent of the workers. In Bangladesh, a worker can be retrenched after giving one month's notice to the concerned worker.

Furthermore, regions within a country may also vary in their labour market flexibility. Aghion et al. (2006) note in their study on the differential effects of trade liberalization across Indian states that, in India, 'labor market institutions started from a common nationwide framework, the Industrial Disputes Act, approved in 1947, which regulated industrial relations in the registered or organized manufacturing sector'. However, under the Indian constitution 'states were entitled to amend the Act, and amendments were in fact extensively introduced. As a result, labor market institutions gradually evolved, and there was a large extent of heterogeneity across Indian states at the time of the industrial policy reforms of the 1980s and 1990s.'

Third, recent insights from the literature on the 'new economic geography' suggest that increases in regional disparities may be a natural feature of the economic development process (Fujita et al. 1999). Specifically, if production is subject to economies of scale (so unit costs fall with larger scale in production), market forces may induce production to agglomerate in a few areas. In this case, the economic development process can be a lumpy one—with some regions growing faster than others do. Trade itself may affect agglomeration patterns and the location of economic activity. Trade liberalization may lead to an increase in the geographic concentration of economic activity—thus, possibly increasing (or decreasing) the extent of regional differences within a country. As WDR 2009 notes, in China, the coastal provinces—three areas known as the Bohai Basin, the Pearl River Delta, and the Yangtze River Delta—accounted for more than half of the country's GDP in 2005, but constitute less than a fifth of China's geographic area. This is a pattern of concentration of economic activity that has accelerated with the expansion of Chinese trade in recent decades.

The preceding discussion highlights contexts in which the effect of trade on poverty alleviation in developing countries may not be uniform—with the specific possibility that lagging regions may not see benefits from trade. It is these issues concerning the differential effects of trade openness on leading and lagging regions within countries in South Asia that this chapter is interested in studying. Using data from South Asia (primarily from India), we study empirically the extent to which trade liberalization affects differently lagging and leading regions within a country. In addition, we attempt to study the factors that inhibit market integration and prevent trade from positively affecting development in lagging regions. Our focus is on poverty—but we do also examine other variables of interest such as industry productivity.

To preview our findings: We find evidence that although trade liberalization is associated with reduced poverty, the effect is smaller in lagging states. A percentage point reduction in the tariff rate decreases poverty by 0.22 per cent in the leading states, while the effect is insignificant in the lagging states. Within leading states, the effects of trade liberalization are also larger in the urban rather than rural areas. A percentage point decrease in the tariff rate decreases poverty by 0.19 per cent in the rural sector and by 0.26 per cent in the urban sector in the leading states.

Lagging states are farther away from ports (on average about 25 per cent farther from the nearest port than an average leading state). For

example, the north-eastern states in India that fall in the 'lagging category' are somewhat geographically isolated. This isolation from the rest of India is accentuated by the intermediate presence of Bangladesh, which makes distance by road to the nearest port quite large (more than 1000 km in some instances). Also, the quality of roads and highway connections in this sector lag behind most states. In contrast, Maharashtra is a leading state, and itself has the country's largest port, the city of Mumbai. In Pakistan, the North West Frontier Province (NWFP) faces a similar problem of remoteness, while the leading region of Sindh has the country's largest port, Karachi. How much does remoteness matter? We find that price transmission (from international prices to domestic prices) is less perfect in lagging states than in leading ones, especially in the rural sector. Our estimates for India suggest that, in the urban sector, a 1 per cent reduction in international prices implies a 0.61 per cent reduction in the unit price in the leading states but a 0.53 per cent reduction in the unit price in the lagging states. In contrast, in the rural sector, a 1 per cent reduction in international prices implies a 0.60 per cent reduction in the unit price in leading states but a 0.34 per cent reduction in the unit price in the lagging states. This, taken along with the findings concerning the links between trade liberalization and poverty reduction described earlier, suggests that it is the lack of exposure to international markets (and not the opposite cause—that is, competition from international trade) that is lowering the rate of poverty reduction in lagging regions relative to leading ones.

Finally, we see that trade liberalization has increased the productivity of Indian industry, while also finding that the increase in productivity due to trade liberalization is (weakly) smaller in lagging states. Specifically, a 1 percentage point reduction in the tariff rate increases productivity by 0.41 per cent across all leading states but only by 0.38 per cent in the lagging states. These results for India suggest that lagging regions and the extent of regional inequality limit the benefits of trade reform in a number of ways.

We study the links between trade and poverty alleviation further using data from other countries in South Asia—Bangladesh, Pakistan, Nepal, and Sri Lanka. We find that the effects of trade liberalization on poverty differ by the proportion on national population living in lagging regions. Countries with a smaller proportion of population in lagging regions benefit more from trade liberalization. Specifically, our results indicate that a percentage point increase in the proportion of population in lagging regions further depresses the annual growth in per capita GDP

after trade liberalization further by 0.01 percentage points. We also find statistically weaker yet suggestive evidence that a percentage point increase in the proportion of population in lagging regions decreases the annual rate of decline in poverty following trade liberalization by an additional 0.01 percentage point. Even though small, since these effects are on the annual rate of growth or decline, these benefits can accumulate to something quite substantial over time.

The rest of this chapter proceeds as follows. In the next section, we briefly survey the existing empirical literature on the effects of trade liberalization. This literature has largely focused on the effects of trade on growth, inequality, and poverty reduction at the national level, paying relatively little attention to subnational variation in outcomes. Nevertheless, as we will point out, a few contributions in this literature have indeed discussed how a variety of economic, political, and institutional factors that vary at the subnational level may lead to differences in regional outcomes. In the sections that follow we discuss our data, our estimation strategy, and our empirical results. In the final sections we discuss the policy implications of the literature and our empirical analysis for South Asia. Finally, we present our conclusions.

TRADE, GROWTH, INEQUALITY, AND POVERTY

Early empirical demonstrations of the linkages between trade and growth include the well-known studies of Bhagwati (1978) and Krueger (1978). Analysing in detail a sample of developing countries including India and Turkey, these studies concluded that trade openness was indeed an important driver of economic growth. These conclusions are also consistent with the recent economic experience—as countries such as China and India have grown extremely fast after their economies became open to trade and foreign direct investment in recent decades. While these countries were also engaged in numerous domestic policy reforms at the same time, it would be hard to argue that international integration did not play an important role in supporting the growth outcomes there.

Other methodological approaches have also been used in the literature to explore the link between trade and growth. Hasan et al. (2007) list Wacziarg and Welch (2004), Edwards (1998), Sachs and Warner (1995), and Dollar (1992), each of whom, using cross-country growth regressions, found positive effects of trade on growth. However, Rodriguez and Rodrik (2001) have argued that results linking trade and growth are not particularly robust to the choice of openness measures. These inconclusive findings have inspired a vigorous debate regarding the limitations of

both case-study and cross-country regression approaches in analysing the relationship between trade and growth. While the trade–growth nexus has not been decisively demonstrated in quantitative exercises, a combination of intuition and experience leads the majority of economists to believe that trade is good for growth (and at a minimum that trade does not harm growth).

An extensive literature has examined the impact of trade liberalization on inequality in developing countries (see Goldberg and Pavcnik [2004] and Winters et al. [2004] for comprehensive surveys). Since developing countries are mainly unskilled labour abundant, trade liberalization should result in specialization in unskilled labour-intensive sectors, pushing the unskilled wage up relative to the skilled wage. However, as Goldberg and Pavcnik (2004) point out, a casual examination of the data suggests that, if anything, there were large increases in inequality between skilled and unskilled workers in the years following trade reform in Latin America (with inequality increasing by 60 per cent between 1987 and 1993 for Mexico and by 20 per cent between 1990 and 1998 for Colombia). Rising skill premia suggest that factors other than (or which dominate) international trade (which, theoretically, should be shrinking skill premia in developing countries) may be at work in determining labour market outcomes. Several explanations have been offered in the literature.

First, returns to particular occupations that require a higher level of education may have increased—as has been observed in Mexico. At the same time, it appears that the fraction of skilled workers has risen across all sectors. Taken together, these facts point to skill biased technological change rather than international trade as the dominant driver of rising skill premia. On the other hand, the literature has also suggested that it may be trade liberalization that causes skill-biased technological change. For instance, in Colombia, demand for skilled workers was largest in those sectors that experienced the largest tariff cuts, suggesting that competition induces firms to pursue research and development (R&D) and invest in technologies and innovation. Finally, it has been argued that international trade has indeed contributed to rising inequality in developing countries because of the nature of production sharing in the global economy. Feenstra and Hanson (1996) have argued that industrial countries typically outsource production of less-skill-intensive intermediate goods to developing countries. However, these intermediate goods are relatively more skill intensive in developing countries. Outsourcing hence increases the relative demand for skilled labour in both industrial and developing countries, thereby increasing the skill premium. Overall, it appears that skill-biased technological change and

international trade may both be relevant in understanding increased wage inequality in industrial and developing countries. Feenstra and Hanson (1996), study US trade data to conclude that both factors are quantitatively significant as well (with international trade explaining roughly 15 per cent of the increased wage inequality and skilled biased technological change explaining another 40 per cent).

The literature has also examined the question of the relationship between trade and poverty. On the one hand, it has been argued that if trade is good for growth, it should also lower poverty. For instance, trade liberalization increases productivity through cheaper intermediate inputs and import competition—and productivity improvements are clearly important for poverty alleviation in the long run. On the other hand, if productivity grows faster than output in the short run, there may be adverse consequences for employment. Equally, import competition may kill weaker domestic firms, pushing their employees into less-well-paying alternatives or unemployment—thereby raising poverty. In one of the relatively few studies to have examined the effects of trade on poverty using disaggregate household level data, Hasan et al. (2007) provide evidence for the poverty-reducing impact of trade reforms in India. Their study also shows that trade reform is associated with larger reductions in poverty in states with flexible labour laws, especially in the urban sector. Finally, their study finds weak evidence that, in addition to the effect of trade liberalization, deregulation reduces poverty in states with flexible labour markets.

Finally, the literature stresses the role played by domestic policy in ensuring that the poor benefit from trade reforms. Rodrik et al. (2002) find that the quality of domestic institutions interacts with trade liberalization. They use an instrumental variables approach to control for the endogeneity of trade and institutions to find that good institutions are important for growth. Hasan et al. (2003) contend that institutions that 'support economic freedom'—like freedom to trade with foreigners, property rights, and rule of law—are key to poverty reduction. Harrison (2006) stresses the need for investment in human capital, credit provision, and infrastructure for globalization to aid poverty reduction.

In closing this brief literature review, we should note that the most, if not all, of the papers in the literature are fraught with methodological issues—notably measurement error of various forms in data and difficult questions concerning identification and inference in the statistical analysis. Improved data and econometric methodologies are nevertheless constantly being brought to bear, and future research will most likely

provide more decisive answers to these questions than has been possible to date until now.

DATA

Poverty

For India, the poverty and trade protection data used in this paper are from Hasan et al. (2007).[1] To measure poverty, we employ urban, rural, and overall poverty rates (headcount indices) by state based on National Sample Survey (NSS) household expenditure surveys, and urban and rural poverty lines for the years 1987–88, 1993–94, and 1999–2000. Different estimates of poverty are available for India because of differences in data and methods used.[2] To ensure that our results are robust to varied approaches to estimating poverty, we employ three different estimates for poverty rates.

The first set of estimates is from Deaton and Dreze (2002). The Deaton and Dreze (DD) poverty estimates improve upon official estimates by using better commodity weights for the consumer-price index (CPI), adjusting for the change in the NSS survey questionnaire in 1999–2000, and accounting for the differentials between urban and rural poverty lines implicit in the official poverty lines. Our second set of estimates is the official Government of India (GOI) poverty estimates adjusted for the change in the NSS expenditure survey questionnaire as proposed by Deaton (2003). The DD and GOI estimates are obtained from thick rounds of the NSS survey. The third set of poverty estimates used in this paper, developed by Ozler-Datt-Ravallion (ODR), was downloaded from LSE's EOPP Indian States Database website. These estimates are based on both thick and thin rounds of the NSS expenditure survey, although they do not correct for the new NSS survey questionnaire in 1999–2000.

For the other South Asian countries in our cross-country regressions, we use poverty data from the World Bank's PovcalNet database. This database incorporates the findings of the 2005 International Comparison Program (ICP). The poverty estimates combine the 2005 purchasing power parity (PPP) exchange rates for household consumption from the 2005 ICP with data from 675 household surveys across 116 developing countries spanning the period 1981–2005. The World Bank's official poverty estimates (as reported in the World Development

[1]Hasan et al. (2007) provide a more comprehensive discussion of the poverty and trade protection estimates used in this paper.

[2]See Hasan et al. (2007) for more details.

Indicators) use unit record household data whenever possible while PovcalNet uses grouped distributions. Our poverty variable is the percentage of population living in households with consumption or income per person below the poverty line. The poverty line is $38.00 per month at 2005 PPP. This is the World Bank $1.25 per day poverty line ($38=$1.25*365/12).

We use two other measures of well-being. The first is the per capita GDP in 2005 PPP US dollars obtained from the World Development Indicators 2009. The second is the Human Development Index (HDI) from the United Nations Development Program (UNDP) as an alternative measure of human well-being. The HDI is a composite index measuring the average achievements in a country in three dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. The dimensions are measured by life expectancy at birth; adult literacy and combined gross enrolment in primary-, secondary-, and tertiary-level education; and GDP per capital in PPP US dollars.[3] HDI measures are available for the years 1975 through 2005 with gaps of five years in between.[4] Hence, we assume that the HDI is constant over five-year intervals in this period.

Measures of Regional Inequality

In our cross-country regressions for South Asia, we use the proportion of population in lagging regions within each country as a measure of regional inequality. We classify regions, states, and provinces within each country as leading and lagging based on data provided to us by the South Asia Poverty Reduction and Economic Management (PREM) team of the World Bank. Table 4.1 lists these regions, states, and provinces and their classifications. Next, we use region-, state-, province-, and national-level populations for each country to construct the proportion of national population in lagging regions. For Bangladesh, India, and Sri Lanka, we use population data provided by the World Bank. For Nepal, we use population data from the Statistical Yearbook 2005 (see Table 4.1), Central Bureau of Statistics, Government of Nepal. For Pakistan, we obtain population data from the Statistics Division,

[3]For details on the construction of the HDI see Technical Notes 1 in *Human Development Report 2007/2008*, UNDP.

[4]HDI are not comparable across time due to differences in methods used in calculation. Hence, we use Table 2 in the *Human Development Report 2007/2008* that provides trends in HDI from 1975 to 2005 with five-year gaps using the same methodology used for the construction of the 2005 HDI.

Ministry of Economic Affairs and Statistics, Population Census Organization, Government of Pakistan (see http://www.statpak.gov.pk/depts/pco/statistics/statistics.html). Data on populations are available only for census years. Hence, we use the populations in the beginning of the decade to calculate the proportion of population in lagging regions for the whole decade.[5] In the absence of such data, we use the population data for the next available year in the decade, and so on.

We use two other controls in our cross-country regressions of poverty on trade liberalization and its interaction with proportion of population

TABLE 4.1 Poverty, Regional Inequality, and Geographical Measures by Country

Variable	Country	Observations	Mean	Standard deviation	Maximum	Minimum
Proportion of population in lagging regions	Afghanistan	0				
	Bangladesh	27	0.72	0.02	0.69	0.73
	Bhutan	0				
	India Rural	17	0.61	0.01	0.6	0.62
	India Urban	17	0.42	0	0.42	0.42
	Maldives	0				
	Nepal	27	0.46	0	0.46	0.46
	Pakistan	40	0.17	0.01	0.17	0.18
	Sri Lanka	17	0.73	0.01	0.71	0.74
Coastline/(Coastline + Land boundary)	Afghanistan	48	0	0	0	0
	Bangladesh	48	0.12	0	0.12	0.12
	Bhutan	48	0	0	0	0
	India Rural	48	0.33	0	0.33	0.33
	India Urban	48	0.33	0	0.33	0.33
	Maldives	48	1	0	1	1
	Nepal	48	0	0	0	0
	Pakistan	48	0.13	0	0.13	0.13
	Sri Lanka	48	1	0	1	1
National average distance to capital city	Afghanistan	48	418	0	418	418

(contd...)

[5]We do not expect the proportion of population in lagging regions to vary greatly over a decade.

Table 4.1 (contd...)

Variable	Country	Observations	Mean	Standard deviation	Maximum	Minimum
	Bangladesh	48	165	0	165	165
	Bhutan	48	99	0	99	99
	India Rural	48	992	0	992	992
	India Urban	48	992	0	992	992
	Maldives	48	276	0	276	276
	Nepal	48	236	0	236	236
	Pakistan	48	661	0	661	661
	Sri Lanka	48	157	0	157	157
Percentage individuals in households below poverty line	Afghanistan	0				
	Bangladesh	7	50.25	4.21	43.03	56.11
	Bhutan	1	26.23	.	26.23	26.23
	India Rural	5	55.74	9.13	43.83	69.02
	India Urban	5	45.49	7.20	36.16	54.79
	Maldives	0				
	Nepal	2	61.78	9.42	55.12	68.44
	Pakistan	7	41.53	18.53	22.59	66.46
	Sri Lanka	4	16.31	2.62	13.95	19.96
Per capita GDP in PPP US$	Afghanistan	0				
	Bangladesh	28	797.10	164.41	614.12	1172.65
	Bhutan	28	2239.86	990.00	922.54	4567.53
	India Rural	28	1445.62	479.43	868.89	2598.59
	India Urban	28	1445.62	479.43	868.89	2598.59
	Maldives	13	3628.52	770.41	2520.01	5035.92
	Nepal	28	777.37	134.76	564.22	975.51
	Pakistan	28	1753.43	307.54	1190.90	2383.32
	Sri Lanka	28	2465.94	701.87	1553.16	4020.22
HDI	Afghanistan	0				
	Bangladesh	33	0.43	0.07	0.35	0.55
	Bhutan	3	0.58	0	0.58	0.58
	India Rural	33	0.51	0.06	0.42	0.62
	India Urban	33	0.51	0.06	0.42	0.62
	Maldives	3	0.74	0	0.74	0.74
	Nepal	33	0.41	0.08	0.30	0.53
	Pakistan	33	0.45	0.06	0.37	0.55
	Sri Lanka	33	0.69	0.04	0.62	0.74

Note: GDP = gross domestic product; HDI = Human Development Indicators; PPP = purchasing power parity.

in lagging regions. The first is the coastline in kilometres divided by the coastline plus the land boundary in kilometres. The second control is the national average distance to the national capital in kilometres. Data on coastlines, land boundaries, and average national distance to the capital are drawn from the World Development Indicators (World Bank 2009b). Table 4.2 provides summary statistics on the poverty, HDI, regional inequality, and geographic measures by country.

Trade Barriers for Poverty Regressions

Following Hasan et al. (2007), we look at both tariffs and non-tariff barriers (NTBs), and alternatively at a principal components aggregation of the two policy instruments as measures of trade protection. Protection measures by state by broad sector (urban, rural, and overall) are arrived at by weighting two-digit industry-level tariff rates and NTB coverage rates (constructed from Pandey 1999) for manufacturing, mining, and agricultural industries by state and sector employment shares. The NTB

TABLE 4.2 Summary Statistics for Protection and Poverty Measures

	Average*		
Variables	1987	1993	1999
Poverty measures			
Deaton-Dreze overall poverty rate	32.63	27.48	20.87
Deaton-Dreze urban poverty rate	21.15	16.93	11.62
Deaton-Dreze rural poverty rate	36.25	30.97	24.19
GOI overall poverty rate	36.58	33.63	26.52
GOI urban poverty rate	36.30	30.27	23.35
GOI rural poverty rate	36.07	33.82	26.91
ODR overall headcount index	40.28	36.66	31.28
ODR urban headcount index	36.46	28.12	22.53
ODR rural headcount index	41.34	39.12	33.70
Trade protection measures (Lagged by one year)			
Overall tariff	94.69	70.63	24.38
Urban tariff	131.49	93.84	36.72
Rural tariff	90.22	67.86	22.86
Overall non-tariff barriers	100	80.80	70.48
Urban non-tariff barriers	100	74.25	53.33
Rural non-tariff barriers	100	81.54	72.47

Notes: GOI = Government of India;
ODR = Ozler-Datt-Ravallion.
*The average is taken over the 15 major states.

measure is the proportion of the value of imports covered by NTBs. The weight for each industry in a state and sector is its employment share from the 1993–4 round of the NSS household data. We exclude non-tradables from our calculation of employment weights.[6] Thus, our state-level protection measures are inverse measures of the trade exposure of the labour force. Such measures make sense in the light of the fact that there is substantial inter-state and inter-industry labour immobility in India. Tariffs and NTBs are strongly correlated, and this prevents our estimates from being precisely estimated. We use principal components analysis, which combines correlated variables into a smaller set containing most of the variation in the data. Because the first principal component contains about 90 per cent of the variation for all industry groups in our case, we use it as a third measure of trade protection.

Table 4.2 presents summary statistics for the poverty and protection measures used in our trade and poverty regressions. Time plots of the three poverty and protection estimates (the tariff, NTB coverage rates, and the first principal component of the two) for the rural, urban, and overall sectors are available at http://faculty.maxwell.syr.edu/dmitra/hmu_appendix.pdf.

For our cross-country regressions, we use a dummy variable that is one after liberalization and zero before liberalization to study the impact of trade liberalization on trends in poverty. Years of trade liberalization for each of the South Asian countries are obtained from Sachs and colleagues (1995) and from Wacziarg and Welch (2003). Sachs and colleagues classify a country as closed to trade if it satisfies at least one of the following conditions: (i) NTBs covering more than 40 per cent or more of trade; (ii) average tariff rate of 40 per cent or more; (iii) a black market exchange rate that is depreciated by 20 per cent or more relative to the official exchange rate, on average, during the 1970s or the 1980s; (iv) a socialist economic system; or (v) a state monopoly on major exports. A country is classified as open if none of the above apply to it. They determine the trade liberalization date as the date after which a country remains open continually until the end of the sample period, which is 1994. Wacziarg and Welch (2003) update the Sachs et al. study and include trade liberalization dates for countries that liberalized after 1994 and before 2001, which is the end of their sample period. They disagree with Sachs et al. on trade liberalization dates for several countries,

[6]The size of the non-tradable part of economy is endogenous to protection given to tradable sectors and to factor endowments (controlled for by our state-specific fixed effects).

TABLE 4.3 Trade Liberalization Dates

Country	Trade liberalization year
Afghanistan	
Bangladesh	1996
Bhutan	
India	1994
Maldives	
Nepal	1991
Pakistan	2001
Sri Lanka	1977–83, 1991

Sources: Wacziarg and Welch 2003; Sachs et al. 1995.

one of which is India. Sachs et al. note 1994 as the year in which India can be classified as open, however, Wacziarg and Welch (2003) find that even though 1994 was the year that saw major tariff reductions in India, the country still had high NTBs, which were not below 40 per cent by the end of 2001. For the purpose of this study, we use 1994 as the year in which India liberalized trade. Table 4.3 provides liberalization dates for each of the South Asian countries in our sample.

Data for Price Transmission Regressions for India

Price data for price transmission regressions, also obtained from Hasan et al. (2007), are unit values for primary commodities computed using information on expenditures and quantities from the NSS consumer expenditure surveys for 1987–8, 1993–4, and 1999–2000. World prices for the same years are derived from the index of export prices in the World Trade Organization's International Trade Statistics handbook. Distance is measured as the weighted sum of the distances between a state capital and all ports, with the weights being the share of each port in overall cargo traffic.[7] Exchange rate data are from the International Monetary Fund (IMF) *International Financial Statistics* (IFS) database. Our tariff and NTB measures are at the commodity level.

Export Data for India

Export data are from the National Bureau for Economic Research–United Nations (NBER–UN) World Import and Export database (http://www.nber.org/data/) provided by Feenstra et al. (2005). The data are at the four-digit level of Standard International Trade Classification (SITC)

[7]For sources of distance data, see Hasan et al. (2007).

Rev 2. The data were matched with production data for manufacturing industries at the two-digit level from the Annual Survey of Industries, CSO, New Delhi.[8] Export and production data are for the years 1980 through 1997. To examine whether lagging states primarily produce goods in export-oriented industries, we use, as a regressor, the value of exports of each two-digit industry as a proportion of overall exports as a measure of export orientation. Net value added in each industry in a state as a proportion of overall net value added of all industries in that state has been used to measure specialization in each industry within a state.

Data for Productivity Regressions for India

For our productivity regressions, we use data on net value added, capital stock, and number of workers for each of 18 two-digit manufacturing industries in 16 Indian states from the Annual Survey of Industries. Tariff and NTB rates, constructed from Pandey (1999), are at the two-digit industry level and are from Hasan et al. (2007). We again classify Indian states as leading and lagging states based on data provided to us by the South Asia PREM team of the World Bank. The states of Assam, Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, and West Bengal are classified as lagging states.

ESTIMATION STRATEGY AND RESULTS

Trade and Poverty

For the period during which India experienced trade liberalization, we want to know whether the differences in the level of development between lagging and leading regions were becoming smaller or getting magnified over time. In other words, we are interested in finding out where development is taking place faster. As a starting point, we ask if poverty trends differ across leading and lagging Indian states, and if they

[8]The ASI data are at the 2-digit level of NIC, India. To match the NBER–UN world trade data with Indian production data, the world trade data were first converted to US NAICS 1997 using the concordance provided by Feenstra and Lipsey at http://www.nber.org/data/. During this process, some export data which Feenstra and Lipsey could not attribute to the 4-digit SITC level and hence attributed to a 3-digit SITC code were lost. We then aggregated the data to the 3-digit NAICS level. A concordance was then written between 3-digit US NAICS 1997 and 2-digit Indian NIC 1987. Data have been aggregated at the 2-digit level to reduce measurement error caused by the concordance. The world trade data are in nominal US dollars and the Indian ASI data in nominal Indian rupees.

are different, where are these trends higher. The specification we adopt for this purpose is as follows:

$$y_{it}^{j} = \gamma^{j} t + \eta^{j} t * \text{Lag}_{i} + \delta_{i}^{j} + \varepsilon_{it}^{j} \quad (4.1)$$

where y^{j}_{it} is the logarithm of poverty in state i and sector j (where j = overall, urban, or rural) at time t, t is the time trend, Lag_i is a dummy variable that equals one if the state is a lagging state and is constant over the three years, δ^{j}_{i} are state fixed effects and ε^{j}_{it} is the error term. We expect a positive coefficient on the interaction between the time trend and the lag dummy if poverty has been rising faster or falling more slowly in lagging states.

Our main question in this chapter focuses on the impact of trade on poverty and the difference in this effect between the leading and the lagging states. We also want to control for trends or time effects common across all states to control for the decline in poverty that would take place in any case through poverty-alleviation programmes and other policies. It is actually quite possible that government programmes to reduce poverty are more concentrated in the lagging states. Not controlling for the differential in trend, which is driven by such policies, in fact makes finding a smaller poverty-reducing effect of trade in lagging more difficult. We work here with the following basic specification:

$$y_{it}^{j} = \alpha + \beta_{1}^{j}\text{protection}_{it-1}^{j} + \beta_{2}^{j}\text{Lag}_{i} * \text{protection}_{it-1}^{j} + \delta_{i}^{j} + \mu_{t}^{j} + \varepsilon_{it}^{j} \quad (4.2)$$

where protection $^{j}_{it\text{-}1}$ is the trade protection measure (the tariff, NTB coverage rate or Principal Component (i) lagged by one year and μ_t represents time fixed effects. Note that the level of protection here is at the state level and is arrived at from industry-level protection for various sectors and weighting them with their employment shares with the overall, urban, or rural sector. In deriving this measure, we restrict ourselves to tradable sectors. The state fixed effects control for time invariant unobservable state-specific factors like factor endowments or local government policy that might affect poverty and might be correlated with protection. While β_1^j identifies the impact of trade liberalization on poverty (in sector j = overall, urban, or rural) in leading states, β_2^j captures the differential effect on lagging states.

Price Transmission

After investigating whether trade affects poverty differently in leading and lagging regions, in the event we find a difference, we would like to

find the causes for it. An important possible cause could be differences in the transmission of international prices and trade protection. We check for differences in the transmission of trade protection to domestic prices between lagging and leading states by running the following regression:

$$p^{j}_{cit} = \alpha + \beta_1 \text{protection}_{ct} + \beta_2 \text{protection}^{ct} * \text{Lag}_i + \beta_3 \text{world price}_{ct} + \beta_4 \text{world price}_{ct} * \text{Lag}_i + \beta_5 \text{exchange rate}_t + \beta_6 \text{inverse distance}_i * \text{protection}_{ct} + \beta_7 \text{inverse distance}_i * \text{world price}_{ct} + \delta_i + \varepsilon_{cit} \quad (4.3)$$

where p^{j}_{cit} is the unit price of commodity c in sector j (rural or urban) in state i at time t. Protection_{ct} is now a vector of protection measures including either tariff rates or NTB coverage rates or both at the industry level. Lag_i is the lagging state dummy that equals one if a state is classified as a lagging state, δ_i are state fixed effects, and ε_{cit} is the error term. The coefficient β_2 will be negative if price transmission in lagging states is more imperfect than in leading states.

Exports

If protection and world prices are transmitted to the leading and lagging states to different degrees, and that causes the differential effects of trade on poverty in leading relative to lagging states, then this could happen through differences in the product mixes of the two types of states. The easiest thing that comes to mind here is to look for the importance of export goods in the overall product mix. We explore whether lagging or leading states produce export-oriented goods as a larger proportion of their output by running the following regression:

$$q_{kit} = \alpha + \beta_1 \exp_{kt} + \beta_2 \exp_{kt} * \text{Lag}_i + \mu_t + \varepsilon_{kit} \quad (4.4)$$

where q_{kit} is output (measured by net value added) in industry k in state i at time t as a proportion of total output in state i at time t and $\exp_{kt}$ is the value of exports from India in industry k at time t as a proportion of overall national exports at time t. If leading states specialize in net export goods and lagging states in other goods we would expect to see a negative β_2.

Productivity

While trade can affect poverty and incomes by making countries more specialized in certain goods and by increasing competition, trade can also force firms to be more efficient and can make them invest more in R&D. Thus productivity is expected to increase through trade, unless

the loss in market size for domestic import-competing firms offsets this effect. However, due to the differential transmission across states, the effect of trade liberalization on productivity might differ across leading and lagging states. Also, factor markets can be more rigid in the lagging states, coming in the way of resource reallocation in response to trade liberalization. To estimate the trend in productivity and to see whether the trends are the same or different across leading and lagging states, we estimate the following regression:

$$\log q_{kit} = \alpha + \beta_1 \log K_{kit} + \beta_2 \log L_{kit} + \beta_3 t + \beta_4 t^* Lag_i + \delta_i + \zeta_k + \varepsilon_{kit} \quad (4.5)$$

where q_{kit}, K_{kit}, and L_{kit} refer to net value added, capital stock, and employment in industry k in state i at time t, and ζ_k are industry fixed effects. We expect a negative β_4 if productivity has been rising more slowly in lagging states. If the trends are actually different, this difference may be caused by the fact, trade affects the two types of states differently. To find this out we focus on the impact of trade policy on industry productivity in India by estimating:

$$\log q_{kit} = \alpha + \beta_1 \log K_{kit} + \beta_2 \log L_{kit} + \beta_3 Lag_i + \beta_4 protection_{kt} + \beta_5 protection_{kt}^* Lag_i + \zeta_k + \mu_t + \varepsilon_{kit} \quad (4.6)$$

where $protection_{kt}$ refers to either the tariff rate or the NTB coverage rate; μ_t are time fixed effects.

Trade and Poverty in South Asia

After running the above regressions for India, we need to generalize our findings to the extent possible with the limited data available for the other South Asian countries. To estimate the effects of trade liberalization on poverty and well-being in South Asia as a whole, we run cross-country regressions of the form:

$$h_{ct} = \alpha + \beta_1 t + \beta_2^* t^* T_{ct} + \varepsilon_{ct} \quad (4.7)$$

where h_{ct} refers to human development poverty in country c at time t and is measured by per capita GDP or percentage of population in households in poverty or the human development index (HDI); 't' is a trend, T_{ct} is the trade liberalization dummy that equals zero pre-liberalization and that equals one post-liberalization. To further study whether these trade liberalization effects on poverty trends depend on the proportion of national population in lagging regions, we estimate the equation:

$$h_{ct} = \alpha + \beta_1 t + \beta_2 {}^* t {}^* \mathrm{T}_{ct} + \beta_3 {}^* t {}^* \mathrm{T}_{ct} {}^* \mathrm{P\ Lagging}_{ct} + \beta_4 {}^* t {}^* \mathrm{T}_{ct} {}^* \mathrm{CB}_{ct} + \beta 5 {}^* t {}^* \mathrm{T}_{ct} {}^* \mathrm{distance}_{ct} + \varepsilon_{ct} \quad (4.8)$$

where P Lagging$_{ct}$; CB$_{ct}$ and distance$_{ct}$ are the proportion of the national population in lagging regions, the ratio of coastline to the total boundary and the national average distance to the capital city, respectively, for country *c* at time *t*.

Trade and Poverty for India

We start with the study of poverty trends in India and how they differ across leading and lagging states. This discussion is followed by an investigation of the effects of changes in protection on poverty, after controlling for common trends or time effects across states. As explained earlier, we allow the effect of protection on poverty to be different for leading and lagging states, mainly because price and protection transmission might be more imperfect in the lagging states. In addition, there are further imperfections in such states, some of which take the form of factor-market rigidities and can be partly responsible for the differential effects. We present these results in Tables 4.4, 4.5, and 4.6, where we use specifications (4.1) and (4.2), for overall and for rural and urban sectors, respectively. Column 1 of each table presents results for specification (4.1), where the DD poverty measure is regressed on a time trend, on the time trend interacted with the lagging state dummy, and on state fixed effects. In other words, we allow for the trend to differ between leading and lagging states and poverty to vary across states because of time-invariant, state-specific factors. Columns 2, 3, and 4 present results for specification (4.2), where the DD poverty measure is regressed on lagged protection, on lagged protection interacted with the lagging state dummy, and on state and time fixed effects. In other words, even controlling, through time effects, for the fact that poverty over time would change all over the country, for example, due to poverty alleviation programmes, we try to see whether protection and the reductions in them over time additionally affect how poverty changes in the various states. We also see how this variation in protection across states explains the variation in poverty across states. The variation in protection across states comes from the variation in the industrial composition of employment across these different states. However, because protection interacts with labour market institutions, distance from ports, and the quality of roads and road transportation, the effect of protection on poverty will be different for lagging and leading states. In columns 2, 3, and 4 of each table, the

trade protection measures are lagged tariff rates, NTB rates, and the first principal component, respectively.

Results from column 1 of Tables 4.4, 4.5, and 4.6 indicate that poverty has been falling in all three sectors (urban, rural, and overall). Poverty seems to be falling faster in the urban than in the rural sector. This is not surprising because most of the trade liberalization took place in manufacturing and transmission of world prices, and trade policy is expected to be stronger in urban compared with rural areas. In addition, it is the urban sector that experiences industrialization and modernization. Though poverty is falling in all states, the positive and significant coefficient on the interaction between the time trend and the lagging state dummy suggests that it has been falling much more slowly in the lagging states.

Next we look at the differential effect of trade reforms as a possible cause for the differential trend. Here we control for time effects or trends

TABLE 4.4 Trade and Poverty—Overall Sector Dependent Variable: Log (DD Poverty Measure)

	(1) Time trend	(2) Protection = Tariff	(3) Protection = NTB	(4) Protection = Principal Component 1
Lagged protection		0.002	0.03**	0.19*
		(0.002)	(0.01)	(0.10)
Lagged protection* Lag		–0.01***	–0.01	-0.08*
		(0.002)	(0.004)	(0.05)
Time trend	–0.06***			
	(0.01)			
Time trend*Lag	0.02**			
	(0.01)			
Constant	5.76***	2.81***	0.37	3.46***
	(0.32)	(0.28)	(0.89)	(0.27)
State Fixed effects	Yes	Yes	Yes	Yes
Year Fixed effects	No	Yes	Yes	Yes
Observations	60	45	45	45
R-squared	0.93	0.96	0.96	0.96

Notes: Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1 Data are for years 1987, 1993, and 1999 for each of 15 Indian states. Lag is equal to one if state is a lagging state, zero otherwise. Tariffs and NTBs are expressed in percentage points. A 50 per cent tariff implies that the tariff variable equals 50.

that are common across all states, and see whether, after controlling for these common effects, we find an effect of protection on poverty that is different for lagging and leading regions. From columns 2, 3, and 4, some evidence suggests that trade protection is positively related to poverty in the leading states. From Table 4.4, column 2, disregarding the insignificance of the pure tariff term, a 1 percentage point decrease in the employment-weighted average tariff rate for a state decreases poverty there by 0.22 per cent overall in the leading states. From column 3, a 1 percentage point decrease in the NTB coverage rate decreases poverty by 3 per cent overall in the leading states, which seems rather large. Stronger results are obtained using the principal component combined measure of tariffs and NTBs. The coefficient of lagged protection is both positive and significant.

Next we look at whether the differential effect on leading versus lagging regions is more pronounced in urban or rural areas. From column 2 in Tables 4.6 and 4.7, a 1 percentage point decrease in the tariff rate reduces poverty more in the urban than in the rural sector of leading states. It

TABLE 4.5 Trade and Poverty—Rural Sector Dependent Variable: Log (DD Poverty Measure)

	(1) Time trend	(2) Protection = Tariff	(3) Protection = NTB	(4) Protection = Principal Component 1
Lagged protection		0.002	0.02*	0.13
		(0.002)	(0.01)	(0.11)
Lagged protection* Lag		–0.01**	-0.01	–0.08*
		(0.002)	(0.005)	(0.05)
Time trend	–0.05***			
	(0.01)			
Time trend*Lag	0.02*			
	(0.01)			
Constant	5.62***	4.01***	1.72	3.64***
	(0.34)	(0.37)	(1.25)	(0.30)
State Fixed effects	Yes	Yes	Yes	Yes
Year Fixed effects	No	Yes	Yes	Yes
Observations	60	45	45	45
R-squared	0.93	0.96	0.95	0.96

Notes: Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Data are for years 1987, 1993, and 1999 for each of 15 Indian states. Lag is equal to one if state is a lagging state, zero otherwise. Tariffs and NTBs are expressed in percentage points. A 50 per cent tariff implies that the tariff variable equals 50.

TABLE 4.6 Trade and Poverty—Urban Sector Dependent Variable: Log (DD Poverty Measure)

	(1) Time trend	(2) Protection = Tariff	(3) Protection = NTB	(4) Protection = Principal Component 1
Lagged protection		0.003	0.01	0.16
		(0.005)	(0.01)	(0.17)
Lagged protection* Lag		–0.004***	–0.01***	–0.10***
		(0.001)	(0.002)	(0.03)
Time trend	–0.07***			
	(0.01)			
Time trend*Lag	0.03***			
	(0.01)			
Constant	6.03***	2.45***	2.04*	3.47***
	(0.29)	(0.65)	(0.99)	(0.28)
State Fixed effects	Yes	Yes	Yes	Yes
Year Fixed effects	No	Yes	Yes	Yes
Observations	60	45	45	45
R-squared	0.91	0.96	0.95	0.95

Notes: Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Data are for years 1987, 1993, and 1999 for each of 15 Indian states. Lag is equal to one if state is a lagging state, zero otherwise. Tariffs and NTBs are expressed in percentage points. A 50 per cent tariff implies that the tariff variable equals 50.

decreases poverty by 0.19 per cent in the rural sector and by 0.26 per cent in the urban sector in the leading states. While the lagged protection measure always has the correct sign, it is significant in the case of NTB for the rural case and for the combined measure for the overall case.

However, not surprisingly and possibly due to differences in the transmission of world prices and protection, the impact of trade liberalization on reducing poverty is smaller in the lagging states (and sometimes goes in the opposite direction) as seen by the negative coefficient on the interaction between protection and the lagging state dummy. The negative coefficient on the interaction term is always significant when the tariff or the first principal component is used for measuring protection. From Table 4.4, column 2, a 1 percentage point decrease in the tariff *increases* poverty by roughly 0.8 per cent in lagging states in the overall sector. From Table 4.5, column 2, we see that in the rural sector a 1 percentage point decrease in the tariff also *increases* poverty by approximately 0.8 per cent, which is much higher than the increase of

0.15 per cent in the urban sector (Table 4.6, column 2). Since the pure tariff term is insignificant (that is, its effect is not precisely measured), it is difficult to say in all the above cases whether trade liberalization actually increased poverty in the lagging states or just whether the reduction in poverty in such states was smaller than in others. When NTB rates are used as a protection measure, the interaction term is no longer significant in the overall and rural sectors, but it is still negative. Thus, from our results, we conclude that while poverty has been decreasing across all states, it has been falling more slowly in lagging states. Besides, trade liberalization may have reduced poverty overall, but it actually could have increased poverty in the lagging states of the country. At the very least, the poverty-reducing effects of trade liberalization were not as large in the case of the lagging states. Our results also suggest that urban areas have benefited more from trade liberalization than rural ones.

To ascertain whether our results are robust to alternative measures of poverty, we use the GOI and ODR measures of poverty to estimate

TABLE 4.7 Trade and Poverty—Overall Sector Dependent Variable: Log (GoI Measure)

	(1) Time trend	(2) Protection = Tariff	(3) Protection = NTB	(4) Protection = Principal Component 1
Lagged protection		0.004*	0.03**	0.24***
		(0.002)	(0.01)	(0.08)
Lagged protection* Lag		–0.01***	–0.01**	–0.09**
		(0.002)	(0.003)	(0.04)
Time trend	–0.04***			
	(0.005)			
Time trend*Lag	0.02***			
	(0.01)			
Constant	4.87***	2.87***	0.86	3.47***
	(0.21)	(0.30)	(0.85)	(0.21)
State Fixed effects	Yes	Yes	Yes	Yes
Year Fixed effects	No	Yes	Yes	Yes
Observations	60	45	45	45
R-squared	0.94	0.96	0.95	0.96

Notes: Robust standard errors in parentheses. ***p < 0.01, ** p < 0.05, *p < 0.1. Data are for years 1987, 1993, and 1999 for each of 15 Indian states. Lag is equal to one if state is a lagging state, zero otherwise. Tariffs and NTBs are expressed in percentage points. A 50 per cent tariff implies that the tariff variable equals 50.

TABLE 4.8 Trade and Poverty—Overall Sector Dependent Variable: Log (ODR Measure)

	(1) Time trend	(2) Protection = Tariff	(3) Protection = NTB	(4) Protection = Principal Component 1
Lagged protection		0.01***	0.01	0.52***
		(0.003)	(0.01)	(0.08)
Lagged protection* Lag		–0.001	–0.004**	–0.01
		(0.001)	(0.002)	(0.02)
Time trend	–0.02***			
	(0.001)			
Time trend*Lag	0.01***			
	(0.001)			
Constant	3.98***	2.87***	2.75**	2.18***
	(0.04)	(0.28)	(1.33)	(0.19)
State Fixed effects	Yes	Yes	Yes	Yes
Year Fixed effects	No	Yes	Yes	Yes
Observations	591	150	150	150
R-squared	0.79	0.91	0.90	0.92

Notes: Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Data are for years 1987, 1993, and 1999 for each of 15 Indian states. Lag is equal to one if state is a lagging state, zero otherwise. Tariffs and NTBs are expressed in percentage points. A 50 per cent tariff implies that the tariff variable equals 50.

specifications (4.1) and (4.2) for the overall sector. A discussion of the pros and cons of these alternative measures can be found in Hasan et al. (2007). The results with our alternative poverty measures are presented in Tables 4.7 and 4.8, both of which are structured exactly like Tables 4.4, 4.5, and 4.6.

The results are qualitatively similar. We find strong evidence that trade liberalization has reduced poverty across all states in India. The coefficient on the lagged protection measure is positive and significant except in one case where the ODR poverty measure is used to measure poverty and the NTB measure to capture protection. The coefficient on lagged protection interacted with the lagging state dummy is always negative and significant except in the case of the ODR measure of poverty where the tariff or the first principal component is used to measure protection. Tables 4.7 and 4.8 support the idea that the poverty-reducing impact of trade liberalization is weaker in lagging states than in leading ones.

Thus, looking overall across all three poverty measures, there seems to be a fair amount of evidence in support of a poverty-reducing effect of trade liberalization across all states, but the effects turn out to be smaller for the lagging states. As explained earlier, this could be due to poorer transmission of world prices and protection in the lagging states as well as greater distance to ports and poorer quality roads in such states. In addition, factor markets probably work better and more smoothly in the leading states. Similar reasons also lead to decreases in the tariff rate leading to bigger reductions in poverty in the urban than in the rural sector of leading states, that is, there is probably better transmission of world prices and protection to urban areas where factor markets are also more efficient.

Price Transmission in India

After finding the differential impacts of trade on poverty and measures of well-being across lagging and leading states, we need to identify the sources of these differential effects. A likely source is poor transmission of world prices and protection, with the extent of the lack of transmission being different in lagging and leading states. Lagging states are not as well connected to ports as are leading states. Also, the quality of roads and their connections to main highways may be much poorer in lagging states. To confirm the correlation between distance from ports and the likelihood of being classified as lagging as opposed to leading, we ran a regression of the logarithm of inverse distance from ports on the lag dummy and found that moving from a leading to a lagging state reduces mean inverse distance by about 25 per cent (increases distance by 25 per cent). The coefficient on Lag is significant at the 10 per cent level.

We next investigate directly the degree of incompleteness of transmission of world prices and protection and the degree to which this differs across lagging and leading states by running specification(4.3). Table 4.9, columns 1 and 2, present results for the rural sector and columns 3 and 4 present results for the urban sector. Our objective is to find out whether the impact of a tariff on unit prices differs between lagging and leading states. In columns 1 and 3, we present results for specification (4.3) for the rural and urban sector respectively with (1 + tariff) and (1 + NTB rate) as our protection measures. If transmission of trade policy to domestic prices is less perfect in lagging states, we would expect the interaction between the trade protection measures and the lagging state dummy to be negative. From columns 1 and 3, we see that this is indeed the case for the tariff measure. In all cases, protection and

TABLE 4.9 Price Transmission Regressions Dependent Variable: Log (Unit Price for Sector)

	Rural sector		Urban sector	
	(1)	(2)	(3)	(4)
Log (1+tariff)	0.60*	0.77***	0.61	0.81
	(0.32)	(0.27)	(0.47)	(0.50)
Log (1+tariff)* Lag	–0.26	–0.36*	–0.08	–0.45*
	(0.43)	(0.20)	(0.53)	(0.25)
Log (1+NTB)	–0.17		–0.21	
	(0.20)		(0.24)	
Log (1+NTB)* Lag	0.11		0.39	
	(0.34)		(0.36)	
Log (world price)	0.28	0.28	0.54**	0.53**
	(0.31)	(0.32)	(0.21)	(0.21)
Log (world price)* Lag	–0.22	–0.21	0.0003	0.01
	(0.15)	(0.14)	(0.11)	(0.11)
Log (exchange rate)	–0.38***	–0.35**	–0.06	–0.05
	(0.15)	(0.15)	(0.10)	(0.10)
Log (inverse distance)* Log (1+tariff)	–0.006	–0.006	–0.10	–0.10
	(0.07)	(0.07)	(0.11)	(0.12)
Log (inverse distance)* Log (world price)	–0.06	–0.06	–0.006	–0.006
	(0.07)	(0.07)	(0.05)	(0.05)
Constant	4.39***	4.17***	2.55***	2.51***
	(0.67)	(0.60)	(0.46)	(0.46)
State fixed effects	Yes	Yes	Yes	Yes
Observations	265	265	266	266
Number of states	15	15	15	15
R-squared	0.13	0.13	0.19	0.19

Notes: Bootstrap standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Data are for years 1988, 1994, and 2000 for 16 goods in each of 15 Indian states. Lag is equal to one if state is a lagging state, zero otherwise. Tariffs and NTBs are expressed in fractions. For instance, a 50 per cent tariff implies that tariff = 0.5

its interaction have the right signs, but we have statistical significance for only half of these relevant terms in these two columns of Table 4.10. Subject to the caveat that not all coefficients are precisely estimated, we can say from columns 1 and 3 that for the rural sector, a 1 per cent increase in (1 + tariff) implies a 0.60 per cent increase in the unit price in leading states but a 0.34 per cent increase in the unit price in the lagging states. For the urban sector, a 1 per cent increase in (1 + tariff)

implies a 0.61 per cent increase in the unit price in the leading states but a 0.53 per cent increase in the unit price in the lagging states. For the NTB protection measure, however, the coefficients are not estimated precisely. Hasan et al. (2007) point out that the statistical insignificance of the NTB term might be caused by the fact that the NTB measure is a coverage ratio, and it is not clear what exact functional form captures its transmission into domestic prices.

In columns 2 and 4, we drop the NTB measure and the interaction between the NTB measure and the lagging state dummy. The results support our hypothesis that transmission is less perfect for lagging states than for leading ones. The coefficient on (1 + tariff) is positive and it is significant for the rural sector. The coefficient on the interaction between (1 + tariff) and the lagging state dummy is now negative and significant at the 5 per cent level for both rural and urban sectors. Results indicate that for the rural sector, although a 1 per cent increase in (1 + tariff)[9] implies an increase in domestic unit price of 0.77 per cent for leading states, it is only 0.41 per cent for lagging states. For the urban sector, a 1 per cent increase in (1 + tariff) implies an increase in the domestic unit price of 0.81 per cent for leading states but an increase of 0.36 per cent for lagging states. In all our regressions, the exchange rate enters with a negative coefficient that is significant for the rural sector but not for the urban sector. The coefficients on the inverse distance interacted with (1 + tariff) and coefficients on the inverse distance interacted with the world price are always negative but never significant.

We conclude that there is evidence of less than perfect price transmission in lagging versus leading states, with some estimates suggesting that this is an even greater issue in rural areas. This result makes sense if connectedness is a larger problem for rural areas than urban ones, which is not unreasonable in most developing countries.

Exports in India

Having found evidence for the imperfect transmission of prices and protection and for this effect to be stronger in lagging states, we next focus on one of the channels through which this imperfect transmission affects development. One of the ways this happens is through the differences in the product mix. At the very basic level, the degree of specialization in export-oriented goods might be different in the lagging and leading

[9]For our price transmission regressions, we express tariff rates and NTB rates as fractions. In other words, a 50 per cent tariff implies that our tariff measure is 0.5. At a 50 per cent tariff, a 1 per cent increase in (1 + tariff) is a 3 per cent increase in our tariff measure.

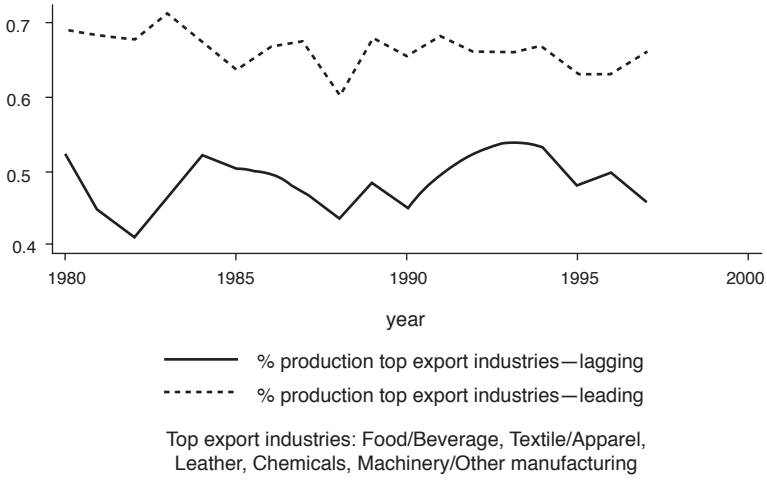

FIGURE 4.1 Production of Export Goods in Leading and Lagging States

Sources: Annual Survey of Industries (ASI) production data; NBER–UN World Export Import Data (Feenstra and Lipsey 2005).

states. In Figure 4.1, we plot output, which is measured by net value added in export industries, as a percentage of total output in leading and lagging states over time.

Export industries are food/beverages, textile/apparel, leather, basic chemicals, and machinery/other manufacturing.[10] The share of export goods in total output is larger for leading states for all years. Further, we employ specification (4.4) to study if, after controlling for time-specific shocks, leading states produce more export goods than lagging states. We regress output—which is measured by net value added in an industry in a state in a given year—as a proportion of total output of that state in that year on national exports of an industry, as a percentage of total national exports in a given year, on this export ratio measure interacted with the lagging state dummy and on year fixed effects.

Results shown in Table 4.10 provide evidence that leading states specialize more in export goods in comparison with lagging states. The interaction between exports and the lagged state dummy is negative and strongly significant showing that leading states specialize in the

[10]These industries have the largest export shares in the Feenstra, Lipsey, and colleagues NBER–UN World Export Import data (1980–97).

TABLE 4.10 Production of Export Goods in Lagging Versus Leading States Dependent Variable: Output in Industry-state/ Total State Output

	(1)
Exports in industry/total exports	0.44***
	(0.02)
(Exports in industry/total exports)*Lag	–0.14***
	(0.03)
Constant	0.05***
	(0.01)
State/Industry fixed effects	No
Year fixed effects	Yes
Observations	3348
R-squared	0.12

Notes: Robust standard errors in parentheses.
***p < 0.01, **p < 0.05, *p < 0.1.
Data are for years 1980 to 1997 for 16 Indian states in 12 broad industry groups
Lag is equal to one if state is a lagging state, zero otherwise.

production of export goods. This is not surprising because the lowering of protection through trade liberalization is transmitted more to leading states and, therefore, we have greater specialization in those states.

Productivity in Indian Manufacturing

The second proximate cause for the difference in the impact of trade on development across the lagging and leading states is possibly the difference in the productivity effects of trade liberalization. We use the production function approach with total factor productivity (TFP), depending on the various trade policy variables and their interactions with the lagging state dummy showing the differential effect mentioned earlier. As explained earlier, by increasing competition, trade can also force firms to be more efficient and can make them invest more in R&D. Thus productivity is expected to increase through trade, unless the loss in market size for domestic import-competing firms offsets this effect. However, due to the differential transmission across states, the effect of trade liberalization on productivity might differ across leading and lagging states. Also, factor markets can be more rigid in the lagging states, coming in the way of resource reallocation in response to trade liberalization.

Table 4.11, column 1, presents results for specification (4.5). We find evidence that productivity in Indian manufacturing has been rising, as shown by the positive and significant coefficient of the trend variable. The

TABLE 4.11 Trade Liberalization and Productivity
Dependent Variable: Log (Net Value Added)

	(1)	(2)	(3)
Log (capital stock)	0.39***	0.42***	0.42***
	(0.01)	(0.02)	(0.02)
Log (employment)	0.69***	0.63***	0.63***
	(0.02)	(0.02)	(0.02)
Time trend	0.0***		
	(0.002)		
Time trend* Lag	–0.01**		
	(0.003)		
Lag		–0.25	–0.12
		(0.18)	(0.23)
Log (tariff)		–0.41***	
		(0.10)	
Log (tariff)* Lag		0.03	
		(0.04)	
Log (NTB)			0.16**
			(0.08)
Log (NTB)* Lag			0.03
			(0.06)
Constant	4.82***	6.18***	5.28***
	(0.18)	(0.43)	(0.35)
State fixed effects	Yes	No	No
Industry fixed effects	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes
Observations	4672	2592	2592
R-squared	0.92	0.91	0.91

Notes: Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Data are for 16 Indian states in 18 broad industry groups. Data for column 1 are for years 1980–97. Data for columns 2 and 3 are for 1988–97. Lag is equal to one if state is a lagging state, zero otherwise. Tariffs and NTBs are expressed in percentage points. A 50 per cent tariff implies that the tariff variable equals 50.

coefficient on the time trend interacted with the lagging state dummy is negative and significant, suggesting that the increase in productivity has been much smaller for the lagging states. Column 2 presents results for specification (4.6) with the tariff rate as the protection measure. The coefficient on the tariff is negative and strongly significant. A 1 per cent decrease in the tariff rate increases productivity by 0.41 per cent across all leading states but only by 0.38 per cent in the lagging states (if we disregard the insignificance of the interaction term). The coefficient on

the interaction term between the tariff and the lagging state dummy is not estimated precisely.

To check for robustness of our results, we use NTB rates as another measure of protection in our productivity regression. We present results in column 3. The results are not qualitatively different. The NTB rate enters with a negative coefficient that is significant at the 5 per cent level. The coefficient on the NTB rate interacted with the lagging state dummy is positive but not significant. To conclude, while there is strong evidence that trade liberalization has had a productivity-enhancing effect across all states and industries, we find weak evidence that the increase in productivity due to trade liberalization is smaller in lagging states.

Trade and Poverty in South Asia

We now want to see whether our results hold more generally for South Asia as a whole. Here we are constrained by data availability. But we try to do the best we can given the data available. We try to investigate whether the trend rate of growth in GDP per capita and the HDI and rate of reduction in poverty change as a result of trade liberalization. Also, we want to see whether the change is in the desired direction and whether the actual magnitude of the change depends on the population size of the lagging regions relative to leading regions, on the average distance of the various regions to the capital, and on the coastline relative to the overall national boundary. Thus, indirectly, we might be able to infer whether lagging regions grow faster or slower and whether the rate of reduction in poverty is slower or faster in them upon trade liberalization. Thus, we use specifications (4.7) and (4.8) to address these issues, and the results obtained from running these specifications are presented in Table 4.12.

In Table 4.12, columns 1 and 2, the dependent variable that measures well-being is the log of per capita GDP. In columns 3 and 4, it is a measure of poverty. More specifically, it is the log of the percentage of individuals living in households below the poverty line. In columns 5 and 6, the measure of well-being is the log of the HDI. From columns 1, 3, and 5, in which we regress measures of poverty or of well-being on a trend and the trend interacted with the trade liberalization dummy that equals one post-liberalization, one strong result emerges. Poverty as measured by the percentage of people below the poverty line is decreasing over time and well-being as measured by per capita GDP or the HDI is increasing over time. The coefficient of the trend in the HDI and per capita GDP

TABLE 4.12 **Trade, Poverty, and Lagging Regions in South Asia**

Variables	(1) ln(GDP per capita)	(2) ln(GDP per capita)	(3) ln(percentage in poverty)	(4) ln(percentage in poverty)	(5) ln(HDI)	(6) ln(HDI)
t	0.05***	0.03***	–0.02**	–0.01	0.01***	0.01***
	(0.005)	(0.006)	(0.01)	(0.02)	(0.003)	(0.002)
$t*T_{ct}$	–0.01***	–0.01***	0.002	0.01	0.002**	–0.0001
	(0.002)	(0.002)	(0.006)	(0.01)	(0.001)	(0.001)
$t*T_{ct}$ *(proportion population in lagging regions)		–0.01***		0.01		-0.003*
		(0.002)		(0.01)		(0.002)
$t*T_{ct}$*(coastline/total land boundary)		0.03***		–0.04***		0.01***
		(0.001)		(0.001)		(0.0009)
$t*T_{ct}$ *(national average distance to capital)		9.27e-06***		3.03e-06		9.16e-07**
		(6.33e-07)		(2.83e-06)		(3.73e-07)
Constant	5.55***	6.06***	4.40***	3.88***	–1.09***	–1.12***
	(0.16)	(0.18)	(0.29)	(0.74)	(0.08)	(0.07)
Observations	181	119	31	21	171	124
R-squared	0.40	0.60	0.10	0.38	0.35	0.55

Notes: Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Data are for years 1961 through 2007 for eight South Asian countries. t is a time trend and T^{ct} is a time dummy that equals one post liberalization.

regressions are positive and strongly significant, and the coefficient of the trend in the poverty regression is negative and significant.

However, the impact of trade liberalization on trends in poverty and well-being are less obvious. From Table 4.12, column 1, although per capita GDP is increasing over time, it grows more slowly post-liberalization. The coefficient on the interaction term between the trend and the trade liberalization dummy is negative and significant. Specifically, the percentage increase in per capita GDP is less by 1.14 percentage points in the post-liberalization period. However, in the case of HDI, the result is the opposite. The coefficient on the interaction term between the trend and the trade liberalization dummy in the HDI regression is positive and significant and suggests that HDI is increasing over time and that the increase is larger post-liberalization. The annual growth rate of HDI is larger by 0.25 percentage points in the period post liberalization. In column 2, we see from the negative coefficient of the trend and the positive coefficient of the interaction between the trend and the trade liberalization dummy that although the percentage of individuals living in poverty is falling over time, this decrease is smaller post-liberalization. However, the interaction effect is statistically insignificant. We conclude that the impact of trade liberalization on poverty is ambiguous. While evidence suggests that trade liberalization was somewhat negatively correlated with per capita income growth (possibly due to macroeconomic factors that accompany or even trigger liberalization episodes), it seems to help growth in human development.

We now examine whether the impact of trade liberalization differs by the percentage of the population living in lagging regions. Given the lack of data on the various regions within each country, this would be our indirect way of finding out whether lagging regions gain less from trade than leading regions all over South Asia. Table 4.13, columns 2, 4, and 6, decomposes the effect of trade on the trends in poverty and well-being. Here our results are clearer. From column 1, we find that the negative effect of trade liberalization on the growth rate of per capita GDP is exacerbated in countries that have a larger population in lagging regions. The coefficient on the triple interaction between the trend, the trade liberalization dummy, and the percentage of population in lagging regions is negative. Results indicate that a one-point increase in the proportion of population in lagging regions depresses the growth in per capita GDP after trade liberalization further by 0.01 percentage points.[11] Because

[11]Note that the proportion of population in lagging regions is measured not in percentage terms but as fraction in our data, that is, the scale is 0–1 and not 0–100.

TABLE 4.13a Inequality

(a) Inequality

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Liberalization				Income share of the bottom 20 percent		
Country		1981–5	1986–90	1991–5	1996–2000	2001–5	2006–7
Bangladesh	1996	9.72	9.73	9.35	8.70	8.76	
India	1994					8.08	
Nepal	1991				7.47	6.02	
Pakistan	2001		8.29	8.82	9.33	9.26	
Sri Lanka	1977–83, 1991	8.19	8.95		8.14	6.99	

Source: *World Development Indicators* (2009).

TABLE 4.13b Poverty

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Liberalization			% individuals in households below poverty line		
Country		1986–90	1991–5	1996–2000	2001–5	2006–7
Bangladesh	1996	52.50	51.13	56.11	50.47	
India (Rural)	1994	55.60	52.46	43.83		
India (Urban)	1994	47.50	40.77	36.16		
Nepal	1991		68.44		55.12	
Pakistan	2001	65.59	23.87	38.60	29.23	
Sri Lanka	1977–83, 1991	15.01	16.32		13.95	

Source: PovcalNet, World Bank.

this is the effect on the annual rate of growth, over time, this benefit will accumulate and become fairly significant. Similarly, a one-point increase in the proportion of population in lagging regions decreases the annual rate of decline in poverty by an additional 0.01 percentage points, but this is statistically insignificant. Thus a country that has 90 per cent of its population in lagging regions can raise its rate of decline in poverty by about 0.4 percentage points if it reduces this population in lagging areas to 50 per cent. For a country with 300 million poor, this means an additional annual reduction of about 1.2 million poor per year. We find stronger results for HDI in terms of statistical significance but weaker results in terms of the magnitude of coefficients. For countries with a larger proportion of population in lagging regions, trade liberalization negatively affected the growth in HDI.

With regard to our control variables, having a higher ratio of coastline to the boundary seems to either reinforce the beneficial effect of trade liberalization or mitigate the negative trade liberalization effects. In two out of the three regressions, having a higher national average distance to the capital city also seems to either dampen the negative effects of trade liberalization on poverty and well-being and boost the positive effects. This is surprising. However, it is possible that what we need is a measure of 'effective' distance to the capital city, one that takes into account transport costs and infrastructure—for instance, the time taken to travel to the capital city. In the absence of such measures, the distance variable may just be proxying for the size (geographic area) of a country, which captures external or agglomeration economies.

IMPLICATIONS FOR SOUTH ASIA

Many South Asian countries began active trade liberalization in the 1990s: Sri Lanka was an exception and introduced trade reform as early as the late 1970s. India started its liberalization process in 1991 after it had to seek IMF help for a debt crisis. India's tariff and NTB reductions have been gradual. Bangladesh, on the other hand, started in the late 1980s and early 1990s with significant reductions in tariffs and quantitative restrictions, generating concerns domestically of foreign competition hurting import-competing industries. However, Bangladesh has seen fast growth in exports since the 1990s in the textiles, garments, footwear, and leather sectors.

The literature on trade, poverty, and inequality and our current study have several implications for South Asia's trade liberalization experience. One implication is that initial conditions affect the impact that trade

liberalization will have on poverty. High-income inequality or spatial inequality will imply fewer benefits from trade liberalization for the poor. Tables 4.13(a) and 4.13(b) show the income share held by the bottom 20 per cent and the percentage of individuals in households below the $1.25 a day poverty line in these countries, respectively, over time, averaged over five-year intervals. Trade liberalization dates are provided in column 2. The figures show that Sri Lanka experienced a slight increase in the percentage of individuals below the poverty line just after liberalization (though poverty fell later). For Sri Lanka, the percentage of poor went up from 15.01 per cent in the 1986–90 period to 16.32 in the 1991–5 period. Focusing on inequality as measured by the income share of the bottom 20 per cent, both these countries either had falling (or relatively stable) income shares of the bottom 20 per cent before liberalization, indicating increasing inequality.

Pakistan's experience on the other hand is different. Income shares of the bottom 20 per cent rose prior to liberalization. The income share rose from 8.82 in the 1991–5 period to 9.33 in the 1993–2000 period. Also, the percentage of poor in Pakistan dropped significantly from 38.60 per cent to 29.23 immediately after reform. Although we cannot make concrete conclusions based on these trends, it appears like increasing inequality prior to liberalization went along with a spike in poverty post-reform before poverty started falling again. Table 4.14 shows some inequality and infrastructure measures for each country for 2006/7. Bangladesh, India, and Nepal show higher regional inequality as measured by above-average poor in the most lagging region as a percentage of the total poor in the economy. For these countries, a priority would be to ensure integration of backward regions and government redistribution programmes to lessen inequality so that the poor may also benefit from trade reforms.

Another implication that emerges from the literature is the importance of infrastructure, credit provision, investment in human capital, flexible labour markets, and better institutions (like rule of law and contract enforcement mechanisms) to ensure that the benefits of trade liberalization reach the poor. From Table 4.14, column 7, Bangladesh, India, and Pakistan perform better than Nepal and Sri Lanka in terms of overall infrastructure. In terms of road and rail density, however, India, Pakistan, and Sri Lanka fare better than Bangladesh and Nepal. Bangladesh, Pakistan, and Sri Lanka seem to have above-average airport (with paved runway) coverage, while Bangladesh has better port coverage than the rest. While more and better ports facilitate trade, higher rail

TABLE 4.14 **Infrastructure and Inequality Indicators for 2007**

(1)	(2) Surface area (km square) /airports	(3) Rail density (kms per 100 km square)	(4) Road density (kms per 100 km square)	(5) Poor in most lagging region as % of country's poor	(6) Index of shipping difficulties	(7) Infrastructure index (1 = worst performer, 5 = best performer)	(8) Ports (number)	(9) Coastline (kms)/ports
	(2007)	(2006)	(2006)	(2006)	(2006)	(2007)	(2007)	(2007)
Bangladesh	9600	2.10	183.80	28.20	112	2.29	2	290
India	13527.82	2.10	113.80	12.20	79	2.90	8	875
Nepal	14718	0	12.20	12.40	151	1.77	0	0
Pakistan	8748.35	1.10	33.50	1	94	2.37	2	523
Sri Lanka	4686.43	2.20	150.50	4	60	2.13	2	670
Mean	10256.12	1.50	98.76	11.56	99.20	2.29	2.80	471.60

Source: World Bank (2009a).

TABLE 4.15 Adult Literacy in South Asia

Country	1991–5	1996–2000	2001–5
Bangladesh	35.32		47.49
India	48.22		61.01
Nepal	32.98		48.59
Pakistan		42.85	46.44
Sri Lanka			90.68

Source: World Development Indicators (2009).

and road density help to reduce transportation costs to lagging regions, thereby ensuring the transmission of world prices to these regions. Hence, it is important to ensure both.

While Bangladesh has better overall infrastructure and better airport and port coverage, developing road and rail density might help target the benefits of trade liberalization towards the poor in Bangladesh's lagging regions. Pakistan appears to have better infrastructure overall and Sri Lanka lags behind in port coverage. India, Pakistan, and Sri Lanka also have smaller indexes of shipping difficulties, which can be a crude measure of institutions. Nepal and Bangladesh have large indexes. Shipping difficulties might arise as a result of the quality of infrastructure at the ports or due to corruption and other institutional failure at the border (customs). Given that Bangladesh performs fairly well with respect to its infrastructure indicators, shipping difficulties might be an indication of corrupt officials or red tape at the border. Further research in this area might help uncover precise policy implications. Table 4.15 gives average literacy rates across five-year periods from 1991 to 2005. Sri Lanka has the highest literacy rates with 90 per cent literacy in the 2000–5 period, and the other South Asian countries seem to have made significant progress in spreading literacy (Nepal went from 33 per cent literacy in the 1991–5 period to 49 per cent literacy in the 2000–5 period). However, literacy rates in India, Nepal, and Pakistan are still low. Continued efforts to increase literacy rates and focus on investment in higher and technical education will promote better distribution of trade gains to the poor by allowing domestic industry to benefit from cheap capital imports to improve production technologies.

CONCLUSION

We find evidence that, for India, poverty has been decreasing over time in Indian states but more slowly in lagging states. While there is strong evidence that trade liberalization led to a decline in poverty

across all leading states, there is evidence that either this decline arising from trade liberalization was smaller or that there may not have been a decline in poverty due to trade liberalization in the lagging states. We see that though productivity has been increasing in Indian manufacturing across all states, it has been increasing more slowly in lagging states. Our results indicate strong evidence that trade liberalization has increased productivity in Indian manufacturing. However, there is weak evidence that the increase in productivity because of trade liberalization has been smaller in lagging states.

Transmission of tariffs to domestic prices in India seems to be less perfect in lagging states, especially in rural areas. We propose that this might be due to poor infrastructure in these states as measured by distance of the state capital from all ports. Results show that leading states in India specialize primarily in export goods.

We use our results for India to examine the importance of regional inequality in availing the benefits of trade reform for the South Asia region as a whole. Measuring regional inequality by the percentage of population in South Asian countries that lives in lagging regions, we find strong support for the hypothesis that more regionally integrated economies are better able to exploit gains from liberalization. We also draw policy implications of the literature and our empirical analysis for South Asia.

Our study confirms that though trade liberalization brings gains, there is scope for policy to ensure that these gains are distributed more equally. Our results highlight the importance of developing infrastructure, including equipped ports, better and more extensive roads, and communication links in exploiting the gains from trade.

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