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Trade Liberalization, Labor-Market Institutions, and Poverty Reduction: Evidence from Indian States#

1. Introduction

International trade can affect poverty through its impact on both efficiency and distribution. There are a number of good reasons for expecting trade to reduce poverty through both channels. In the first place, trade generates efficiency gains from specialization and exchange, as well as through the availability of larger varieties of final and intermediate goods. Secondly, many poor countries are abundant in unskilled labor. Under fairly plausible conditions freer trade should lead to an increase in the returns to unskilled labor in poor countries and in this way reduce poverty.

A number of factors may, however, prevent trade from having its expected effect of reducing poverty. For example, only in the presence of perfect intersectoral factor mobility can we unambiguously say that trade will increase the returns to unskilled labor in highly labor-abundant developing countries. Such factor mobility may hold only in the long run. In the

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shorter run, there will be adjustment costs to be incurred and at best inter-sectoral factor mobility will be imperfect. Under those conditions, the short to medium run impact of trade liberalization on poverty, in theory, will be ambiguous. These ambiguities are accentuated further by the lack of clear theoretical predictions also on the effect of trade on growth. Ultimately, the relationship between trade and poverty thus becomes an empirical question.

In this paper, we empirically investigate the impact of trade on poverty, using state-level data from India, an extremely labor-abundant country in which around a third of the world's $1-a-day poor live. This is also a country that has, starting from virtual autarky, experienced large scale and deep trade reforms since the early 1990s (or according to some the late 1980s). To obtain a clearer picture of what went on with respect to poverty during this period, we also investigate the impact of another important, complementary component of economic reforms, namely product market deregulation. Since independence, a system of industrial licensing governed the entry, expansion, and location of manufacturing activities. Starting from the mid-1980s, the government began a serious process of exempting specific industries from industrial licensing, a process commonly referred to as delicensing.

While the effects of economic reforms, in general, on overall prosperity are fairly visible, the effects of trade liberalization on poverty reduction, in particular, have been questioned by many. As for the effects of delicensing, we are not aware of any study examining the links between delicensing and poverty. Yet, it is an important link to examine. As Aghion et al (2005) point out in their recent study of delicensing, its impact on output, employment, and investment in formal (organized) manufacturing appears to have varied by the particular regulatory environment across India's states. In particular, states with business friendly labor market institutions appear to have gained from delicensing vis-à-vis states with pro-worker labor market institutions. This leaves open the possibility that delicensing may have worsened economic conditions at least in some states, with possibly adverse consequences for poverty reduction.

The most sophisticated evidence brought to bear on trade-poverty linkages is that of Topalova (2005) who has examined the impact of trade liberalization on district level poverty in India. Her study finds that "rural districts where industries more exposed to trade liberalization were concentrated experienced a slower progress in poverty reduction". She further

writes that "compared to a rural district experiencing no change in tariffs, a district experiencing the mean level of tariff changes saw a 2 percentage points increase in poverty incidence and a 0.6 percentage points increase in poverty depth. This setback represents about 15 percent of India's progress in poverty reduction over the 1990s." She also finds this poverty accentuating effect of openness to be much weaker in states that had more flexible labor market institutions. However, she finds "no statistically significant relationship between trade exposure and poverty in urban India", even though the point estimates of the effect are still in the same direction as in the case of rural poverty.

Although Topalova's study is based on a careful analysis of poverty-and trade-related data it is important to examine the robustness of her results. While our paper's focus on the impact of trade on poverty is, therefore, the same as Topalova's, there are some important differences. First, while Topalova restricts her analysis to tariffs, we look at both tariffs and nontariff barriers (NTBs), and alternatively at a principal components aggregation of the two policy instruments. We weigh tariffs and alternatively NTBs by sectoral employment to arrive at the state level inverse measure of the trade exposure of the labor force (as does Topalova at the district level for tariffs). However, we refrain from using nontradable employment weights in the aggregation of protection. Topalova uses nontradable sector employment in her tariff aggregation by assuming nontradable tariffs to be zero. We do not agree with this approach. Firstly, goods can be nontradable if the natural/informal barriers to trade are prohibitive (not if they are nonexistent). Also, given that this employment-weighted tariff is an inverse measure of trade exposure, assuming a zero tariff for nontradables would defeat the purpose of this instrument. The easiest way to understand this is to look at two states A and B which have the same distribution of their labor force in the tradable sectors across those industries but A has a larger fraction of its employment in the nontradable sector than B. In this case, while A has a lower exposure to trade overall, Topalova's measure will imply a lower inverse measure, that is, a higher exposure to trade. On the other hand, a higher tariff in one or more sectors, holding everything else constant, results in an increase in her measure and to that extent, it is indeed an inverse measure of trade exposure.[1]

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

Second, we allow for the transmission of changes in protection rates to domestic prices to vary by state in some of our analysis. This is an important possibility to consider since a variety of factors, such as a given geographical unit's distance from ports and its quality of transportation infrastructure will influence how domestic prices at that location are affected by changes in protection rates.[2]

Third, in contrast to Topolova's approach of using district-level measures of urban and rural poverty, we work with state-level measures of urban, rural, and overall poverty. However, we complement this analysis through robustness checks using region-level measures of poverty.[3] Our approach is based on the official position of the Government of India and the sample design strategy employed by the National Sample Survey Organization (NSSO) in collecting survey data on household expenditures.[4] The NSSO (1999) note on sample design and estimation for the 55th Round of their Consumption Expenditure Survey clearly states that the sample of households is random within each "stratum", which is formed by a random sample of "first-stage units (FSUs)" within it. While an FSU is a village for rural areas, it is an "urban-frame survey block" for urban areas. A stratum is normally a district in the case of the survey for rural areas, which means that estimation of rural poverty at the district level will normally be justified. However, in many cases a few small districts are combined to form a single stratum in the sampling process. This is done so that the sample of households is large and meaningful enough. Furthermore, some district boundaries change over time. The real problem arises in the estimation of urban poverty at the district level since an urban stratum is never a district but is based on either a "hospital area" or an "industrial area" or a "bazaar area" within a city or a collection of small towns.

Fourth, like Topolova's, our poverty measures are based on the poverty lines recommended by Deaton and Drèze (2002; henceforth, DD) and their approach for adjusting poverty estimates for a change in the questionnaire design of the 1999–2000 National Sample Survey (NSS) household

2. We are grateful to T.N. Srinivasan for drawing our attention to this point.

3. These regions, often referred to as NSS regions, refer to an intermediate geographical unit lying between a state and district. A region is usually made up of several districts within a state with similar agro-climatic conditions and socio-economic factors (Murthi, Srinivasan, and Subramanian 1999).

4. Official estimates of poverty are computed by India's Planning Commission. These estimates pertain to poverty rates in rural and urban areas at the state level.

expenditure survey. However, we also use two additional sets of poverty measures to check the robustness of our results to alternative estimates of poverty. One corresponds to the official Government of India (GOI) estimates of poverty with an adjustment made for the new questionnaire adopted in 1999–2000. The other is based on a longer series (10 years of data for the 1990s and late 1980s) of state-level poverty rates created by Ozler, Datt and Ravallion (2006) using both the "thick" and "thin" rounds of the NSS in India.[5]

Finally, while our "thick-round" analysis is based on poverty estimates for three years—that is, corresponding to the latest three available "thick" rounds of the NSS (that is, 1987–88, 1993–94 and 1999–2000) for which protection data are available—Topalova's analysis is restricted to two thick rounds, those for 1987–88 and 1999–2000, as she believes there is uncertainty regarding whether the 1993–94 poverty is driven by post or pre-reform policies. We, on the other hand, include 1993–94 in our thick round analysis since the state-level trade exposure measure is being used as a regressor.

Our results are different from Topolova's. In no case do we find reductions in trade protection to have worsened poverty at the state or region level. Instead, we find that states whose workers are on average more exposed to foreign competition tend to have lower rural, urban and overall poverty rates (and poverty gaps), and this beneficial effect of greater trade openness is more pronounced in states that have more flexible labor market institutions. Trade liberalization has led to poverty reduction to a greater degree in states more exposed to foreign competition by virtue of their sectoral composition. Our results hold, at varying strengths and significance, for overall, urban and rural poverty.

It needs to be emphasized here that we do not believe it is the difference between the way we compute our tariff measure and the way Topalova computes hers that generates the difference in results. Just sticking to tariffs will not give us strong conclusive results. It is ultimately the additional use of NTBs and the first principal component measure of protection that generates a fairly, clear overall picture that trade liberalization is positively

5. While in theory the DD measure is superior to both the GOI and ODR measures, in practice in a world with imperfect data it is possible that it is not so. This could be due to the high demands placed on the wide variety of data required to compute the DD measure. Also, the ODR provides us with a much longer series, thereby enabling us to exploit the longer time variation available for our right-hand side variables.

associated with poverty reduction, at least in states with more flexible labor-market institutions. We also find some evidence that industrial delicensing has had a more beneficial impact on poverty reduction in states with flexible labor institutions consistent with the findings of Aghion et al (2005) on the relationship between delicensing and performance of registered manufacturing sector across Indian states.

The remainder of this paper is organized as follows. Section 2 reviews the literature on the relationships between trade, growth, and poverty. Section 3 describes key elements of the Indian policy framework relating to trade, labor regulations, and the industrial licensing regime over the 1980s and 1990s. Section 4 discusses data issues concerning poverty and measures relating to the policies described in Section 3. Section 5 presents the results of our empirical work while Section 6 concludes.

2. Trade and Poverty: Review of Related Literature

The effects of trade barriers on growth and income have been studied since the early 1990s. While Dollar (1992), Sachs and Warner (1995) and Edwards (1998), using different measures of openness, in many cases constructed from standard policy measures, showed positive effects of trade on growth, these papers have been strongly criticized by Rodriguez and Rodrik (2001) for the problems with measures of trade openness and the econometric techniques used as well as for the difficulty in establishing the direction of causality. While Rodriguez and Rodrik (2001) have criticized the measure of openness used by Sachs and Warner (1995) as capturing many aspects of the macroeconomic environment in addition to trade policy, Baldwin (2003) has recently defended that approach on the grounds that the other policy reforms captured in the measure, though not trade reforms per se, accompany most trade reforms sponsored by international institutions. Therefore, using such a measure tells us the value of the entire package of trade and accompanying reforms. Wacziarg and Welch (2003) have updated the Sachs-Warner dataset and have again shown the benefit of such reforms in driving growth.

Recently, the empirical literature has shifted focus to levels from growth rates. Frankel and Romer (1999) look at the effect of trade share in GDP on income levels across countries for the year 1985. They construct an instrument for the trade share by summing up the gravity-model driven,

geography-based predicted values of bilateral trade flows across all trading partners. The variables used to predict bilateral trade flows include distance, country size variables such as land area and population and dummies for whether the countries are landlocked, have a common border etc. They find that their instrumental variables approach produces positive effects of trade on income levels that are greater than the estimates produced by ordinary least squares. Irwin and Tervio (2002) apply the Frankel-Romer approach to cross-country data from various periods in the twentieth century to show that this trade-income relationship is indeed highly robust.

Building on two literatures, namely the one on institutions and incomes and the other on trade and incomes, Rodrik, Subramanian and Trebbi (2002) have looked at the simultaneous effects of institutions, geography and trade on per capita income levels. Using a measure of property rights and the rule of law to capture institutions and the trade-GDP ratio to capture openness in trade, and treating them both as endogenous in their growth regressions, they use the instruments that Acemoglu, Johnson and Robinson (2001) and Frankel and Romer (1999) use to instrument institutions and trade openness respectively (and separately). Rodrik, Subramanian and Trebbi (2002) find that "the quality of institutions trumps everything else". However, trade and institutions have positive effects on each other, so that the former affects incomes through the latter. Similarly, geography also affects institutions.

The literature on the impact of trade on growth and incomes is important in our context, as it is an important potential channel through which trade affects poverty. The literature on the direct determinants of poverty rates and changes (or rather reductions) in it is much smaller.[6] Dollar and Kraay (2002), in a cross-country study of 92 countries over the last four decades, find that the growth rates of average incomes of people in the bottom quintile are no different from the growth rates of overall per capita incomes, with the former growth always associated with the latter. Thus the share of the bottom quintile of the population in overall income is fairly stable. Also policies that promote overall growth promote growth in the incomes

6. For an excellent, comprehensive survey of the evidence on the globalization-poverty linkage, see Harrison (2006). On the basis of all the evidence she surveys, Harrison concludes that globalization is more likely to help in poverty reduction if complementary policies that include human capital and infrastructure investment, credit promotion, macroeconomic stability etc are in place. She also emphasizes the need for "carefully targeted safety nets" arising mainly from the fact that even among the poor there are both winners and losers from globalization.

of the poor. These policies include trade openness, macroeconomic stability, moderate government size, financial development, and strong property rights and the rule of law. In another paper, Dollar and Kraay (2004), based on data from the post-1980 "globalizing developing economies", argue that per capita income growth arising from expansion in trade in those countries has led to a sharp fall in absolute poverty there in the past 20 years.

Ravallion (2001), on the other hand, used a more conventional definition of poverty in studying its relationship with growth. He finds that an increase in the per capita income by 1 percent can reduce the proportion of people below the $1-a-day poverty line by about 2.5 percent on an average. This varies across countries, depending on initial inequality. In other words, how close the poor are to the poverty line matters. Similar to this cross-country study, there is also research by Ravallion and Datt (1999) on the determinants of poverty reduction across India's major states between 1960 and 1994, which shows empirically how initial conditions—and thus initial inequalities—matter. Similar to the findings from cross-country comparisons of poverty-growth linkages, Ravallion and Datt find that the impact of a given amount of growth in non-farm output on poverty reduction can vary considerably across India's states. For example, a one percent increase in non-agricultural state domestic product leads to a 1.2 percent decline in poverty rates in the states of Kerala and West Bengal versus only 0.3 percent decline in Bihar. The fact that growth of non-farm output was also relatively meager in Bihar over the period under consideration exacerbated the poverty problem in Bihar.[7]

Finally, a recent paper that looks at the determinants of poverty, as measured by the headcount ratio, is by Hasan, Quibria and Kim (2003) who argue, using cross-country evidence, that "policies and institutions that support economic freedom are critical for poverty reduction." Economic

7. Ravallion and Datt then explore which factors "explain" this differential impact of non-farm sector growth on poverty by state. Differences in initial conditions relating to rural development and human resources are found to be a key source of the inter-state differential in poverty impacts of non-farm output. The role played by initial literacy appears especially large. In particular, Ravallion and Datt find that more than half of the differential impact of non-farm output on poverty rates is attributable to Kerala's much higher levels of initial literacy. Their results suggest that while the transition from (low-wage) agriculture to (higher wage) non-farm sectors may be key for the removal of poverty, making the transition is not easy or automatic for the poor. In other words, there are costs to be incurred on the part of a poor agricultural worker to make the transition. These costs are not only pecuniary ones but also non-pecuniary associated with investments in minimum levels of education, nutrition, and health so as to be able to work productively in the non-farm sector.

freedom indicators used by these authors include, government size, price stability, freedom to trade with foreigners, absence of over-regulations of markets and civil liberties as reflected in property rights, rule of law etc.

As we can see, most of the empirical literature on the determinants of growth and poverty employs cross-country regressions. Since it is difficult to control for numerous institutional and other differences across countries, results from such regressions will not be reliable enough to draw any policy implications. Furthermore, some of the empirical studies on poverty described above use the concept of the "$1-a-day" poverty line. Ideally, the poverty line should be specific to a country (or a region within a country) and a point in time. Therefore, for the above reasons, a country-specific study like ours can be useful for policy evaluation.

3. Indian Policy Framework

3.1 Trade Policy Reforms in India

Import-substituting industrialization was one of the hallmarks of India's development strategy from the 1950s to the early 1980s. A complex regime of import licensing requirements along with other barriers to trade kept the Indian economy fairly insulated from international competition. Along with a system of industrial licensing (see below) and a large role for public sector enterprises, India's trade policies played an important role in the development of a highly diversified industrial structure. However, policymakers became increasingly convinced by the late 1970s and early 1980s that the interventionist trade and industrial policies had gone too far. The government embarked upon a modest effort at economic reforms. These included reducing barriers to trade, especially insofar as imports of capital goods were concerned.

By far the most decisive break with the trade policies of the past came in 1991, however, when the Indian Government was faced with a balance of payments crisis. The crisis was the result of several factors including a rapid rise in the fiscal deficit to GDP ratio, in foreign commercial debt, and in the debt service ratio during the 1980s. These problems were further accentuated by a dramatic increase in the price of oil as a result of the Gulf War of 1990–91. India's external payments problem assumed crisis like proportions and led the government to approach the International Monetary Fund (IMF) for assistance. The IMF provided India with a standby credit of $2.3 billion over 20 months. The IMF credit, however, came attached with

the strong conditionality of major economic reforms that were initiated almost immediately. Given several earlier attempts to avoid IMF loans and the associated conditionalities, these reforms came as a surprise.

The objectives of the reform program included the removal of most licensing and other non-tariff barriers on all imports of intermediate and capital goods, the broadening and simplification of export incentives, the removal of export restrictions, the elimination of the trade monopolies of the state trading agencies, the simplification of the trade regime, the reduction of tariff levels and their dispersion and the full convertibility of the domestic currency for foreign exchange transactions. The maximum tariff was reduced from 400 percent to 150 percent in July 1991. Subsequent reductions saw the maximum tariff down to roughly 45 percent by 1997–98. Mean tariffs, which were 128 percent before July 1991 had fallen to roughly 35 percent by 1997–98. The standard deviation of tariffs during this period went down from 41 percentage points to roughly 15.[8]

Non-tariff barriers were also reduced. Prior to 1991, there were quantitative restrictions on 90 percent of the value added in the manufacturing sector. In April 1992, all the twenty-six import-licensing lists were eliminated. However a "negative list" (from which most intermediate and capital goods were excluded) of items, whose imports were prohibited, was introduced. This eliminated many of the licensing procedures and discretionary aspects of the previous import regime. The reductions in tariffs and non-tariff barriers to trade were also accompanied by devaluations of the Indian rupee (the Rupee was devalued 20 percent against the US dollar in July 1991 and further devalued in February 1992) and the introduction of an explicit dual exchange market in 1992.[9]

3.2 Labor Markets: Regulations and Rigidity

A comprehensive review of labor regulations in India is beyond the scope of this paper.[10] However, two features of India's labor regulations are noteworthy. First, the placement of labor issues in the Indian constitution suggests variation in labor regulations and/or their enforcement across

8. See Dutt (2003) and Krishna and Mitra (1998) for details.

9. It may be noted that the percentage reduction in tariffs and non-tariff barriers were much greater than the percentage devaluation—and even larger relative to the real exchange rate devaluation on account of fairly high inflation during the initial years of the reforms (hitting roughly 14 percent). Therefore, the import enhancing effect of trade liberalization should have more than offset the import reducing effect of the exchange rate devaluation.

10. See Anant et al (2006) for a detailed discussion of India's labor-market regulations.

India's states. Under the constitution, both the central (federal) government as well as individual state governments have the authority to legislate on labor related issues. In fact, the latter have the authority to amend central legislations or to introduce subsidiary legislations. In addition, the enforcement of many labor regulations, even those enacted by the central government, lies with the state governments.

Second, there is considerable debate among observers of the Indian economy regarding the impact of labor market regulations on a variety of dimensions of India's economic performance. Most pro-reform policymakers and analysts believe that India's labor laws have made labor markets in the formal (or organized) manufacturing sector rigid in the sense of placing serious constraints on the ability of firms to hire and fire workers. Consider chapter VB of the Industrial Disputes Act (IDA) which makes it compulsory for employers with more than 100 workers to seek the prior approval of the government before workers can be dismissed. Critics of the Act argue that while the IDA does not prohibit layoffs and retrenchments, governments have often been unwilling to grant permission to retrench (Datta-Chaudhuri 1996).[11] The unintended results of the regulation have been to create a strong disincentive to hire (additional) workers, and substitute (abundant) labor with (scarce) capital, thereby leading to weak employment growth. Similar arguments have been made for other elements of labor regulations, including specific provisions of the Industrial Employment (Standing Orders) Act and the Trade Union Act (TUA).[12]

Not all analysts agree, however, that India's labor laws have made for a rigid labor market. An important counter-argument to the views expressed above is that India's labor regulations relating to job-security have been either ignored (see Nagaraj (2002)) or circumvented through the increased usage of temporary or contract labor [see, in particular, Datta (2003) and Ramaswamy (2003)]. Ultimately, whether India's labor laws have created significant rigidities in labor markets or not is an empirical issue.

11. The term layoff refers to a temporary or seasonal dismissal of a group of workers due to slackness of current demand. Retrenchments, on the other hand, denote permanent dismissals of a group of workers. Both terms may be distinguished from "termination" which refers to separation of an individual from his or her job.

12. As per the Standing Orders Act, worker consent is required to modify job descriptions or move workers from one plant to another. While the goal of promoting worker consent is certainly an important one, Anant (2000) argues that rigidities can creep in on account of how one defines or establishes worker consent. With the Trade Union Act allowing multiple unions within the same establishment and rivalries common across unions, a requirement of worker consent for enacting changes "can become one of consensus amongst all unions and groups, a virtual impossibility" (page 251).

3.3 Industrial Regulations and Delicensing

The centerpiece of industrial regulations in India has been a system of industrial licensing.[13] The Industries (Development and Regulatory) Act of 1951 required every investor over a very small size to obtain a license before establishing an industrial plant, adding a new product line to an existing plant, substantially expanding output, or changing a plant's location. Applications for an industrial license were submitted to a Licensing Committee, which examined each proposal in light of the national planning targets for industrial production and investment in the various sectors.

According to numerous observers, the system of industrial licensing imposed many rigidities on India's manufacturing sector adversely affecting various dimensions of industrial performance.[14] A tentative set of reforms of the industrial licensing system were introduced from 1975–1984. However, most observers have argued that as a whole these reforms were marginal and that the industrial licensing regime continued to impose binding constraints to entry and growth for most firms outside the small-scale sector. More serious liberalization of the licensing regime began in 1985 with delicensing—the exemption from the requirement of obtaining an industrial license—of 25 broad categories of industries. The next major reform of the licensing regime came in 1991 when industrial licensing was abolished except in the case of a small number of industries.

4. Data

4.1 Poverty

NSS household expenditure surveys and poverty lines for urban and rural sectors provide the basis on which measures of poverty in Indian states and NSS regions can be computed. However, differences in methods used to set (base year) poverty lines, the CPIs used to adjust these poverty lines over time and across states, and the treatment of expenditure data gathered from the 1999–2000 NSS round, have led to different estimates

13. Other elements of industrial regulation in India included special controls on the operations of large firms as per the Monopolies and Restrictive Trade Practices Act of 1969, the "reservation" of a variety of industrial products for exclusive production by firms belonging to the small-scale sector starting in 1967, and a variety of foreign exchange related regulations governing import-and export-related transactions of firms.

14. See the discussion in Fikkert and Hasan (1998).

of poverty.[15,16] Given the various controversies that exist regarding poverty estimates in India, we use three distinct sets of estimates for poverty rates (also known as head count indexes) by state. This is useful in establishing the robustness of our results to different methods and approaches used to estimate poverty. Additionally, we also examine the robustness of our results to an alternative *measure* of poverty, the poverty gap index (PGI). The PGI, unlike the poverty rate, gives a sense of how poor the poor are and is equivalent to the shortfall of consumption below the poverty line per head of the total population, and is expressed as a percentage of the poverty line.[17]

Our preferred set of poverty estimates are drawn from/based on DD (2002).[18] These are available for 1987–88, 1993–94, and 1999–2000, years

15. The starting point of the official methodology for computing poverty rates in India are separate "all-India" poverty lines for the rural and urban sectors areas (specifically, Rs. 49.09 per person per month in rural India and Rs. 56.64 in urban India, both based on a fixed basket of goods consumed by the poor at 1973 prices). State-specific poverty lines for urban and rural sectors are subsequently obtained by using spatial price indexes to capture interstate differentials in the cost of living and state-specific Consumer Price Index of Agricultural Laborers (CPIAL) and Consumer Price Index of Industrial Workers (CPIIW), for rural and urban areas, respectively, to capture changes in the cost of living over time. These poverty lines are used to identify the poor as those who fall below the minimum level of expenditure.

16. The 1999–2000 round of the NSS used a mixed recall period in its survey of household expenditures (7/30 days for many high-frequency consumption items such as food, 30 days for some items (for example, fuel and light), and 30/365 days for durables and other less frequently purchased items). This was different from previous thick sample rounds where a 30-day recall period was used for all items (along with a 365 days recall for some low-frequency items in the 1993–94 survey). In the case of food and other high-frequency consumption items, this was the only recall period used. Researchers argue that the usage of mixed recall periods for food and other high-frequency consumption items, in particular, affected the comparability of results arising from the 1999–2000 survey with previous surveys. See DD (2002) for a comprehensive discussion.

17. The PGI can be expressed as:

$$PGI = \left(1/n\right) \sum_{i=1}^{m} \frac{z - y_i}{z}$$

where y_i represents consumption of the i-th poor person, z is the poverty line, n the total population, and m the number of poor. The poverty rate, or head count index, is simply m/n, of course.

18. DD (2002) report their estimates of poverty only at the state level. In order to work with the region level, we also need region specific estimates of poverty that are analogous to the state-level poverty estimates of DD. We obtain these using the state-and sector-specific poverty lines of DD and a simplified parametric version of their methods to adjust for the changes in the 1999–2000 NSS questionnaire. For details on the adjustment method used, see Deaton (2003a).

which correspond closely with our protection data (see below). The DD estimates of poverty rates (and PGI) incorporate several adjustments to the official estimates. First, the DD estimates incorporate an adjustment for changes to the NSS's survey questionnaire adopted in 1999–2000. The adjustment attempts to make the 1999–2000 survey results comparable with previous thick sample NSS rounds.[19] Second, the DD estimates rely on CPIs, which are built up from unit values of consumption goods derived from the NSS expenditure survey data as opposed to standard CPI data available from government sources.[20] DD argue that the latter price indexes, such as the CPI for Agriculture Laborers and CPI for Industrial Workers, are based on "fixed and frequently outdated commodity weights". Finally, the starting point for the computation of the DD estimates is not the official all-India urban and rural poverty lines of 1973. Rather, it is the official all-India rural poverty line of 1987–88. This is then converted into state specific rural and urban poverty lines using the CPIs derived from the NSS expenditure and quantity data. In this way, DD claim to get around the "rather implausible" differentials between urban and rural poverty lines that are implicit in the official urban and rural poverty lines.[21]

A second set of poverty estimates is based on the poverty lines and CPI data used for computing the official Government of India poverty estimates, but with the adjustment proposed by Deaton (2003b) to make the household expenditure data of 1999–2000 comparable to earlier rounds. These estimates, which we label GOI, rely on the thick NSS rounds like the DD estimates and are obtained from Deaton (2003c). The third and final set of poverty estimates is that of Ozler-Datt-Ravallion (ODR).[22] While this set

19. The adjustment exploits the fact that the 1999–2000 expenditure survey used a 30 day recall period exclusively for a number of items, including fuel and light, non-institutional medical care, and various miscellaneous goods and services. DD (2002) find that the expenditure on these items turns out to be highly correlated with total expenditures and therefore use these to estimate total expenditures comparable with those of previous thick sample rounds.

20. DD note that households report not only expenditures but also the quantities purchased for over 170 commodities. Dividing expenditures by the corresponding quantities yields unit values, or estimates of the price paid on these items.

21. As examples, DD cite the cases of Andhra Pradesh and Karnataka where official urban poverty lines have been around 70 percent higher than the corresponding rural lines. These differentials result in official estimates of urban poverty being much higher than rural poverty in these states, a situation which DD consider unreasonable.

22. The ODR estimates are based on Ozler Datt, and Ravallion (1996), downloaded from LSE's EOPP Indian States Database website: http://sticerd.lse.ac.uk/eopp/research/indian.asp. The estimates available from the LSE website include updates that incorporate the results from the 1999–2000 NSS survey.

of estimates does not attempt to correct for the new survey questionnaire of the 1999–2000 NSS round, it is based on both "thick" as well as the "thin" rounds of the NSS and therefore, consists of a longer series.

All three sets of poverty estimates are available for rural and urban areas separately by state. We use a common series on state population by urban and rural areas, provided in the EOPP Indian States Database, to compute overall poverty (that is, a rural and urban population weighted overall measure). The time plots of the various estimates of poverty by state (overall poverty as well as urban and rural poverty) are posted on the website: http://faculty.maxwell.syr.edu/dmitra/hmu_appendix.pdf

4.2 Protection

State-level protection measures by broad sector (overall as well as urban and rural), have been constructed by weighting industry level tariff rates and NTB coverage rates (for manufacturing, mining and agricultural industries) by state and sector specific employment shares:[23,24]

$$Tariff_{it}^{j} = \sum_{k_m} \gamma_{ik_m,1993}^{j} * Ind\_Tariff_{k_m t} \quad (1)$$

$$NTB_{it}^{j} = \sum_{k_m} \gamma_{ik_m,1993}^{j} * Ind\_NTB_{k_m t} \quad (2)$$

where $\gamma_{ik_m,\,1993}^{j}$ is the employment share of industry k_m in broad sector j of state i from the 1993–94 round of NSS household data.[25] Ind_Tariff_{kmt} and Ind_NTB_{kmt} are industry specific tariff rates and non-tariff coverage rates that are measured at the 2-digit industry level for each year t. $\sum_{k_m} \gamma_{ik_m,1993}^{j} = 1$

23. The information on industry level tariff rates and NTB coverage rate are from Pandey (1999). Pandey reports these for various years over the period 1988 to 1998. As is explained below, our estimation strategy requires that we also have protection related data for 1986. We estimate these by assuming that tariff and NTB coverage rates grew at the same annual rate between 1986 and 1988 as they did between 1988 and 1989. The NTB coverage rates estimated for 1986 are bounded at 100 percent.

24. We also constructed state specific tariff and NTB rates for manufacturing and agricultural goods. Using these does not change our results in any significant way.

25. 1993–94 is the middle year in our data and we thus treat this as the base (reference) year in the construction of our state-level openness index. Like in the case of any good index, the weights therefore are not allowed to change from one year to another. Our results are robust to using any other year as the base, as well as to using employment weights which are the average over the three thick round years. Also, when we allow the weights to change with time, our results are qualitatively similar.

where k_m represents tradable 2-digit industries (comprising agricultural, mining, and manufacturing industries). Non-tradable industries were excluded from the calculations.

A combined measure of tariffs and non-tariff barriers is calculated using principal component analysis (PCA). PCA is commonly used to reduce the dimension of a matrix of correlated variables by combining them into a smaller set of variables that contains most of the variation in the data. In our case, the first principal component contains approximately 90 percent of the variation in the protection data for all industry groups, and hence is used as a combined measure. Figures showing the plots of the three protection measures by state (overall) are available on the website mentioned above.

4.3 Labor-Market Flexibility

As noted in Section 3, India's states can be expected to vary in terms of the flexibility of their labor markets. We use two approaches to partition states in terms of whether they have flexible labor markets or not. A first approach starts with Besley and Burgess' (2004) coding of amendments to the Industrial Disputes Act between 1958 and 1992 as pro-employee, anti-employee, or neutral, and extends it to 1999.[26] Five states are found to have had anti-employee amendments [in net year terms, as defined in Besley and Burgess, (2004)]: Andhra Pradesh, Karnataka, Kerala, Rajasthan, and Tamil Nadu.[27] Since anti-employee amendments are likely to give rise to flexible labor markets, a natural partition of states would be to treat these five states as having flexible labor markets.[28] These states are termed *Flex* states in our empirical analysis. For these states the variable *Flex* equals 1, while it takes the value of 0 for other states.

This partition has some puzzling features, however. Maharashtra and Gujarat, two of India's most industrialized states, are categorized as having

26. Besley and Burgess (2004) consider each state-level amendment to the IDA between 1958 and 1992 and code it as a 1, –1, or 0 depending on whether the amendment in question is deemed to be pro-employee, anti-employee, or neutral. The scores are then cumulated over time with any multiple amendments for a given year coded to give the general direction of change. See Besley and Burgess (2004) for details. (The Besley and Burgess coding is available at http://econ/lse/ac.uk/staff/rburgess/#wp.)

27. With the exception of Karnataka these anti-employee amendments took place in 1980 or earlier. For Karnataka the anti-employee amendments take place in 1988.

28. An alternative measure of labor-market flexibility/rigidity would have been to use the cumulative scores on amendments. This is the approach of Besley and Burgess (2004). Using these scores in place of our labor-market flexibility dummy variable leaves our results qualitatively unchanged.

inflexible labor markets on account of having passed pro-employee amendments to the IDA. However, Indian businesses typically perceive these states to be good locations for setting up manufacturing plants. It is questionable whether Indian businesses would consider Maharashtra and Gujarat to be especially good destinations for their capital if their labor markets were very rigid. Conversely, Kerala is categorized as having a flexible labor market despite an industrial record which is patchy in comparison with that of Maharashtra and Gujarat. Moreover, few Indian businesses would consider it a prime location for setting up manufacturing activity.

An alternative partition of states arises by including Maharashtra and Gujarat in the list of states with flexible labor markets while dropping Kerala. A World Bank research project on the investment climate faced by manufacturing firms across 10 Indian states lends strong support to such a switch (see Dollar, Iarossi, and Mengistae (2002) and World Bank (2003)).[29] First, rankings by managers of surveyed firms lead Maharashtra and Gujarat to be the two states categorized as "Best Investment Climate" states; Kerala was one of the three "Poor Investment Climate" states. Second, the study reports that small and medium sized enterprises receive twice as many factory inspections a year in poor climate states (of which Kerala is a member) as in the two best climate states of Maharashtra and Gujarat. This suggests that even if IDA amendments have been pro-employee in the Maharashtra and Gujarat, their enforcement may be weak. Finally, a question on firms' perceptions about "over-manning"—that is, how the optimal level of employment would differ from current employment given the current level of output—indicate that while over-manning is present in all states, it is lowest on average in Maharashtra and Gujarat.[30]

Thus, we also consider a modified partition in which Maharashtra and Gujarat are treated as states with flexible labor markets while Kerala is treated as a state with inflexible labor markets. The six states with flexible

29. Over a thousand firms were surveyed across ten states. Over nine hundred belong to the manufacturing sector.

30. A supplement to the original World Bank survey carried out in two good investment climate states and one poor investment climate state was aimed at determining the reasons behind over-manning. The results indicated that over-manning was partially the result of labor hoarding in anticipation of higher growth in the future in the good investment climate states but hardly so in the poor investment climate state. In fact, labor regulations were noted as a major reason for over-manning in the latter. This lends indirect support to the notion that given Maharashtra and Gujarat's ranking as best investment climate states, labor regulations have in effect been less binding on firms than the amendments to the IDA may suggest.

labor markets as per this modification are termed *Flex2* states (that is, Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan, and Tamil Nadu). For these states the variable *Flex2* equals 1, while it takes the value of 0 for other states.

4.4 Delicensing

Our measure of industrial delicensing, the share of state manufacturing output accounted by delicensed industries (in each year from 1986 through 1998), is based on Aghion et al (2005) who use industrial policy statements, press notes, and notifications issued by the central government to identify when various 3-digit manufacturing industries were delicensed.

Starting with Aghion et al's figure 1, which lists industries delicensed by year of delicensing, we carry out the following steps. First, since the manufacturing industries listed by them are expressed in terms of the Indian National Industrial Classification (NIC) 1987 industrial codes, we map the listed industries in terms of their NIC 1970 classification. This step is essential given that state level information on three digit manufacturing industries between 1986 and 1988 is available from the Annual Survey of Industry (ASI) in terms of NIC 1970 only. Second, we follow Aghion et al in dropping all three digit industries which are either included in any given state for less than 10 years or are active in less than five states. This step is carried out in order to maximize the comparability of states' experience with delicensing. Once all the above steps are undertaken, it is a simple matter to construct the share of state manufacturing output accounted by delicensed industries in any given year. A time plot of this variable by state can be viewed on our website mentioned above. Substituting output with employment yields very similar trends.

Table 1 provides the summary statistics for the measures of poverty, protection, and industrial delicensing by thick-round years.

5. Estimation Strategy and Results

5.1 Estimation Strategy

We estimate variants of the following basic specification for the various measures of poverty, trade protection and labor market flexibility with and without controls:

$$(4) \qquad y^j_{it} = \alpha + \beta_1 \, protection^j_{it-1} + \beta_2 \, Flex_i * protection^j_{it-1} + \delta_i + \varepsilon_{it}$$

TABLE 1. Summary Statistics

	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 Measure			
(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
Delicensed Industry Measur			
(Lagged by one year):			
Real Output Share of Delicensed Industries	46.65	91.65	94.13

Note: * The average is taken over the 15 major states.

where y^j_{it} is the logarithm of poverty in state i and sector j (overall, urban, and rural), $protection^j_{it-1}$ refers to one of our three measures of trade protection lagged once,[31] and $Flex_i$ is a time-invariant dummy variable which takes the value 1 if the state is defined to have flexible labor market institutions according to one of the two definitions discussed above (that is, Andhra Pradesh, Karnataka, Kerala, Rajasthan, and Tamil Nadu if we use *Flex* and Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan, and

31. Using contemporaneous protection on the right-hand side gave us smaller coefficients and at times reduced coefficients. But the overall message remained unchanged: trade liberalization reduces poverty on average and at times, more so in flexible labor market states. In many cases both protection and its interaction with labor market flexibility do not remain significant at the same time (though they have the right signs), but in most regressions at least one of them is significant. The fit of the contemporaneous regressions was much worse than that of lagged regressions. We therefore decided to work exclusively with lagged protection measures.

Tamil Nadu if we use *Flex2*) and 0 otherwise. δ_i represents fixed state effects. Alternatively, we consider the following specification with fixed year effects:

$$(5) \quad y^j_{it} = \alpha + \beta_1 \, protection^j_{it-1} + \beta_2 \, Flex_i * protection^j_{it-1} + \delta_i + \mu_t + \varepsilon_{it}$$

where μ_t represents the year dummy. The specifications for examining the impact of delicensing on poverty are similar and are obtained by simply replacing the lagged protection measure by the lagged delicensing measure. The additional control variables we use include development expenditures and alternatively gross state domestic product, both in per capita terms.[32]

5.2 Incomes, Liberalization, and Poverty

As noted by Bhagwati (2004), "The scientific analysis of the effect of trade on poverty ….. has centered on a two-step argument: that trade enhances growth, and that growth reduces poverty." In this subsection we examine a variant of this argument to first see how trade policy and state per capita income are related and then look at the relationship between state per capita income and poverty. It is important to note that since we are looking at income levels and not growth, our analysis is not strictly of the relationship between growth and poverty reduction.

Due to space limitations, we do not report these regressions in this paper.[33] Here we just provide a qualitative discussion of those results. Without year dummies, we find that declines in protection and increases in the share of manufacturing output accounted for by delicensed industries are associated with increases in per capita incomes. Moreover, these effects are stronger in the *Flex* or *Flex2* states. Even in the presence of time dummies, this relationship between tariffs and per capita incomes continues to hold. However, the effects of delicensing become weaker. None of the own terms is statistically significant in general. But the interaction terms between delicensing and *Flex* or *Flex2* have positive and statistically significant coefficients, indicating that per capita incomes increase with greater delicensing in states with more flexible labor markets.

32. The data on development expenditures (expenditure on education, public health, water supply, sanitation, relief from natural calamities and food subsidy) at the state level also come from the LSE's EOPP Indian States Database website mentioned above. They are converted into real values using gross state domestic product (GSDP) deflators. Gross state domestic product (GSDP) series were obtained from the official website of the Central Statistical Organisation (CSO) and www.statesforum.org. They are expressed in 1993 Rupees.

33. These regression results can be viewed at: http://faculty.maxwell.syr.edu/dmitra/hmu_appendix.pdf

Are poverty and state per capita incomes related? Two specifications are run for each measure of poverty, one without time dummies and one with time dummies. In every case, there is an unequivocal beneficial impact of state per capita incomes on poverty. A 1 percent increase in state per capita income leads to a 1.15 percent reduction in the poverty rate on average. The inclusion of time dummies into the specification leads to a reduction in the coefficient on per capita income. However, this is to be expected since the year dummies will capture that component of economic growth which is common to all states.

The regression results examined so far suggest that reductions in trade protection may, through their positive impact on per capita income, have contributed to reducing poverty. However, the trade-poverty relationship needs further investigation. For trade liberalization to generate economic growth and at the same time reduce poverty, it is essential that reductions in trade protection do not significantly worsen income distribution. In what follows, we therefore turn to examining the direct relationship between trade protection and poverty.

5.3 Poverty and Trade Protection

RESULTS WITH STATE FIXED-EFFECTS AND NO TIME EFFECTS. In table 2, we present results using the overall DD poverty rate as the dependent variable. In these regressions, we use state-level fixed effects but no time effects. The state-level protection measures used are tariffs and NTB weighted by employment across the different tradable sectors, as well as a principal-components combination of the two. There is considerable evidence here that poverty is increasing in protection across all measures of protection, when there are no controls. When an additional variable, namely an interaction of these protection measures with the state-level labor-market flexibility measure (either *Flex* or *Flex2*), is introduced, we find that this variable is positive but statistically insignificant. The protection variable, by itself, still remains positive and significant. Introducing the per capita development expenditure measure on the right hand side preserves our results on the effects of protection. The overall picture that emerges from this table is that poverty on average is increasing with respect to protection over time and across states. Based on column 1 of table 2, we can say that for every percentage point reduction in the weighted tariff rate, there was a 0.75 percent reduction in poverty. During the period 1991–99, the average value across states of the weighted tariff rate went down by about 75 percentage points, which implies there was a 55 percent reduction in poverty during this period

TABLE 2. DD Headcount Index: Overall

	Tariff					*NTB*					*First principal component*				
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
Constant	2.69	2.69	2.68	5.81	5.59	1.74	1.74	1.74	6.89	7.22	3.15	3.15	3.15	5.82	5.86
	[37.37]***	[35.10]***	[37.99]***	[2.32]**	[2.31]**	[8.89]***	[8.87]***	[8.68]***	[2.87]***	[3.02]***	[117.92]***	[118.63]***	[115.71]***	[2.34]**	[2.35]**
Protection	7.50E-03	7.28E-03	6.96E-03	5.61E-03	5.48E-03	1.7E-02	1.53E-02	1.63E-02	9.34E-03	9.63E-03	0.17	0.16	0.16	0.12	0.12
	[8.10]***	[4.92]***	[5.15]***	[2.60]**	[2.78]***	[7.94]***	[5.20]***	[4.99]***	[2.53]**	[2.38]**	[8.59]***	[5.31]***	[5.37]***	[2.71]**	[2.71]**
Protection* Flex		5.40E-04		4.10E-04			4.86E-03		3.35E-03			0.03		0.02	
		[0.32]		[0.26]			[1.25]		[0.88]			[0.83]		[0.70]	
Protection* Flex2			1.47E-03		1.13E-03			1.81E-03		1.13E-03			0.02		0.02
			[0.91]		[0.75]			[0.44]		[0.29]			[0.65]		[0.53]
Development Exp (per capita, log)				−0.33	−0.31				−0.51	−0.54				−0.30	−0.30
				[1.25]	[1.21]				[2.13]**	[2.27]**				[1.07]	[1.09]
Year Dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
R-squared	0.73	0.73	0.73	0.74	0.75	0.64	0.65	0.64	0.68	0.68	0.71	0.72	0.71	0.73	0.72

Notes: Absolute value of robust t statistics in brackets.
*significant at 10%; **significant at 5%; ***significant at 1%.

that was associated with tariff reduction. The results from columns 2–5 are qualitatively similar. However, the quantitative impact of tariff reductions on poverty sounds more plausible: moving to column 5 where we control for per capita development expenditure, this number goes down to 40 percent. We believe that this impact of trade liberalization on poverty is probably an overestimate, as there could be several other factors, correlated with trade reforms, which may be driving poverty.

As seen in column 6, there is a 1.7 percent reduction in poverty corresponding to every percentage point reduction in the NTB coverage ratio. However, the overall reduction in the across states average of the weighted coverage ratio was about 25 percentage points for the 1988 to 1999 period, implying a 42.5 percent average reduction in poverty associated with the NTB reduction that took place across states. Based on columns (9) and (10) where we control for per capita development expenditure, this number goes down to 12.5 percent which sounds more plausible. We need to interpret the magnitude of this effect with caution and should not consider it to be something in addition to the effect of tariffs, as there is a large overlap in the variation of these two measures of protection. As in the case of the tariff-based estimates, with NTB as well there is no evidence for statistically significant differences between the experiences of *Flex* or *Flex2* states. Using a principal-components aggregator of weighted tariffs and NTBs gives us a similar picture, that is, poverty goes down with trade liberalization in all states.

We see that per capita development expenditure appears with a negative sign and is significant in columns 9 and 10. This clearly shows the important role of development expenditure (expenditure on education, public health, water supply, sanitation, relief from natural calamities and food subsidy) in poverty reduction.

We have also run similar regressions with urban and rural poverty separately as dependent variables.[34] In the case of urban poverty the results are qualitatively very similar to overall poverty results with respect to weighted NTB, tariffs and the principal components factor. However, an important difference is that in every single case, the interaction terms with *Flex* or *Flex2* are all statistically significant. This indicates that trade liberalization has been associated with larger reductions in poverty in states with flexible regulations. This result remains even when per capita development expenditure is included as a control.

34. The results for these are available at: http://faculty.maxwell.syr.edu/dmitra/hmu_appendix.pdf

Rural poverty's response is similar to that of overall poverty when it comes to both the protection variables as well as the *Flex* or *Flex2* interaction variables. This is not surprising as rural poverty is a much bigger component of overall poverty than urban poverty. Additionally, the finding that the effects of trade protection vary by *Flex* or *Flex2* in urban areas and not rural areas makes sense as regulations have primarily been targeted toward the formal (organized) sector—a sector which is largely to be found in urban areas.

RESULTS WITH STATE AND TIME FIXED-EFFECTS. We now turn to the effects of introducing fixed time effects in addition to the state fixed effects. The time fixed effects (or time dummies) will capture the effects of the component of protection variables that behaves uniformly across states. When reforms are being carried out, this component, that is time specific but is common across states, can be quite large. As before, the state effects will capture state-level relative endowments and structural characteristics that do not change significantly over time. Thus, in the presence of state and time-specific effects, what the employment weighted protection measures will capture will be the effects of the state-specific, time-varying elements of such protection. To the extent that different industries will have some differences in their protection trends and different weights will be given to different industries in different states depending on their employment composition, there could be a significant proportion of state-specific, time varying element of protection.

The results for overall, urban, and rural DD poverty rates are provided in tables 3 through 5, respectively. The results are similar to the specifications with state fixed-effects only—but the statistical significance is weaker. With overall DD poverty, the coefficients on tariff rates fail to be significant in all but one case (column 5). However, several of the NTB terms and all of the first principal component factor terms are statistically significant. As before, none of the interaction terms involving *Flex* or *Flex2* are significant. [35]

35. With the GOI and the ODR poverty rates, the precise results are somewhat different from those obtained with the DD measure; more of the protection terms are statistically significant as are a majority of the interactions terms. However, a crucial feature common to the results across all three poverty measures is that to the extent that some of the specifications yield a statistically significant relationship between protection and poverty, this is always in the direction of reductions in protection being associated with reductions in poverty. Moreover, this result is stronger in the Flex or Flex2 states. Regression results using the GOI and ODR poverty measures are available at: http://faculty.maxwell.syr.edu/dmitra/hmu_appendix.pdf

TABLE 3. DD Headcount Index: Overall with Year Dummies

	Tariff					*NTB*					*First principal component*				
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
Constant	2.75	2.80	2.73	5.77	5.85	–0.22	0.07	–0.19	1.86	1.88	3.34	3.29	2.84	5.53	4.95
	[31.01]***	[22.44]***	[33.20]***	[2.19]***	[2.19]**	[0.14]	[0.04]	[0.12]	[0.46]	[0.45]	[26.39]***	[18.72]***	[25.81]***	[1.94]*	[1.71]
Protection	4.41E-03	2.11E-03	4.73E-03	2.51E-03	4.32E-03	0.04	0.03	0.04	0.03	0.03	0.31	0.28	0.32	0.25	0.28
	[1.60]	[0.47]	[1.65]	[0.69]	[1.76]*	[2.32]**	[1.98]*	[2.25]**	[1.54]	[1.67]	[4.45]***	[2.07]**	[5.29]***	[1.72]*	[3.02]***
Protection* Flex		1.49E-03		1.02E-03			3.55E-03		3.19E-03			0.02		0.01	
		[0.71]		[0.54]			[1.00]		[0.91]			[0.35]		[0.27]	
Protection* Flex2			1.20E-03		9.60E-04			1.82E-03		1.60E-03			0.03		0.02
			[0.65]		[0.54]			[0.54]		[0.48]			[0.83]		[0.73]
Development Exp				–0.32	–0.34				–0.16	–0.18				–0.25	–0.23
(per capita, log)				[1.14]	[1.17]				[0.50]	[0.57]				[0.77]	[0.74]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
R-squared	0.73	0.74	0.74	0.75	0.75	0.76	0.77	0.76	0.77	0.76	0.76	0.76	0.76	0.76	0.77

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

But once again, this situation changes with urban poverty rates and the urban analogues of the protection terms. Although almost every protection measure's direct term loses statistical significance with the inclusion of time fixed effects, all the interaction terms are positive and significant indicating that declines in protection have been associated with poverty reduction in *Flex* or *Flex2* states (table 4). The results for rural poverty show no such tendency (table 5). But a few of the direct terms on protection remain statistically significant (columns 6, 8, 11, and 13). Significantly, for rural poverty, none of these terms involve tariffs—the measure used by Topalova—suggesting that omitting NTBs may give a misleading picture of the relationship between protection and poverty. Additionally, one must remember here that the state and the time effects together account for a lot of the variation in our protection measures, and that can account for the lack of statistical significance in many cases.

ROBUSTNESS CHECK I: STATE VERSUS REGIONS. How robust are these results? A first robustness check involves examining whether the use of states as our geographical unit of analysis, opposed to lower levels of geographical aggregation as used by Topolova, is driving the difference between our and her results. Tables 6 and 7 describe results when estimation is carried out at the level of urban and rural NSS regions. As noted in Section 4 earlier, not only do the NSS regions represent a more disaggregated geographical unit than the state, the NSS regions are also considered by Topolova.[36] These results are therefore directly comparable to those of Topolova's region-level estimates in so far as the geographical unit of analysis is concerned.

Our results using the NSS regions are very similar to those reported in tables 4 and 5. In urban areas, the direct term of every protection measure is statistically insignificant. But all the interaction terms involving *Flex* or *Flex2* are positive and significant. In the case of rural poverty, some of the interaction terms involving *Flex* (but not *Flex2*) are significant. More importantly, some of the direct terms on protection are positive and statistically significant. As with the state level estimates, none of these terms involves tariffs, the measure of trade protection used by Topalova and for which she obtains a negative and often statistically significant coefficient. The similarity between the results of tables 6 and 7 and tables 4 and 5 gives us confidence that our use of states as the unit of analysis is not biasing our results in some systematic manner. In what follows, we proceed with further robustness checks reverting to the state as our unit of analysis.

36. A draft version of Topolova (2005) also reports results using NSS regions (see table 4b of Topolova 2004). Her results are qualitatively opposite to ours. While she excludes the year 1993, we include it. Also following the literature, our left-hand side variable is the logarithm of the poverty rate while she uses the poverty rate in levels.

TABLE 4. DD Headcount Index: Urban with Year Dummies

	Tariff					*NTB*					*First principal component*				
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
Constant	1.91	1.89	1.69	4.21	4.22	2.58	0.91	2.43	3.35	5.33	2.70	3.23	2.76	4.75	5.40
	[2.39]**	[2.50]**	[2.39]**	[1.44]	[1.55]	[2.23]**	[0.63]	[1.94]*	[1.00]	[1.93]*	[7.27]***	[7.60]***	[8.12]***	[1.78]*	[2.43]**
Protection	8.11E-03	7.52E-03	8.75E-03	6.04E-03	7.04E-03	4.01E-03	0.02	3.63E-03	0.02	3.23E-03	0.20	0.46	0.20	0.42	0.16
	[1.34]	[1.29]	[1.63]	[1.04]	[1.23]	[0.35]	[1.30]	[0.29]	[1.13]	[0.27]	[0.92]	[1.94]*	[1.02]	[1.55]	[0.78]
Protection* Flex		2.31E-03		2.07E-03			7.36E-03		6.56E-03			0.10		0.09	
		[2.25]**		[1.93]*			[3.01]***		[2.35]**			[3.49]***		[2.66]**	
Protection* Flex2			2.68E-03		2.54E-03			4.82E-03		4.45E-03			0.07		0.06
			[2.52]**		[2.47]**			[2.15]**		[2.12]**			[2.30]**		[2.25]**
Development Exp				–0.24	–0.26				–0.25	–0.32				–0.17	–0.29
(per capita, log)				[0.83]	[1.02]				[0.89]	[1.34]				[0.55]	[1.14]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
R-squared	0.82	0.84	0.85	0.84	0.85	0.81	0.84	0.83	0.85	0.84	0.81	0.85	0.84	0.85	0.85

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 5. DD Headcount Index: Rural with Year Dummies

	Tariff					*NTB*					*First principal component*				
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
Constant	3.22	3.35	3.22	6.17	6.36	1.15	1.45	1.14	3.98	3.98	3.17	3.23	3.15	5.81	5.84
	[10.35]***	[8.65]***	[9.47]***	[2.40]**	[2.30]**	[1.19]	[1.56]	[1.13]	[1.10]	[1.06]	[18.82]***	[12.85]***	[16.16]***	[2.06]**	[1.98]*
Protection	2.98E-03	9.50E-04	2.96E-03	1.58E-03	2.72E-03	0.03	0.02	0.03	0.02	0.02	0.19	0.15	0.20	0.13	0.16
	[0.86]	[0.19]	[0.83]	[0.39]	[0.90]	[1.88]*	[1.50]	[1.83]*	[1.01]	[1.23]	[1.92]*	[0.87]	[1.81]*	[0.89]	[1.39]
Protection* Flex		1.38E-03		8.40E-04			3.49E-03		2.96E-03			0.02		0.01	
		[0.57]		[0.38]			[0.77]		[0.66]			[0.39]		[0.28]	
Protection* Flex2			–6.00E-05		–2.90E-04			5.90E-04		1.00E-04			9.04E-03		2.76E-03
			[0.03]		[0.13]			[0.14]		[0.02]			[0.20]		[0.06]
Development Exp				–0.32	–0.35				–0.24	–0.26				–0.29	–0.30
(per capita, log)				[1.14]	[1.16]				[0.75]	[0.80]				[0.94]	[0.93]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
R-squared	0.67	0.68	0.67	0.69	0.69	0.68	0.69	0.68	0.69	0.69	0.68	0.68	0.68	0.69	0.69

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 6. DD Headcount Index, Regional: Urban with Year Dummies

	Tariff			*NTB*			*First principal component*		
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Constant	2.01	2.08	1.93	2.19	3.30	1.73	2.56	2.70	2.48
	[2.73]***	[2.95]***	[2.70]***	[0.88]	[1.31]	[0.69]	[6.53]***	[6.94]***	[6.42]***
Protection	7.85E-03	6.19E-03	7.18E-03	8.29E-03	–6.37E-03	8.80E-03	0.28	0.16	0.28
	[1.36]	[1.12]	[1.29]	[0.33]	[0.24]	[0.35]	[1.19]	[0.68]	[1.23]
Protection* Flex1		3.50E-03			0.01			0.10	
		[2.32]**			[2.07]**			[2.11]**	
Protection* Flex2			2.60E-03			7.85E-03			0.08
			[1.90]*			[1.76]*			[1.95]*
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	174	174	174	174	174	174	174	174	174
Number of regions	58	58	58	58	58	58	58	58	58
R-squared	0.47	0.5	0.49	0.46	0.49	0.48	0.47	0.49	0.49

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 7. DD Headcount Index, Regional: Rural with Year Dummies

	Tariff			*NTB*			*First principal component*		
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Constant	2.97	3.05	2.95	0.53	1.34	0.33	3.46	3.29	3.53
	[30.94]***	[31.96]***	[29.18]***	[0.32]	[0.82]	[0.20]	[16.81]***	[13.27]***	[15.86]***
Protection	4.63E-03	2.70E-04	4.99E-03	0.03	0.02	0.03	0.26	0.12	0.28
	[1.26]	[0.06]	[1.34]	[1.84]*	[1.15]	[1.82]*	[1.87]*	[0.69]	[2.00]**
Protection* Flex1		3.20E-03			8.13E-03			0.06	
		[1.71]*			[2.00]**			[1.48]	
Protection* Flex2			1.20E-03			3.31E-03			0.04
			[0.67]			[0.87]			[1.00]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	174	174	174	174	174	174	174	174	174
Number of regions	58	58	58	58	58	58	58	58	58
R-squared	0.45	0.47	0.45	0.46	0.48	0.46	0.46	0.47	0.46

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

ROBUSTNESS CHECK II: TRANSMISSION OF CHANGES IN PROTECTION RATES TO DOMESTIC PRICES. A second robustness check concerns the transmission of changes in protection rates to domestic prices at the state level. In our analysis so far, we have implicitly assumed that this transmission is perfect and/or identical across states. However, this may be too strong an assumption. The transmission of changes in protection rates to domestic prices may vary across states for a variety of reasons.[37] Transportation costs of imported goods, for example, are likely to differ across states on account of whether a state has a port or not, the average distance from ports, and the quality of the transportation infrastructure. A given reduction in tariff rates could therefore lead to a different configuration of domestic prices across states. State specific policies regarding taxes and subsidies could also play a similar role.

We tackle this issue in two ways. The first is to estimate price transmission regressions whereby we regress domestic prices for various commodities on corresponding world prices, protection rates, the exchange rate, and a control for distance from ports.[38] We estimate the price transmission regressions using fixed effects and random coefficient models. Table 8 describes the results for urban and rural sectors, respectively.[39] The key finding is the positive and statistically significant coefficients on the tariff and world price terms indicating that world prices and protection rates do get transmitted to domestic prices.[40] As one would expect on the basis of their better access to markets, urban areas have higher coefficients. However, the tariff and world price terms enter the regressions for the rural areas with positive and statistically significant coefficients as well. In addition,

37. We are grateful to T. N. Srinivasan for raising this issue.

38. To capture domestic prices, we computed unit values for primary commodities using household level information on expenditures and quantities from the NSS data on consumer expenditure. For world prices, we draw on the index of export prices reported in the WTO International Trade Statistics handbook. The distance from port variable is variously based on the distance from a state's capital (or commercial capital in case of Assam and Gujarat) to major Indian ports and the volume of cargo traffic (in tons) being handled by each port. For example, one approach is to simply use the distance between a capital to the nearest port. Another is to weight the distance between a capital to a port by the share of that port in overall cargo traffic and sum over all ports. The distance data is obtained using the distance calculator provided at www.mapsofindia.com while the volume of cargo traffic by port is obtained from two sources, ADB (1992) and the Indian Ports Association website, www.ipa.nic.in/oper2b.htm

39. We use random coefficient regressions that allow coefficients to vary across states since there might be factors other than distance that might vary across states and may affect the transmission mechanism.

40. Since our NTB measure is a coverage ratio, it is difficult to figure out the precise functional form that captures its transmission into domestic prices, which might explain its statistical insignificance in the presence of the strong statistical significance of the tariff term.

TABLE 8. Price-Transmission Regression, Urban and Rural (Dependent Variable: Log of Unit Price)

	Rural				*Urban*			
	Random coefficients		*Fixed effects*		*Random coefficients*		*Fixed effects*	
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
log (1+ Tariff)	0.90	0.66	0.50	0.68	1.09	0.89	0.94	1.13
	(0.20)***	(0.19)***	(0.20)**	(0.28)**	(0.24)***	(0.24)***	(0.27)***	(0.34)***
log (1+ NTB)	0.23	0.19	–0.12	0.06	0.17	0.13	–0.02	0.08
	(0.18)	(0.17)	(0.15)	(0.31)	(0.17)	(0.16)	(0.18)	(0.23)
log (World Price)	0.75	0.41	0.42	0.47	0.76	0.43	0.56	0.57
	(0.05)***	(0.08)***	(0.06)***	(0.13)***	(0.05)***	(0.07)***	(0.05)***	(0.05)***
log (Exchange Rate)	0.35	–0.13	–0.38	–0.38	0.36	0.06	–0.06	–0.06
	(0.07)***	(0.14)	(0.14)***	(0.14)***	(0.06)***	(0.09)	(0.10)	(0.10)
log (Inverse Distance)		82.74				58.84		
		(81.18)				(56.02)		
log (1+ Tariff)* Inverse Distance		–0.04		–0.98		2.70E-03		–1.03
		(0.07)		(19.70)		(0.06)		(16.70)
log (1+NTB)* Inverse Distance		–0.07		–0.98		–0.04		–0.61
		(0.07)		(29.30)		(0.05)		(11.95)
log (World Price)* Inverse Distance		0.38		–0.22		0.28		–0.06
		(0.11)***		(9.84)		(0.08)***		(1.23)
Observations	265	265	265	265	266	266	266	266
Number of states	15	15	15	15	15	15	15	15
Wald Test Statistics	43149.67	213.81	142.06	79.62	55105.75	844.75	271.43	349.04

Notes: Bootstrapped standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

none of the interaction terms between protection rates and the distance variables are statistically significant.

Of course, the transmission of changes in protection rates to domestic prices may still vary in some systematic manner across states, thereby reducing the usefulness of the coefficients on protection rates in our poverty regressions in drawing inferences on the relationship between protection rates and poverty. A way to deal with this issue is to allow the impact of protection rates on poverty to vary by state specific factors that can be expected to influence the degree of transmission. As noted earlier, such factors would include variations across states in terms of their distances to ports, transportation costs, and tax/subsidy policies. In addition to the data on ports and distances discussed above, we use information on road density by state (total kilometers of road divided by total state area) and information on state revenues to construct proxies for transportation costs and state specific tax policy/rates.

Regardless of how we construct and introduce the distance to ports variable—for example, measuring it in terms of the distance of the state capital (political or commercial) to the nearest port, or as a weighted sum of the distance of the state capital to all major ports (with the weights based on each ports' share in total cargo traffic)—the general favor of results from tables 4 and 5 is unchanged. Reductions in protection rates are never associated with increases in poverty and tend to be poverty reducing (in urban areas) in states with flexible labor institutions. Constructing measures to capture states' tax regimes is more difficult. But once again, working with what we have, our results are unchanged. For example, some urban local governments impose octroi, a charge levied on the entry of goods for consumption or sale. Not all states levy the tax but the prominent ones levying it over the time period we cover are Maharashtra, Gujarat, Punjab and Rajasthan.[41] A simple way to check how accounting for octroi could change our results is to create and interact a dummy for these four states with our protection measures. Since octroi is levied by urban governments we carry out this exercise for our urban sample. None of our key results change. In fact, the interaction term involving the dummy for the four major octroi-levying states is always insignificant.[42]

41. We thank M. G. Rao for pointing this out.

42. Similarly, we interacted our protection measures with the ratio of the state sales tax less central sales tax collected by the state to gross state domestic product to try and account for differences across states in their tax regimes as may be pertinent to the issue at hand. Once again, in no case is a reduction in protection associated with an increase in poverty. (We obtained the state tax data from the Handbook of Statistics on State Government Finances published by the Reserve bank of India, http://www.rbi.org.in/scripts/publications.aspx.)

The main exception to finding little role for proxies of state-wise differences in the degree of protection-price transmissions is when we introduce interaction terms between protection rates and road density. Focusing on the statistically significant terms in tables 9 and 10, declines in protection rates are poverty reducing in states with high road density. Interestingly, this effect is stronger for rural areas. Presumably, this reflects the fact that most urban areas are relatively well covered by roads. The big difference in road density across states is likely to be driven by the situation in rural areas. More generally, it must be noted that even in these regressions, the usual pattern of results still follows. Declines in trade protection are not associated with statistically significant increases in poverty, while in urban areas they tend to be poverty reducing in states with flexible labor institutions.

ROBUSTNESS CHECK III: OTHER ISSUES. The results of our poverty regressions with and without time dummies together can be viewed as providing evidence that trade reforms reduce poverty and that states where the labor force is more exposed to foreign competition are likely to have lower poverty rates. Also, such states experienced greater poverty reduction as a result of trade liberalization. To make these statements even stronger and more unqualified, we run our regressions with time trends in place of time dummies. These results*, clearly support our earlier results. Any poverty reduction, which is a departure from the national trend, seems to be strongly related in the expected manner to off-the-trend shocks to our inverse measure of exposure to foreign competition. Also, as before, while this relationship is uniform in the case of rural poverty across states with different labor-market institutions, in the case of urban poverty this relationship exists mainly in states with flexible labor markets.

Another robustness check we have tried is the use of Besley-Burgess (2004) direct cumulative scores on amendments in place of our *Flex* or *Flex2* variable. Our results remain qualitatively unchanged. A final check involves introducing the log of gross state domestic product per capita as a control in place of development expenditures (also available on the website mentioned above). As the results show, protection continues to show up with a positive sign in every case, several of which are also statistically significant. At a minimum, there seems to be no adverse distributional impact of trade liberalization which is poverty *increasing*.

* available at http://faculty.maxwell.syr.edu/dmitra/hmu_appendix.pdf

TABLE 9. DD Headcount Index: Urban with Normalized Road Density

	Tariff			*NTB*			*First principal component*		
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Constant	1.91	1.27	1.90	2.17	0.87	1.98	2.71	3.24	2.81
	[1.79]*	[1.21]	[2.14]**	[1.90]*	[0.60]	[1.72]*	[7.17]***	[7.59]***	[8.29]***
Protection	8.17E-03	0.01	7.10E-03	8.54E-03	0.02	8.45E-03	0.20	0.46	0.22
	[1.02]	[1.52]	[1.04]	[0.75]	[1.37]	[0.73]	[0.92]	[1.96]*	[1.13]
Protection* Road	–1.00E-05	–9.70E-04	3.50E-04	2.83E-03	1.23E-03	3.02E-03	2.52E-03	–0.01	0.01
	[0.02]	[1.47]	[0.71]	[1.95]*	[0.74]	[2.23]**	[0.17]	[0.91]	[1.09]
Protection* Flex		3.17E-03			6.76E-03			0.11	
		[2.60]**			[2.49]**			[3.33]***	
Protection* Flex2			2.81E-03			4.96E-03			0.08
			[2.46]**			[2.25]**			[2.47]**
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15
R-squared	0.82	0.85	0.85	0.82	0.84	0.84	0.81	0.85	0.84

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 10. DD Headcount Index: Rural with Normalized Road Density

	Tariff			*NTB*			*First principal component*		
Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Constant	4.20	4.21	4.19	2.62	2.62	2.63	3.57	3.67	3.65
	[7.69]***	[7.70]***	[7.65]***	[2.36]**	[2.32]**	[2.19]**	[3.78]***	[3.78]***	[3.79]***
Protection	–7.97E-03	–8.08E-03	–8.09E-03	4.17E-03	4.38E-03	4.13E-03	–0.05	–0.12	–0.11
	[1.31]	[1.34]	[1.36]	[0.26]	[0.28]	[0.25]	[0.09]	[0.20]	[0.19]
Protection* Road	2.40E-03	2.36E-03	2.46E-03	5.82E-03	6.00E-03	5.84E-03	0.03	0.03	0.04
	[2.30]**	[1.91]*	[2.42]**	[2.63]**	[1.72]*	[2.46]**	[0.47]	[0.50]	[0.58]
Protection* Flex		2.00E-04			–5.90E-04			0.02	
		[0.08]			[0.10]			[0.44]	
Protection* Flex2			5.70E-04			–2.80E-04			0.02
			[0.26]			[0.06]			[0.46]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15
R-squared	0.7	0.7	0.71	0.71	0.71	0.71	0.69	0.69	0.69

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

5.4 Poverty and Industrial Delicensing

We now turn to the relationship between poverty and industrial delicensing. Table 11 presents the results for overall DD poverty. The first five columns include only state fixed effects. The next five include time fixed effects as well. Focusing on the results without time fixed effects we find that all the delicensing terms are negatively signed (columns 1 through 5). This implies that an increase in the share of state manufacturing output accounted by delicensed industries is associated with a reduction in poverty. However, the direct delicensing terms lose significance when development expenditures are added as controls (columns 4 and 5). Moreover, none of the interaction terms with *Flex* or *Flex2* are significant. With time fixed effects, none of the direct terms retain significance (columns 6–10). However, the interaction terms with *Flex* become significant (columns 7 and 9).

The corresponding results for urban and rural poverty are available on our above-mentioned website containing our additional results. The results without time fixed effects are very similar to those in table 11. The point estimates on the delicensing term tend to be more negative in the case of urban poverty than rural poverty. To the extent that one would predict delicensing to impact poverty in one of the two sectors more, it would be the urban sector given that licensing applied to formal (organized) sector manufacturing—these are predominantly located in urban areas.

With time fixed effects, some differences emerge. In the case of rural poverty, none of the terms involving delicensing, whether direct or in interaction with *Flex* or *Flex2*—is significant. In the urban case, however, there is some evidence that delicensing may have been associated with greater poverty in the non-*Flex* states in particular. This is seen in the positive (negative) and significant coefficient on the direct (interaction) term involving delicensing.

What happens if we introduce the delicensing and protection terms together? It turns out that it is the trade protection measure that has a significant impact on poverty and not delicensing. The negative (and the somewhat marginally significant) coefficient of the interaction between delicensing and *Flex2*, provides some weak evidence, that in addition to the effect of trade liberalization, deregulation does reduce poverty in states with flexible labor markets.

5.5 Poverty Gap

Our entire analysis has so far focused on poverty rates. In this final subsection we consider briefly the implications of working with the poverty

TABLE 11. DD Headcount Index: Overall with Delicensed Output Share

Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Constant	3.70	3.69	3.69	11.98	12.04	3.42	3.38	3.41	6.07	6.48
	[33.53]***	[34.77]***	[34.93]***	[6.59]***	[6.48]***	[16.56]***	[19.77]***	[18.96***	[2.52]**	[2.63]**
Delicensed	–6.93E-03	–5.87E-03	–6.01E-03	–1.36E-03	–1.62E-03	–6.60E-04	1.23E-03	4.30E-04	2.00E-04	–6.20E-04
	[4.52]***	[2.84]***	[2.66]***	[1.15]	[1.34]	[0.16]	[0.32]	[0.11]	[0.06]	[0.19]
Delicensed* Flex		–2.76E-03		–1.35E-03			–3.45E-03		–2.78E-03	
		[1.02]		[0.82]			[1.95]*		[1.87]*	
Delicensed* Flex2			–2.18E-03		–5.40E-04			–2.36E-03		–1.71E-03
			[0.79]		[0.31]			[1.25]		[1.07]
Development Exp				–0.96	–0.97				–0.30	–0.34
(per capita, log)				[4.61]***	[4.53]***				[1.11]	[1.23]
Year Dummies	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15	15
R-squared	0.38	0.39	0.39	0.64	0.63	0.72	0.75	0.73	0.76	0.75

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

gap index (PGI) as the measure of poverty. Table 12 presents the results of regressions of the logarithm of overall PGI on protection with both state and time fixed effects included. The regression results with rural and urban PGI are available on our website. Essentially, the results are very similar to the corresponding estimates for poverty rates described above. Whenever trade protection's relationship with poverty is significant, it is a positive one so that reductions in protection are associated with a decline in the PGI. A significantly different relationship between *Flex* or *Flex2* states and the others emerges in urban areas but not rural areas (i.e., the interaction term involving trade protection and the *Flex* or *Flex2* dummies are significant in urban areas only). Finally, any statistically significant relationship between protection and rural poverty is driven by NTBs.[43]

6. Conclusion

Our empirical investigation of the impact of economic reforms, mainly trade reforms but also industrial delicensing, shows that there is a fair amount of evidence in support of the poverty reducing effects of these reforms. The beneficial effects are larger and can be shown to have more certainly been present in states with more flexible labor market institutions. For example, our estimates indicate that reductions in tariff rates over the 1990s were associated with a 15 percent decline in urban poverty in states with flexible labor market institutions relative to other states. The evidence makes a case for the reform of labor laws, especially in these latter states. We also find that the positive impact of trade liberalization on poverty reduction works through both the efficiency and distribution channels.

Most of the regressions show that the impact of trade liberalization on poverty is statistically more significant and sometimes larger in magnitude in the absence of time effects than in the presence of such effects. This is not surprising due to the common, time-varying element of these reforms across states. Also, we find greater importance for flexible labor market institutions and deregulation in urban areas. This is also expected, given that these institutions and policies directly impact organized manufacturing firms, primarily located in urban areas.

43. We also ran regressions of PGI on delicensing with both state and time fixed effects included. Again, the results are quite similar to the case of poverty rates. For example, non-Flex states see higher PGIs in response to delicensing in urban areas. This is similar to the case of poverty rates and delicensing. The main difference is that while the results for poverty rates showed no significant relationship between delicensing and rural poverty, delicensing appears to lead to a fall in PGIs in Flex states in rural areas.

TABLE 12. DD Poverty Gap Index: Overall with Year Dummies

	Tariff					*NTB*					*First principal component*				
Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Constant	1.06	1.15	1.03	4.53	4.92	–2.70	–2.13	–2.66	–0.31	–0.22	1.66	1.50	1.28	4.28	4.06
	[9.29]***	[7.47]***	[9.81]***	[1.37]	[1.38]	[1.43]	[1.12]	[1.44]	[0.06]	[0.04]	[8.60]***	[5.83]***	[7.65]***	[1.18]	[1.03]
Protection	3.66E-03	–1.27E-03	4.13E-03	–8.20E-04	3.63E-03	0.05	0.04	0.04	0.03	0.04	0.33	0.21	0.34	0.18	0.29
	[1.05]	[0.23]	[1.14]	[0.18]	[1.14]	[2.44]**	[1.93]*	[2.38]**	[1.44]	[1.68]	[2.99]***	[1.11]	[3.62]***	[0.86]	[2.15]**
Protection* Flex		3.20E-03		2.66E-03			6.90E-03		6.54E-03			0.05		0.05	
		[1.16]		[1.05]			[1.44]		[1.38]			[0.88]		[0.84]	
Protection* Flex2			1.75E-03		1.45E-03			2.72E-03		2.46E-03			0.04		0.04
			[0.69]		[0.58]			[0.56]		[0.51]			[0.83]		[0.72]
Development Exp				–0.37	–0.42				–0.16	–0.21				–0.31	–0.30
(per capita, log)				[1.04]	[1.10]				[0.38]	[0.48]				[0.75]	[0.72]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Number of states	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
R-squared	0.73	0.75	0.74	0.76	0.75	0.76	0.77	0.76	0.78	0.77	0.75	0.76	0.76	0.76	0.76

Notes: Absolute value of robust t statistics in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Comments and Discussion

Kenneth Kletzer: This is an interesting and thoughtful paper that reconsiders the impact of trade liberalization on poverty rates across regions of India. The paper is a companion study to the district-level examination of differences in poverty reduction due to tariff reduction by Topolova (2005). Hasan, Mitra and Ural modify Topolova's approach and arrive at qualitatively different conclusions. The empirical methodology and theoretical arguments of the two papers are essentially the same. Therefore, my comments first address the line of research in both studies and then turn to the contribution of Hasan, Mitra and Ural.

The question of whether trade liberalization, or market reform in general, reduces poverty is an important one and does not have an unambiguous theoretical answer. As argued by the authors, the impact of protection on the incidence of poverty requires empirical investigation. The means by which trade reforms affect poverty rates are not quite as simple as suggested by these papers. It is tempting to place this research in the context of cross-country estimates showing that trade raises growth rates and growth in turn reduces the incidence of poverty. However, directly regressing poverty rates on measures of trade protection skips over the means through which trade reforms affect income growth and poverty. These include the static income distribution effects of trade policy changes and the net effects of trade liberalization on growth through factor accumulation and productivity increases.

The empirical model in the Topolova paper is interpreted using a specific factors model of trade with labor as a fixed factor in traded goods industries. This assumption is motivated by the low degree of unskilled labor mobility across sectors and regions, particularly for rural populations, in India. The approach of this line of research is to relate differences in the rate of decrease in poverty to differences in the impact of trade liberalization for regions of India. Trade impact is measured by weighting the relative prices of tradable goods by employment to obtain an index of the terms of trade for each state or district. Tariff reductions, therefore, should have a larger effect on the incomes of unskilled laborers for a region that has a higher share of employment in import-competing industries weighted by the percentage tariff reduction for the output of each industry.

This approach has a parallel in the estimation of the effect of trade or technological progress on earnings and employment in advanced industrialized countries using relative producer prices to measure trade impacts. The movement of labor from declining to expanding sectors takes time so that laborers in trade-impacted industries realize short-run income losses even if they eventually gain from trade liberalization. Workers with lower human capital are less mobile and tend to suffer larger losses in declining sectors. Therefore, the effect of trade on the incomes of low-skilled labor depends on rates of worker mobility and job creation in expanding industries.

The analog in the case of India is that the sign of the effect of regional trade exposure on low income households over the decade of the 1990s should depend on the rate of adjustment in employment as well as medium-run equilibrium returns to unskilled labor. While Topolova finds that districts with greater trade exposure experience a lower rate of poverty decline between the 1988–89 and 1999–2000 surveys. This is consistent with the interpretation that unskilled labor is a specific factor. In the current paper, Hasan, Mitra and Ural find state-wide exposure to trade is correlated with a larger rate of poverty decline using the additional survey round for 1993–94, implying labor mobility between activities. This is only a partial interpretation since trade liberalization probably had a positive effect on India's aggregate growth rate in the 1990s contributing to the overall reduction in poverty. These papers measure the differences in poverty declines across regions that differ by trade exposure controlling for inter-regional differences in social spending on poverty reduction. The finding that districts with more employment in import-competing industries experienced lower rates of labor income growth may not be very surprising over a short horizon. The results of the current paper suggest that the poorest households are benefiting from India's trade reforms within a span of a few years.

The major differences in the empirical approach include the addition of a measure of non-tariff barriers by Hasan, Mitra and Ural. The reduction of quantitative trade restrictions complemented tariff rate reductions during the 1990s so that tariff rates might be an insufficient measure of the impact of trade reform on incomes. The index of non-tariff barrier coverage rates may measure the impact of non-tariff barriers poorly, but the addition seems reasonable and appears to matter for the results. Hasan, Mitra and Ural also add variables that measure labor market flexibility and industry delicensing. Two measures are use to represent labor market flexibility. The first is the coding of state amendments to the Industrial Disputes Act by Besley and Burgess (2004). The second modifies Besley and Burgess' classification of states based on the authors' view of the reasonableness of the

classification of states such as Maharastra, Gujarat and Kerala. The new measure is a qualitative measure based on survey data. Both measures are at best ad hoc and do not have a sound quantitative grounding. The last added variable is a more reasonable quantitative measure of industrial delicensing which may capture variance in the ease of firm entry across states.

The paper also aggregates the data to the state level but repeats the analysis for National Sample Survey regions (strata). The NSS regions are typically made up of several districts, so that the number of observations used in the district-level analysis of Topolova is much greater. Since many states of India are very populous, with populations for some exceeding one hundred million, the state-level regressions are analogous to cross-country regressions with a common policy change. Therefore, we should worry about all of the shortcomings of cross-country regressions. It is difficult to understand why aggregation is desirable, even if the analysis at the regional level confirms the results. It would be useful to run the regressions for the district level poverty data including the measures of policy reform added by Hasan, Mitra and Ural so that we might see if adding non-tariff barriers or delicensing variables leads to the reversal of Topolova's result. Otherwise, it is hard to see whether these measures or the unit of observation is responsible for finding that more trade-impacted regions experience higher rather than lower rates of poverty decline.

To elaborate this point, a state with a population exceeding any member of the European Union has a fairly diversified sectoral composition of output. A district, however, should be much more specialized in traded goods industries. A higher share of employment in import-competing goods may be associated with smaller decline in poverty at the district level, but aggregating over a large number of heterogeneous districts can make the result disappear. Adding up employment in import-competing, export and non-traded goods industries across districts could very likely yield regression results that reflect the overall gains from trade liberalization in poverty rate declines. A state that has more international trade can experience net gains from liberalization even though it will have a larger employment share in import-competing industries.

I would like to reiterate the major point made by T.N. regarding the measurement of the impact of tariff reductions on regional employment. The construction of the protection index uses tariff rates so that it measures border prices. With the high cost of transporting goods within India, this index is a poor measure of relative producer prices inland. Since transport costs for traded goods can vary widely by region, goods that are tradable in Mumbai may not be tradable in rural eastern Maharashtra. If the cost

of producing a tradable good locally is less than the cost of delivering the same good imported to a district, then that good is non-tradable. Reducing the tariff rate should not affect the local price of the good until the total cost of an imported unit equals the local cost of production. Therefore, tariff reduction will not proportionally reduce the price of some tradable goods, and the effect of tariff reductions on relative producer prices will vary by location. Some goods very likely can remain non-traded in some regions while becoming traded in others. Variations in commodity taxes both across regions and over time can also give rise to non-proportional changes in relative prices with tariff reductions.

Because the tradability of a good for an interior district that can be imported or exported at the coast is endogenous, the measure of relative prices used in this paper only works at the border. The index based on tariffs incorrectly measures impact of trade liberalization on different regions or states of India by overstating relative price changes for regions facing high costs of transportation from ports. A problem is that the costs of transportation and whether a good is traded could be correlated with changes in the level of poverty. Poorer districts could well have higher transport costs and be more specialized in production creating a bias in the estimations. This argument should also apply to the index of non-tariff barriers.

Studying the effects of policy reform on poverty using disaggregated regional variation in production and employment is an interesting and promising research agenda. The underlying theory connects trade liberalization and other policy reforms to regional outcomes through its impact on relative prices at the level of the producer. This requires the data on changes in local prices in the presence of significant variation in the cost of transportation. That said, the effort to estimate empirically the effects of trade and regulatory reform on poverty in India is a worthy enterprise.

T. N. Srinivasan: At the outset I want to express my appreciation for the hard work the authors have put in the revision, and the seriousness and care with which they have tried to address comments of the discussants of the conference version of the paper. My following comments raise my remaining concerns, some of which apply to the genre of the literature and not specifically to the paper and others, though specific to the paper, might be difficult or impossible to address without substantial additional work. Let me hasten to add that I will be quite happy with the publication of the paper as it is—it is a vast improvement over the much overrated paper of Topalova.

First, although the authors rightly emphasize the importance of tariff as well as non-tariff barriers (NTBs) to trade, they (and the literature in general) do not adequately recognize and address the fact, that both measures are often used simultaneously to protect the same product. For example, in India quantitative restrictions (QR), an ubiquitous Indian NTB until a WTO Dispute Settlement ruling several years after reform ruled it out, as well as a tariff were imposed on imports of many commodities. In many cases, the tariff served merely as a device to transfer part of the quota rent to the government—it had no protective effect, in the sense that any changes in tariff within limits would have had *no effect* on imports. Thus, the tariff equivalent of the QR in such cases was higher than the actual tariff. In others, the QR was not binding and only the tariff determined the level of imports. Thus, the joint protective effect of a tariff and NTB on a product is not a straightforward matter—at the margin, only one, affects imports and not both.

The authors construct a separate sectoral measure of tariffs and NTBs and use them *one at a time* in their regressions (in addition to using only the first principal component). I would argue that they should have used both in *each* regression, unless the correlation between the two was very high. Since there are only two, tariffs and NTBs, I would presume that there are only *two* principal components (which *are* orthogonal linear combinations of tariffs and NTBs). Only one degree of freedom is saved by using the first principal component, rather than both tariffs and NTBs in each regression. I do not see much point in using the principal component. While the authors are absolutely correct in rejecting Topalova's economically meaningless treatment of non-traded goods as if they are traded goods with zero tariffs, they do not probe the effect of changes in real exchange rates (that is, relative price of traded goods in terms of non-traded goods) following trade liberalization on poverty. It can go either way, depending on the weight of non-traded goods in the poverty basket.

Second, I am not convinced that there is any need to use several poverty measures—whatever may be the merits and demerits of one measure as compared to another, they would not be expected to bias the results of the paper (unless merits and demerits of a poverty measure interacts with protection, which is implausible), since its focus is the poverty impact of differences in protection *across states or regions*. If I am right, the authors can drop the discussion of alternative poverty measures and use only one and explain why. Also, the description of the methodology of computing "official" poverty lines by the Planning Commission in footnote 15 is misleading. Even if a fixed basket of goods (poverty basket) was used and

valued at 1973 prices to determine the 1973 price poverty line, its updating by price indices with a fixed weighting pattern that has no connection to the weights implied in the poverty basket breaks the link between the poverty line and the poverty basket for years other than 1973. The authors say (p. 4) that "an urban stratum is never a district but is based on either a "hospital area" or an "industrial area" or a "bazaar area" within a city or a collection of small towns." I have no idea where they got this idea. NSS report 506 (Appendix B, p. B-2) states that "In the urban sector, strata were formed within each NSS region on the basis of size class of towns as per Population Census 2001."

Third, the authors run price-transmission regressions in response to my comment on the importance of taking into account the implications of domestic transport costs, taxes, movement restrictions, etc. The broader thrust, beyond price transmission, of my comment was that each state or region of a country is open to trade, to varying degrees, *not only with other countries but also with other states or regions within the country.* This being the case, what is traded (exported from or imported into it) by a state or region, and what is not (that is, produced and consumed within the state) are endogenously determined in an equilibrium, in which the market clears within each state for *non-traded* goods, and for to other goods, markets may clear at the level of a sub-set of states or nationally or globally. Even if the country is a price taker in world markets so that global market clearance is not relevant for internationally traded commodities, still the general spatial equilibrium set-up is complicated. Although, the price transmission regressions are surprisingly strong, given the level of commodity aggregation, I am not sure they are to be interpreted as saying that, through tariffs and NTBs, world price movements are transmitted fully to relevant prices faced by producers and consumers in each state. Besides, there is an endogenous real exchange rate analogue at the state or regional level that has to be taken into account in analyzing poverty.

Fourth, given that any two digit sector almost surely will include exportables as well as importables, sectoral tariffs and NTBs apply only to the importable subset of products within the sector. This being the case, the fact that domestic taxes and transport costs would affect the domestic price of importable and exportable differentially relative to their prices at the port, I am not sure the price transmission regressions adequately capture the differential effects. And these differential effects are central to the determination of whether a commodity is a non-traded one within a state.

Fifth, the authors cite (but do not reference) the paper of Nagaraj (2002) for the finding that labour market regulations had no impact. This study

and several others are defective: they do not take into account the fact that the regulations affect the entry-exit dynamics of firms so that firms in existence at any point in time are survivors of those who entered earlier.

Lastly, the authors use a uniform one period lag between changes in tariffs and NTBs and their effect on poverty. One could argue that a distributed lag model would be more appropriate.

General Discussion

Esther Duflo began the general discussion by questioning the paper's decision not to use district level analysis. She argued that the NSS design in fact preserves random sampling even within districts, so that poverty rates calculated at the district level are valid. She further pointed out that performing analysis at the state level can introduce unnecessary noise into the data.

Professor Duflo also raised the issue of treatment of correlation in the error term of individual states over time. As the paper compares cross-sectional regressions run for three different time periods, she suggested that without taking account of the error correlation the paper's significance findings could be overstated.

Abhijit Banerjee noted that the regression coefficients on labor flexibility appeared quite sensitive to which measure of flexibility was used. He thought that the switching of only a few states from flexible to inflexible led to implausibly large changes in the coefficients, making interpretation of the results problematic. Dilip Mookherjee took up this point and suggested that because the two flexibility measures reflected distinct underlying trends (one in labor laws and the other in business climate), the regression should properly include both variables. Devesh Kapur cautioned against using the Besley and Burgess labor-law measure of flexibility, noting that it did not take account of the level of enforcement of labor laws in different states.

He also suggested that any study of poverty in India should control for remittances across states. If heterogeneous trade restrictions lead to variance in growth across Indian states, then it might follow that labor would migrate to the faster growing states leading to high levels of remittances to the poorer areas. It is possible that this would lead to observed reductions in poverty in poorer states, albeit through a very different channel than that investigated by the authors.

Arvind Panagariya questioned the relevance of the data series used for delicensing. In his view, the more important change in licensing restrictions

in India in the 1980s concerned the gradual across-the-board raising of the investment ceiling for firms without a license, rather than the industry-specific abolishment of licensing requirements used in the paper.

Abhijit Banerjee was concerned about the emphasis on the Deaton-Dreze measures of poverty. There is a large divergence between their and the official poverty measures that may have significant effects on the empirical results. There are also difficulties of comparing rural and urban poverty and poverty across urban areas of different size. He did not believe that state-level measures of poverty were particularly meaningful. The data difficulties were also highlighted by participants who pointed to the increasing divergence between reported levels of income and consumption in the household surveys.

Other participants thought that a further parsing of the trade restrictions data could be useful. The well-known theory of the second best says that reducing product market tariffs without concomitant reductions in input markets can lead to reduced living standards. It would therefore be useful to know something about input market imperfections in various states, particularly with regard to capital markets.

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