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Abstract

We examine the effects of trade and services liberalization on wage inequality in India. We find that labor reallocations and wage shifts attributable to liberalization account for at most 29% of the increase in inequality between 1993 and 2004, and that effects of services reforms are many times larger than those of trade liberalization. In contrast, 30%–66% of the increase in wage inequality is due to changes in industry wages and skill premiums that cannot be empirically linked to liberalization. These results suggest that if liberalization did, in fact, contribute significantly to increased inequality, the bulk of its effects do not linger in inter-industry wage and skill premiums but are subsumed by general equilibrium effects. Studies of the liberalization–inequality relationship that focus on differences in employment and wage outcomes across industries, or on tradable goods alone, may therefore only be exploring the tip of the iceberg.

I. Introduction

India's market-oriented economic reforms, which were initiated in the 1980s but took full shape in the 1990s, are widely credited with having raised India's rates of economic growth. While gross domestic product (GDP) per capita grew by an average of around 1.2% annually from 1960 to 1980, each subsequent decade has seen average annual growth rates of 2.8%, 4.1%, and 6.2%, respectively. However, there is considerable concern that the main beneficiaries of these reforms have been those at the higher end of the income distribution given the virtually contemporaneous timing of the reforms and the rise in inequality. For example, based on nationally representative household expenditure data collected by India's National Sample Survey Organisation (NSSO), the Gini coefficient was fairly stable at around 32% between 1983 and 1993 but increased to around 36% in 2004 (Cain et al. 2010). Evidence of rising inequality over the 1990s also comes from other sources, including data on wages from the NSSO's employment–unemployment surveys (Kijima 2006); corporate incomes; starting salaries of graduates of India's top universities; and even *Forbes* magazine's annual list of the world's billionaires (see Walton 2010 for a detailed discussion on growing inequality in India).

Have India's economic reforms contributed to inequality as the simple timing-based evidence suggests? If so, through what channels? More specifically, to what extent have liberalization of trade policy as it applies to the manufacturing sector and investment policy in the services sector—key elements of India's market-oriented economic reforms—contributed to a rise in inequality? These are the central questions that motivate this paper. To provide an answer, we use the NSSO's employment–unemployment surveys for 1993 and 2004 to examine the links between trade liberalization and services liberalization on one hand, and wage inequality on the other.

Like Kumar and Mishra (2008) and Dutta (2007) before us, a key focus of our paper is on liberalization-induced changes in industry wage premia—the portion of wages that cannot be explained by observable worker characteristics such as age, gender, and level of education—as a channel through which liberalization may affect wage inequality. In addition, we restrict our attention to the urban sector, as do Kumar and Mishra and, for all practical purposes, Dutta as well, given her omission of the agriculture sector in her analysis. However, our analysis departs from both of these studies in several important ways (other than using more recent data, i.e., 2004 rather than 1999).

First, we examine the effects of the liberalization of India's services sector (as in the analysis of household expenditure inequality by Cain et al. 2010). Our measure of services liberalization takes into account the openness of individual services subsectors to both domestic private and foreign investors. Given the large role of India's services sector in employment generation, aggregate output, and output growth, any analysis of the links between economic reforms and inequality in India that omits services from its purview is likely to be incomplete. This concern is reinforced by the inequality decompositions of Cain et al., which show that the rising expenditures of better educated households whose incomes are derived from services employment account for much of the increases in consumption inequality between 1993 and 2004.

Second, we allow industry wage premia to vary across skilled and unskilled workers (as proxied by whether or not a worker had a college degree). Third, instead of simply asking how much reforms have shifted industry wage premia and altered employment patterns, we go on to examine how much these effects matter for wage inequality. We do this using a decomposition framework based on Ferreira, Leite, and Wai-Poi (2007), henceforth referred to as FLW. We modify the FLW framework to admit the effects on inequality, not only of trade liberalization, but also of services liberalization.

Finally, FLW's approach also allows us to consider the effects on wage inequality of those changes in returns to education that cannot be statistically attributed to reform measures. While no attempt is made to establish how much of these unexplained changes in returns to education are driven by trade and services reforms per se, FLW's approach does give us some sense of upper and lower bounds on the effects of reforms on inequality under varying assumptions about the relationship between these unexplained changes in returns to education and reforms. Finding, as we do, that these upper and lower bounds are very different, implies that not much of the effects of reforms on inequality can be identified with certainty. This is not surprising, given the very limited effects of protections on labor allocation noted in the literature (Goldberg and Pavcnik 2007) and the remarkable rigidity of industry wage premia, even in the face of major economic reforms and shocks (e.g., Arbache et al. 2004, Oh et al. 2007). The implication is that the effects of many disparate reforms are mostly blended in a general equilibrium setting, and are difficult to pick apart *ex post*. Studies focused on the effects of trade on differences in employment outcomes between sectors may therefore only be examining the tip of the iceberg of the liberalization–inequality relationship.

The remainder of this paper is organized as follows. Section II provides a brief review of the literature on market-oriented economic reforms and inequality. Section III discusses data and measurement issues pertaining to liberalization and wages. In addition to commenting briefly on the patterns of protection in India and describing the construction of industry-specific measures of protection/liberalization, the section discusses available labor force survey data and how these are used to construct measures of wage inequality. Section IV details the methodology used here to understand the relationship between liberalization and wage inequality. Section V describes the results of our empirical analysis, while Section VI concludes.

II. Market-Oriented Reforms and Inequality: A Brief Review

Virtually all developing countries have undertaken market-oriented reforms over the last 2–3 decades, integrating themselves more closely with the international economy. Two important elements of these reforms, often undertaken in tandem, include the liberalization of trade policy and investment policy. While the former involves the reduction of tariff barriers over time and the substitution of nontariff barriers to trade with tariff barriers, the latter involves the removal of restrictions on investment decisions by private agents, both domestic and foreign. What have been the implications of these reforms for inequality? In what follows, we provide a brief review of the literature, focusing on the channels through which trade liberalization, in particular, may influence wage inequality.

An important insight from trade theory is that reductions in trade protection have distributional implications. Based largely on the logic of the workhorse Heckscher-Ohlin model of trade, conventional wisdom has held that trade liberalization leads to declines in income inequality in developing countries—i.e., countries abundant in unskilled/less skilled workers.[1] The conventional wisdom seems consistent with experience in the newly industrialized eonomies (Hong Kong, China; the Republic of Korea; Singapore; and Taipei,China) in the mid-1960s–1970s when these economies opened up to foreign trade (Wood 1997).[2]

Since the 1980s, however, the evidence points to a contemporaneous increase in measures of globalization and inequality across the developing world. Indeed, as Goldberg and Pavcnik (2007) note in their comprehensive survey of the distributional effects of globalization in developing countries, two clear trends emerge from the available data. First, the exposure of developing countries to international markets, whether in terms of measures of protection, share of trade in GDP, or foreign direct investment (FDI), etc., has increased dramatically in recent years. Second, most available measures of inequality trended upward. While causality is difficult to establish, the available evidence has "provided little support for the conventional wisdom that trade openness in developing countries would favor the least fortunate (at least in relative terms)" (Goldberg and Pavcnik 2007, 77).

Why might trade liberalization have led to greater inequality? Some specific factors are worth highlighting.

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[1] Because developing countries are typically presumed to be abundant in unskilled rather than skilled labor, trade liberalization in such countries may be expected to raise the relative factor price of unskilled labor.

[2] The *manner* in which these economies opened up to foreign trade is, however, disputed by scholars.

A pervasive finding in the literature is that skill premia, most often captured by the relative wages of workers with and without college degrees, increased. These increases appear to be demand-driven and have been found even in unskilled-labor-abundant developing countries—a puzzling finding in the context of standard trade theory. Various explanations have been offered for this apparent deviation from the predictions of theory. These involve skill-biased technological changes induced by trade,[3] barriers to within-country factor mobility, and trade in intermediate products.[4] Patterns of protection prior to liberalization and differential degrees of liberalization across sectors could be driving some of the observed results. For example, while it is typically assumed that developing countries are more likely to protect skill- or capital-intensive sectors, trade protection in a number of countries (e.g., Colombia, Mexico, and the Philippines), was initially higher in labor-intensive sectors.

Trade liberalization may also influence inequality through its effects on industry-specific wages. There are a number of channels by which this could happen. First, especially in the short to medium term, when workers are likely to be immobile across sectors, reductions in tariffs may lead to reductions in industry wage premia, i.e., the portion of workers' wages attributable to the industry of employment. Second, and in the context of imperfect competition, tariff reductions are likely to put pressure on the profits earned by domestic firms. To the extent that firms share rents with their workers, tariff reductions can be expected to lead to further reductions in industry wage premia.[5] Finally, trade reductions can affect industry wage premia through their effects on productivity. In the case of India, for example, Krishna and Mitra (1998) find trade liberalization to be associated with improvements in firm productivity. If these improvements translate into increases in worker's wages, industry wage premium can be expected to be positively related to trade liberalization.

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[3] A popular explanation works as follows. Closer integration with global markets has led to greater flows of technology (embodied in imported capital goods, for example) from developed to developing countries. If new technology is designed to be used by skilled, or highly educated workers (which is entirely plausible, given the relative abundance of skilled workers in developed countries) then greater openness can lift the returns to skills or higher education.

[4] A considerable part of trade is in intermediate products, a phenomenon sometimes referred to as global production sharing or outsourcing. It has been argued that outsourcing also raises returns to skilled labor in both developed and developing countries (Feenstra and Hanson 1996 and 2003), because the products whose production is outsourced are low-skilled relative to the labor endowments of developed countries, but high-skilled relative to the endowments of developing countries. Thus outsourcing raises relative skills demand and inequality in developed and developing countries alike.

[5] Greater openness to trade may also increase inequality by reducing the bargaining power of labor (see, for example, Rodrik 1997). Since greater openness makes it easier to import all kinds of goods—capital inputs, finished goods, and intermediate goods—it can make it easier to substitute the services of domestic workers via the import of capital inputs or the products they were producing. In this way, trade liberalization can erode the bargaining power of workers vis-à-vis the owners of capital in the sharing of profits. Consistent with this, Hasan, Mitra, and Ramaswamy (2007) use industry-level panel data from India's formal manufacturing sector and find that estimates of labor demand elasticity and the wage bill shares of output and value added are larger after 1991, and larger in industries with lower tariff rates or nontariff barrier coverage ratios. For example, controlling for industry and location (via the introduction of industry-location fixed effects), their estimates of labor share equations suggest that labor shares would decline by around 4% (as a share of total output) and 5% (as a share of value added) for a reduction in tariffs from 150% to 40%.

What does the empirical evidence show? The typical study examines one particular channel linking trade and inequality. In the Indian context, several studies have documented a rise in wage inequality over the period of market-oriented reforms. Using data on full-time urban male workers, Kijima (2006) finds that wage inequality (as measured by wage differentials between the 90th and 10th percentiles of the wage distribution) began increasing in the 1980s, and also documents an increase in the returns to skills (proxied by education). She speculates that the liberalization of trade policies and industrial deregulation in the early 1990s may have had something to do with this.[6]

Chamarbagwala (2006) analyzes this issue further and includes all wage and salary workers in her analysis. Like Kijima, she finds that wage inequality between college-educated and less educated groups increased over the 1980s and 1990s, and that increases in relative demand for college-educated workers was the main driving force. She then uses the factor content approach, converting trade flow data (relating to both manufactured goods as well as services) into labor supply equivalents in order to measure the impact of trade on relative demand. She finds evidence that trade has indeed increased demand for college-educated workers relative to other workers.

The other trade-inequality channel that has been examined in the Indian context works through industry wage premia (Dutta 2007, Kumar and Mishra 2008). Interestingly, both studies examine the period from 1983 to 1999 and consider only wages in the manufacturing sector, their results being diametrically opposite. Dutta restricts her attention to prime aged adult males engaged in regular wage employment. She finds a positive relationship between tariff rates and industry wage premia, suggesting that trade liberalization has reduced industry wage premia. Mishra and Kumar, on the other hand, find a negative relationship between tariff rates and industry wage premia. Their results are thus consistent with a scenario where liberalization increases productivity at the firm level. Firms then pass on a portion of the benefits to workers in the form of increases in industry wages. Mishra and Kumar argue that their findings suggest that trade liberalization has led to decreased wage inequality in India.

Leaving aside the fact that some of the studies yield very different results even when examining a particular trade-inequality channel, given that most studies examine only one channel through which trade liberalization may affect inequality, it is difficult to get a

[6] Whether or not it is the trade/technology story that is driving the increasing convexity of returns to education is an issue that needs to be examined more closely. Among other things, definitions and measures of "skills" and "skill-biased technical change" are all somewhat controversial. Moreover, there are other channels that could explain why returns to college education have gone up and do not need to rely on technological changes, but that may still be linked to market-oriented reforms. In particular, increases in returns to postsecondary or college education can be linked to the increasing returns to specific occupations that also require, or are typically staffed by, people with a college education. In Mexico, for example, a rapid increase in earnings of professionals and administrators was a key driving force behind increases in the returns to postsecondary education over a period of trade reforms, a finding that has been attributed to increased demand for individuals who could respond to the rapid changes introduced by the reforms (Cragg and Epelbaum 1996, Mehta and Acuna-Mohr 2010).

comprehensive sense of the trade–inequality relationship. Moreover, the specific channels through which market-oriented reforms have influenced wage inequality are important to disentangle, since the appropriate policy response may depend upon which channels are more relevant. It is precisely to get around these weaknesses that we use a more comprehensive approach to capture liberalization-wage inequality linkages, building upon the work of Ferreira, Leite, and Wai-Poi (2007) for Brazil.

III. Data and Measurement

Our analysis makes use of three sources of data: trade protection data quantifying patterns of protection across manufacturing industries, an index of liberalization in service sector industries, and the employment–unemployment surveys of the NSSO, which provides information on the earnings of wage and salaried workers.

A. Trade Protection

Like many other developing countries, India pursued protectionist policies from the 1950s to the 1970s. Although there was some liberalization of trade policy in the 1980s, it was mainly aimed at reducing barriers to the import of capital goods. A decisive break with the trade policies of the past came in 1991 when the Indian government, faced with a balance of payments crisis, approached the International Monetary Fund (IMF) for assistance. IMF credit came attached with the strong conditionality of major economic reforms. Given several earlier attempts to avoid IMF loans and the associated conditionalities, these reforms came as a surprise. Among other things, they involved the removal of most licensing and other nontariff barriers (NTBs) on all imports of intermediate and capital goods, broadening and simplification of export incentives, removal of export restrictions, elimination of the trade monopolies of the state trading agencies, simplification of the trade regime, reduction of tariff levels and their dispersion, and full convertibility of the domestic currency for foreign exchange transactions.[7]

[7] The reductions in tariffs and NTBs to trade were also accompanied by devaluations of the Indian rupee and the introduction of an explicit dual exchange market in 1992. The percentage reduction in tariffs and NTBs 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%). Therefore, the import-enhancing effect of trade liberalization should have more than offset the import-reducing effect of the exchange rate devaluation.

To capture the extent of protection and its reduction across industries, we use information on commodity-specific tariff rates and nontariff barrier (NTB) coverage rate from Pandey (1998) and Das (2008) to construct industry-specific tariff rates and nontariff coverage rates at the 2-digit industry level for each year relevant to our analysis.[8, 9] There are 23 such industries spanning the mining and manufacturing sectors.

Table 1 reports industry-specific average tariff rates and nontariff coverage rates for 1992 and 2003. Large declines in protection are apparent for all industries. For example, tariff rates declined an average of 82.3 percentage points for our 23 industries. However, the extent of reduction in protection varies considerably across industries. For example, while the petroleum and natural gas extraction industry experienced a decline in tariff rates of almost 104 percentage points (from 114% in 1992 to just 10% by 2003), manufactured food products experienced a decline of around 53 percentage points (from 104% to 51%). In general, tariff reductions were larger in industries with higher tariff rates to begin with (the slope of the dashed line in Figure 1 is less than 1). Interestingly, tariff reductions have altered the structure of tariff protection. Thus, while the simple correlation coefficient between tariff rates in 1992 and 2003 works out to 0.43 (statistically significant at the 5% level), the Spearman rank correlation is only 0.25 (and statistically insignificant at even the 10% level).

These patterns are repeated in the case of NTB coverage rates, but more dramatically. Thus, while NTB coverage rates were on average 66% across the 23 industries in 1992, there were less than 5% in 2003. Indeed, with the exception of three industries where NTB coverage rates remained sizable (i.e., between 20% and 34%), these rates had fallen to less than 2% for most other industries.

[8] Pandey (1998) reports commodity-specific tariff rates and NTB coverage rate for various years over the period 1988 to 1998. Das (2008) updates these for various years up to 2003 using the methodology of Pandey. We use simple linear interpolation to account for the fact that there are some years between 1988 and 2003 for which we do not have information on trade protection.

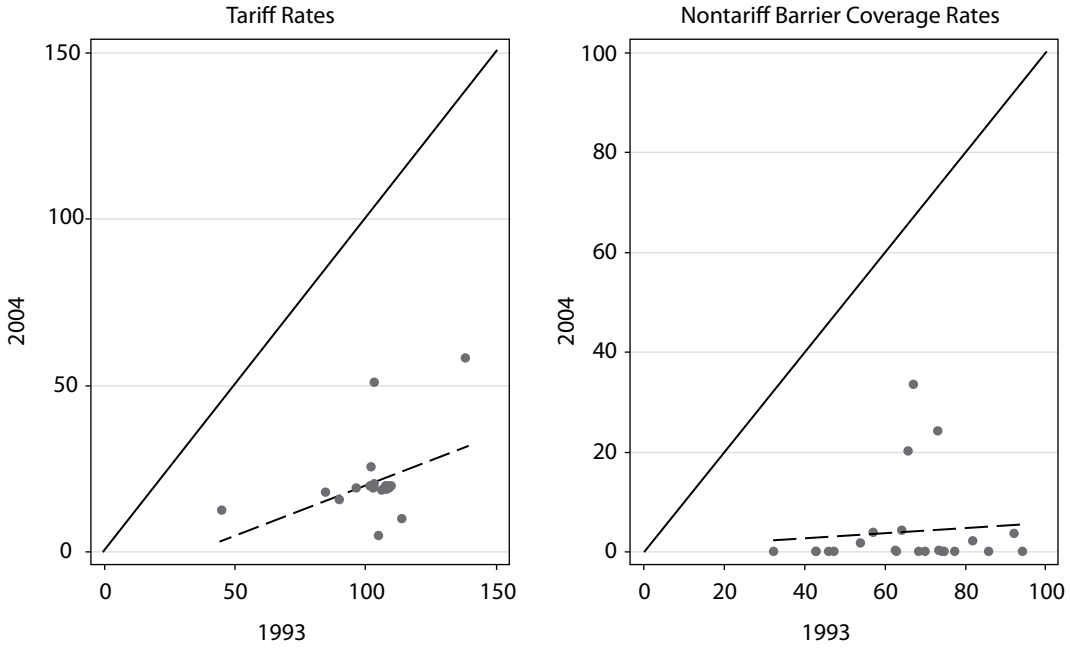
[9] We define industries on the basis of the 1987 National Industrial Classification.

Table 1: Tariff and Nontariff Barriers

Industry	Tariffs		Nontariff Barriers	
	1992	2003	1992	2003
Petroleum and natural gas extraction	113.9	10.0	74.3	0.0
Mining of nonferrous metal ores	105.0	5.0	46.0	0.0
Leather and leather products	109.4	19.4	73.4	0.3
Mining/quarrying not elsewhere classified (nec)	109.9	20.0	54.1	1.8
Nonmetallic mineral products	109.2	19.3	85.9	0.0
Basic chemicals and chemical products	108.2	18.9	64.3	4.2
Electrical/industrial machinery	107.8	18.7	57.1	4.0
Metal products and parts, excluding machinery/equipment	108.4	19.4	62.8	0.0
Jute and other vegetable fiber textiles	108.8	20.0	77.5	0.0
Machinery and equipment excluding transport	107.5	19.3	47.4	0.0
Other manufacturing industries	107.9	19.7	73.2	24.3
Wood and wood products, including furniture	108.2	20.0	74.7	0.0
Basic metal and alloy industries	106.3	18.6	32.5	0.2
Rubber, plastic and petroleum products	103.1	19.1	65.8	20.1
Cotton textiles	103.6	20.5	68.6	0.0
Textile products, including apparel	102.0	19.9	92.2	3.8
Manufacturing of beverages, tobacco and related	138.5	58.2	94.3	0.0
Wool, silk, and synthetic textiles	96.5	19.4	70.0	0.0
Transport equipment and parts	102.5	25.6	62.6	0.3
Paper and paper products	90.1	15.8	67.1	33.6
Coal/lignite mining, peat extraction	85.0	18.0	42.9	0.0
Manufacture of food products	103.7	50.8	81.9	2.2
Mining of iron ore	45.0	12.5	42.9	0.0

Note: Sectors are arranged in order of the absolute value of tariff reductions.
Source: Authors' estimates.

Figure 1: Tariff and Nontariff Barriers, Before and After (percent)



Note: The solid lines are y=x. The dotted lines are regression lines.
Source: Authors' estimates.

B. Services Liberalization

Measuring the extent of liberalization in services sector industries is more challenging. Due to the nature of services, there is nothing corresponding to the protection data as exists for the agriculture and manufacturing sectors. Fortunately, a World Bank study on India's services sector (World Bank 2004) provides useful information on the extent to which services industries were liberalized by the early 2000s. In particular, the study considered the following to construct an index of liberalization for industries or subsectors in services: (i) Is the subsector open to the domestic private sector? (ii) Is the subsector open to foreign investment? (iii) Is there an independent regulatory body and/or is the level of regulation adequate for the subsector? If the answer to all three is YES, the subsector is deemed to be significantly liberalized. If one or two of the answers are NO, the subsector is moderately liberalized. Finally, if the answers to all the three questions are NO, the subsector is treated as closed.[10, 11] Table 2 describes how the various services subsectors have been classified. (We drop some services subsectors from our analysis. A case in point is "international organizations", a minor employer whose wages are influenced by global salary norms among international organizations.)

[10] We rely mostly on Cain et al. for the classification of service subsectors. Cain et al. combine information provided on the degree of liberalization across subsectors provided in Figures 6 and 14 and Annex Table 1 of World Bank (2004). They augment this information in several ways. For example, they treat subsectors such as public services as closed/nontraded given that provision by the private sector, domestic or foreign, is either prohibited or nonexistent. They also make a judgment for some other subsectors that were not considered by the World Bank study. For example, they code commission agents in the same way that the World Bank study coded wholesale trade given that the work of commission agents appears to be more in the line of wholesale trade and not retail trade activities. Similarly, they use information on policy on FDI to categorize subsectors within utilities. While the utilities are not part of services, the principle of using information on whether or not FDI is permitted within the subsector is similar to that used by World Bank (2004) for the services subsectors.

[11] While it would have been ideal to have information on the three variables separately, this is not available. Nevertheless, this is not too much of a drawback in the context of India's industrial and trade policy regime of the 1980s and 1990s. In particular, the trade liberalization of 1991 was accompanied by widespread domestic deregulation whereby industrial licensing requirements, to which Indian manufacturing industries had previously been subject, were removed. Since the widespread industrial delicensing did not necessarily apply to service sector industries, having a liberalization variable that captures not only a service subsector's openness to foreign investments but also whether it is open to domestic private sector or not is useful.

Table 2: Services Classified by Degree of Liberalization, 2004

Least Liberalized	
	Water works and supply
	Retailing
	Railways
	Storage and warehousing
	Postal, telegraph, wireless, and signal communications
	Real estate
	Legal services
	Lotteries
	Renting and leasing
	Accounting, auditing, tax consultancy
	Public administration and defense
	Sanitary services
	Community services
	Recreation and cultural services excluding movie distribution
	Personal services and services nec
	Repair services
	International and other extraterritorial bodies
	Agricultural services
Moderately Liberalized	
	Electricity generation, transmission, distribution
	Gas and steam generation and distribution through pipes
	Nonconventional energy generation and distribution
	Construction and allied activities
	Wholesaling
	Commission agents
	Transportation services, excluding railways and travel agencies
	Financial services, including banking
	Provident and insurance services
	Education, scientific and research services
	Health and medical services
Most Liberalized	
	Hotels and restaurants
	Travel agencies
	Communications, excluding post and telegraph
	Other business services
	Motion picture and video film production
	Motion picture and video film distribution

Sources: Adapted from Cain et al. (2010) and World Bank (2004).

C. Wages and Employment

Approximately every 5 years, the NSSO carries out an "employment–unemployment" survey of over a hundred thousand households. In addition to collecting standard demographic information on all household members, the survey also collects details on the participation of household members in the labor force and employment-related particulars of working members, including the type of employment they are engaged in (i.e., self-employment, regular wage employment, or casual wage employment); their industry and occupation of employment; and earnings of wage employees (regular and casual) in the 7 days prior to the survey. For this paper's analysis, we work with employment–unemployment surveys conducted in 1993–1994 (henceforth 1993), and 2004–2005 (henceforth 2004), which is the latest available survey.[12] We restrict our attention to the urban sectors of 16 major states.[13]

We focus on the experience of urban male and female wage and salaried workers aged 15–65. This is because the NSSO's employment–unemployment surveys do not provide information on the earnings of self-employed workers. While the omission of the self-employed is regrettable, the alternative of including the self-employed by imputing their earnings based on the estimated relationship between earnings and individual characteristics of wage employees (as in the work of Kijima) may introduce serious biases. We combine weekly earnings data with information on the number of days worked to compute a daily wage rate for each wage employee.[14, 15] The nominal daily wage rate is then deflated using a price index derived from official state (urban sector) poverty lines for 1993 and 2004.[16] The advantage of this is that it adjusts nominal wages for both spatial price differences across the urban sectors of India's states, as well as inflation.

Table 3 describes average (real daily) wages and employment shares for nine major production sectors, as well as in aggregate (i.e., for the subset of wage and salaried workers belonging to the nine sectors). Comparing columns 1 and 2 we find that real wages increased by an average of 2.8% per year between 1993 and 2004. There is considerable variation in wage growth across the sectors, however. For example, construction workers (the lowest paid group to begin with) saw average wage growth of only 1.4% per year. In contrast, workers in public administration and defense (a group

[12] Survey work in the two rounds was carried out between July and June. For example, the 1993–1994 survey is based on data collected between July 1993 and June 1994.

[13] Three new states were formed after 2000: Chattisgarh, formerly part of Madhya Pradesh; Jharkhand, formerly part of Bihar; and Uttaranchal, formerly part of Uttar Pradesh. Some of our analysis draws upon state-level information. In order to maintain consistency across years, we consider the earlier state boundaries.

[14] The NSSO breaks each of the 7 days into two half-day segments of 4 hours each. A worker who is employed for even 1 hour in a given half-day segment is recorded as being employed for that segment.

[15] An examination of the information on these revealed that many regular wage workers are recorded as working on all 7 days of the week. Since standard practice in India is for regular wage workers to work six days a week, we took six days as the upper bound on days worked in a week for regular workers.

[16] All state-specific values of this index are expressed relative to a value of 1 for the urban sector of India as a whole in 2004.

that has been consistently among the best paid) experienced wage growth in excess of 4.1% per year. As columns 3 and 4 show, the largest increases in employment shares have been in construction, trade services and hotels/restaurants, and business services. While the first two include many of urban India's lowest paid workers, the last covers some of India's best paid.

Table 3: Wage and Employment Structure by Major Industry Groups, 1993 and 2004

	Average Daily Wage		Share of Nonagricultural Wage Employment	
Industry Group	**1993**	**2004**	**1993**	**2004**
Mining/quarrying	191.5	382.8	2.0	1.4
Manufacturing	119.6	142.2	30.3	28.7
Utilities	206.5	378.0	1.9	1.4
Construction	76.2	89.0	9.6	12.1
Retail, wholesale, hotels/restaurants	83.9	104.7	9.7	12.3
Transportation, storage, communication	135.8	214.4	11.5	10.3
Business services	252.6	366.3	4.9	7.1
Public administration and defense	204.1	321.1	16.6	10.8
Other services	161.4	231.4	13.5	15.9
Overall	143.1	194.8	100.0	100.0

Source: Authors' estimates.

Table 4 describes how wage inequality evolved across the nine production sectors and in aggregate. As the last row shows, inequality increased between 1993 and 2004 in terms of each of the four measures reported. Thus, for example, the Gini coefficient increased by 7 percentage points, from 0.42 to 0.49. Inequality also tended to increase within the nine sectors. The main exceptions are the construction sector and trade services and hotels/restaurants.

Table 4: Wage Inequality by Major Nonagricultural Sector

	Gini Coefficient		GE(0)		GE(1)		90-10 Log Wage Diff.	
	1993	**2004**	**1993**	**2004**	**1993**	**2004**	**1993**	**2004**
Mining/quarrying	0.34	0.42	0.25	0.35	0.21	0.33	1.90	2.19
Manufacturing	0.43	0.46	0.35	0.36	0.32	0.39	2.15	2.02
Utilities	0.33	0.37	0.23	0.26	0.19	0.23	1.79	2.04
Construction	0.33	0.31	0.23	0.16	0.22	0.19	1.32	1.27
Retail, wholesale, hotels/restaurants	0.39	0.39	0.29	0.26	0.29	0.29	1.74	1.61
Transportation, storage, communication	0.37	0.44	0.26	0.34	0.22	0.33	1.82	2.12
Business services	0.38	0.50	0.35	0.48	0.25	0.47	2.17	2.59
Public administration and defense	0.30	0.32	0.22	0.20	0.16	0.17	1.45	1.71
Other services	0.42	0.48	0.37	0.45	0.29	0.37	2.27	2.61
Overall	0.42	0.49	0.36	0.43	0.30	0.43	2.13	2.34

GE = generalized entropy index.
Source: Authors' estimates.

IV. Methodology

In order to understand how much of the observed change in wage inequality between 1993 and 2004 is accounted for by changes in trade policy and services liberalization, both directly through their effects on wages as well as indirectly through their effects on employment reallocation, we modify the method developed by FLW. This method involves several interrelated steps, combining an extended version of the two-stage estimation framework of Pavcnik et al. (2004) to identify the impact of liberalization on industry wage and skill premia and on employment reallocation, with a decomposition of the changes in the entire wage distribution based on Juhn, Murphy, and Pierce (1993) into liberalization and nonliberalization factors.

The goal is to decompose the shift in some measure of inequality in an underlying wage distribution. Let $\mathbf{w_t}$ capture the vector of wages observed in period *t*, and $I(\mathbf{w_t})$ be a function mapping wage distributions into a measure of wage inequality. We use a three-step procedure to decompose the change in wage inequality over some time interval $I(\mathbf{w_1}) - I(\mathbf{w_0})$ into the changes due to several (in our case, 16) different effects. The first stage involves the estimation of industry wage and skill premia and industries' shares of skilled and unskilled wage employment in 1993 and in 2004. In the second stage, these are regressed on measures of trade and services liberalization. In the third stage, we generate a series of 15 counterfactual wage distributions to simulate the effects of liberalization-induced changes in employment shares and wage premia (the magnitude of which is predicted by the second-stage regressions), as well as changes in the "prices" of other worker attributes. The changes in inequality as we move from the 1993 wage distribution through the counterfactuals capture the effects of the 15 changes in sequence. The difference between wage inequality in 2004 and in the 15^{th} counterfactual distribution is attributed to all other changes that we have not simulated.

Given that trade was liberalized at the same time that regulations on services (as well as other nontradable activities such as construction and public utilities) were relaxed, our primary objective is to work out how much of the observed increase in wage inequality between 1993 and 2004 can be attributed to trade liberalization, and how much to services liberalization. We are additionally interested in whether these effects operate through the reallocation of workers across tradable or nontradable subsectors (quantity effects), or through changes in sector wages (price effects). Finally, we are interested in the role of employment and wage changes among skilled (college-educated), relative to unskilled (other) workers. These three concerns imply that eight ($=2^3$) possible counterfactuals are required to examine the discernible effects of economic liberalization. Additionally, we will simulate counterfactual wage distributions to capture the effects of changing prices of specific worker characteristics not predicted by our liberalization measures. These changes capture general equilibrium effects, some of which could be due to economic liberalization.

We now delineate the first- and second-stage regressions and the various counterfactual wage distributions, explaining how they are constructed and interpreted, and where our methodology deviates from that of FLW (2007).

(i) Stage 1: Estimating Industry Wage and Skill Premia and Employment Shares

We begin by running the following wage regression separately for each year:

$$\ln W_i = \mathbf{X_i}\dagger + \sum_{j=1}^{J_T+J_{NT}} \left(wp_j + sp_j S_i\right) D_{ij} + e_i; \quad (1)$$

where W_i is the i^{th} worker's wage, S_i indicates that worker *i* is skilled (they have a college degree), and D_{ij} that they work in subsector *j*. There are $J_T + J_{NT} = 56$ subsectors in total, belonging to two sectors: $J_T = 23$ subsectors are tradable, and $J_{NT} = 33$ are nontradable. Note that we omit the constant in this regression, but retain dummies for all 56 subsectors. Thus wp_j, the industry wage premium, captures an unskilled worker's earnings in subsector *j*, normalized for the **X** variables. Note that in this formulation, the industry wage premia correspond simply to the industry fixed effects (sans the constant), and do not average out to zero. We record the standard errors of the industry wage and skill premia directly from this regression, for use in the second-stage regression. We will return to this point when examining the second-stage regression and third-stage decomposition results, as the results are somewhat sensitive to these decisions. Primary and secondary education attainment is recorded as a series of dummies (included in **X**) capturing the highest level completed, with no education/illiterate as the omitted category. Returns to education are therefore defined relative to the wages of uneducated employees. Similarly, sp_j is the industry skill premium, and captures the wages of college-educated relative to uneducated workers in that sector. This formulation, wherein returns to college vary across sectors, while returns to basic education do not, is intended to preserve degrees of freedom without obfuscating the widely noted role of skill premia in driving inequality.

We also estimate subsectors' shares of unskilled and skilled wage employment within their respective sectors (tradable/nontradable) in each period. Thus, we have eight sets of employment shares, each of which sums to one. For example $\lambda_{j,T,U,1993} \equiv P\left(j \mid Tradable, unskilled, 1993\right)$ is the fraction of unskilled employees in the tradable sectors who were employed in subsector *j* in 1993. We compute these eight sets of employment shares and their standard errors directly from the data.[17]

[17] This differs from the approach adopted by FLW. They use a multinomial logit model to estimate workers' propensities, conditional on a set of individual characteristics, to belong to 10 broad employment categories, only three of which are wage-earning. In contrast, given our interest in changing differences in wage employment opportunities across skill groups, we only condition our results on whether workers are college-educated or not, but track changing employment propensities over time across 56 industries.

(ii) Stage 2: Estimating the Effects of Trade and Services Liberalization

In the second stage, we regress the industry wage and skill premia and the skilled and unskilled employment shares on measures of trade and services liberalization. Because our measures of trade and services liberalization are distinct, we do this separately for workers within tradable sectors and those within nontradable sectors. Thus, we have eight second-stage regressions (four outcomes—skilled and unskilled employment shares, wage, and skill premia—within two sectors, tradables/nontradables).

Let Prot_t denote a vector containing trade-protections at time t (nominal rates of protection, NTB coverage rates, and/or the principal components of the two). Then, for tradables, we estimate the following second-stage regressions pooling the wage and skill premia from both periods:

$$wp^{*}_{j,t} = \alpha_w (j,t) + \beta_{W,T}\text{Prot}_{j,t} + e_{j,t} \quad (2a)$$

$$sp^{*}_{j,t} = \alpha_S (j,t) + \beta_{S,T}\text{Prot}_{j,t} + u_{j,t} \quad (2b)$$

We attempted several specifications, including and excluding industry and time fixed effects. In all cases, we use weighted least squares, taking the reciprocals of the variances of the wage and skill premia respectively as weights. In addition, given the possibility that the differential potential of sectors to earn rents drove initial differences in protections across industries, we estimated the regressions in differences, instrumenting the change in tariffs and NTBs with initial tariffs and NTBs. This instrumental variable strategy, used also by many others in the empirical trade literature (e.g., Goldberg and Pavcnik 2005 and 2007; Hasan et al. 2011), rests on the assumption that while past protection levels determine current changes in protection, they are less likely to be correlated with current changes in the error term of the second-stage wage and skill premium regressions.

The specifications for the tradable sector employment share regressions are analogous to equation (2). Only the dependent variables are different: the wage and skill premiums are replaced with the shares of skilled and unskilled wage employment within tradables. Here too we ran the regressions with and without time and industry fixed effects, and in differences, instrumenting the change in protections with initial protections. The regressions are weighted by the reciprocal of the estimated variances of the employment shares.

For the nontradable sectors, we also ran regressions analogous to equation (2). The difference is that here we regressed wage and skill premia and employment shares on two dummies. The dummies are contained in a vector, $\mathbf{Lib}_j$, and take on a value of 0 in 1993, but in 2004 reflect whether a sector was among the least liberalized (the omitted category), moderately liberalized, or among the most liberalized. Here, no instruments for

the liberalization dummies are available, but we did run the regressions with and without industry fixed effects to ensure that the results were robust. Once more, the regressions are weighted by the reciprocals of the variances of the estimated dependent variables.

These eight regressions yield eight sets of coefficients, capturing the effects of trade protections and services liberalization on employment and wages among skilled and unskilled workers. We denote these eight sets of coefficients $\hat{\beta}_{Y,Tradable}$, where $Y = W$ (wage premia), S (skill premia), UE (unskilled workers' employment shares), SE (skilled workers' employment shares), and $Tradable = T$ (tradable) or NT (nontradable).

(iii) Stage 3: Decomposing the Change in Wage Inequality

The decomposition exercise works as follows. We keep in our dataset only those workers observed in 1993. We then expanded the dataset, creating as many replicates of each observed worker as the sample weights indicate that worker stands in for. The resultant wage vector is $\mathbf{w_0}$ and wage inequality among these workers is $I(\mathbf{w_0})$. Each worker-replicate is then treated as an independent observation in what follows.

The first four counterfactual wage distributions (C1–C4) simulated the effects of trade liberalization on wage and skill premia and employment shares in tradables. They were constructed as follows:

C1. ***Effects of trade liberalization on unskilled employment.*** The employment shares of unskilled tradables workers across tradable subsectors were adjusted from what they were in 1993, to what our second stage regression predicted they would be given trade liberalization. The shift in sector *j's* employment shares was given by $\hat{\beta}_{UE,T}\Delta\text{Prot}_j$.[18] Unskilled workers were then quasi-randomly reassigned across sectors to match the predicted employment shares.[19] Those switching sectors were assigned the wage premium of their new sector.

C2. ***Effects of trade liberalization on skilled employment.*** Analogous to and building on C1, skilled workers in tradable sectors are reassigned to reflect their trade-predicted employment shares. Those switching sectors were assigned the wage and skill premium of their new sector.

C3. ***Effects of trade liberalization on industry wages.*** The wages of workers in each tradable sector *j* were shifted by $\hat{\beta}_{W,T}\Delta\text{Prot}_j$. Note that the industry

[18] Negative predicted employment shares were replaced with zeros, and the remaining predicted shares were scaled so that they add up to 1.

[19] Workers in each sector predicted to grow remained in their original sector. In each sector predicted to shrink, a subset of as many workers as were expected to remain in the sector was chosen at random. These workers were left in their original sector, while the remaining workers were reassigned randomly across sectors to make up their predicted employment shares.

affiliation used to determine *j* was the counterfactual affiliation determined in C2.

C4. Effects of trade liberalization on industry skill premia. The relative wages of skilled workers in each tradable sector *j* were shifted additionally by $\hat{\beta}_{S,T}\Delta\text{Prot}_j$. The industry affiliation assigned in C2 was used to determine *j*.

Notice that counterfactuals C3 and C4 adjust wages and not wage premia. In other words, in line with previous literature (e.g., Dutta 2007) we are interpreting the second-stage wage regression coefficients as measures of the shift in (unskilled and skilled) wages due to trade liberalization, not as measures of the stretching/compression of industry (unskilled and skilled workers') wage premia around a fixed average wage.

C5–C8: Effects of services liberalization. These four counterfactuals are, respectively, the analogs to C1–C4, in which *nontradables* workers are reassigned to reflect the changes in employment shares and sector wages associated with their liberalization category. The shifts in unskilled employment are predicted by $\hat{\beta}_{EU,NT}Lib_j$, those of skilled employment by $\hat{\beta}_{SE,NT}Lib_j$ wage premia, and those of skill premia by $\hat{\beta}_{W,NT}Lib_j$ and $\hat{\beta}_{S,NT}Lib_j$.

C9–C12: Effects of observed shifts in average industry wage. Here we change industry log-wages to their actual 2004 levels. Specifically, C9 adjusts the C1 wages of unskilled tradables workers assigned (or reassigned) to section *j* upward by Δwp_j, while C10 adjusts the C2 skill premia of tradables workers upward by Δsp_j. It follows that $I(\mathbf{w_{C10}})$-$I(\mathbf{w_{C8}})$ reflects the increase in wage inequality due to changes in industry wages and skill premia over and above those predicted by trade liberalization. This effect will be large if returns to skill rose sharply for reasons not attributable to trade liberalization. Counterfactuals 11 and 12 analogously shift nontradables workers wages by Δwp_j and their skill premia by Δsp_j from where they were in C6.

The next three counterfactuals adjust the "prices" of other worker attributes (attributes **X**, with prices **β)**. C13 adjusts the wages of workers with elementary, middle-school, lower-secondary, and upper secondary education to reflect the change in returns to these education levels over time. C14 accounts for changing interstate wage differentials, and C15 accounts for changes in the returns to age and gender.

The final comparison, $I(\mathbf{w_1})$- $I(\mathbf{w_{C15}})$ captures the effects of all changes in worker characteristics (education, age, gender); employment readjustments not predicted

by trade or services liberalization (including a shift of workers from tradables into nontradables); and residual wage inequality.

To put bounds on the effects of trade and services liberalization on wage inequality, we constructed two sets of counterfactuals using different sets of estimates for the second-stage wage and skill premium regressions. The first is the most empirically conservative, including time and industry fixed effects to net out differences in premia over time and industry that may not be due to protection or regulation. As we shall see, these counterfactuals attribute none of the increase in inequality to trade liberalization. The second set of counterfactuals omit time fixed effects, but include industry fixed effects, implicitly attributing more of the changes over time in industries' wages and skill premia to liberalization.

V. Results

A. Estimation of Wage Equations and Wage Premia

Table 5 presents selected coefficients from the wage regression (equation 1) for 1993 and 2004. In addition to the standard controls for age and gender, and dummies capturing the highest level of educational attainment of workers, each regression equation also includes dummies capturing wage and skill premia and state dummies. We can see from a comparison of estimates across columns 1 and 2 that there has been an increase in returns to all levels of primary and secondary schooling relative to no schooling between 1993 and 2004. A simplified regression (not shown) in which skill premia are held constant across industries confirms the findings of every other study of wage inequality in India (Kijima 2006, Mehta et al. 2009), wherein average returns to skill increased in both tradable and nontradable sectors rose from 12.5% per year of tertiary schooling in 1993 to 17.3% in 2004.

Table 5: Select First Stage Wage Regression Coefficients

	1993		2004	
Age	0.072 ***	(0.004)	0.072 ***	(0.004)
Age-squared	−0.001 ***	(0.000)	−0.001 ***	(0.000)
Male dummy	0.275 ***	(0.070)	0.481 ***	(0.063)
(Male dummy) x age	0.004 *	(0.002)	−0.003 *	(0.002)
Elementary-school completion dummy	0.099 ***	(0.022)	0.147 ***	(0.025)
Middle-school completion dummy	0.147 ***	(0.022)	0.217 ***	(0.022)
Lower-secondary completion education dummy	0.253 ***	(0.022)	0.296 ***	(0.020)
Higher-secondary education completion dummy	0.544 ***	(0.019)	0.600 ***	(0.021)
Observations	27,025		25,581	
Mean squared error	0.74		0.59	
R-squared	0.41		0.59	

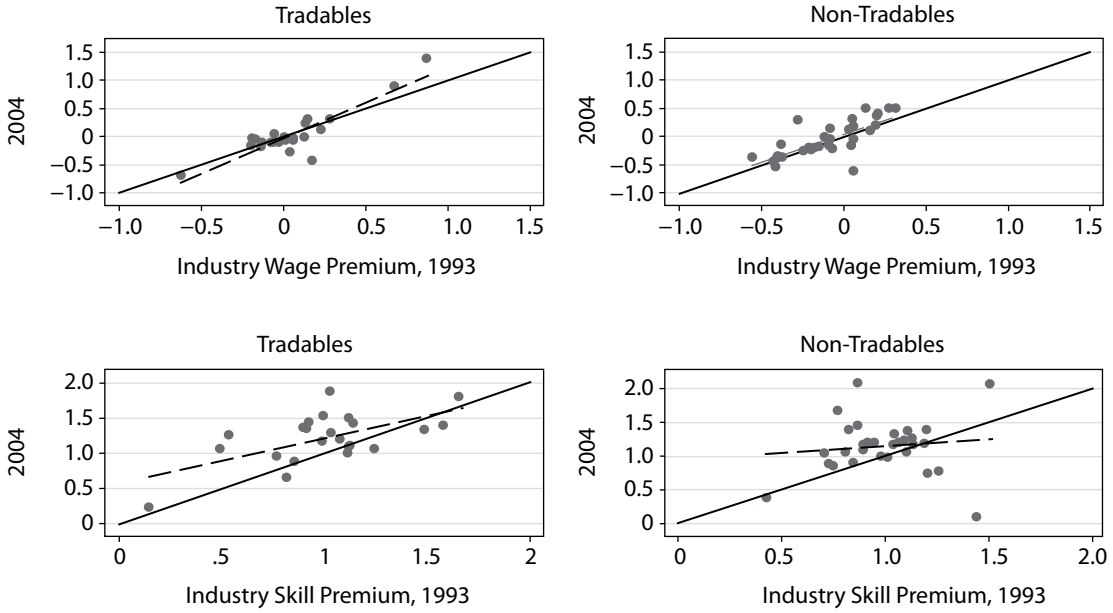
*** p<0.01, ** p<0.05, * p<0.1.

Note: Robust standard errors in parentheses. Each regression also includes dummies capturing industry wage and skill premiums, and state dummies.

Source: Authors' estimates.

Figure 2 presents scatter plots of the estimated industry wage and skill premia for tradables (i.e., mining and manufacturing industries) and nontradable subsectors. Here, for purposes of examining their stability, we have normalized industry wage premia around their averages within tradables and nontradables. The estimated industry wage premia for both tradables and nontradables display remarkable stability over time. This can be seen from the fact that the scatter plots in the upper panels of Figure 2 fall close to the solid (45%) line. This stability in the industry wage premia over time suggests that shifts in trade protections will not have discernible effects on the unskilled wage distribution. To the extent that wage premia reflect profit sharing, this suggests that the "typical" (unskilled) worker was not cut in on the rents associated with trade protections. Skill premia show more variation over time, especially in nontradable industries. This can be seen from the scatter plots in the lower panels of Figure 2. Interestingly, the skill premia for nontradables become less varied overtime. While the fact that skill premia appear to be less stable than wage premia could in part be an artifact of attenuation bias (far fewer workers have college degrees than do not, so skill premiums will be measured with greater sampling error), the lower slope in the skill premium graph in nontradables relative to tradables is unlikely to reflect such measurement errors. This is because nontradables are more skill-intensive than tradables. We therefore believe that there has been a greater flattening of skill premia in nontradables than in tradables.[20]

Figure 2: Industry Wage and Skill Premiums, Before and After



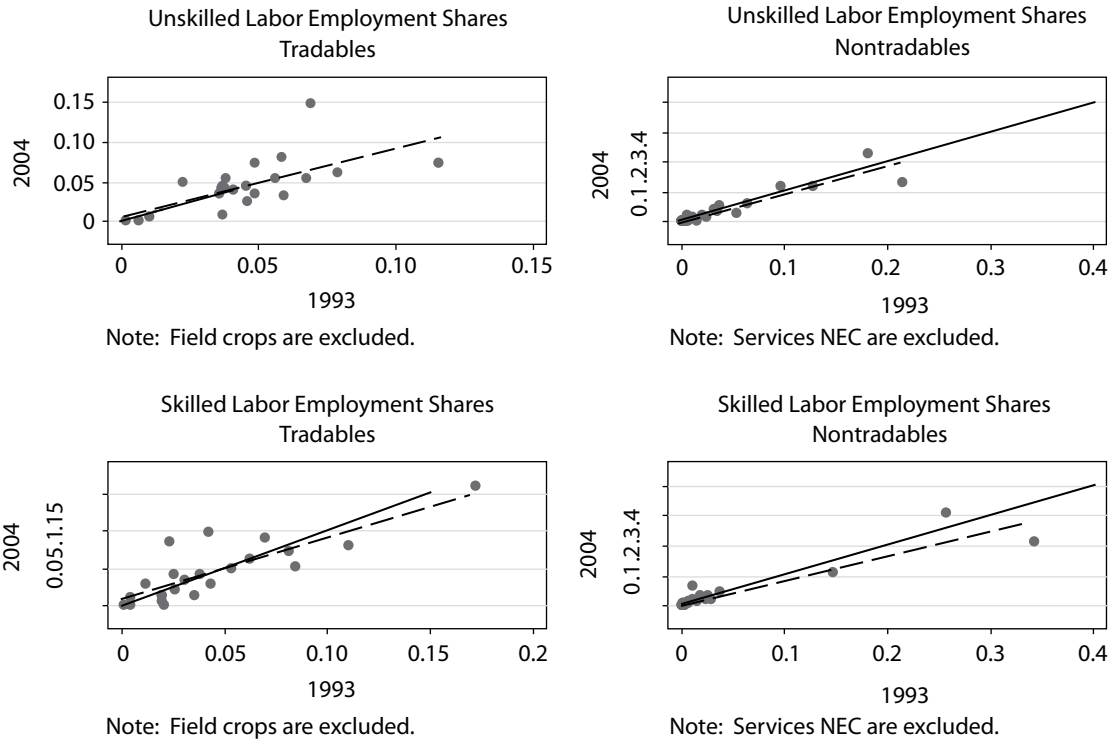
Note: Industry wage and skill premiums are estimated using specification (1). Wage premiums are normalized. The solid lines are y=x. The dotted lines are regression lines.

[20] These visual impressions are confirmed numerically: the raw correlations over time in skill premia are moderate in tradables (0.61) but negligible in nontradables (-0.08); and the correlations are higher for wage premia (0.88 in tradables, 0.73 in nontradables) than for skill premia (0.61 and –0.08, respectively). Rank correlations track similarly.

B. Employment Shares

Figure 3 depicts subsectors' employment shares in 1993 and 2004. These are expressed as shares of skilled and unskilled, tradable, and nontradable wage employment. Reallocations of labor have been more substantial in tradables than in nontradables, suggesting that if job creation and destruction have lifted inequality, they are more likely to be observed in the tradable sector.

Figure 3: Industry Employment Shares, Before and After



Note: Field crops are excluded.

Note: Services NEC are excluded.

Note: Field crops are excluded.

Note: Services NEC are excluded.

NEC = not elsewhere classified.
Note: Employment shares are directly estimated from the data. The solid lines are y=x. The dotted lines are regression lines.
Source: Authors' estimates.

C. Impact of Liberalization on Industry Wage/Skill Premia and Employment

As explained in the methodology section, we regress separately the pooled industry wage premia, industry skill premia, and employment shares on measures of trade protection and services liberalization. Results are provided in Tables 6 and 7 for tradables, and Tables 8 and 9 for services (nontradables), respectively.

Table 6: Effects of Protection on Wage and Skill Premiums in Goods Sectors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Industry Wage Premiums					Skill Premiums				
Nominal Rate of Protection	−0.403	−0.813 **	-0.236	−0.135	−0.660 *	−0.082	0.735	−0.475 *	0.004	0.358
	(0.270)	(0.352)	(0.138)	(0.272)	(0.381)	(0.441)	(0.569)	(0.241)	(0.361)	(0.608)
Nontariff barriers	0.062	−0.483	0.124	−0.068	0.096	0.458	0.356	0.288	0.099	0.604
	(0.197)	(0.357)	(0.176)	(0.348)	(0.224)	(0.342)	(0.476)	(0.303)	(0.458)	(0.381)
Dummy (year=2004)	−0.178	−0.876 ***				0.433	0.815			
	(0.248)	(0.316)				(0.407)	(0.496)			
Constant	2.804 ***	3.605 ***	2.588 ***	2.592 ***	-0.368	0.707	0.041	1.229 ***	0.998 ***	0.880 *
	(0.303)	(0.376)	(0.037)	(0.090)	(0.315)	(0.495)	(0.594)	(0.066)	(0.118)	(0.504)
Industry fixed effects?	Yes	No	Yes	No	N.A.	Yes	No	Yes	No	N.A.
Panel regression estimated in	Levels	Levels	Levels	Levels	Differences	Levels	Levels	Levels	Levels	Differences
Hausman test p-value					0.62					0.15
Observations (Industry-years)	46	46	46	46	23	46	46	46	46	23
R-squared	0.944	0.208	0.942	0.063	0.061	0.915	0.068	0.910	0.008	0.026

*** p<0.01, ** p<0.05, * p<0.1.

Note: Standard errors in parentheses. Specifications 1–4 and 6–10 include time and industry fixed effects and are weighted by variance of estimated premiums. Specifications (5) and (10) regress changes in wage premiums on changes in protections, using initial protections as instruments.

Source: Authors' estimates.

Table 7: Effects of Protection on Employment Shares in Goods Sectors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Unskilled Workers' Employment Shares					Skilled Workers' Employment Shares				
Nominal Rate of Protection	−0.009	0.022	0.008	−0.013	0.057	0.018	0.021	0.015	0.003	0.058
	(0.025)	(0.034)	(0.021)	(0.036)	(0.049)	(0.034)	(0.047)	(0.019)	(0.034)	(0.046)
Nontariff barrier	0.018	0.039	−0.012	−0.021	−0.055	−0.024	−0.022	−0.021	−0.026	−0.072 **
	(0.033)	(0.036)	(0.027)	(0.030)	(0.037)	(0.044)	(0.049)	(0.025)	(0.029)	(0.035)
Dummy (year=2004)		0.042		−0.024			0.003		−0.014	
		(0.031)		(0.033)			(0.042)		(0.031)	
Constant	0.039 ***	−0.054	0.043 ***	0.071 **	0.016	0.039 ***	0.021	0.040 ***	0.044	0.008
	(0.008)	(0.035)	(0.004)	(0.031)	(0.033)	(0.011)	(0.050)	(0.005)	(0.040)	(0.040)
Industry fixed effects	No	No	Yes	Yes	NA	No	No	Yes	Yes	NA
Hausman Test, p-value					0.09					0.06
Observations (Industry-years)	46	46	46	46	23	46	46	46	46	23
R-squared	0.013	0.162	0.904	0.908		0.012	0.015	0.913	0.913	

*** p<0.01, ** p<0.05, * p<0.1.

Note: Standard errors in parentheses. Specifications 1–4 and 6–10 include time and industry fixed effects & are weighted by variance of estimated premiums. Specifications (5) and (10) regress changes in wage premiums on changes in protections, using initial protections as instruments.

Source: Authors' estimates.

Table 8: Effects of Protection on Wage and Skill Premiums in Services Sectors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Wage Premium				Skill Premium			
Partially liberalized*dummy (year=2004)	0.104	0.223 **	-0.035	0.194 ***	0.204 ***	0.235 ***	0.062	0.181 ***
	(0.102)	(0.085)	(0.052)	(0.056)	(0.070)	(0.057)	(0.074)	(0.057)
More liberalized*dummy (year=2004)	-0.007	0.112	-0.019	0.209 **	0.286 **	0.317 ***	0.127	0.246
	(0.139)	(0.128)	(0.073)	(0.095)	(0.121)	(0.114)	(0.155)	(0.158)
Dummy (year=2004)	0.172 *		0.228 ***		0.045		0.119**	
	(0.086)		(0.036)		(0.058)		(0.051)	
Constant	2.388 ***	2.440 ***	2.389 ***	2.439 ***	0.913 ***	0.927 ***	0.913 ***	0.941 ***
	(0.048)	(0.041)	(0.017)	(0.023)	(0.032)	(0.026)	(0.024)	(0.023)
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations (Industry-years)	66	66	66	66	63	63	63	63
R-squared	0.156	0.102	0.949	0.881	0.279	0.272	0.815	0.779

*** p<0.01, ** p<0.05, * p<0.1.

Note: Standard errors in parentheses. All regressions include time fixed effects and are weighted by variance of estimated premiums.

Source: Authors' estimates.

An examination of the regression results for the industry wages and skill premia for tradables (Table 6) suggests that tariff protections reduced both (and thus reductions in protection—i.e., trade liberalization—would increase both). However, this result is not significant when industry and time fixed effects are permitted (columns 1 and 6). The Hausman tests cannot reject the null that the instrumentation is unnecessary, so we stick with ordinary least squares (OLS) results. We take the results with time and industry fixed effects as our empirically conservative benchmark, given the possibility that general equilibrium effects and technological change require the use of time dummies, and that industries offer stable compensating wage differentials that call for industry fixed effects.[21] This implies that, at a point estimate, trade liberalization increased wages slightly.

The regressions of skill and unskilled employment shares of tradables on our protection measures yield a similarly mixed picture in terms of the direction of the relationship between trade liberalization and wage employment shares (Table 7). Here the Hausman test rejects the null that OLS estimates are unbiased, and the Stock-Yogo test statistics indicate the instruments are not weak. We therefore focus on specifications (5) and (10). These suggest that tariff protection increases employment while NTBs reduce it, but only the effect of NTBs on skilled employment are significant.

Our results for the services sector reveal a generally positive relationship between liberalization and skill premia—albeit one that loses statistical significance once time and industry fixed effects are included. Partial liberalization may also lift wage premia, but even the sign of this relationship does not survive the introduction of year fixed effects. As with the wage and skill premium regressions for goods, empirical conservatism requires that we utilize time and industry fixed effects (specifications 3 and 7). This would lead to the conclusion that liberalization slightly reduced industry wages, but slightly increased skill premia. However, when seeking a more liberal estimate of the effects of liberalization on inequality, we will drop the year fixed effect (specifications 4 and 8).

Finally, services liberalization has generally positive, but insignificant effects on employment, so long as industry fixed effects are employed (Table 9). Once more, the conservative estimates employ industry and year fixed effects (specifications 4 and 8).

[21] Our results should not be seen as inconsistent with prior literature that finds that protections increased industries' relative wages. For example, when we follow the approach adopted by Dutta (2007), and weight the wage premium regressions using standard errors derived as suggested by Haisken-DeNew and Schmidt (1997), we obtain positive (but insignificant) coefficients on tariffs and NTBs of roughly the same magnitude as Dutta reports. The Haisken-DeNew and Schmidt procedure renormalization expresses industry wage premia as deviations from the mean wage. Given that we are interested, in our decompositions, in attributing movements in absolute, rather than relative, wage levels to trade liberalization, we stick with estimates that weight using the estimated variances of nonnormalized wage premia.

Table 9: Effects of Services Reforms on Services Employment Shares

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unskilled Workers' Employment Shares				Skilled Workers' Employment Shares			
Partially liberalized*dummy (year=2004)	0.020	0.025	0.003	0.008	0.030	0.036	0.003	0.010
	(0.017)	(0.020)	(0.006)	(0.007)	(0.025)	(0.029)	(0.009)	(0.012)
More liberalized*dummy (year=2004)	-0.012	-0.007	0.007	0.011	-0.011	-0.005	0.012	0.019
	(0.022)	(0.025)	(0.008)	(0.009)	(0.031)	(0.034)	(0.012)	(0.014)
Dummy (year=2004)		-0.007		-0.005		-0.010		-0.007
		(0.016)		(0.005)		(0.022)		(0.008)
Constant	0.028 ***	0.030 ***	0.029 ***	0.030 ***	0.028 ***	0.031 **	0.030 ***	0.032 ***
	(0.007)	(0.009)	(0.002)	(0.002)	(0.010)	(0.013)	(0.003)	(0.004)
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations (industry-years)	66	66	66	66	63	63	63	63
R-squared	0.029	0.032	0.968	0.969	0.028	0.031	0.962	0.963

*** p<0.01, ** p<0.05, * p<0.1.

Note: Standard errors in parentheses. All regressions include time fixed effects and are weighted by variance of estimated premiums.

Source: Authors' estimates.

The results so far suggest a limited role for liberalization in driving inequality increases on account of shifts in wage premia or on employment. Results are generally statistically insignificant, unless the year fixed effect is eliminated. However, if we take into account results without year fixed effects, so that much of the temporal shift in labor market outcomes can be attributed to trade, there is some support for the view that tariff liberalization increased skill premia in tradables, that reductions in NTBs increased skilled employment, and that services liberalization lifted wages and skill premia and also had marginal positive effects on employment.

However, these estimates, though they suggest an increase in wage inequality, cannot speak to how much liberalization would change inequality. We turn to our analysis of wage decompositions in order to get a sense of this. In doing so, we ignore the statistical insignificance of the remainder of our estimated relationships between liberalization and labor market outcomes, utilizing the point estimates as our best estimates of liberalization's effects.

D. Wage Decompositions

Table 10 reports Gini coefficients from 1993 and 2004 (which are actual wage distributions) and also for the 15 counterfactual wage distributions (which are simulated). As noted, we simulated two sets of counterfactuals. The conservative estimates uses the second-stage wage and skill premium regression coefficients obtained when industry and year fixed effects are included; the "liberal" results, which are engineered to attribute more of the increase in inequality to liberalization, utilizes estimates for the wage and skill premium regressions that omit the time fixed effect. The results, which are qualitatively identical when we use a Theil index and the mean log-deviation index, can be summarized as follows.

Under conservative assumptions, trade liberalization led to a 13% decline in wage inequality (compare 1993 wages to C4). This is partly because liberalization-induced labor reallocation had little effect on inequality (C2 vs. 1993), as labor was reallocated toward sectors offering more typical wages (C1 vs. 1993) but larger skill premia (C2 vs. C1). Meanwhile, the loss of protection increased tradable industry wages, which reduces inequality (C3 vs. C2) because tradables generally offer lower wages than nontradables (Table 4); but decreased industry skill premia, also reducing inequality (C4 vs. C3).

Given that this surprising negative effect of trade liberalization on wage inequality hinges on possibly overly conservative specification, we turn to the decomposition under liberal assumptions. The first two counterfactuals are identical by construction. Thereafter, trade liberalization still reduces inequality by flattening industry wages (C3). However, it does lift skill premia, increasing inequality (C4), so that in total, 4% of the total increase in inequality can be attributed to trade liberalization.

Table 10: Simulation Results

Wage Distribution		Gini Coefficients under:			
		Conservative Assumptions		Liberal Assumptions	
		Level	Percent of Observed Shift between 1993 and 2004	Level	Percent of Observed Shift between 1993 and 2004
Observed 1993		0.42		0.42	
C1	Unskilled labor allocation within tradables	0.43		0.43	
C2	Skilled labor allocation within tradables	0.42		0.42	
C3	Tradable sectors' industry wage premiums	0.42		0.42	
C4	Tradable sectors' industry skill premiums	0.41	−12.9	0.43	3.8
Effects of Services Liberalization on					
C5	Unskilled labor allocation within nontradables	0.41		0.43	
C6	Skilled labor allocation within nontradables	0.41		0.43	
C7	Nontradable sectors' industry wage premiums	0.41		0.43	
C8	Nontradable sectors' industry skill premiums	0.42	5.1	0.44	25.0
Effects of Measured Shifts in Industry Wage and Skill Premiums					
C9	Tradable sectors' industry wage premiums	0.43		0.44	
C10	Tradable sectors' industry skill premiums	0.43		0.45	
C11	Nontradable sectors' industry wage premiums	0.45		0.45	
C12	Nontradable sectors' industry skill premiums	0.46	66.2	0.46	29.7
Other Changes					
C13	Returns to primary and secondary education	0.47		0.47	
C14	Shifting state premiums	0.47		0.47	
C15	Shifting returns to age and gender	0.48	17.7	0.48	17.7
Observed 2004		0.49	23.9	0.49	23.9

Source: Authors' estimates.

Turning to services liberalization, once more under conservative assumptions, we find that it contributed slightly to rising inequality (5% of its observed increase, C8 vs. C4). As might have been expected from Figures 2 and 3, effects of liberalization-induced employment reallocation and industry wage shifts are negligible (C7 vs. C4). However, services liberalization lifted skill premia, raising inequality (C8). Under liberal assumptions, services liberalization contributed 25% of the increase in inequality, and 90% of that contribution is due to its effects on skill premia (compare C4, C7, and C8).

We might also ask what proportion of the increase in wage inequality can be attributed to measured trade and services liberalization is attributed to trade liberalization policy. The answer ranges from none of it, under conservative assumptions, to 13% (=3.8%/25%), under liberal ones.

Next, we look at the effect of shifting wage and skill premia over and above those predicted by liberalization (C9–C12). The inequality indices are equal at and after C12 by construction, because the assumptions that differ only concern how much of the observed shift in these premia can be attributed to policy. The shifts in wage and skill premia that are not, under conservative assumptions, explained by policy, drove 66% of the increase in inequality. Under liberal assumptions more of these shifts in premia are attributed to policy, so that the residual shifts in premia contributed 30% of the increase in inequality. Moreover, unexplained shifts in wage and skill premia in nontradables contributed to the large majority of these policy-unrelated shifts (71% under conservative assumptions, 90% under liberal ones), regardless of assumptions.

Beyond this, rising returns to primary and secondary education levels (relative to no-schooling, C13), shifts in the interstate wage structure (C14), and returns to age and gender (C15) together account for only 18% of the increase in wage inequality. The remaining 24% of the observed shift in inequality is due to employment reallocations not predicted by liberalization measures, changes in worker characteristics (i.e., demography and educational attainment) and changes in wage residuals. Given that the mean-squared error of the wage regressions declined over time, we expect that trade-unrelated employment shifts, demography, and educational expansion do most of this work.

We therefore conclude the following regarding the effects of liberalization. Liberalization-induced labor reallocations within tradables and nontradables contributed nothing to rising wage inequality. Changes in industry wage and skill premia contributed approximately 3/5 of the increase in inequality, and depending on assumptions, between none and half of that contribution can be linked statistically to measured liberalization-related policy changes. Thus, the available data permit between none and 3/10 of the observed shifts in wage inequality to be attributed statistically to liberalization. This said, those changes in wages and skill premia that drove inequality but cannot be linked to liberalization statistically might nevertheless have been the result of forces unleashed by liberalization that are dissipated across sectors through general equilibrium wage adjustments. The effects of these changes would not be reflected in wage differences across industries, and so would not be discernible statistically.

We also note that the large majority of the observed shift in wage inequality, and of the shift in wage inequality that is attributable to liberalization, is due to shifts in skill premia within nontradables (compare C8, C4, and 1993). This underscores the key role of services relative to trade liberalization.

Finally, another way to tabulate these results is to ask how much of the increases in inequality that are attributable either to tradables or to nontradables is actually due to tradables. This can be done by attributing the changes from 1993 to C4 and from C8 to C10 to tradables, and those from C4 to C8 and C10 to C12 to nontradables. Here, we

find that only 10% of the shift in the Gini that can be attributed to one or the other sector (C12 vs. 1993) is attributed to tradables.

VI. Conclusion

We have analyzed the role of trade and services liberalization in influencing changes in wage inequality in India between 1993 and 2004. Tariff and NTB coverage rates declined considerably between these 2 years while both exports and imports rose sharply. Over the same period, data from labor force surveys reveal that wage inequality increased considerably. For example, the Gini coefficient over urban real weekly wages increased from 42% to 49% between 1993 and 2004.

These two sets of facts—i.e., increasing openness to trade and increasing inequality—are consistent with a growing body of literature that has found trade liberalization to lead to shifts in industry wage premia and increases in skill premia within tradables sectors (especially manufacturing), both of which are expected to increase inequality. We take up three issues that have received inadequate attention in this literature.

First, trade liberalization was usually accompanied by a raft of other liberalization measures that affect nontradable sectors. Nontradables employ a growing share of the labor force in most developing countries, and, so long as agricultural workers are excluded, employ more workers than tradable sectors. We have asked how much of the increase in wage inequality that can be attributed to either tradables or nontradables is attributable to nontradables. We conclude that this figure is around 90%. Similarly, we have utilized a measure of services liberalization and asked how much of the shift in inequality that can be attributed to measured policy liberalization are attributed to trade (rather than services) policy, and found that the answer ranges from none of it to 13%.

This figure may owe something to the exclusion of the agricultural sector from our analysis. Nevertheless, it urges caution in drawing conclusions about changes in wage inequality from studies of the manufacturing sector alone. It suggests either that trade policy alone does not explain the shift in wage inequality, or that the effects of trade policy operate primarily through their impact on wages (especially those of skilled workers) in nontradables. In this respect, the results are simpatico with recent results from Mexico (Mehta and Acuna-Mohr 2010).

Second, we have asked how much the shifts in industry wage premia and industry skill premia attributable to policy shifts increased inequality. If labor is mobile across sectors and wages are flexible, little of the effect of policy-induced shifts in sectoral labor and skills demand would linger in industry-specific wage and skill premia. Thus, it is possible that, given time, most of the effects of policy shifts could be absorbed in changes in the general wage level (thus not affecting wage inequality), or in economywide returns to skill. If so, the bulk of the effects of policy shifts would not be discernible from an analysis

of interindustry differences in wages and returns to skill. Indeed, we find that, depending on assumptions, between none and 3/10 of the increase in inequality can be empirically related with policy measures.

Third, we have attempted to measure the effects of liberalization-induced labor reallocations on inequality. These are statistically and economically insignificant for unskilled labor, and slightly bigger, but generally statistically insignificant for skilled labor. However, there is much movement in employment shares that is not attributable to the available liberalization measures. Thus, whatever the shifts in subsectoral unskilled and skilled labor demand are that gave rise to the increase in economywide skill premia and inequality, they are not generally attributable to the available measures of liberalization.

We therefore conclude with some suggestions for future studies. First, developing more refined measures of services liberalization is important. Second, nontradable sectors are ignored at peril in studies of inequality in liberalizing economies, given the typically contemporaneous liberalization of multiple features of economies. Third, to the extent that services reforms affect productivity in tradable sectors (Arnold et al. 2010), and trade reforms influence productivity in nontradable sectors, policy reforms in each sector may affect the other. Incorporating such interactions may increase the explanatory power of existing measures of policy reform. Fourth, it is important to be open to the possibility that something other than policy reforms has driven returns to skill and inequality upward. For example, explanations involving structural changes associated with the movement of unskilled labor out of agriculture, or with changing patterns of services demand due to Engel effects driven by an expanding middle class, are quite compatible with the trends that we have uncovered.

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About the Paper

India's economic reforms of the 1990s are widely credited with having raised India's rates of economic growth. They are also believed to have contributed to a widening of inequality. Aashish Mehta and Rana Hasan use labor force survey data from India to examine the extent to which trade and services liberalization—key components of India's economic reforms—have contributed to increases in wage inequality.

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