
# Is Indian Trade Policy Pro-Poor?

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**Abstract**

This paper studies the pro-poor bias of Indian trade policy by estimating the household welfare effects of eliminating the current protection structure. The elimination of a pro-poor trade policy is expected to have lower welfare gains, or higher welfare loss, at the low end of the per capita expenditure distribution. The paper first constructs trade restrictiveness indices for household consumption items using both tariffs and the ad-valorem equivalent of non-tariff barriers. The welfare effects are estimated through its impacts on household expenditure and earnings. The results indicate that Indian trade policy is pro-poor through the earnings channel, as its elimination leads to higher welfare loss for poorer households. On the other hand, the current protection structure is pro-rich through the expenditure channel, as its elimination leads to higher welfare gains for poorer households, implying that the current trade policy raises the cost of consumption relatively more for poorer households. The net effect through these two channels is estimated to be pro-rich. These results indicate that a trade policy that protects unskilled workers may increase the prices of unskilled-labor-intensive products that are more important for poor household's budget, leading to adverse distributional consequences through its effect on household expenditure.

Keywords: Trade Protection, Consumption Inequality, Poverty.
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# 1 Introduction

There is a large literature on the distributional impacts of trade liberalization in developing countries.[1] Changes in trade policy affect domestic prices, which in turn influence production and consumption decisions at the household level. While the effect on wages is extensively studied, the effect on household consumption is often overlooked (Han et al., 2016; Goldberg and Hellerstein, 2013). This is a crucial component, as the members of an household who participate in the labor market earn wages, and these wage incomes partially or fully determine the budget constraint of the household. A careful consideration of these two channels, and their relation to each other, recognizes the fact that households are complex establishments that contribute to the economy, not only as producers, but also as consumers.

This paper defines household welfare as the net expenditure of households, which is decomposed into changes in expenditure and changes in earnings (Deaton, 1997). A trade protection structure may be pro-poor through its effect on household income and pro-rich through its effect on household consumption. For instance, a trade policy that is designed to protect unskilled labor may raise the prices of unskilled-labor intensive goods which have a higher budget share among poorer households. The net effect is therefore determined by the relative magnitudes of these two channels (Nicita, 2009; Nicita et al., 2014; Porto, 2006; Ural Marchand, 2012; Han et al., 2016).

The distributional effects of current trade policy through the earnings and consumption channels are investigated by answering the following questions: What would be the impact of eliminating the current protection structure? And how these impacts differ across households with different per capita expenditure levels? If the existing policy benefits poor individuals more than rich individuals, then the elimination of trade protection is expected to lead to a relatively higher levels of welfare loss, or smaller welfare gains, for poorer households as compared to richer households (Nicita et al., 2014). The pro-poor bias of trade policy is then determined by the welfare implications of moving from the current trade policy to completely free trade across the expenditure distribution.

The budget structures of households are systematically different across the distribution. Specifically, poor households tend to allocate a large portion of their budget to food-related expenditures, and a small share to manufacturing items, such as clothing and household durables, while the budget share of nontradable services tends to be very small. On the other hand, households that are on the right end of the distribution tend to allocate a higher share to services, such as health and education. The variation in the budget shares has implications for the distributional effects of international trade, as agriculture and manufacturing commodities are internationally tradable goods, and their prices are directly affected by trade policy. These price changes, in turn, influence

[1] See Goldberg and Pavcnik (2007) and Winters et al. (2004) for extensive reviews of the literature.

household welfare depending on the importance of each good in their budget.

On the earnings component, international trade is expected to have differential effects on skilled and unskilled workers. According to the theory of international trade, developing countries import products that use skilled labor more intensively, and thus, the relative wages of skilled labor decrease as the economy adjusts to the expansion in imports, while the relative wages of unskilled workers increase. Trade liberalization, therefore, reduces wage inequality in developing countries. However, this interpretation of the theory is based on a movement from a closed economy to free trade and does not necessarily imply that a movement from the current trade policy to free trade will reduce inequality. If the initial protection structure is biased towards unskilled-labor-intensive products, the removal of such protection may disproportionably hurt unskilled labor and increase inequality, which would imply that the current trade policy is pro-poor through the earnings component.

This paper starts with the construction of trade restrictiveness indices for India that account for heterogeneity in trade protection at the tariff line level. For household expenditure items, an index value is constructed using the trade protection level, import demand elasticity, and tariff variance within each composite product group. These indices represent a uniform tariff rate applied to imports instead of the current structure of protection that would keep the country's welfare at its current level (Kee et al., 2009). In addition, an alternative trade restrictiveness index is constructed using both tariffs and the ad-valorem equivalent of non-tariff barriers, which also reflects trade policy tools such as quotas and subsidies. Results indicate that the highest levels of trade restrictiveness are observed in the food categories, particularly in grains, followed by durables and energy. The level of trade restrictiveness is higher when non-tariff barriers are incorporated, with the highest difference again observed in the food categories, implying that non-tariff policy tools are used intensively in this category.

Through household expenditure, the welfare analysis shows that Indian trade policy is pro-rich in the sense that the elimination of the current protection structure would benefit poorer individuals more than rich individuals. The welfare gains are estimated to be around 14% for the poorest decile if all tariffs are removed, and this effect decreases to 8% for the richest decile. If both tariffs and non-tariff barriers are eliminated, these effects are estimated to be 21% and 11% for the poorest and richest deciles, respectively. While the structure of protection within the manufacturing sector is pro-poor, the magnitude is much smaller. The importance of food products in the household budget and their relatively high levels of trade protection means that the welfare effect through household consumption is dominated by the food category, both in terms of its size and its distributional properties.

The earning component of the welfare is estimated by assessing the impact of tariff removals on the wage incomes of workers with different education levels. Thus, it allows

for the use of differential skill levels across the income distribution. The results suggest that the earnings component of the trade policy is pro-poor. Elimination of trade protection would reduce the earnings of agricultural workers in the lowest decile by as much as 3.5%, while the effect is around 2% for the highest decile. The impact is lower for individuals in the energy and manufacturing sectors due to lower current protection rates, as well as lower employment levels. Overall, the removal of tariffs and non-tariff barriers is estimated to reduce earnings by 1.4%, on average.

In terms of its net effect on household welfare through the expenditure and earnings channels, the trade protection structure is estimated to be pro-rich. The total dismantlement of tariffs is estimated to increase the welfare of households by 13% in the poorest decile and 8% in the richest decile. When both tariffs and non-tariff barriers are eliminated, these effects are estimated to be 20% and 11% for poorest and richest deciles, respectively. The welfare inequality of households is estimated to decrease following the elimination of trade protection. Consistent with these result, the index for pro-poor bias, proposed by Nicita et al. (2014), indicates that the protection structure is pro-poor through the earnings channel, and pro-rich through the expenditure channel, while the net effect is pro-rich, in the sense that the elimination of trade protection benefits poor households more than the rich households.

The effect of Indian trade policy on poverty is a controversial topic in the literature (Hasan et al., 2006; Ural Marchand, 2012). However, most of the literature focuses on the impact of the 1991 trade liberalization, while they are silent with respect to the distributional impacts of contemporary trade policy. This paper provides compelling evidence on the pro-poor bias of the *existing* protection structure, and it determines whether this policy exacerbates or mitigates inequality. In addition, this paper provides estimates of earnings elasticities with respect to changes in consumer prices for different educational categories and shows that the responsiveness of earnings increases along the education profile. While trade may affect households through many potential channels, the current paper aims to improve our understanding of the distributional impacts through two of the most important channels, earnings and expenditure, by providing evidence that the direction and magnitude of the pro-poor bias differs across these channels.

The paper is organized as follows. Section 2 lays out the framework to analyze the effect of trade policy on household welfare. Section 3 presents the data used in the paper, and Section 4 discusses the construction of trade restrictiveness indices for India. Sections 5 and 6 present the results for the expenditure and earnings components, respectively, and Section 8 shows the impact on inequality indicators. Section 8 concludes the paper.

# 2 Impact of Trade Policy on Households

The impact of trade policy on household welfare is defined as the negative compensating variation of price changes expressed as a percentage of initial expenditure. It reflects the amount by which households need to be compensated in order to have the same utility they had prior to the price change. The theoretical framework for this measure was built by Deaton (1989, 1997), and was later extended by Porto (2006, 2010) and Nicita (2009). Household welfare in this framework is defined as:

$$dW_h = -\sum_{c=1}^{C} \theta_{ch} dlnp_c + \left( \sum_{m=1}^{M} \sum_{c=1}^{C} \theta_{w_{ch}} \varepsilon_m \right) \Delta lnp_c \tag{1}$$

where $\theta_{ch}$ indicates the budget share of composite good $c$ for household $h$, $\theta_{ch}^{m}$ is the share of income of household member $m$ from the production of good $c$, $\varepsilon_m$ is the responsiveness of earnings for member $m$, and $dlnp_c$ is the price change for composite good $c$.

In this framework, the net expenditure of the household is defined as expenditure minus earnings, and the negative of the changes in net expenditure induced by price changes are defined as the welfare impact. In the case of a welfare loss, it represents the amount by which the household needs to be compensated in order to have the same utility level prior to the price change, expressed as a percentage of their initial household expenditure level. The first term in the parenthesis can be interpreted as the impact through the cost of consumption. This term enters negatively in the welfare function, as an increase in prices increases the net expenditure of a household for a given consumption basket, thus reducing welfare. Each price change affects household welfare proportional to the budget share of the corresponding consumption good. The second term defines the impact through the effect on earnings. The price changes may have industry-specific or skill-specific effects on the earnings of household members. This effect enters positively in the household welfare function, as improvements in income reduce net expenditure and increase household welfare. The effect of an income change on household welfare is proportional to the importance of that income source in the total household expenditure.

The term $dlnp_c$ is defined as the price change that would be incurred if all international trade restrictions of good $c$ are eliminated. If $dW_h$ is estimated to be positive for household $h$, this implies that the elimination of all trade protection benefits this household, thus the current trade policy is associated with a welfare loss for this household. Similarly, if the poor households are estimated to have a higher $dW_h$ than the rich households, it implies that the current trade policy has a pro-rich bias, as a complete trade liberalization would be more beneficial to poor households (Nicita et al., 2014).

# 3 Data and Stylized Facts

## 3.1 Household Surveys

The expenditure shares of households for the composite categories are computed from the $66^{th}$ NSS Consumer Expenditure Survey. This survey reports the quantity and value of 383 commodities for 100,683 households. It is a nationally-representative sample for India, and sampling weights are used in all estimations to ensure that the results are consistent estimates for the population. The survey has varying recall periods for different consumption items. Following the guidelines in the survey, all the expenditures are converted to a 30-day expenditure period, assuming a linear distribution over time.[2]

The expenditure shares of broad categories across per capita expenditure deciles are presented in Table 1. The total budget share of tradable goods, including food, energy, and manufacturing, is 83.43% for the poorest decile, and it decreases to 51.82% for the highest decile. It can be seen from the table that the budget share of food constitutes a large part of the tradable good category, and its budget share decreases quite sharply as we move up the distribution. This is expected, as predicted by Engel's Law, which states that the share of food expenditure decreases with income. The budget share of energy expenditure also decreases with income. Manufacturing items have the opposite trend, as the households allocate a higher share of their budget to manufacturing items as their budget expands. The same is true for nontradable services, such as health and education, as their budget share increases substantially as we move up the distribution. As discussed in Deaton (2000) and Eswaran and Kotwal (1994), the basic necessities, such as food and energy, have precedence over other commodities, but their expenditure does not increase proportionately with income, which leads to a negative relationship with income and their budget share.

The local linear regression of expenditure shares of internationally tradable and non-tradable items on per capita expenditure is provided in Figure A.1. The break-up of tradable items of the same regression is provided in Figure A.1, and the break-up of internationally nontradable items is provided in Figure A.2. The results show an increase of budget shares of goods for households at the high end of the distribution. The break-up of tradable commodities shows that this increase is due to the manufacturing share, which has a very steep slope at the high end. Once the basic necessities are satisfied, the manufacturing expenditure share is very sensitive to increases in budget constraints.

[2]Households are asked the value and quantity of the consumption (i) within the last 30 days for the following commodity groups: cereals, pulses, milk and milk products, sugar and salt, rents, and taxes; (ii) within the last 7 days for the following commodity groups: edible oil, egg, fish and meat, vegetables, fruits, spices, beverages, and processed food. These are multiplied by $(30 \div 7)$; (iii) within the last 365 days for the following commodity groups: clothing, bedding, footwear, durable goods, education, and medical expenses. These are multiplied by $(30 \div 365)$. Only total expenditure (not the quantity) is recorded for internationally nontradable items such as education, health, rents, and taxes.

The share of internationally nontradable services also increases with income, but it slows down at the high end of the distribution, potentially due to the increased share of manufacturing products, such as households durables and textile. In fact, Figure A.2 shows that the budget shares of all major nontradable items increase very sharply in the middle and high-middle part of the distribution, but decreases with an even higher slope at the high end of the distribution.

### 3.2 Matching the Trade Data

The data for tariffs and imports for the year 2016 are obtained from the United Nation's TRAINS Database. Ad-valorem equivalents of non-tariff trade barriers and import demand elasticities are from Kee et al. (2009). All trade data is obtained at the 6-digit Harmonized System (HS6) level. The implementation of the welfare measures requires aggregating tariffs in a way that matches the household expenditure items defined in the household survey. The household budget includes products that are not internationally tradable, such as rent, utility charges, health, education, and other locally obtained services. The tariff schedule of India also includes items that are not in the household budget, such as heavy machinery. When there is an overlap, the household expenditure items are often more broadly defined than the import tariffs and non-tariff barriers (NTBs) at the HS6 level.[3]

Given these considerations, a concordance table is constructed between HS6 categories and the expenditure categories in the household survey, by hand-matching each expenditure item to the HS6 items that are a direct counterpart, a variation that is not defined elsewhere, a raw material that can be turned into the final product by the household, or an input that can be turned into the final product by the household.[4] This concordance produced 133 composite categories for tradable goods with 65 food items, 7 energy items, and 60 manufacturing items.

## 4 Trade Restrictiveness

In order to measure trade restrictiveness and its impact on households, the trade policy variables need to be aggregated up to the composite expenditure categories. As discussed in Nicita et al. (2014), this aggregation is not straightforward. A simple average

[3]For example, there are 194 different HS6 lines for what is defined as "fish expenditure" in the household survey, and the tariff rates for different HS6 lines for fish vary substantially depending on the type of fish and whether the fish was fresh, frozen, processed, or canned. Similarly for manufacturing items, for example, import tariff lines differ depending on whether a washing machine is fully automatic, has a built-in centrifugal drier, or whether it exceeds 10 kg of capacity, while it is a single consumption item in the household survey.

[4]For example, 'clothing and bedding' expenditure is matched to finished clothing items, as well as woven fabric and cotton yarn. These concordances are available upon request.

of tariff rates across products is problematic, as it may overrepresent relatively unimportant expenditure items, or underrepresent crucial expenditure items. The most common method of aggregating tariffs is by weighting them by imports. However, there are several issues with this aggregation method. First, the low import levels of a product may be due to its high tariff rates. Assigning a low weight for such a product underestimates the impact of a high tariff in the aggregate measure. Equivalently, this aggregation systematically gives higher weights to products with lower trade restrictions. Second, both cases will enter as quantitatively similar trade restrictiveness components in the aggregate index. Third, import demand elasticities vary substantially across products. A tariff may virtually eliminate imports for a product with high elasticity, thereby imposing a high welfare loss from trade protection. On the other hand, an equivalent tariff may have little impact on the imports of a low elasticity product, resulting in a lower welfare loss. The lower weight of the product with higher welfare loss, and vice versa, would induce a bias to any subsequent welfare analysis of trade restrictiveness (Anderson and Neary, 1994).

This paper constructs the trade restrictiveness indices for India for each of the 133 composite commodities. The theoretical foundation for this index was first developed by Anderson and Neary (1994), and extended by Anderson and Neary (1996, 2003). It is based on the idea of finding a uniform tariff level that would lead to the same level of imports as the differentiated tariff structure. Feenstra (1995) showed that Anderson's index can be approximated by a weighted average of the squares of the tariffs, if we assume away the general equilibrium feedbacks. The economy-wide version of this index was later estimated for all countries by Kee et al. (2009, 2013). The trade restrictiveness for each composite category $c$ is given by:

$$TTRI_c = \left( \frac{\sum_{c \in i} m_i \epsilon_i \tau_i^2}{\sum_{c \in i} m_i \epsilon_i} \right)^{1/2} \tag{2}$$

where $i$ is the HS6 product, $m$ is the import of product $i$, $\tau$ is the tariff that is imposed by the country for the product $i$, and $\epsilon$ is the import demand elasticity of product $i$. These elasticities are borrowed from Kee et al. (2008), and they are defined as the percentage change in the quantity of an imported good when the price of this good increases by one percent, holding the prices of all other goods constant.

Another consideration relates to the aggregation of different trade policies. The treatment of tariffs is straightforward, as it can directly be transmitted onto domestic price changes using a pricing equation, assuming perfect pass-through of tariff rates. However, non-tariff trade barriers can take many forms, including quotas, import licenses, or subsidies. The two most commonly used measures of non-tariff trade barriers are frequency ratio and coverage ratio, both of which are based on a calculation of the ratio of commodity lines subject to at least one non-tariff trade barrier in a total number of lines for the respective group. This measure, however, does not account for the importance of

each non-tariff trade barriers, as the policies counted as binary numbers.

The ad-valorem equivalents of NTBs for India are borrowed from Nicita et al. (2014), which is a continuous variable covering both domestic subsidies, and direct trade restrictions, such as quotas and import licenses. The non-tariff trade barriers are a substantial protectionist tool for India, as this data suggests that 27% of the tariff lines (HS6 categories) are subject to a non-tariff trade barrier, as well as a positive tariff rate.[5] The overall trade protection imposed on product $i$ is then given by:

$$T_i = \tau_i + NTB_i \tag{3}$$

where $NTB_i$ is the ad-valorem equivalent of non-tariff trade barriers of HS6 product $i$. The overall trade protection index is then given by:

$$OTRI_c = \left( \frac{\sum_{c \in i} m_i \epsilon_i T_i^2}{\sum_{c \in i} m_i \epsilon_i} \right)^{1/2} \tag{4}$$

The household welfare impacts of trade restrictiveness work through price changes. What would be the impact of the elimination of trade restrictions on domestic prices? Assuming perfect-pass through on prices, these changes are computed as:

$$\Delta lnp_c^{TTRI} = -\frac{TTRI_c}{(1 + TTRI_c)} \tag{5}$$

The $\Delta lnp_c^{OTRI}$ is computed in the similar manner, where $OTRI$ is substituted for the $TTRI$ measure (Nicita et al., 2014).

A summary of the trade restrictiveness indices is presented in columns (1) and (2) of Table 2. The results show that India's overall trade restrictiveness based on tariffs is 22.7%, implying that a uniform 22.7% tariff would lead to the same level of imports and welfare as the current tariff structure. When the non-tariff barriers are included, this rate increases to 39.1%. There is substantial heterogeneity across products. The highest level of protection is in the food category with 36.2% $TTRI$ and 54.1% $OTRI$. Decomposing this index into 'grains' and 'other food' categories show that $OTRI$ is very high for grains at 75.4%, meaning that non-tariff measures are used more often and at higher degrees for grain products. The highest index value in the data is for 'rice', with 294.48% $OTRI$. [6]

For energy products, the $TTRI$ is relatively low with 8.85%, while this value increases to 21.33% for $OTRI$. The level of trade protection is slightly higher for manufacturing

[5]Not all these non-tariff trade barriers are binding, as 27% of them estimated to be zero or statistically equivalent to zero. The rate of non-binding non-tariff trade barriers for positive tariff lines is 20%.

[6]The main HS6 category for the composite 'rice' product group is given by 'rice, semi-milled or wholly milled' (HS6 code: 100630). While the tariff rate for this category is 69.02%, the ad-valorem equivalent of non-tariff barriers is 227.5%, which leads to an outlier value of the trade restrictiveness index for India. Rice is a staple product for Indian households, with a higher expenditure share among poorer households. Therefore, the welfare cost associated with this composite good is expected to be relatively high.

categories. However, there is some heterogeneity within the manufacturing sector. The protection level for durables is substantially higher than textile and nondurable manufacturing items. For this category, $TTRI$ is 15.84% and $OTRI$ is 33.72%. The gap between $TTRI$ and $OTRI$ is largest for food and durables, as the $OTRI$ was about 18 percentage points higher for these categories.

The price changes associated with the elimination of these trade barriers are presented in columns (3) and (4). Consistent with the trade restrictiveness, the highest price reduction can be seen in the food category, with a 22.6% reduction with respect to $TTRI$ and a 28.8% reduction with respect to $OTRI$. Overall, prices reduce by 15% if only tariffs are eliminated, and 23.3% if both tariffs and non-tariff trade barriers are eliminated. The magnitudes of these estimates are likely to be biased upwards due to the perfect pass-through assumption. However, we are interested in the pro-poor bias of trade policy, and the distributional effects are unaffected as long as the price pass-through affects all households in the same direction. As such, the estimates should be interpreted as an upper-bound based on perfectly elastic prices in all regions and products.

# 5 Distributional Effect through Consumption

Table 3 presents results for the first component of Equation 1 across the per capita expenditure deciles. Households at the first decile of per capita expenditure distribution experience a 13.4% reduction in their food expenditure following a total dismantlement of tariffs. The gains decline monotonically across the per capita expenditure distribution until they reach 6.9% for the households at the highest decile. This implies that the tariff schedule for food items has a pro-rich bias, as the current tariff schedule increases expenditure more for poor households as compared to richer households. The gains are higher for all deciles when all trade policy tools, including non-tariff barriers are considered. The difference between the welfare measures based on the two trade restrictiveness indices is also largest for the poorest decile, implying that consumption items with relatively higher non-tariff trade restrictions are more important in a poorer households' budget as compared to a richer households' budget.[7]

From the household point of view, trade restrictions on energy also had a pro-rich bias, although the welfare impact of removing these restrictions is smaller in magnitude. This is because the current trade restrictiveness levels, as well as budget shares, are lower for energy commodities. Removing all trade protection induces a 0.4% welfare gain for households at the poorest decile, and this estimate decreases to 0.1% for the household at the highest decile. The only category which exhibit pro-poor bias through the expenditure

[7]The results do not substantially differ across rural and urban areas due to their similar budget structure, which varies across income distribution, but the variation across rural or urban residences is not substantial. These are available upon request.

channel is manufacturing, with estimates of 0.2% and 1.3% for the poorest decile and richest decile, respectively.

The estimates in columns (7) and (8) show the results for all tradable products in the household budget. Overall, the burden of trade restrictions on the household budget is estimated to be 11.6% with respect to tariffs and 17% with respect to the combined effect of tariffs and non-tariff barriers. Both the magnitude and the distributional effect through the consumption channel is dominated by the effect on food commodities. The total effect on the household budget is pro-rich. As a percentage of their budget, poor households would benefit substantially more from the removal of current trade restrictions, or equivalently, poor households bear a higher burden of trade restrictions as a percentage of their budget.

# 6 Distributional effect through earnings

Approximately half of the Indian labor force is employed in internationally-tradable industries, including agriculture, manufacturing, and mining (Table 4). However, these shares vary substantially across the per capita expenditure distribution. Figure 2 shows that employment is much more concentrated in tradable sectors at the low end of the distribution, as it is higher than 90 percent among the poorest households, and monotonically decreases to less than 10 percent among the richest households. This distribution is largely driven by the share of workers in the agricultural sector, as can be seen in Figure A.3. While the employment share in the manufacturing sector increases with per capita income, the magnitude is still relatively low when compared to the agricultural sector, and mining (energy) employment is negligible. The share of the nontradable service sector, on the other hand, exhibits a positive slope at the low end of the distribution, and a negative slope at the high end of the distribution, while the overall trend is positive. Based on the structure of the labor force, we expect the trade restrictions to have a larger direct effect among poorer households relative to richer households, assuming away the indirect general equilibrium effects on nontradable sectors, such as education, health, and housing.[8]

Another important aspect to consider is the structure of human capital across the distribution. The most prominent international trade theory suggest that a country that is relatively scarce in skilled labor becomes importer of skill labor-intensive products once they engage in free trade. This lowers the relative prices of skilled-labor-intensive goods, and thus the relative wages in these sectors. A movement from autarky to free trade should, therefore, reduce the relative wages of skilled workers, increase the wages of unskilled labor, and reduce wage inequality. However, the exercise in this paper is to

[8]The effect of trade on these sectors is expected to be small, as the prices in education and health are highly regulated in India.

investigate the effects of a complete elimination of current trade restrictions, a movement from the current trade policy to free trade, rather than from autarky to free trade. As discussed in Goldberg and Pavcnik (2007), the structure of initial protection matters. A country may have a relatively high trade protection levels in its comparative advantage sectors due to political economy or distributional considerations. In this case, a removal of trade protection would lower the relative wages of the unskilled labor that is used more intensively in the production of comparative advantage good, lowering the relative wage of unskilled labor and widening wage inequality.

Similar to the computation for household consumption items, trade policy variables at the HS6 level are aggregated to employment categories defined at the 4-digit International Standard Industrial Classification (ISIC Rev3) level.[9] This yields $TTRI$ and $OTRI$ indices for each employment category reported by individuals in the employment survey. Table 4 shows the average trade restrictiveness across 1-digit ISIC Rev3 categories.[10] The results show that, contrary to the theoretical predictions, India protects its unskilled labor-intensive sectors relatively more than its skilled labor-intensive sectors. The trade restrictiveness index is as high as 56% in the agricultural sector, whereas it is only about 27% in the manufacturing sector, and 12% in the energy sector.

The elimination of this protection structure would translate into a higher percentage reduction in agriculture, an industry with the highest employment share and the highest poverty rates. According to the columns (3) and (4), 36.87% of the labor force is in agriculture, and 44.47% of the workers in this industry are living in households where per capita consumption is below the international poverty line of $1.90. The poverty rates and employment shares in the manufacturing sector are 11.93% and 11.92%, respectively. If we only focus on tariffs ($TTRI$), trade protection is higher in labor-intensive manufacturing compared to capital-intensive manufacturing. However, they are similar when non-tariff barriers are also incorporated in the index ($OTRI$), implying that non-tariff trade restrictions are used more intensely in the capital-intensive industries.

Thus, through the employment channel, Indian trade policy is structured in a way that protects unskilled labor using both tariffs and the combined effect of tariffs and non-tariff barriers as policy tools. In order to formally estimate these effects, we need to evaluate the industry-level price reductions resulting from the elimination of trade restrictiveness for each individual and assess the structure of these effects across the per capita expenditure distribution. An important consideration is the responsiveness of earnings to changes in prices. On one hand, wages may be directly affected by price changes through the

[9] The concordences between the two definitons are readily available at the United Nations database.

[10] These indices are not identical to trade indices presented in Table 2, as they are based on International Standard Industrial Classification (ISIC Rev3), rather than the household expenditure categories in the consumption survey. Some industries in the ISIC Rev3 categories are not household consumption items. For example, 'energy' includes all activities, including extraction and processing of oil and gas, whereas only the end products are represented in the household survey.

cost minimization of firms. This response may be limited if labor market regulations are strict, products markets are imperfectly competitive, or labor markets are imperfectly competitive, among other reasons. On the other hand, individuals may adjust their labor supply due to changes in employment opportunities or changes in the opportunity cost of leisure.

In order to incorporate the responsiveness of earnings, the following earnings equation is estimated.

$$lne_{ijdt} = \alpha_0 + \alpha_1 lnp_{dt} + \alpha_2 \mathbf{X}'_{\mathbf{idt}} + \gamma_s + \beta_t + \delta_j + \varepsilon_{ijdt} \tag{6}$$

where $e_{idt}$ is the weekly earnings of individual $i$ in industry $j$ in district $d$ at time $t$; $lnp_{dt}$ is the price level, $\mathbf{X}'$ is a vector of individual characteristics, $\gamma_s$ is state fixed effects, $\delta_j$ is 2-digit industry fixed effects, $\beta_t$ is year fixed effects, and $\varepsilon_{ijdt}$ is an $i.i.d.$ error term.

Because district level consumer price indices and producer price indices are not available, prices are computed from the corresponding rounds of the NSS Consumer Expenditure Survey where the quantity and value of consumption items are reported for each household. This yields the unit values of consumption items for each household, which are then aggregated up to the district level. One potential problem with aggregation is that a simple average across products and across households may lead to and overrepresentation of relatively unimportant items for which the employment shares are very low. In order to circumvent this problem, the prices are aggregated using a weighted average where weights are the employment shares for each product.

This model is estimated using two rounds of the NSS Employment and Unemployment Survey from the years of 2004-2005 ($61^{st}$ round) and 2009-2010 ($66^{th}$ round). The sample focuses on individuals who reported earnings and are employed in the agriculture, manufacturing or mining sectors. Because there is no restriction on the ages of workers in the household welfare analysis, all ages are included in the earnings regressions. The survey covers formal and informal employment, providing a comprehensive coverage of the labor force in India. State-specific changes in policies or industry-specific changes in productivity or cost structure may bias the elasticity estimates. Additional specifications are thus estimated using state-specific trends, state-year fixed effects, and industry-year fixed effects. Because the aim is to assess the distributional effects, the model is also estimated separately for three different educational categories.

Results presented in Table 5 show that prices have significant and positive effects on earnings. According to the OLS results, the elasticity of earnings with respect to prices is about 3%, and this estimate is robust to interacting state or industry fixed effects with the year fixed effects. The estimates are lower for individuals with low education, while they increase along the education profile. Based on column (3), the estimated coefficient is insignificantly different than zero for individuals with primary education or below, 3.8% for individuals with secondary education, and 4.6% for individuals with

tertiary education. The higher responsiveness may potentially be due to the fact the share of formal employment is higher among individuals with more education. It may also be consistent with the results in the literature that agricultural wages tend to be sticky, as individuals with primary education or below are disproportionately employed in agriculture.

The prices in Equation 6 may be endogenous, as district-level shocks may be associated with higher wages and may also lead to increases in prices. Columns (4) to (6) present the results where employment-weighted prices are instrumented by an alternative definition of employment weights that represent employment shares in all states, except the state in which the district is located. The coefficients are higher with this instrumentation, but relatively robust across different specifications. Based on column (6), the estimated coefficients increase to 5.8% for individuals with primary education or below, 18% for individuals with secondary education and 16% for individuals with tertiary education.[11]

The second component of Equation 1 evaluates the price changes induced by the elimination of current trade policy, as well as the price elasticity of earnings, which are evaluated for each individual. The household-level effects are obtained by adding all individual level effects, weighted by the importance of that individual-level income, $\theta_{w_{ch}}$. These estimates represent the welfare loss through the earnings channel as a percentage of their initial expenditure levels. The decile-level average of the earnings effects are presented in Table 5, and the result of the local linear regression of the earning effects on the per capita expenditure of households is presented in Figure 5. The overall trend is positive, implying that the removal of trade protection would result in a higher welfare loss among poorer households. Thus, the current trade policy is pro-poor through the earnings channel. Overall, the lowest decile incurs a 3% welfare loss through earnings from protection of both tariff and non-tariff barriers, while this effect is 1% for the richest decile. The losses are lower in the middle of the distribution, as the share of unskilled workers is relatively high in this part of the distribution. The average earnings reduction as a percentage of initial expenditure levels are estimated to be 6.5% for agricultural households, 2% for households for households in energy sector, and 3.5% for workers in the manufacturing sector.[12]

[11]The following robustness tests are conducted: The inclusion of nontradable sectors yields lower elasticities. The exclusion of children below 15 years of age yields results that are similar to the baseline estimates. The use of precipitation rates in each region as an instrument provides robust results. The use consumption shares instead of employment shares as weights provide lower OLS estimates in magnitude, potentially due to similar expenditure shares across regions. The splitting of the sample across industry categories rather than education categories yields lower estimates for agriculture and mining, and slightly higher estimates for manufacturing.

[12]The primary industry of the household is used to construct this table. However, welfare analyses are based on the industry affiliation of the individual rather than the household.

# 7 Effect of Trade Restrictiveness on Inequality

The net effects through the consumption and earnings channels are presented in Table 7. The results suggest that individuals in the lowest decile experience a 12% welfare gain through the elimination of tariffs, and a 18.4% welfare gain through the elimination of tariffs and non-tariff trade barriers. Both of these effects decrease along the per capita expenditure distribution. The welfare effects for households at the highest decile are 7.8% and 10.1% for the elimination of tariffs and all trade restrictions, respectively. Because the poorest households gain relatively more from the elimination of trade protection, it follows that the current protection structure is more costly to poor individuals relative to better-off individuals. This can also be seen from Figure 6, which presents the results of the local linear regressions for the elimination of both tariffs and non-tariff trade barriers. The effect monotonically decreases for low to medium-high per capita expenditure households, and it starts to increase once again for high income households as the earning effect dissipates.

Suppose the initial welfare of the household is defined as $W$ and defined as the per capita expenditure of the household. While per capita expenditure may not be a complete measure of well-being, it is assumed to represent the general well-being of the household for the inequality analysis. We can then compare the distributional properties of this welfare measure to the properties of welfare under free trade, as defined by $W_h + dW_h$, where $dW_h$ is defined in Equation 1. The results presented in Table 8 suggest that welfare inequality is lower under free trade for all inequality measures considered in the paper. The $p90/p10$ percentile ratio decreases from its initial level of 4.7 to 4.6 once tariffs are eliminated, and to 4.5 once all trade restrictions are eliminated. In all percentile measures, inequality is smaller once non-tariff barriers are reduced to zero, with the exception of the $p10/p50$ measure, potentially due to the lower earnings effect in the middle of the distribution. Gini coefficient of welfare inequality is reduced from its initial level of 0.32 to 0.30 once tariffs and non-tariff barriers are eliminated. Atkinson's measure of inequality also decreases to 0.30 from 0.32. Sen's Social Welfare Index, defined as $Mean(1 - Gini)$, is estimated to be higher under free trade compared to social welfare under the current trade regime.

Next, I estimate the index of pro-poor bias in the structure of protection, as in Nicita et al. (2014). This measure is defined as the difference in the percentage change in the welfare of the average household in the top $d_r$ deciles and the percentage change in welfare of the average household in the bottom $d_p$ deciles. It is defined as:

$$P_d = E[dW_h|Q_h = d_r] - E[dW_h|Q_h = d_p] \tag{7}$$

where $Q_h$ is the quintile to which household $h$ belongs. This measure is computed by setting $d_r$ and $d_p$ at the top and bottom 40% of the distribution and checking for robustness

using the top and bottom 20% of the distribution. The results are presented in Table 9. The positive values in this table indicate that the elimination of trade barriers benefits rich households more than poor households, thus the current structure of protection is pro-poor. A negative value, on the other hand, indicates a pro-rich trade policy. The results indicate that India's trade policy is pro-poor through earnings, pro-rich through expenditure, and the overall bias of trade protection is also pro-rich. The direction of bias is robust to adding non-tariff trade barriers, and to considering the top and bottom 20% instead of the top and bottom 40%.

# 8 Conclusion

This paper investigates the pro-poor bias of current trade policy of India. If removal of current trade restrictions leads to higher welfare gains for rich individuals as compared to poor individuals, then the protection structure is pro-poor, as it implies that the poor do not bear a disproportionate burden of the trade protection. On the other hand, if poor individuals experience higher welfare gains from elimination of trade barriers, then the trade policy is deemed to be pro-rich, as it would imply that the welfare cost is disproportionately high for poor households. This paper focuses on the effects on household welfare through the expenditure channel and the earnings channel. It is possible that trade policy is designed in a way that protects relatively low skilled workers, and thus have pro-poor bias through the earnings channel. However, if the products that use unskilled labor more intensively have a higher budget among poorer households, the same protection structure may be pro-rich through the consumption channel. The overall pro-poor bias of trade policy depends on the relative magnitude of these effects.

Overall, the results suggest that Indian trade protection structure places a disproportionate burden on the households on the low end of the distribution. On one hand, the protection level is higher for products that have a high budget share of poor individuals, and higher prices associated with higher levels of protection cause higher welfare cost for the poorest households. One the other hand, trade protection is relatively higher in industries in which unskilled workers are concentrated, thus the protection structure is pro-poor in the sense that it protects unskilled labor more than skilled labor. However, the direct effect through the earnings channel only applies to workers who are employed in these industries, while the consumption channel affects all households. In addition, earnings are not perfectly responsive to price changes. For these reasons, the pro-rich effect through the consumption channel dominates the pro-poor effect through the earnings channel.

The estimated pro-poor bias in this paper is based on first order effects only, as it uses a baseline budget structure and employment structure in latest available household surveys. There may also be second order effects. For example, consumers may substitute between

consumption items and change their budget structure. The structure of employment may change as some industries expand and the other contract. That said, these second-order effects tend to be small in magnitude. Another limitation of the paper is that it presents the pro-poor bias only through its impact on the household budget and earnings. While these are arguably two of the most important channels, there may be other effects through assets, government transfers, remittances, and farm profits. These channels should be investigated in future work as more data become available.

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# 9 Tables

**Table 1: Expenditure Shares Across Deciles**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | | Tradable Goods | | | |
| | Tradable Goods | Food | Energy | Manufacturing | Nontradable Services |
| 1 | 83.43 | 68.67 | 9.02 | 5.78 | 16.57 |
| 2 | 81.15 | 67.27 | 8.05 | 5.86 | 18.85 |
| 3 | 79.35 | 65.95 | 7.37 | 6.04 | 20.65 |
| 4 | 77.48 | 64.47 | 6.90 | 6.13 | 22.52 |
| 5 | 75.40 | 62.60 | 6.48 | 6.33 | 24.60 |
| 6 | 72.90 | 60.29 | 6.07 | 6.54 | 27.10 |
| 7 | 70.25 | 57.87 | 5.52 | 6.86 | 29.75 |
| 8 | 65.90 | 53.75 | 4.93 | 7.23 | 34.10 |
| 9 | 60.40 | 48.49 | 4.15 | 7.77 | 39.60 |
| 10 | 51.82 | 39.15 | 3.05 | 9.62 | 48.18 |
| Overall | 71.91 | 58.94 | 6.16 | 6.80 | 28.09 |

*Notes*: The household consumption items and ISICRev3 industry categories are merged to create composite categories of household consumption. Averages of expenditure shares across per capita expenditure deciles are presented.

**Table 2: Trade Restrictiveness Indices across Expenditure Items**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | $TTRI$ | $OTRI$ | $\Delta lnp^{TTRI}$ | $\Delta lnp^{OTRI}$ |
| Expenditure Categories: | | | | |
| **Food** | 36.19 | 54.08 | -22.58 | -28.82 |
| | (35.78) | (60.15) | (16.36) | (18.47) |
| *Grains* | 29.18 | 75.44 | -19.46 | -30.44 |
| | (28.14) | (110.17) | (17.37) | (25.23) |
| *Other Food* | 32.89 | 43.52 | -21.60 | -26.93 |
| | (30.00) | (32.82) | (14.93) | (15.98) |
| **Energy** | 8.65 | 21.33 | -7.52 | -15.41 |
| | (8.86) | (23.59) | (6.80) | (14.04) |
| **Manufacturing** | 13.29 | 29.03 | -9.70 | -19.78 |
| | (22.48) | (27.86) | (10.60) | (13.33) |
| *Textile* | 7.97 | 20.12 | -7.35 | -16.43 |
| | (2.51) | (9.03) | (2.18) | (6.38) |
| *Nondurables* | 7.19 | 17.43 | -6.64 | -13.97 |
| | (2.99) | (13.21) | (2.67 ) | (9.12 ) |
| *Durables* | 15.84 | 33.72 | -10.94 | -21.99 |
| | (26.64) | (31.58) | (12.48) | (14.65) |
| **All** | 22.65 | 39.07 | -15.00 | -23.28 |
| | (30.40) | (45.73) | (14.58) | (16.29) |

*Notes*: Table presents means and standard deviations of trade restrictiveness indices, which are estimated across composite categories according to the Equations 2 and 2. The broad categories are indicated with bold letters, and sub-categories are indicated with italic letters. $\Delta lnp^{TTRI}$ and $\Delta lnp^{TTRI}$ are computed according to Equation 5.

**Table 3: Change in the Cost of Household Consumption Basket**

| | Food | | Energy | | Manufacturing | | All Items | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Tariffs | Tariffs and NTBs | Tariffs | Tariffs and NTBs | Tariffs | Tariffs and NTBs | Tariffs | Tariffs and NTBs |
| 1 | 13.38 | 20.50 | 0.40 | 0.52 | 0.21 | 0.38 | 13.99 | 21.41 |
| 2 | 12.83 | 19.26 | 0.36 | 0.48 | 0.23 | 0.40 | 13.41 | 20.14 |
| 3 | 12.46 | 18.53 | 0.33 | 0.45 | 0.25 | 0.44 | 13.04 | 19.42 |
| 4 | 12.08 | 17.80 | 0.30 | 0.43 | 0.28 | 0.46 | 12.66 | 18.69 |
| 5 | 11.58 | 16.81 | 0.28 | 0.43 | 0.33 | 0.52 | 12.19 | 17.75 |
| 6 | 11.05 | 15.91 | 0.26 | 0.42 | 0.37 | 0.57 | 11.69 | 16.89 |
| 7 | 10.47 | 14.93 | 0.24 | 0.41 | 0.45 | 0.65 | 11.15 | 15.99 |
| 8 | 9.70 | 13.67 | 0.21 | 0.38 | 0.55 | 0.76 | 10.45 | 14.81 |
| 9 | 8.70 | 12.09 | 0.17 | 0.34 | 0.70 | 0.92 | 9.57 | 13.35 |
| 10 | 6.87 | 9.30 | 0.12 | 0.24 | 1.30 | 1.57 | 8.30 | 11.12 |
| All | 10.93 | 15.91 | 0.27 | 0.41 | 0.46 | 0.66 | 11.64 | 16.96 |

Notes: The reduction in cost is based on the first component of Equation 1. The estimated mean within each decile and product category is presented. The standard errors of the mean estimations are omitted for brevity.

## Table 4: Trade Restrictiveness Indices and Composition of Workers

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | *TTRI* | *OTRI* | % Employment | % Poor |
| Industry Categories: | | | | |
| **Agriculture** | 31.34 | 56.34 | 36.87 | 44.47 |
| | (6.57) | (16.59) | | |
| **Energy** | 11.67 | 11.67 | 0.75 | 0.72 |
| | (8.76) | (8.76) | | |
| **Manufacturing** | 10.67 | 27.74 | 11.93 | 11.92 |
| | (15.10) | (24.23) | | |
| *Labor Intensive* | 13.97 | 25.92 | 5.53 | 5.29 |
| | (19.43) | (23.19) | | |
| *Capital Intensive* | 8.17 | 24.36 | 6.40 | 6.63 |
| | (10.84) | (17.62) | | |
| **Nontradable** | | | 50.45 | 42.90 |

*Notes*: Means and standard deviations of trade restrictiveness indices across industries are presented. The broad categories are indicated with bold letters, and sub-categories are indicated with italic letters. The distribution of employment across sectors are presented in column (3). All age groups are included in the estimates. The distribution of poor individuals across industries is presented in column (4). The poverty line is the international poverty line of $1.90 per person per day evaluated at the 2010 PPP of Rs 18.7 (World Development Indicators, 2017). Capital intensive manufacturing industries are determined as 2-digit NIC 1987 industries with higher than median level of capital-labor ratio according to the Annual Survey of Industries (1999). These capital-intensive industry categories are: manufacture of food products; wood silk and man-made fiber; vegetable fibre textiles; textile products; wood and wood Products; paper and paper products; basic chemicals; metal products and parts.

**Table 5: Effect of district-level consumer prices on earnings**

| | OLS | | | IV | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Dependent Variable: ln(earnings)* | | | | | | |
| *All India* | | | | | | |
| $ln(p)$ | 0.031*** | 0.027** | 0.027** | 0.100*** | 0.107*** | 0.105*** |
| | (0.010) | (0.011) | (0.011) | (0.022) | (0.033) | (0.032) |
| $N$ | 50120 | 50120 | 50120 | 50120 | 50120 | 50120 |
| $R^2$ | 0.650 | 0.652 | 0.653 | 0.647 | 0.648 | 0.649 |
| Kleibergen-Paap | | | | 16.837 | 17.164 | 16.777 |
| *Primary and Below* | | | | | | |
| $ln(p)$ | 0.021** | 0.015 | 0.015 | 0.068*** | 0.060* | 0.058* |
| | (0.008) | (0.009) | (0.009) | (0.023) | (0.032) | (0.032) |
| $N$ | 33,340 | 33,340 | 33,340 | 33,340 | 33,340 | 33,340 |
| $R^2$ | 0.465 | 0.470 | 0.472 | 0.464 | 0.470 | 0.472 |
| Kleibergen-Paap | | | | 144.651 | 125.17 | 126.83 |
| *Secondary* | | | | | | |
| $ln(p)$ | 0.041*** | 0.039*** | 0.038*** | 0.149*** | 0.178*** | 0.176*** |
| | (0.012) | (0.013) | (0.013) | (0.026) | (0.040) | (0.039) |
| $N$ | 13,949 | 13,949 | 13,949 | 13,949 | 13,949 | 13,949 |
| $R^2$ | 0.475 | 0.480 | 0.482 | 0.475 | 0.480 | 0.482 |
| Kleibergen-Paap | | | | 92.00 | 84.34 | 86.4 |
| *Tertiary* | | | | | | |
| $ln(p)$ | 0.056** | 0.053** | 0.046** | 0.115** | 0.162*** | 0.159** |
| | (0.022) | (0.024) | (0.023) | (0.048) | (0.063) | (0.065) |
| $N$ | 2,923 | 2,923 | 2,923 | 2,923 | 2,923 | 2,923 |
| $R^2$ | 0.47 | 0.483 | 0.497 | 0.468 | 0.479 | 0.495 |
| Kleibergen-Paap | | | | 52.54 | 54.78 | 54.59 |
| State FE | Yes | No | No | Yes | No | No |
| Year FE | Yes | No | No | Yes | No | No |
| 2-digit Industry FE | Yes | Yes | No | Yes | Yes | No |
| State*Year FE | No | Yes | Yes | No | Yes | Yes |
| Industry*Year | No | No | Yes | No | No | Yes |

*Notes*: All regressions include age, age-squared, a dummy for male workers, a dummy for married workers, a dummy for rural households, and education indicators. In columns (4)-(6), the $ln(p)$ variable is instrumented with employment-weighted prices within districts where the weights are employment shares except the state in which the district is located. Employment weighs are from the 2004-2005 ($61^{st}$ round) of the NSS Employment and Unemployment Survey. Education categories are defined as primary or below (not literate, literate without formal schooling, literate below primary, and primary), secondary (middle, secondary, and higher secondary), and tertiary (diploma/certificate course, graduate, postgraduate and above). Standard errors are clustered within districts.

**Table 6: Change in Earnings Following the Elimination of Trade Protection**

| | Agriculture | | Energy | | Manufacturing | | All Sectors | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Tariffs | Tariffs and NTBs | Tariffs | Tariffs and NTBs | Tariffs | Tariffs and NTBs | Tariffs | Tariffs and NTBs |
| 1 | -4.12 | -6.19 | -1.87 | -2.39 | -1.58 | -3.13 | -1.94 | -3.02 |
| 2 | -4.36 | -6.57 | -1.78 | -2.15 | -1.65 | -3.49 | -1.97 | -3.11 |
| 3 | -4.47 | -6.75 | -1.76 | -2.06 | -1.55 | -3.30 | -2.05 | -3.23 |
| 4 | -4.43 | -6.73 | -1.77 | -1.97 | -1.65 | -3.54 | -1.99 | -3.15 |
| 5 | -4.45 | -6.75 | -1.87 | -1.99 | -1.60 | -3.63 | -1.86 | -2.97 |
| 6 | -4.49 | -6.79 | -2.09 | -2.39 | -1.54 | -3.67 | -1.73 | -2.79 |
| 7 | -4.26 | -6.47 | -2.04 | -2.24 | -1.48 | -3.48 | -1.44 | -2.35 |
| 8 | -4.28 | -6.53 | -1.84 | -2.01 | -1.42 | -3.53 | -1.21 | -2.02 |
| 9 | -4.09 | -6.27 | -2.01 | -2.06 | -1.44 | -3.46 | -0.86 | -1.49 |
| 10 | -3.65 | -5.57 | -1.38 | -1.51 | -1.47 | -3.42 | -0.57 | -1.02 |
| All | -4.26 | -6.46 | -3.83 | -2.08 | -1.54 | -3.47 | -1.56 | -2.51 |

*Notes*: The change in earnings is based on the second component of Equation 1. The estimated mean within each decile and product category is presented. The standard errors of the mean estimation are omitted for brevity.

**Table 7: Changes in Welfare Following the Elimination of Trade Protection**

| | (1) | (2) |
|---|---|---|
| | Tariffs | Tariffs and NTBs |
| 1 | 12.05 | 18.39 |
| | (0.05) | (0.09) |
| 2 | 11.44 | 17.03 |
| | (0.05) | (0.09) |
| 3 | 10.99 | 16.18 |
| | (0.05) | (0.08) |
| 4 | 10.67 | 15.53 |
| | (0.04) | (0.07) |
| 5 | 10.33 | 14.77 |
| | (0.04) | (0.06) |
| 6 | 9.95 | 14.10 |
| | (0.04) | (0.06) |
| 7 | 9.70 | 13.64 |
| | (0.04) | (0.06) |
| 8 | 9.24 | 12.79 |
| | (0.04) | (0.06) |
| 9 | 8.71 | 11.86 |
| | (0.04) | (0.06) |
| 10 | 7.77 | 10.12 |
| | (0.08) | (0.11) |
| All | 10.08 | 14.44 |
| | (0.05) | (0.06) |

*Notes*: The change in welfare following the elimination of trade protection is estimated according to Equation 1. The mean and the standard error of the mean is presented for each per capita expenditure decile.

**Table 8: Welfare Inequality Following the Elimination of Trade Protection**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | p90/p10 | p90/p50 | p10/p50 | p75/p25 | Gini | Atkinson (2) | Sen's Social Welfare Index |
| Initial | 4.741 | 2.443 | 0.515 | 2.245 | 0.367 | 0.323 | 105,473 |
| Post-TTRI | 4.607 | 2.400 | 0.521 | 2.209 | 0.361 | 0.314 | 116,369 |
| Post-OTRI | 4.501 | 2.372 | 0.527 | 2.180 | 0.356 | 0.306 | 121,186 |

*Notes*: Initial welfare is the per capita expenditure of the household ($W$). Post-TTRI is computed as $W(1+\Delta W_{TTRI})$, and post-OTRI is computed as $W(1+\Delta W_{OTRI})$, where both values incorporate the effects through wages and consumption. Sen's Social Welfare Index is defined as $Mean(1-Gini)$.

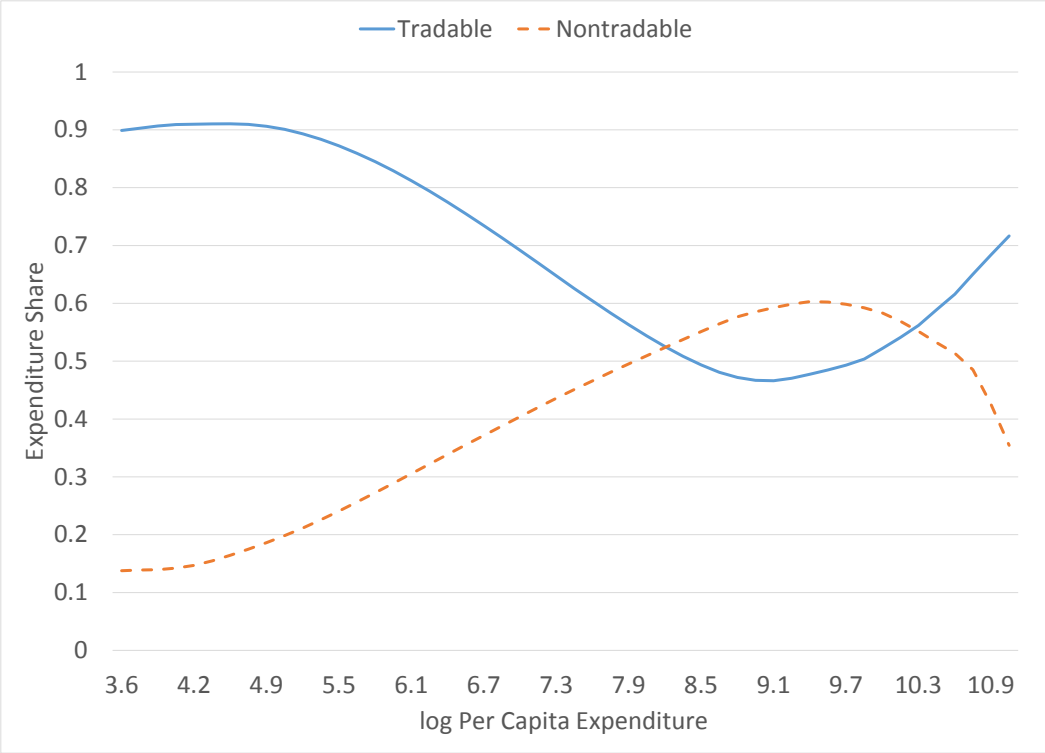
**Table 9: Index of Pro-poor Bias in Trade Policy**

| | Tariffs | | | Tariffs and NTBs | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Overall | Expenditure | Earnings | Overall | Expenditure | Earnings |
| Top 40%-bottom 40% | -2.43 | -3.40 | 0.97 | -4.68 | -6.09 | 1.41 |
| Top 20%-bottom 20% | -3.51 | -4.75 | 1.24 | -6.72 | -8.53 | 1.81 |

*Notes*: This table presents the pro-poor bias index of trade policy based on Equation 7. Positive value indicates that the existing trade policy is pro-poor. The standard errors of the mean estimation omitted for brevity.

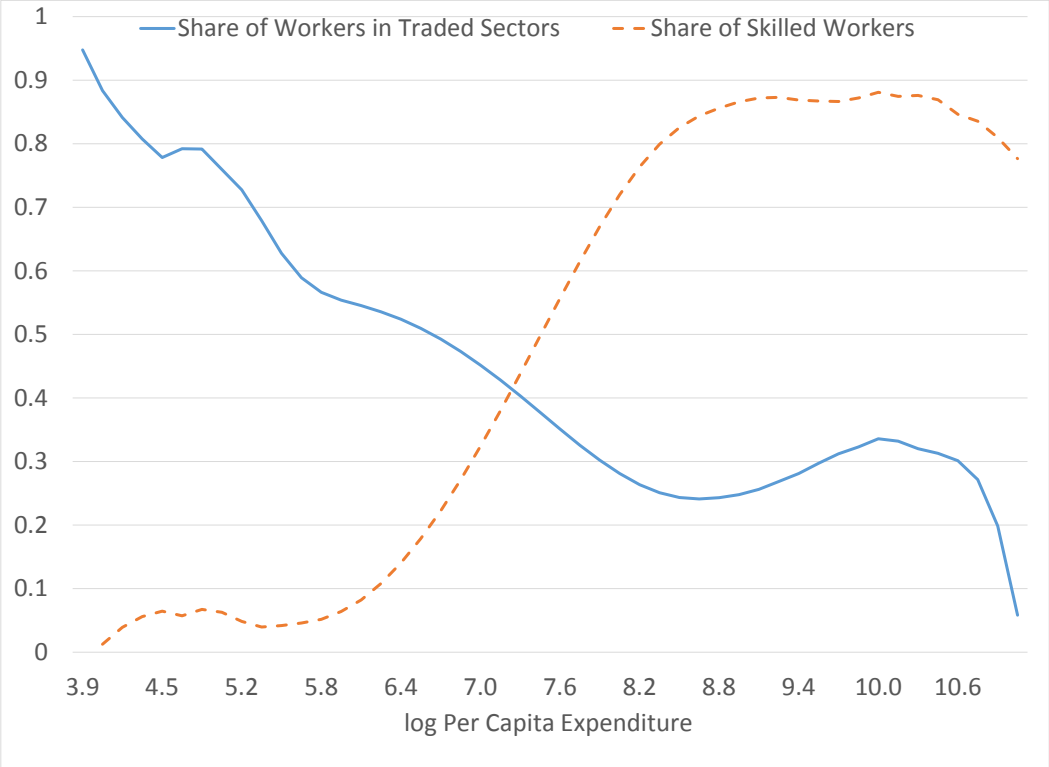
# 10 Figures

**Figure 1:** Expenditure Share of Internationally-Tradable Merchandise



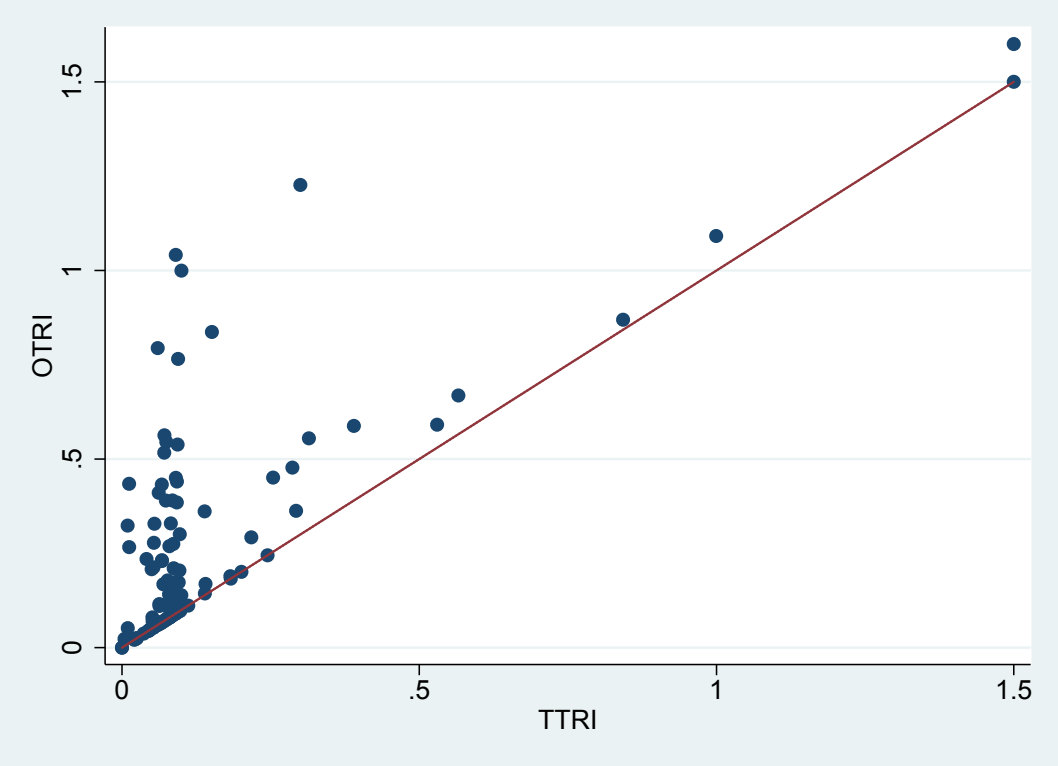

*Notes*: Tradable goods include food, energy and manufactured items. Nontradable goods include education, housing, medical services, and other services. Source: Government of India National Sample Organization. 2010. Employment and Unemployment Survey, $66^{th}$ Round.

**Figure 2:** Share of Workers in the Tradable Sectors and Share of Skilled Workers



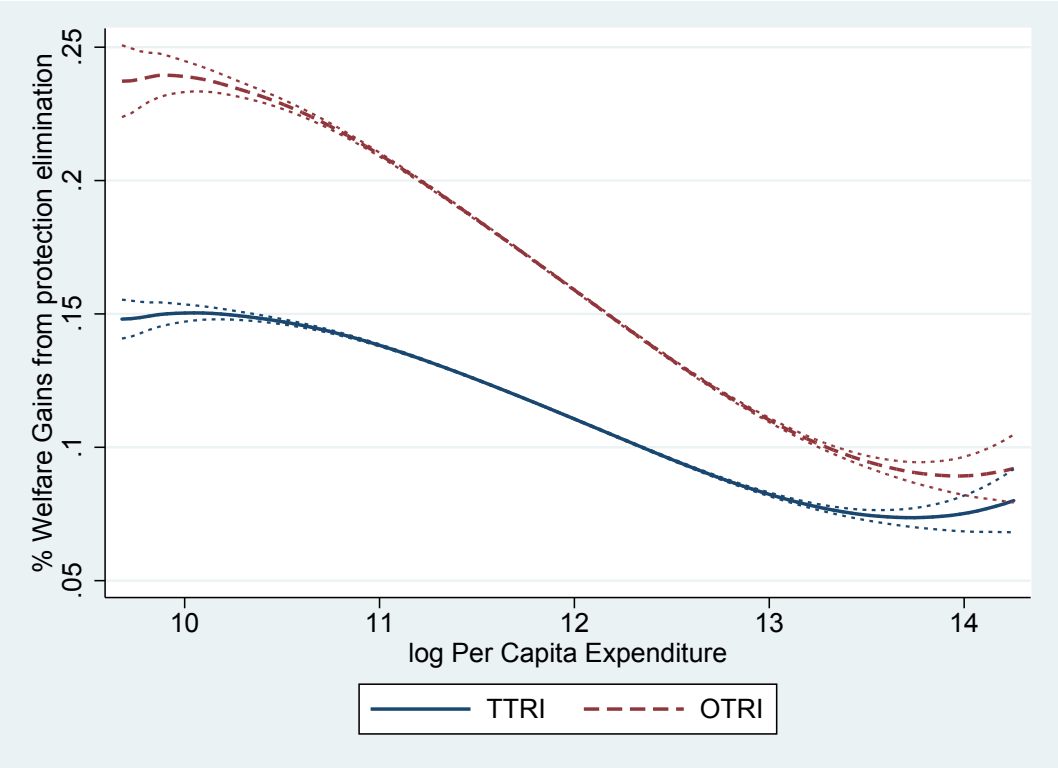

*Notes*: Tradable sectors include agriculture, manufacturing, and mining sectors. A skilled worker is defined as a worker with at least secondary education. Source: Government of India National Sample Organization. 2010. Employment and Unemployment Survey, $66^{th}$ Round.

**Figure 3:** Correlation between Trade Restrictiveness based on Tariffs (TTRI) and All Trade Policy Tools (OTRI)



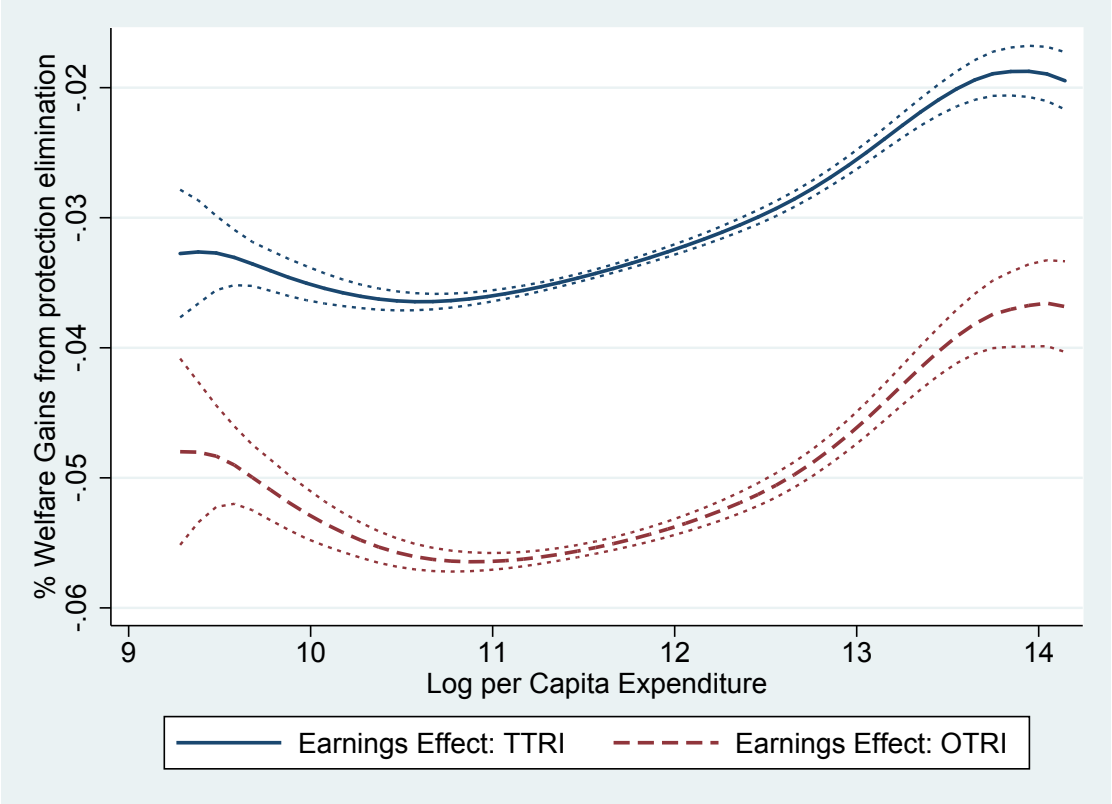

*Notes*: This figure presents results of Equations 2 and 4. Each scatter point represents a 4-digit ISIC 3 Rev Industry. The red line shows the 45 degree line.

**Figure 4:** Expenditure Effect of Trade Restrictiveness across Per Capita Expenditure Spectrum



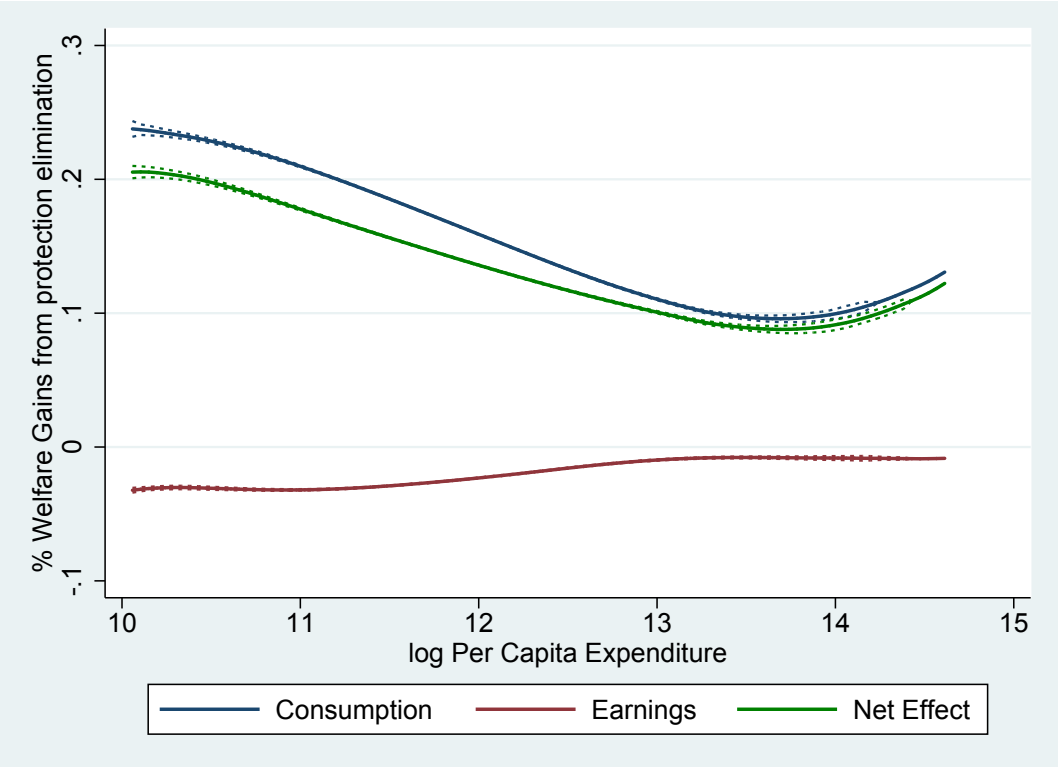

*Notes*: This figure shows the local linear regression of the consumption component of Equation 1 on per capita income. Short-dash lines shows the 95% confidence intervals.

**Figure 5:** Earnings Effect across the Per Capita Expenditure Spectrum




*Notes*: This figure shows the local linear regression of the earnings component of Equation 1 on per capita income. Short-dash lines shows the 95% confidence intervals.

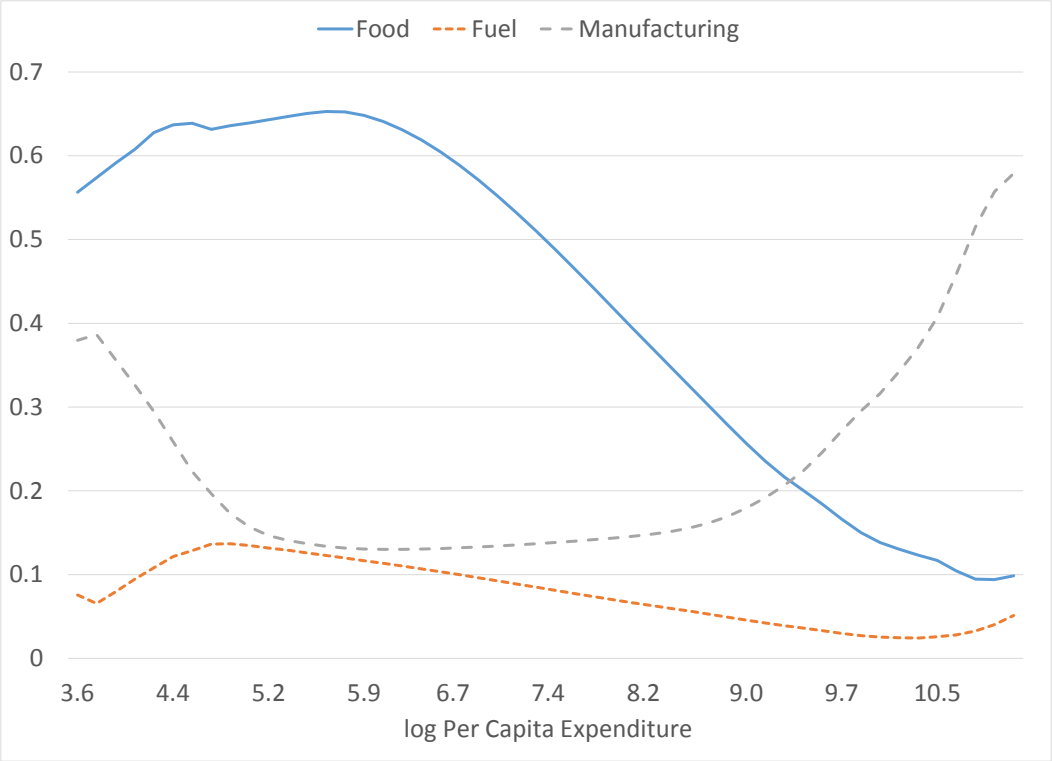
**Figure 6:** Net Welfare Effect across the Per Capita Expenditure Spectrum (OTRI)




*Notes*: The figure shows local linear regression of the net effect, consumption effect, and earnings effect based on Equation 1 on per capita income. Short-dash lines show the 95% confidence intervals.

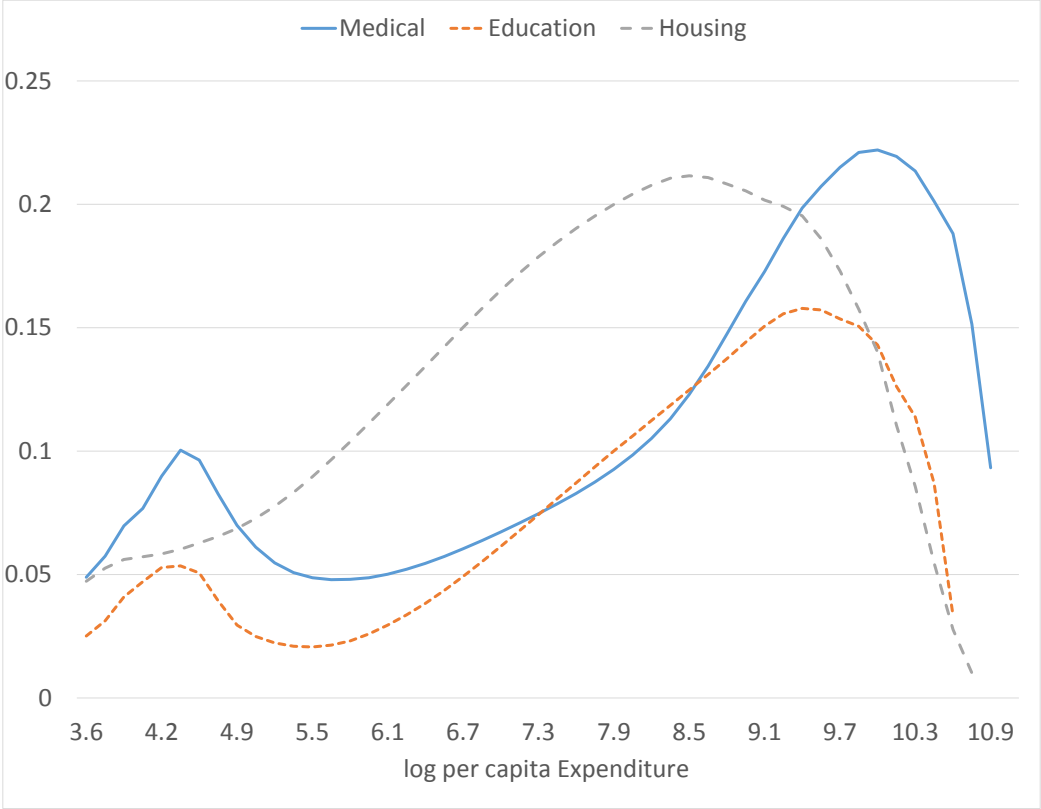
# A Appendix

**Figure A.1:** Brake-up of Tradable and Nontradable Budget Shares



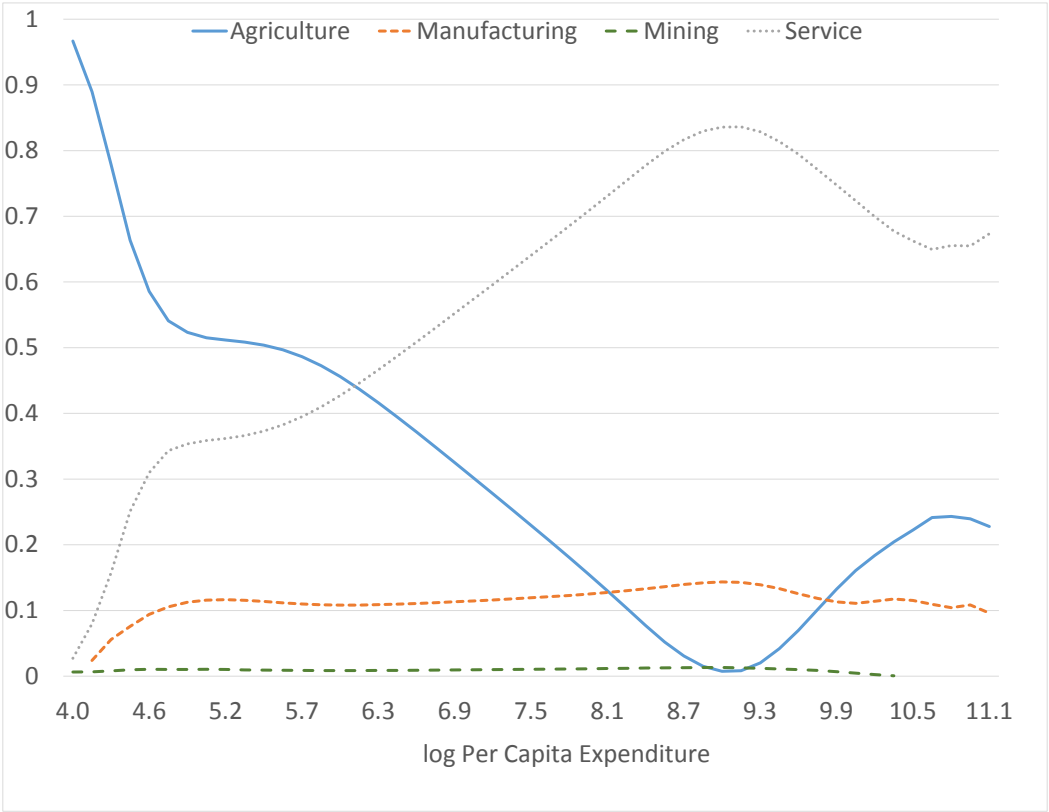

*Notes*: Government of India National Sample Organization. 2010. Employment and Unemployment Survey, $66^{th}$ Round.

**Figure A.2:** Brake-up of Nontradable Budget Shares




*Notes*: Government of India National Sample Organization. 2010. Employment and Unemployment Survey, $66^{th}$Round.

**Figure A.3:** Break-up of Workers in Tradable and Nontradable Sectors




*Notes*: Tradable sectors include agriculture, manufacturing, and mining sectors. Source: Government of India National Sample Organization. 2010. Employment and Unemployment Survey, $66^{th}$ Round.