ABSTRACT

Title of Dissertation:	Essays on Inequality and Reforms: Evidence from India
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Economic reforms along with its promise of increasing income and growth rates have also raised concerns about its distributional implications. These concerns are at the heart of the arguments of those who oppose certain economic reforms. Focusing on the economic reforms implemented in India, we investigate the distributional implications of the reforms using four waves of nationally representative household survey data over the period 1983 to 2000. Chapter 1 provides an overview of the economic policies in India, including a discussion of the reforms implemented in 1991. We also examine the economic performance across states and regions in India over the period 1980-2000.

Chapter 2 investigates the role of economic geography, as measured by proximity to markets and suppliers. In this chapter we ask two questions, first

whether market access affects regional wage inequality and second, whether that has changed after the reforms in 1991 were implemented. With the deregulation of private sector activity implemented as a part of the reforms, location features such as proximity to markets and suppliers are likely to influence the location of new investments. The differences in spatial features contribute to the between-region component of the total income inequality. We find that regions closer to the ports have higher wages associated with them. On the other hand, greater proximity to domestic markets and sources of supply are not associated with higher region wage premia before liberalization. However, there is heterogeneity in their role over the time period under study. We find that post-reforms the role of domestic market and supply access has become stronger and they have a positive and statistically significant impact on wages associated with a region. The effect of greater access to ports does not appear to have become any stronger post-reforms. This suggests that the share of the between-region component in the total income inequality will be higher, resulting in an increase in spatial income inequality, in the post-reform period.

Chapter 3 evaluates empirically the impact of the dramatic 1991 trade liberalization in India on its industry wage structure. The empirical strategy uses the variation in industry wage premia and trade policy across industries and over time. We find a strong and robust relationship between reductions in Indian trade barriers and an increase in the industry wage premia over time. We also find that trade liberalization has led to decreased wage inequality between skilled and unskilled workers in India.

Essays on Inequality and Reforms: Evidence from India

By

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Dedication

To my parents, Professor Balraj Kumar and Mrs. Neelam Gupta.

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Chapter 1: Introduction

Economic reforms along with its promise of increasing income and growth rates have also raised concerns about its distributional implications. These concerns are at the heart of the arguments of those who oppose certain economic reforms.

There are various reasons that make it interesting to look at the issue of inequality and why we care about inequality. Many economists view inequality as a necessary evil at worst and a "reasonable" price to pay at best for growth. Birdsall (2005), in an overview on the issue of inequality and development, provides the counter-argument that inequality is "destructive" and that it restricts growth. This is especially true in the case of developing countries where markets are not as competitive and where governments are not as effective in compensating for the weakness of the markets through public policy. Thus, inequality matters for growth.

In addition, inequality undermines good public policy—inhibiting growth promoting and poverty reduction policies. The rich can influence policy to maintain their status quo, which can be growth inhibiting. This is more so the case if there is concentration of income at the top, a small middle class and substantial poverty at the bottom. Thus, inequalities can also to lead government failure. On the other hand, when those disadvantaged do have a political voice, inequality increases the likelihood of populist programs that can make inequality worse and also restrict growth.

Also, persistent inequality can change the incentive structure of individuals. If there is limited vertical mobility, as is the case in developing countries, this might distort the incentives of individuals at the lower end of the distribution to invest in education and acquire human capital as they find themselves in a low-income trap across generations. This can lead to a vicious circle of low education and persistent income inequality.

Further, if income or well-being of other individuals enters our own utility function, disparities in incomes affects our own welfare. According to this view, an individual tends to view income as a measure of their worth in the society and their status relative to others. Increasing disparities can lead to perceptions of injustice and unfairness. These perceptions of increasing gaps can lead to perverse policy choices.

The issue of who wins and who loses as a consequence of the reforms is a critical one and can be analyzed from various perspectives. In this dissertation, focusing on the economic reforms implemented in India in 1991, we investigate this question along two dimensions.

First, in Chapter 2, we analyze whether location affects regional inequality in India and whether that effect was exacerbated or ameliorated by the recent economic reform. More specifically, we focus on the role of proximity to markets and suppliers in influencing the wages associated with a location. With de-licensing and deregulation of private manufacturing sector activity which were implemented as a part of the reforms, spatial features are likely to influence decision-making in the private sector.

We find regions closer to the ports have higher wages associated with them. On the other hand, greater proximity to domestic markets and sources of supply are not associated with higher region wage premia before liberalization. However, there is heterogeneity in their role over the time period under study. We find that post-reforms the role of domestic market and supply access has become stronger and they have a positive and statistically significant impact on wages associated with a region. The effect of greater access to ports does not appear to have become any stronger post-reforms. One possible reason we see no change in the importance of ports could be that India's growth path has been unique, it has relied more on domestic markets than exports (Das (2006)) and external trade in India has not "taken off" in the same fashion as it has for China and Mexico.

These spatial features (i.e., proximity to ports, domestic markets and suppliers) contribute to the between-region component of the total income inequality. With no change in the role of ports and an increased importance of domestic market and supply access, results in Chapter 2 suggest that the share of the between-region component in the total income inequality will be higher, resulting in an increase in spatial income inequality, in the post-reform period.

Second, in Chapter 3 (joint with Prachi Mishra) we evaluate the impact of trade liberalization in India on its industry wage structure. In the process, we also provide an answer to the broader question of what happened to the wage inequality between skilled and unskilled workers as a result of the trade reforms. The empirical strategy uses the variation in industry wage premia and trade policy across industries and over time. In contrast to most of the earlier studies on developing countries, we find a strong and robust relationship between reductions in the Indian trade barriers and an increase in the industry wage premia over time. The results are consistent with liberalization-induced productivity increases at the firm level, which get passed on to industry wages.

The relationship between trade policy and industry wage premia has important implications for the impact of trade liberalization on wage inequality. Since different industries employ different shares of skilled workers, changes in industry wage premia translate into changes in relative incomes of skilled and unskilled workers. Further, the tariff reductions were relatively larger in sectors with a higher proportion of unskilled workers and these sectors experienced an increase in wages relative to other sectors, this implies that the unskilled workers experienced an increase in incomes relative to skilled workers. Thus, we find that trade liberalization has led to decreased wage inequality between skilled and unskilled workers in India through the wage premium channel in India.

We use individual level data nationally representative survey undertaken by the National Sample Survey Organization (NSSO) for the years 1983, 1987-88, 1993-94 and 1999-2000 to investigate these issues.

The next section summarizes the main aspects of economic policy in India over the period 1947-2000, including a discussion of the reforms implemented in 1991. This is followed by a discussion of economic performance across states and regions in India over the period 1980-2000. The chapter concludes with an overview of the trade policy.

1.1 Economic Policy in India

Before we delve into the analysis of who wins and who loses from reforms, it is important to understand the economic scenario that prevailed in India prior to reforms. With the discussion below we hope to bring forth the point that the economic reforms marked a sea-change in the economic policies of India. We highlight the key aspects of the trade and industrial policies and the changes introduced in these areas.

1.1.1 1947-1980: A Snapshot

In this section, we provide a brief overview of the development strategy in India after Independence in 1947. The discussion here presents only the main features and we refer the reader to some of the excellent literature on this subject for additional details.[1] As India emerged from colonialism in 1947, under the leadership of Prime Minister Jawaharlal Nehru and P. C. Mahalanobis, it embarked upon a socialist strategy of development which was implemented via Five-Year Plans.

This strategy envisaged a heavy role for the government and the public sector in shaping India's economy and industrialization. Having just emerged from colonialism, self-sufficiency was the top most priority. This combined with the need to reduce dependence on foreign exchange and to channel the available resources in the "right" direction led to a highly restrictive trade policy and a heavily regulated private sector. In addition, to achieve the goals of equality and balanced regional development, which could not be left to the private sector, government adopted a system of industrial licensing and quotas to regulate private sector activity and trade. The development strategy relied on a mix of import-substitution, prominent role of the government in providing infrastructure, creation of domestic heavy industries (solely reserved for the public sector in some cases), and as a regulator and provider (sometimes sole) of goods and services to achieve rapid industrialization.

[1] A more detailed account can be found in the following references: Bhagwati and Desai (1970), Bhagwati and Srinivasan (1993), Joshi and Little (1994), and Krueger (1975).

While the private sector was allowed, it was heavily regulated to be consistent with the overall objectives of the development strategy. Das (2002, pp. 11) summarizes the attitude of the government towards private sector post- independence by noting that, "Gandhi distrusted technology but not businessmen. Nehru distrusted businessmen but not technology. Instead of sorting out the contradictions, we mixed the two up. We have had to deal with holy cows: small companies are better than big ones (Gandhi); public enterprises are better than private ones (Nehru); local companies are better than foreign ones (both)".

The industrial licensing system, started under the Industries Act (1951), required government permission on *what* (product-mix), *how* (input-mix so as to reduce dependence on foreign exchange, encourage greater domestic content and credit allocation), *where* (location), *how much* (expansion of existing capacities required permission) to produce. Thus most of the factors on which new investment decisions would be based were controlled by the government through licensing. This licensing system became a huge drag on India's industrialization and was notoriously referred to as the "license *raj*".[2] To avoid concentration of economic activity in the hands of a few large industrial houses, Monopoly and Restrictive Trade Practices Act (MRTP) and Foreign Exchange Regulation Act (FERA) were enacted.

Beginning 1950, the policy of small-scale reservations was initiated to encourage labor intensive manufacturing in the private sector and this led to the emergence of the small-scale industries (SSI) sector. The incentives doled out included tax concessions and tax-holidays, preferential access to and subsidized

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[2] *Raj* means rule.

credit. However, the key element of this policy, introduced in 1967, was that some products were exclusively reserved for production by the small-scale sector. Once a product is classified to be produced by the small-scale sector no further capacity expansion was permitted for medium- or large-scale units, though they were allowed to produce[3]. All further expansion or capacity creation is reserved only for the small-scale sector. Another special feature of the SSI policy in India is the eligibility criteria. While most countries define SSI in terms of employment levels, the Indian definition has been largely based on cumulative amount of investment in plant and machinery. These definitional investment limits are periodically revised upwards with inflation. The importance of these investment limits are clear once it is recognized that only those firms which have investment limits below the threshold can produce items reserved for the SSI. Mohan (2002) provides an excellent overview and a critical evaluation of the small-scale industrial policy in India.

As mentioned earlier, India followed a highly restrictive trade policy after independence. To give an idea of the level of protection, in 1991 before the sweeping reforms were introduced, the average tariff was 117 percent and the import coverage ratio (a measure of non-tariff barriers) was 82 percent. The trade regime, which was characterized by high nominal tariffs and non-tariff barriers, was further complicated by a myriad of exemptions applicable to the basic duty rate.

The growth rate through the 1960s and 1970s hovered around 3-3.5 percent per annum, in what came to be known as the *Hindu* rate of growth. Kochhar et al. (2006) examine the implications of the development strategy followed since

[3] Medium- or large-scale sectors are allowed to expand if they undertake to export a minimum of 75 percent of their production (50 percent in case of ready-made garments) (Mohan, 2002).

Independence. They show that India seems to have gone down a “strange pattern” of development. Compared to countries with similar size and development, circa 1981, manufacturing output and employment appeared to be above the norm in industries that are typically skill intensive or have large establishments. Also, the average establishment size was substantially smaller than in comparable countries. Further, the Indian manufacturing was more diversified both in terms of output and employment. They attribute this to “perverse” policy measures adopted since Independence. They go on to argue that the distortions in policy may have created potential sources of growth that allowed India to follow a different growth path as these distortions were removed.

1.1.2 1980s: The Unnoticed Decade

Beginning in the early 1980s, there was some emergence of thinking about the need for a change in India’s economic policy. Many observers, for example, Rodrik and Subramanian (2005), among others, have noted the “pro-business” tilt in the development strategy and a shift away from the “license-permit-quota *raj*”. Among many reasons for this shift was the realization of the limitations of the development strategy followed hitherto. Also, the changing center-state relationship since 1977, coupled with increasing challenges to the Congress Party, have been put forward as possible causes for the shift.

Rodrik and Subramanian (2005) argue that the break from the *Hindu* rate of growth came not in the 1990s but in the 1980s and this was because of the pro-business shift that has largely gone unnoticed. Sharma (2006) using firm level dataset for the period 1980-94 shows that industrial deregulation during the 1980s led to a significant rise in firm productivity. Further, she shows that there exists a strategic complementarity between trade and industrial polices—industries and firms that were de-licensed tend to have higher productivity after trade liberalization.

Some of the key aspects of the changes that took place in the 1980s were easing of the industrial and import licensing requirements, replacing quantitative restrictions with tariff barriers, simplifying the tariff barriers, and more importantly 1980s was the first instance of a three-year trade policy. As Das (2003) notes there was a conscious effort to dismantle the import licensing regime via reductions in the number of products listed under banned/restricted category.

While the first steps towards reforms were taken in the 1980s, most of the observers who argue in favor of the changes starting in 1980s also note that the "big breakthrough" came in 1991. We discuss this in greater detail in the next section.

1.1.3 The Summer of 1991: Crisis and Reforms

As the 1980s came to a close, India witnessed changes on both the political and the economic front. The general elections in 1989 saw the ouster of the Congress Party and the Janta Dal came into power. From the beginning the government was unstable and was dependent on the support from other parties. Fresh elections were announced in May 1991 and the Congress Party was voted back into power. Political uncertainties combined with the Gulf war in 1991, which sent India's oil import bills soaring, pushed it to the brink of a crisis.

As the Congress took over the reins in Delhi in 1991, an economic crisis was looming large. Sample this, gross fiscal deficit as a percentage of GDP of the central government increased from 5.8 % in 1980-81 to 7.9 % in 1990-91, and combined gross fiscal deficit of the state and central governments as a percentage of GDP increased from 7.5 % to 9.5 % over this period. Inflation was hovering around 15%, current account deficit increased from 1.5 % in 1980-81 to 3.1% in 1990-91, and the debt-service ratio was around 35% in 1990-91.[4] Foreign exchange reserves nose-dived to about US$ 1 billion, enough to cover only two weeks of imports, and India was on the verge of default on its international commitments. Gold was pledged with the Bank of England to maintain enough liquidity of foreign exchange reserves. Given the past history with England, this was considered a national humiliation and a sell out by the new government.

The Government of India requested a Stand-By-Arrangement from the IMF in August 1991 and entered into an IMF supported program. In addition to policies pertaining to reducing fiscal and current account deficit, a wide array of structural adjustment policies spanning the external, trade, industrial, financial and banking sectors were implemented. The extent and depth of the reforms introduced in 1991 took everybody by surprise and were largely unanticipated (Aghion et al. (2006), Topalova (2005)).

The New Industrial Policy announced in July 1991 extended industrial deregulation, in both its coverage and depth, much beyond its initial phase in the 1980s. These measures included abolition of industrial licensing for all but 18 industries, eliminating public sector monopolies and allowing private investment in these industries (industries restricted for the public sector were reduced to 8 from 17), and relaxation of foreign direct investment rules. While there was an upper limit on

[4] Source: Reserve Bank of India (RBI).

the extent of foreign participation, this varied from one industry to the other and has increased over the period.

Not only were the FDI rules relaxed, but doors were opened to portfolio investment as well. There was an immediate devaluation of the Rupee by 22% and a dual exchange rate system was introduced. Over time, Rupee was made fully convertible on the current account while there is still, at best, only partial convertibility on the capital account.

Sweeping trade liberalization measures were introduced. These included elimination of import licensing, progressive reduction of tariff and non-tariff barriers. We discuss these changes in greater detail in Section 1.3 and also compare them with the trade liberalization episodes in other developing countries.

The export-import policy (EXIM policy) of 1992–97 reaffirmed India's commitment to promote free trade. All import licensing lists were eliminated and a "negative" list was established.[5] Except consumer goods, almost all capital and intermediate goods could be freely imported subject to tariffs. By April 2002, all the remaining quantitative restrictions were removed.

Reforms were undertaken in the banking and the financial sectors as well. These included removal of control on capital issues, free entry for domestic and foreign private banks, and opening up of the insurance sector. Liberalization measures were taken in important services such as telecommunications. Some of the areas that remain largely untouched by reforms, even after 15 years, are the labor

[5] Establishment of a "negative" list implied that all items except for those on the negative list could be imported without any import licenses and were not subject to any quantitative restrictions. Negative list consists of three sections: prohibited list, canalized items, and restricted list.

market, small-scale industries, and the agricultural sector. Despite all the initial and continued opposition to the changes, reforms have continued with every successive government and irrespective of where the political parties are positioned on the political spectrum.

1.2 State-level Performance and Spatial Inequality in India

Dehejia (1993) summarizes the 1991 reforms by saying, "The most striking achievement of the reforms (has been) that *commercial considerations*, rather than government mandates are now the determinants in all investment decisions, including ownership, *location*, local content, technology fees, and royalty. The approval authority in the Directorate General of Technical Development in the Ministry of Industries has been eliminated. The Monopolies and Restrictive Practices Act has been amended…..Controls on the import of capital goods have been removed, and the many regulatory bodies (have been) dissolved or reconstructed….*States now compete with each other to attract new investments* (emphasis added)." As a result, location features are likely to become important in the investment decisions.

The role of the public sector has diminished substantially, both as an owner and a regulator of industrial location, leading to increased private sector dominance.[6] One of the objectives of the planned model followed since independence, and of the licensing system, was to ensure balanced regional development. However, with the diminished role of the public sector in the post-reform period and the private sector getting a free hand to make decisions on the location, there will be an increased

[6] Kochhar et al. (2006) show rising private investment and falling public investment.

variation in industrial location. This is expected to contribute to the differences in the regional outcomes such as income, leading to higher spatial income inequality.

Ahluwalia (2000) and Kochhar et al. (2006) note that the devolution of political and economic powers to the states has prompted them to take a more active role in policy making, thus giving them the ability to formulate the right set of incentives to attract private investment.[7] Therefore, it is important to study the differences in performance among states and to understand the reasons for better performance of some states vis-à-vis others. Kochhar et al. (2006) show that state level capabilities, policies, and institutions started to gain importance in the post-reform period. With the center no longer enforcing inter-state equity, divergence in growth rates among the states has increased.

This divergent trend of the growth performance across states in India is well documented. Table 1.1 shows the average growth rates across states in the 1980s and 1990s. The last row in Table 1.1 points towards an increased variation in the growth performance across states in the 1990s. Table 1.1 shows that three of the poorest states: Uttar Pradesh (undivided), Bihar (undivided) and Orissa have continually performed far below the national average.[8]

Further, we see from Figure 1.1 that the inter-state inequality in India, as measured by the Gini-coefficient, was fairly stable up to the mid-1980s, began to

[7] The transformation in the center-state relationship, however, started much earlier in 1977.

[8] State of Uttar Pradesh was divided into two parts, one is still called Uttar Pradesh and the other part is Uttaranchal. Similarly, two states formed out of the division of the state of Bihar are Jharkhand and Bihar. State of Chattisgarh was carved out of Madhya Pradesh. These divisions took place in 2001 and do not affect the current analysis, since the latest quinquennial household survey data available is for the year 1999-2000 (more on the survey data in Chapter 2). From hereon, Bihar, Uttar Pradesh, and Madhya Pradesh refer to the undivided states.

increase in the late 1980s, and has continued to do so through the 1990s.[9] Ahluwalia (2000) points out that the difference in the growth rates does not necessarily point towards a failure of the policy and stresses that given their sheer size and diversity, it is probably unrealistic to expect the states to grow at the same rate. Nonetheless, a continued low growth rate for the poorer states leads to increased inequality and a regional concentration of poverty. Given the size of these states (Uttar Pradesh, Bihar and Orissa) in terms of area (approximately 20 percent of total area), population (one third of the total population) and political representation (accounts for almost 20 percent of the Members of Parliament), increased regional disparities can lead to a socially and a politically explosive situation.

The analysis in Chapter 2 looks at income disparities at the sub-state level. Before moving further, it is important to understand the concept of spatial inequality. It is a dimension of overall inequality where individuals are grouped according to their location and different spatial or geographical units are at different levels for some variables of interest, for example incomes, and each individual is assumed to receive the spatial unit's average income.[10]

Using micro-level data, Table 1.2 shows regional wage inequality measures for the urban manufacturing sector, which is the sample under consideration in this

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[9] Inter-state inequality was calculated assuming that all individuals within a state have a gross income equal to the per capita state domestic product. Gini-coefficient then measures the inequality in the total population which arises solely because of inequality among states.

[10] This discussion is from Kanbur and Venables (2005). There are several possible characterizations of spatial inequality: (i) Unweighted variation in per capita income across spatial units, (ii) Population-share weighted variation in per capita income across spatial units, (iii) Contribution of variation in per capita income across spatial units to income variation across all individuals. They note that it is the last two characterizations "that come closest to the instinct of mainstream economics to treat interpersonal inequality as being the fundamental object of interest." From the perspective of this paper, it is the third characterization of spatial inequality that is of interest and if the ultimate objective is overall interpersonal inequality then the third definition is the preferred one.

study.[11] Wage inequality is calculated from the household survey data and using the Gini coefficient and the Generalized (Theil) Entropy measure is reported.[12] Gini coefficient is calculated assuming that all the individuals in the urban manufacturing sector receive the average wage of the region. As shown in Table 1.2, regional inequality in urban manufacturing has increased over the twenty year period.[13]

Theil's measure uses income shares as weights of the within-group component of the respective groups for decomposing total inequality into the within-region and between-region components. The between-group component of the decomposition tells us the portion of inequality attributable to the region-specific features when everyone in the region receives the average wage of the region. As shown in the last column of Table 1.2, spatial inequality has increased over the period under study and the share of between–region component (in total inequality) has gone up from 15 percent to 24 percent.

Table 1.3 and Figure 1.2 provide a cross-country comparison of spatial inequality using the share of the between-component in the total inequality. It is evident that spatial inequality in India is fairly big when compared with other countries. Table 1.3 and Figure 1.2 show that the spatial inequality may not be a very high percentage of the total inequality (especially when compared with rural-urban component of inequality). However, as Kanbur and Venables (2005) note, its mere

[11] Definition of region is provided in Section 2.5. Appendix A provides a map of India and Appendix B a list of regions included in the study.

[12] A detailed description of the data follows in Chapter 2.

[13] Both Gini coefficient and Theil's measure show an upward spike in inequality in 1987. On further investigation it was found that there is a distinct upward spike across all states in average wages in this period. However, we continue to use the data for 1987 despite this anomaly because our results are based on "wage premia" and they do not seem to show any odd behavior in this period. See Table 2.3.

existence becomes important when regional inequalities coincide with the divisions of socio-economic groups which can lead to discontentment, social tensions and extreme outcomes.

If there are differences in regional outcomes and there are no barriers to movement of labor within the country, one would expect people to migrate. Topalova (2005) points out (for India) that "the absence of mobility is striking".[14] She further notes that the pattern of migration has also remained remarkably constant over time and there have been no visible spikes after the reforms in 1991. Using the national household survey data (same data as used in Chapter 2) for 1999-2000, she reports that in urban areas 13 percent of the people and only 3-4 percent in rural areas reported to have changed their district or sector (i.e. from rural to urban and vice-versa) and this pattern has remained stable over time. Further, less than 0.5 percent of the population in the rural and 4 percent of the population in the urban areas migrated because of economic considerations.[15]

This is confirmed if we look at the statistics from the 2001 census, which is the latest round of enumeration in India. The relevant migration pattern from the perspective of the present study is migration for work or employment (economic considerations), movement across districts (within a state) or inter-state movement and limited to cases when the duration of migration is less than 10 years. These are reported in columns 3 and 4 of Panels A, B, and C in Table 1.4. The table indicates

[14] Chiquiar (2004) and Amiti and Cameron (2004) note limited internal migration in Mexico and Indonesia, respectively.

[15] Migration figures are movement of people within the past 10 years across district boundaries or within a district across different sectors (i.e., from rural to urban and vice-versa).

that migration is very low and points towards labor immobility. Some of the possible reasons for this could be: credit constraints, lack of information about opportunities in other regions and attachment to native place. One factor which is likely to be unique for India is the enormous linguistic and cultural diversity across states.

Limited internal migration and region-specific features accounting for a greater share of total income inequality combined with the diminished role of the central government in determining the location of new investments, makes it an interesting research question to understand the determinants of wage distributions across regions. We analyze the role of proximity to markets and suppliers in the regional wage structure and examine if they have a differential impact in the post-reform period when there is less government intervention. This will shed light on better understanding the differences in the regional performance in India, an issue that holds much relevance for policymaking in developing countries. We look at this in detail in the next chapter.

1.2.1 Manufacturing Sector in India

The analysis in Chapter 2 focuses on the manufacturing sector. We do so for a variety of reasons. First, the theoretical predictions used in our analysis in Chapter 2 are based on New Economic Geography (NEG) models. We remain close to the NEG framework and restrict our analysis to the footloose manufacturing sector only, where transportation costs combined with increasing returns to scale can serve as a centripetal force. Second, manufacturing was the most restricted sector through licensing and highly through trade barriers (Section 1.3 provides further details). Reforms gave the manufacturing sector a free hand to take its investment decisions, including those related to location. Thus, location characteristics are likely to play a greater role in firm decisions leading to disparities in economic outcomes. Therefore it is important to understand how the manufacturing sector has responded to reforms, its implications for growth pattern and distribution of income.[16]

Third, India's growth path has been very different from the traditional view proposed by Kuznets-Chenery which suggests an increase in the share of manufacturing with development, a commensurate decline in agriculture and little effect on services. In contrast to the East Asian and the South East Asian economies it is services rather than manufacturing that have led the growth in India. It is not necessary for all the countries to follow the traditional pattern of growth where manufacturing expands before services, and it might be the case that India has been able to carve out its own unique growth path. However this pattern is true for only some states and not all.

In this sub-section, we provide an overview of the manufacturing sector, its contribution to the whole economy in terms of employment and value added over the period under study and how does it compare with other countries.[17]

Table 1.5 presents the shares of output and employment in different sectors in India in 1981 and 2000, and compares it with a set of developing and developed countries. When compared with the East Asian economies and China, India's share in manufacturing circa 1980, at 16 percent, seems to be low but the share of

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[16] Correlation between regional disparities (as measured by Gini coefficient calculated for each of the four rounds of household survey data) in the urban manufacturing sector and the urban services sector or the complement set of urban manufacturing sector (i.e. rural and urban services sector plus rural manufacturing) is positive. These correlations are 0.7 or higher. Thus, looking at the urban manufacturing sector gives us an idea of overall inequalities in incomes across regions.

[17] The discussion here is based on Kochhar et al. (2006).

manufacturing varies with the level of development. For its level of development and size, in 1981, India had approximately the normal share of output and employment in manufacturing and below the norm in services.

Over the 20 period 1980-2000, the share of manufacturing in value added in India remained unchanged at roughly 16 percent and the share of employment in industry increased from 14 percent to 18 percent. It is the services sector that increased its share in valued added from 37 percent to 49 percent (mirroring the decline in agriculture) and from 19 percent to 22 percent in employment over the same period. Indian manufacturing sector showed signs over the period 1980-2000 of not keeping up with the average performance in other, similar, countries. The data suggests a pattern of a relative slowing in manufacturing growth, ironically when over this period the reforms were removing the shackles on manufacturing.

The aggregate developments are mirrored at the state level as well. Despite the liberalization policies, India is veering away from labor-intensive industries. Furthermore, there is no clear pattern of movement amongst states towards these industries and they seem to be moving into skill intensive services. However for the slow growing states, to catch up with fast growing, manufacturing might be the answer. With the Central government no longer enforcing balanced regional development through licensing, location features are important in influencing investment decisions.

In Chapter 2, we examine if regions closer to markets and suppliers have higher wages associated with them and if these location features become more important in the post-reform period. Improvement in infrastructure resulting in lower transportation costs along with labor reforms will help lagging regions attract labor-intensive manufacturing to utilize vast pools of underemployed low-cost labor.

1.3 Trade Policy in India

One of the key ingredients of the reforms implemented in 1991 was the trade reforms. Academic and policy debates on the merits and demerits of trade liberalization have centered on the internal distributional consequences and on the question of how trade reforms affect labor markets. We investigate this further in Chapter 3. The rest of this section discusses the changes introduced in India's trade policy as a part of the reforms implemented in 1991.

The international trade data on India that we use is from Das (2003). This database covers 72 three-digit manufacturing industries, according to the National Industrial Classification 1987 (NIC-1987), for the period 1980–81 to 1999–2000.[18]

Figure 1.3 shows the average tariff for the 72 manufacturing industries in the 1980s and the 1990s. The average tariff in the manufacturing sector increased from 86 percent in 1980–81 to 117 percent in 1990–91, and then declined to 39 percent in 1999–2000. In comparison, the trade reforms in Brazil reduced the average tariff level in manufacturing from about 60 percent in 1987 to 15 percent in 1998; in Colombia, from 50 percent to 13 percent between 1984 and 1998. Between 1980 and 1990, the average tariffs in Mexico decreased from 23 percent to 13 percent. Thus, the percentage point reduction in average tariffs between 1990–91 and 1999–2000 was more drastic in India than in the Latin American countries (Figure 1.3).

[18] The list of 72 industries is provided in Appendix C.

The level of protection also varied widely across industries. The standard deviation of the tariff rate was 23% in 1980–81. Imports in the two most protected sectors, textiles and cotton spinning, faced tariffs of 118 percent and 115 percent respectively. There was a considerable drop in the dispersion of tariff rates in the post-reform period. In 1999–2000, the standard deviation of the tariff rates dropped to 6%.

The trade reforms also changed the structure of protection across industries. Figure 1.4 plots the tariffs in 1980–81 and 1999–2000 in various manufacturing industries. The tariffs declined in all the industries and the decline differed across industries. Table 1.6 shows the correlations of tariffs over five-year periods since 1980–81. The pair-wise correlations range from 0.51 to 0.87. The correlation between tariffs in 1980-81 and 1999-00 is 0.51. The inter-temporal correlation of Indian tariffs is significantly lower than the correlation in U.S. tariffs. The correlation between U.S. tariffs in 1972 and 1988 is about 0.98. The low year-to-year correlation in the case of India is comparable to that in Brazil and Colombia (Pavcnik et al. (2004), Goldberg and Pavcnik (2005)).

In addition to tariffs, non-tariff barriers (NTBs) have also been reduced since 1991. The measure of non-tariff barriers we use is the "import coverage ratio" which is defined as the share of imports subject to non-tariff barriers. Figure 1.5 shows the average import coverage ratio in manufacturing in the 1980s and 1990s. The average import coverage ratio declined from 82 percent in 1990–91 to 17 percent in 1999–2000.

Chapter 3 investigates the impact of these far-reaching reductions in Indian trade barriers, which came as a surprise, on its industry wage structure. We also examine the implications of the trade reforms for the wage inequality between skilled and unskilled labor.

Chapter 2: Economic Geography, Spatial Inequality and Liberalization: Evidence from India

2.1 Introduction

There is a great disparity in incomes across space, a fact that is well documented in the literature. This is true both across countries and within them. Figure 2.1 presents a cross-country comparison of the Gini coefficient of regional disparities. As shown, there are wide income disparities within countries and this is particularly true for emerging markets like China, Hungary, India, Mexico, Poland, and Turkey. A number of potential explanations like natural endowments such as climate and the disease environment[19], institutions[20], and geographic location as emphasized in the new economic geography models have been put forward to explain these disparities across space.[21] This chapter focuses on the role of geographic location in explaining disparities in income across space.

Location is important because of the barriers distance (in the form of transportation costs) creates to movements of final goods and inputs. Redding and Venables (2004), with the help of a simple example, show that transport costs can have first order effects on economic activity.[22] Limão and Venables (2001) show that

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[19] See Diamond (1997), Gallup et al. (1998), Sachs (2001).

[20] See Acemoglu (2001), La Porta et al. (1998), Rodrik et al. (2004).

[21] See Krugman (1991), Krugman and Venables (1995), and Fujita et al. (1999) for a synthesis of theoretical research and Overman et al. (2003) for an overview of empirical work.

[22] The illustration used by Redding and Venables (2004) is as follows. Suppose that prices for intermediate goods and final output are set in world markets, and intermediates account for 50 percent of the total costs. Further, if there are 10 percent ad valorem transportation costs on both final outputs

doubling transportation costs can reduce trade flows by as much as 50 percent. Thus, distance can create significant frictions both between the firm and its markets, and also between input suppliers and the producers. Transport costs interact with increasing returns to scale to create demand and cost linkages resulting in agglomeration of economic activity, as has been shown in the New Economic Geography (NEG) models by Krugman (1991) and Krugman and Venables (1995), among others. The first question that we examine is the role of economic geography i.e., if greater proximity to markets and suppliers result in higher wages being associated with a region.

To investigate and answer this question, we look at spatial income inequalities in India. The following reasons make India an interesting case study. First, there exist wide disparities in incomes across states in India. Not only are these income disparities large but also among the highest as shown by the cross country comparison in Figure 2.1. Second, inter-state inequality has increased over the period 1980-2000, which coincides with the time period under study for the case at hand. Figure 1.1 shows the evolution of inter-state inequality. The Gini coefficient measuring the inter-state inequality increased from 0.15 to 0.225 (an increase of 50 percent) over the twenty year period.

Third, as discussed in Chapter 1, India witnessed a paradigm shift in policy making following the balance of payment crisis in 1991. There was a shift away from a 'command and control' economy towards a free market based economic system. The decision making moved from the public to the private sector. As Dehejia (1993)

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and intermediate goods which are borne by the producing country, then the value added falls by 30 percent compared to the case with zero transportation costs.

notes the "most striking achievement of reforms" has been that post-reforms it is *commercial considerations* that dictate the choice of *location* in investment decisions and not government mandates. We examine the additional question of whether proximity to the markets and suppliers become relatively more important in the post-reform period.

The prospect of increased economic integration, deregulation, and liberalization by developing countries has led to widespread debates on the distributional implications, not only across countries, but also within national borders—which groups or individuals have benefited vis-à-vis the ones which have lost. It is, therefore, important to understand what factors contribute to uneven distribution of spoils from economic reforms. This issue is of relevance to fast growing emerging markets like China, Central and East European Countries (CEECs), Mexico and India, the last one being the focus of this analysis.

This essay is the first one to examine the role of economic geography in the regional wage structure and to probe if there are additional effects of spatial features (i.e. proximity to markets and suppliers) on wages in the post-reform period in India.

The empirical methodology used is a two-step approach adapted from the labor literature. In the two step methodology, we first estimate *Mincer*-style wage regressions. This allows us to control for observable worker characteristics and compare similar workers across regions to look at the impact of proximity to markets and suppliers on wages. In the second step, we use estimated regional wage premia as a measure of wages to assess if regions with higher access to markets and suppliers have higher wages associated with them. Existing literature looks at the impact of economic geography on the average wages of a location and this can potentially lead to biased estimates due to omitted worker characteristics. To the best of our knowledge, this is the first analysis to use this two-step "region-wage premium" methodology to examine the role of spatial characteristics in explaining the structure of regional wages.

We use nationally representative household survey data from India for the period 1980-2000 to investigate the question of whether location affects regional inequality in India and also examine whether that effect was exacerbated or ameliorated by the recent economic reforms. More specifically, we focus on the role of proximity to markets and suppliers in influencing the wages associated with a location. With de-licensing and deregulation of private manufacturing sector activity which were implemented as a part of the reforms, spatial features are likely to influence decision-making in the private sector.

We find that greater access to ports has a positive and a statistically significant effect on region wage premia i.e., regions closer to ports have higher wages associated with them. On the other hand, greater proximity to domestic markets and sources of supply is not associated with higher region wage premia. However, there is heterogeneity in their role over the time period under study. We find that in the post-reform period the role of domestic market and supply access has become stronger and they have a positive and a statistically significant impact on wages associated with a region. However, we do not find any statistically significant increase in the importance of proximity to ports in the post-reform period.

The results obtained in our analysis are in contrast to those obtained in the existing studies (Hanson (1998) for Mexico, Crozet and Koenig-Soubeyran (2004) for Romania, Forster et al. (2005) for transition economies in CEECs, Lin (2005) for China). These papers conclude that regions closer to the bigger markets of the developed countries or closer to the ports have benefited during the post-reform period. One possible reason we see no change in the importance of ports could be that India's growth path has been unique in that it has relied more on domestic markets than exports (Das (2006)) and external trade in India has not "taken off" in the same fashion as it has for China and Mexico.

These spatial features (i.e., proximity to ports, domestic markets and suppliers) contribute to the between-region component of the total income inequality. With no change in the role of ports and an increased importance of domestic market and supply access, our results in this chapter suggest that the share of the between-region component in the total income inequality will be higher, resulting in an increase in spatial income inequality, in the post-reform period.

The rest of this chapter is organized as follows. Section 2.2 presents a literature review and puts this study in the context of the existing literature, Section 2.3 provides a discussion of the conceptual framework, Section 2.4 presents the empirical strategy, measurement of variables and discusses the estimation issues. Section 2.5 describes the data used in the analysis, Section 2.6 presents the results, various robustness checks of the main results and their discussion, and Section 2.7 concludes.

2.2 Past Literature and Contributions

We look at the role of economic geography in explaining spatial inequalities in India and if the role of spatial features has changed in the post-reform period. This study relates to several strands of literature. The first strand of literature with which this essay can be linked to is related to the determinants of spatial inequality. Among these are the special volumes of Journal of Economic Geography (2005), Review of Development Economics (2005), and edited volume by Kanbur and Venables (2005).[23] Davis and Weinstein (2005) investigate the importance of demand and cost linkages on regional productivity in Japan. They find that cost linkages between producers and suppliers of inputs, among other factors, has an important effect on productivity of a region.

Lin (2005) examines inter-regional wage inequality by looking at the effect of access to international markets and suppliers on wages in China. The results in her paper support the prediction from the NEG models that geography matters in determining the returns to labor. She finds that about 25 percent of the wage differences in coastal provinces and 15 percent of the wage differences in internal provinces can be attributed to differences in access to international markets and suppliers. Kanbur and Venables (2005) in their introduction to the volume note that "this (referring to the results from Lin (2005)) is further support for the proposition that greater openness can lead to greater spatial inequality in living standards, even when such opening up increases overall efficiency and growth, as it has done in China".

[23] Studies discussed under this strand of literature are from one of these three collections.

Kanbur and Zhang (2005) use time-series data from China to establish that regional inequality is mainly caused by three key policy variables—ratio of heavy industry to gross output, degree of decentralization, and degree of openness. Wan and Zhou (2005) using regression-based decomposition framework and household level data from rural China present a study of inequality accounting. They find that geography has been the dominating factor, but is becoming less important over time.

Lall and Chakravorty (2005) argue that spatial inequality in industrial location is a primary cause of spatial income inequality in India. They show that the local industrial diversity is one of the factors with significant and substantial cost-reducing effects.[24] The authors show that the new private sector industrial investment in India is biased towards the existing industrial and coastal districts. They conclude "that structural reforms lead to increased spatial inequality in industrialization" and infer that this will lead to higher spatial inequality in income.

The analysis in this chapter differs from their study in two ways. First, we look directly at the effect of access to markets and sources of supply on the wages associated with a region. Second, they examine cross sectional firm level data to show that while spatial features guide private industrial investments, this is not the case for state industrial investments. Further, they argue that with the role of the state curtailed (both as an industrial owner and industrial location regulator), increased domination of private sector activity will lead to spatial concentration of economic activity post-structural reforms. We use household survey data over the period 1983-2000 to see if there is any heterogeneity in the role of spatial features in the post-

[24] Other paper in the same vein are Chakravorty (2000), Lall and Mengistae (2005), and Lall et al. (2004).

reform period vis-à-vis the pre-reform period in explaining wages associated with a region.

The second set of studies with which this work is connected deals with the empirical testing of the NEG framework. Some of the papers include Hanson (2005), Redding and Venables (2004), Amiti and Cameron (2004). Overman et al. (2003) provides a very good overview of empirical work on NEG models. Hanson (2005) uses county level data for U.S. on wages, consumer purchasing power (total income used as proxy) and housing stock to examine if regional product market linkages contribute to spatial agglomeration in the framework as developed by Helpman (1998). He finds that the demand linkages are strong and are growing over time, though limited in geographical scope. Redding and Venables (2004), using cross-country data show that access to markets and sources of supply are important in explaining the variation in per capita incomes across countries. Amiti and Cameron (2004) use firm level Indonesian data to estimate the agglomeration benefits that arise from vertical linkages between firms and show that demand and cost linkages are quantitatively important and highly localized.

A sub-strand of the literature dealing with empirical work on the NEG models investigates the importance of proximity to markets in the relocation of industrial activity within a country after the implementation of economic reforms. The analysis here is closely related to this sub-strand of literature. This set of papers deals mainly with Mexico and CEECs. These studies show that post-reforms the pull of the domestic market as measured by access to the industrial hub (usually the capital city) decreases and the pull of the bigger markets of the developed countries increases.

Hanson (1997) for Mexico and Crozet and Koenig-Soubeyran (2004) for Romania show that wage and employment patterns are consistent with the idea that market access matters for industrial location.

Forster et al. (2005), in a study of transition economies (Czech Republic, Hungary, Poland and Russia) conclude that capital city and well connected urban areas closer to the western markets in European Union have benefited more than the remote regions from economic growth. This is consistent with the findings from the study on Romania by Crozet and Koenig-Soubeyran (2004). Hanson (1998) examines the effect of trade reforms on regional employment in Mexico. He shows that transportation costs and cost-demand linkages influence regional employment. Further, post-trade reforms industries closer to the US border and closer to their markets and suppliers have seen relatively high employment growth. He concludes that trade-reforms have contributed to the decline of the manufacturing belt around Mexico City and formation of a new one along Northern Mexico.

On the contrary, we find that in the post-reform period, it is access to *domestic* markets and suppliers that have a positive effect on the region wage premia while there is no additional effect of being closer to the *ports*.[25] We put forward potential explanations for this result which is in contrast with the existing results in the literature.

We contribute to the current literature in a variety of ways. This is the first study to examine the importance of proximity to markets and suppliers in explaining

[25] India does not share a common border with any developed country and has little trade with its neighbors. Proximity to ports is used as a measure of access to foreign markets as explained in Section 2.4.

spatial inequalities at a sub-state level in India. Secondly, the two-step estimation methodology, adapted from the labor literature, presents a new approach to studying the determinants of spatial inequality using household survey data.[26] Finally, the current analysis adds to the empirical work done on the NEG framework by extending it to India.

2.3 Conceptual Framework

Starting with Krugman (1991) there is a growing literature that deals with the spatial distribution of economic activity and stresses the fact that distance and associated transport costs are important (Krugman and Venables (1995), Venables and Limão (2002)). This category of models is referred to as the New Economic Geography (NEG) models and is related to Harris' (1954) market potential function. Fujita, Krugman and Venables (1999) show in a broad set of models how scale economies and transport costs interact to create demand and cost linkages resulting in agglomeration. NEG models predict that locations with better cost and demand linkages attract more industrial activity and have higher wages. In other words, some regions lag behind simply because of their remote locations.

The theoretical framework used here is based on the NEG model developed by Krugman and Venables (1995). This is presented in Appendix D.

[26] Two other papers that come close to this methodology are Hanson (1997) and te Velde and Morrissey (2005). While Hanson (1997) uses the two stage procedure, he does not control for worker characteristics in the first stage. On the other hand, te Velde and Morrissey (2005) do not implement the second stage described above. They just control for the worker being located in the capital city of the country or not and interpret the coefficient on the dummy variable as the wage premium from being in the capital city. However, we go a step further and examine if greater access to markets and suppliers results in higher region wage premia.

The key assumptions of the model are, first, production is subject to increasing returns to scale at the firm level. Second, each firm produces a different form of the good i.e., goods are differentiated, or in other words, they are imperfect substitutes. Third, these differentiated goods enter the consumer's utility function and the firm's production function symmetrically. Next, the firms are completely symmetric and with free entry and exit there are sufficiently numerous firms to allow for monopolistic competition. Physical distance between consumers and firms leads to transportation costs. This introduces frictions and inhibits trade between regions bringing in the spatial dimension. Transport costs are assumed to be of the "iceberg" form. Finally, labor is assumed to be immobile between regions.

Maximizing the consumer's and producer's objective function gives the following wage equation (D.13 in the Appendix),

$$(w_s^b v_s^g c_s)^s = A(SA_s)^{\frac{a s}{s-1}}(MA_s)\,. \qquad (2.3.1)$$

Where, a is the share of the composite intermediate input in the total expenditure of the firm, b is the share of labor, g is the share of the mobile primary factor of production and it is assumed that $a + b + g = 1$, s is the elasticity of substitution between any two varieties, and A is a constant. The left hand side of Equation 2.3.1 contains the wage (w_s), the price of the mobile factor of production (v_s), and a measure of technological differences (c_s). The terms on the right hand of Equation 2.3.1 are defined next.

SA_s is the supplier access of region s and is defined as,

$$SA_s = \left[\sum_r^R n_r (p_r t_{sr})^{1-s}\right] = \left[\sum_r s_r (t_{sr})^{1-s}\right]. \qquad (2.3.2)$$

Supplier access is a transport cost (t_{sr}) weighted measure of the supply capacity of all the regions. Supply capacity as measured by $s_r (= n_r p_r^{1-s})$ is a product of the number of firms in other regions and their price competitiveness. Supplier access summarizes the benefits of proximity to suppliers. The exponent on $SA, \frac{as}{s-1}$, in Equation 2.3.1 gives the "black-hole" condition. If it is greater than one then no matter how high the transportation costs, few regions (which will be the "core") will see agglomeration of economic activity. This will happen either if the share of intermediate inputs in costs (a) is very high making the backward and forward linkages strong or if elasticity substitution between varieties (s) is small i.e. economies of scale are very large.

MA_s is the market access of region *s* and is defined as,

$$MA_s = \left[\sum_r^R E_r G_r^{s-1} (t_{sr})^{1-s} \right] = \left[\sum_r m_r (t_{sr})^{1-s} \right]. \qquad (2.3.3)$$

Analogous to supplier access, market access is a transport cost weighted measure of market capacity of all regions. Market capacity $m_r (= E_r G_r^{s-1})$ in turn depends on the expenditure (E_r) on manufactures (both by the consumers and the firms in the form of intermediate inputs) and the price index in region r (G_r^{s-1}). Thus, market capacity of a region is the purchasing power of that region.

Thus, the wage in location *s* is a function of its market access (MA) and supply access (SA). Equation (2.3.1) can be expressed in logarithm form as follows,

$$\ln w_s = q_0 + q_1 \ln(SA_s) + q_2 \ln(MA_s) + h_s . \qquad (2.3.4)$$

Where , $q_0 = \left[A^{1/s}\right]^{1/b}$, $q_1 = \dfrac{a}{b(s-1)}$, $q_2 = \dfrac{1}{bs}$. Further , q_0, q_1, and q_2 are all positive. In other words, regions with a greater proximity to markets and suppliers have higher wages associated with them. Regions with a greater supply access benefit from being close to a larger supply of intermediate inputs due to savings on transport costs and from access to a greater variety of inputs. All other things equal, this implies lower cost of production and higher zero profit wages. This is the cost linkage or the supply access effect. Similarly, firms gain from being located in regions closer to the markets for their output on account of greater demand. This leads to increased revenues and higher zero profit wages. This is the demand linkage or the market access effect.

From the perspective of this analysis, access to markets and suppliers have two components markets and suppliers within the country and second, foreign markets and sources of supply. The error term in Equation 2.3.4, h_s , includes the prices of mobile factors of production and the measure of technical efficiency (c_S). We discuss estimation issues arising from this in the next section.

2.4 Empirical Strategy, Measurement of Variables and Estimation Issues

2.4.1 Empirical Strategy

The empirical strategy used is a two-step estimation approach widely used in the labor literature. We use regional wage premia, similar to the industry wage premia, as a measure of wages to examine if regions with higher access to markets and suppliers have higher wages associated with them. Regional wage premia are defined as the portion of individual wages that accrue to the worker's region affiliation after controlling for worker characteristics. Using the regional wage premia has the advantage that it helps to control for observable worker characteristics and compare similar workers across regions.

In the first stage, the log of individual worker (working in region *r* at time period *t*) *i's* real weekly earnings $(\ln w_{irt})$ are regressed on a vector of worker characteristics (x_{irt}) like education, age, gender, marital status, industry affiliation, occupation indicators, dummy variable for whether the worker is self employed and a vector of region dummies (r_{irt}). Real earnings are used with weekly earnings deflated by the state level CPI. The first stage regressions are estimated separately for each time period in the sample. The estimating equation in the first stage is,

$$\ln(w_{irt}) = b_t x_{irt} + l_t r_{irt} + u_{irt} . \qquad (2.4.1.1)$$

The coefficient on the region dummy is the region wage premium (l_t) and it captures the part of the variation in wages that is explained by the worker's location. The above specification gives us a set of region wage premia (l_t) for each period. Also, the coefficients on individual characteristics (b_t) vary over time.

Following Krueger and Summers (1988), the estimated wage premia are expressed as deviations from the employment weighted average wage premium. The normalized wage premium can be interpreted as the proportional difference in wages for a worker in a given region relative to the average worker in all regions with the same observable characteristics.

In the second stage, normalized regional wage premia from the first stage are pooled and then regressed on spatial characteristics. The second stage regression is estimated using weighted least squares. The weights used are the inverse of the standard errors of the normalized wage premium which are calculated using Haisken-DeNew and Schmidt (1997) procedure.

$$\hat{l}_{rkt} = k + t_1 \ln(Access_{rt}) + d_1 \ln(Port_r) + f_t + j_k + f_t * j_k + e_{rt}. \qquad (2.4.1.2)$$

Where, $\hat{l}_{rk(t)}$ is the normalized wage premium in region r in state k (at time period t), $Access_{r(t)}$ is the domestic market access (DMA) and/or the domestic supply access (DSA) of region r (at time period t). We estimate different specifications where both are included in the same regression and where only one is included at a time. The core specifications are with either the domestic market or domestic supply access individually. The high degree of correlation between measures of market and supply access makes it difficult to identify their effects separately.

$Port_r$ is a measure of proximity of region r to foreign markets (FMA) or foreign suppliers (FSA). We do not include region fixed effects in any of the specifications because the fixed effects act like a composite measure of location-specific features encompassing the time invariant measure of proximity to ports and institutions. However, state indicators (j_k) are included in all specifications to control for variation in economic activity across states resulting from differences in policies, state-level institutions, and other potentially unobserved state level characteristics. We also include time indicators (f_t) to take into account macroeconomic shocks and other time variant but region invariant factors. The core specifications include interactions of the state and the time indicators.

The NEG model discussed in Section 2.3 show that regions with higher market access or supplier access have higher wages associated with them. Therefore, we expect the coefficient on *Access* (both *DMA* and *DSA*) and *Port* to be positive.

The time period under study, 1983-2000, witnessed sweeping changes in the economic landscape in India. With deregulation and liberalization, the role of the public sector declined both as the owner and as a regulator of private sector activity. Thus, with greater freedom to the private sector, location features are likely to gain in importance in the decisions of the private sector. The increased disparity in the location of new investments resulting from differences in spatial features can lead to greater inequality in outcomes between regions in the post-reform period. It is therefore interesting to examine if the role of spatial characteristics changed in the post reform period.

To examine for heterogeneity in the effect of spatial features on wage premia over time, we interact our variables of interest (i.e., *Access* and *Port*) with a post-liberalization dummy. The specification estimated is,

$$\hat{l}_{rkt} = k + t_1 \ln(Access_{rt}) + t_2 \ln(Access_{rt}) * Postlib_t + d_1 \ln(Port_r) + d_2 \ln(Port_r) * Postlib_t + f_t + j_k + f_t * j_k + e_{rt}\,. \quad (2.4.1.3)$$

Where $Postlib_t$ is the post-liberalization dummy which takes the value one in the post-reform period (i.e., post-1991) and zero otherwise. Many researchers have dated the reform process to the mid-1980s instead of 1991. While there were some reforms in mid-1980s, most of observers agree that the big change came in 1991 and the extent of reforms was far wider than those implemented in the mid-1980s. We therefore characterize post-1991 as the post reform period. A greater role for the location features in the post-reform period should be reflected in a positive coefficient on the interaction terms of both *Access* (both DMA and DSA) and *Port* with $Postlib_t$.

2.4.2 Measuring Domestic Market Access (DMA) and Foreign Market Access (FMA)

Market access (MA) is defined as the distance weighted measure of market capacity or proximity to the markets in which output is sold. Firms located close to regions with high market capacity benefit from greater demand and from low transportation costs making them more profitable. For the purposes of the present analysis, access to regions within the country and those outside the country are considered separately. The former is referred to as the domestic market access (DMA), and the latter is called the foreign market access (FMA).

Domestic market access of a region has two components. One is the demand from one's own region, and the second is the demand from other regions but within the country. Domestic market access within one's own region, *ownDMA*, is measured as:

$$ownDMA_{rt} = \frac{mc_{rt}}{mc_{allt}} * d_{rr}^{-1}. \qquad (2.4.2.1)$$

Here, mc_{rt} is the market capacity of region r at time period t. It is divided by the market capacity of all the regions combined, mc_{allt} (i.e., mc_{allt} is the sum of mc_{rt} over all regions, r, at time period t) to get the share of market capacity of each region r in total market capacity. This is then adjusted for distance within own region (d_{rr})

to make it comparable to *otherDMA*, which measures proximity to other regions within the country. This is measured as follows.

$$otherDMA_{rt} = \sum_{s \neq r}^{R} \frac{mc_{st}}{mc_{allt}} * d_{rs}^{-1} . \qquad (2.4.2.2)$$

Where, mc_{st} is the market capacity of other region s and d_{rs} is the greater-circle distance between regions r and s. We use two measures of domestic market access (*DMA*). First is the *totalDMA* which is the sum of *ownDMA* and *otherDMA* and second is the *otherDMA*.

Referring to the definition of MA in Equation 2.3.3, market capacity of a region is the total expenditure on manufactures (both by the consumers and by the firms in the form of intermediate inputs) of that region deflated by the appropriate price index. We use household expenditure of a region as a measure of the spending capacity of the consumers of that region. These are deflated by state level CPI. The spatial unit of analysis in this paper is a "region" (see section 2.5), which is a sub-state unit. To the extent that there are variations in prices across regions within the states, use of state level CPI is a limitation of this study.

Due to limited data availability, we use state level data to find the expenditure on intermediate goods at the region level. The expenditure on intermediate inputs by each 3-digit manufacturing industry at the region level is calculated by multiplying the expenditure at the state level for that 3-digit level of manufacturing industry with the share of employment of a region (which is calculated for the respective rounds from the household survey data) in that state for the corresponding 3-digit level. The total expenditure on the intermediate inputs in a region is obtained by adding the expenditures of all 3-digit level manufacturing industries in that region. We use the state GDP deflator to arrive at the real expenditure on intermediate inputs. This is then added to consumer demand to obtain the market capacity of each region. Since the data on the intermediate inputs for the region is not directly available, we do robustness checks by using only consumer expenditure as a measure of market capacity.

Distances between regions (d_{rs}) are based on the great-circle distance formula.[27] Internal distance (d_{rr}) for each region is defined (following Leamer (1997) and Nitsch (2000)) as proportional to the square root of the area of the region, which gives $d_{rr} = (0.376)\sqrt{area_r}$ where $area_r$ is the area of region *r*.[28]

Following Amiti and Cameron (2004), the measure of market access used is the expenditure in each region scaled by the total expenditure in the country as a

[27] Great-circle distance formula calculates the minimum distance between any two points on the surface of a sphere along the path on the surface of a sphere (rather than going through the sphere). The shape of the earth is taken to be a sphere to calculate distance between two points on the earth. Latitude and longitude for each of the points between which the distance is to be calculated is required and the following formula is used:

Distance (in kilometers)=6377*ARCCOS[(COS(90-X_i)*COS(90- X_j)) + SIN(90- X_i)*SIN (90-X_j)*COS (Y_i – Y_j)]

Where X_i and X_j are the latitudes of points `i' and `j' respectively between which the distance is to be measured. Y_i and Y_j are the longitudes of points `i' and `j' respectively. Latitudes and longitudes are divided by 57.3 to convert them into radians and are used in radians in the above formula. Negative of latitude and longitude is taken if the location lies to the south of the equator or west of the prime meridian respectively.

[28] The discussion here is based on Head and Mayer (2000). Calculation of internal distance in the following way assumes that the economic geography of a region can be approximated with a disk in which all the production is concentrated in the center and consumers are randomly distributed throughout the rest of the area. Then the average distance between a producer and a consumer is given by, $d_{rr} = \int_0^X x.f(x)dx$. Where, *X* denotes the radius of the disk, and *f(x)* is the density of the consumers at any given distance *r* to the center, $f(x) = 2x / X^2$ and $X = \sqrt{area_{rr} / p}$. Integrating and solving gives $d_{rr} = (0.376)\sqrt{area_r}$.

whole. This is then divided by distance to give more weight to demand from closer regions than demand from regions that are further away. The aim here is not to get an estimate of structural parameters but to understand the importance of the proximity to the markets in influencing the spatial distribution of wages. As Equation 2.3.4 suggests, proximity to larger markets (as measured by share of market capacity) should lead to higher wages.

Foreign market access is measured as the inverse of the distance, in kilometers, between the region and the closest port (*Ports*). Distance is calculated using the great-circle formula. There are limitations in using this measure of FMA. First, it does not vary over time and second, it does not include any measure of market capacity (see Equation 2.3.3 for definition of market access). As a result, *Ports*, might not capture the right access to foreign markets and lead to measurement errors.

We check our results with an alternative measure of FMA. Market capacity is a measure of the purchasing power. To construct an alternative measure of FMA, gross domestic product (measured in purchasing power parity terms) of various countries is used as a measure of market capacity. The alternative measure of FMA, *FMA_gdp*, is defined as the sum of the share of GDP of various countries in the world GDP (other than India) divided by the distance from each region in India to that country. In terms of Equation 2.4.2.2, mc_{allt} is the total world GDP and mc_{st} is the GDP of a country, *s*, other than India. Distance from each region, *r*, in India to a country s (d_{rs}) is calculated as the sum of the distance from that region to the closest port and from that port to the capital city of a country.[29]

2.4.3 Measuring Domestic Supply Access (DSA) and Foreign Supply Access (FSA)

Analogous to market access, we measure domestic supply access (DSA) and foreign supply access (FSA). Supply access is the distance-weighted measure of supply capacity or the proximity of firms in a region to its suppliers. Firms use intermediate inputs in production and locating close to regions with higher supplier capacity reduces not only the cost of intermediate inputs but also makes available to them a greater variety of inputs. This combined with lower transportation costs reduces the costs of production making the firms in the region more profitable.

Two measures of supply access used are *totalDSA* and *otherDSA*. *TotalDSA* is the sum of *ownDSA* and *otherDSA*, which in turn are defined as follows,

$$ownDSA_{rt} = \frac{sc_{rt}}{sc_{allt}} * d_{rr}^{-1} \qquad (2.4.3.1)$$

$$otherDSA_{rt} = \sum_{s \neq r}^{R} \frac{sc_{st}}{sc_{allt}} * d_{rs}^{-1} \qquad (2.4.3.2)$$

Where, $sc_{rt}(sc_{st})$ is the supply capacity of region r (s), sc_{allt} is the sum of supply capacity of all regions at time period t.

[29] Instead of including all the countries individually, we look at the following countries or country groups. This is a very exhaustive list and covers 85% of the world GDP. The city used for geo-location is in the brackets. The countries or country groups included are: Australia-New Zealand (Canberra), Bangladesh (Dhaka), Canada (Ottawa), China (Beijing), East Asia (Jakarta), European Union excluding CEECs (Brussels), Japan (Tokyo), Latin America and Caribbean (Brasilia), Middle East (Riyadh), Nepal (Kathmandu), North Africa (Cairo), Pakistan (Islamabad), Sri Lanka (Colombo), Sub-Saharan Africa (Pretoria), United Kingdom (London), United States of America (Washington, D.C.).

Supply capacity of a region is measured by the output produced in that region. We use the state level data to find the output produced in each region. The output produced by each 3-digit manufacturing industry at the region level is calculated by multiplying the output at the state level for that 3-digit level of manufacturing industry with the share of employment of a region (which is calculated for the respective rounds from the household survey data) in that state for the corresponding 3-digit level. Total output produced in a region is then the sum of output of all 3-digit level manufacturing industries in that region. We use the state GDP deflator to arrive at the output produced in real terms at the region level.

Foreign supply access is measured as inverse of the distance, in kilometers, between the region and the closest port (*Ports*). This measure of FSA is the same as that used for FMA and has the same limitations as discussed before. We use as alternative measure of FSA, this measure is *FMA_gdp* (defined in Section 2.4.2). Since market and supply access tend to be highly correlated and also because GDP of a country is a good indicator of the output produced, *FMA_gdp* is a good proxy for FSA.

2.4.4 Estimation Issues

The location characteristics used to explain the regional structure of wages are proximity to markets and suppliers. However, it could be the case that the regions performing well due to better access to markets and suppliers might actually be doing so because of them sharing good institutions. This could lead to an omitted variable bias because of better institutions leading to greater access to other regions and higher wages. To control for this potential omitted variable bias, we include a measure of institutional quality as another location feature.

However, institutions and proximity to markets are influenced not only by each other but also by income levels making them endogenous.[30] If the measure of institutions used suffers from reverse causality, this will lead to biased estimates of the coefficient for institutions. Further, institutions should independently determine income and not simply be the consequence of greater access to markets and suppliers. Similarly, the coefficient on proximity to markets and suppliers should capture their direct effect on income. However, what it should not capture is the reverse feedback from income.

To deal with these issues what is needed is a source of exogenous variation for market access, supply access and institutional environment that is uncorrelated with the other determinants of income. Domestic market (supply) access for the current purpose is defined as the share of market (supply) capacity adjusted by distance. We take into account not only the region's own market (supply) capacity but also that of other regions. The argument that there is reverse feedback from income to proximity is more likely to hold for own market (supply) access rather than access to other markets (suppliers). Therefore, the core results are based on the specifications which use *otherDMA* and *otherDSA* as measures of proximity. In addition, we perform robustness checks using *otherDMA* and *otherDSA* as instruments for *totalDMA* and *totalDSA*, respectively.

[30] Rodrik et al. (2004) provide an excellent overview of potential problems that arise when dealing with these causal factors.

Acemoglu et al. (2001), working with the assumption that institutions change gradually over time, use settler mortality as an instrument for institutional quality to explain cross-country differences in income. In a similar vein, Banerjee-Iyer (2005) exploit colonial land revenue institutions set up during the British rule in India to show that differences in historical property rights leads to sustained differences in economic outcomes. Under the assumption that present day institutions are a result of historical developments and that institutions change only gradually over time, the Banerjee-Iyer measure of property right institutions is a good proxy for current day institutions.

Given that the measure of institutions used here is a historical measure, better institutional quality leading to higher income being the result of reverse causality from current income can be ruled out. Also, given the historic nature of the measure, institutional quality picking up any indirect effect of better access to markets and suppliers is minimized.

The measure of access to foreign regions used in the baseline specifications is the distance to the closest port. It could be the case that this definition of access to foreign regions is leading to some measurement error and is not capturing fully the access to foreign markets and suppliers. To address this problem, we use an alternative measure of access to foreign markets and suppliers, *FMA_gdp*, as defined in Section 2.4.2.2. The results are discussed in the section on robustness checks.

Referring to Equation 2.3.2 and the estimating equations in the second stage, as given by 2.4.1.2 and 2.4.1.3, the error term includes prices of mobile factors of production and differences in the levels of technical efficiency. For those factors that are perfectly mobile, prices are included in the constant. To the extent that different states are not at the same distance from the technology frontier (Aghion et al. (2006)), these differences in technology across states are taken care of by the state indicators and their interactions with time indicators. However, to the extent that there might be differences in technology within regions in the same state these are not controlled for and this might bias the estimates.

2.5 Data

The data used in this study draws from several sources. The individual level data comes from the Employment and Unemployment Schedule of the National Sample Survey Organization (NSSO), undertaken by the Government of India. The survey provides information on individual characteristics such as age, education, industry of employment, occupation, household size, marital status, monthly per capita expenditure, and location. We use the "thick" household surveys covering the period 1983-2000. More specifically, the household surveys used are: 38th round (1983), 43rd round (1987-88), 50th round (1993-94) and 55th round (1999-2000).[31, 32] NSS survey data is used to construct the regional wage premia as discussed in the previous section.

The analysis is restricted to individuals in the age group of 15 to 65 years who work in the urban manufacturing sector, are a part of the labor force and report

[31] "Thick" surveys refer to the quinquennial surveys. NSSO conducts "thin" surveys every year. However, Employment and Unemployment survey is not carried out as a part of these "thin" surveys. Also, the number of households covered in the "thin" surveys is far less than those covered in the "thick" surveys. These surveys are repeated cross-sections.

[32] In general, NSSO covers around 70,000-80,000 rural households and about 45,000-70,000 urban households.

positive weekly earnings. We use the household survey data for 15 states and two union territories.[33, 34] All the North Eastern states and all the union territories are excluded with the exception of the two Union Territories of Delhi and Chandigarh (Appendix A gives an outline of the map of India). Union Territory of Delhi is included on the grounds that it is the capital of India and also because it is one of the four big metropolises of India (the other three being Chennai, Kolkata, and Mumbai). Since the remaining three are included as a part of their respective regions, we include Delhi as well. Union Territory of Chandigarh is included because it serves as the capital to the two North Indian states of Haryana and Punjab. We therefore include all the major states and these are the ones commonly used for a cross-region analysis in India.[35]

In terms of the hierarchy of government, at the top is the Central (or federal) government followed by the State government and then the District administration (similar to county in the U.S.). Though using district level data would have been better as it allows for more dis-aggregation, we are restricted by the household survey

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[33] States included are Andhra Pradesh, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. The two union territories included are Delhi and Chandigarh (complete list of union territories in provided in footnote 34). States excluded are all the North Eastern states (see footnote 35 for a detailed list), Goa, Jammu and Kashmir. Since the period under study is till 2000, creation of new states in 2001 does not affect the current work.

[34] Union Territories are regions governed by the central government. Union Territories are Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli, Daman and Diu (Before 1990, this was Goa, Daman and Diu. Since Goa is left out it does not affect the current analysis), Delhi, Lakshadweep, and Pondicherry.

[35] We exclude Assam, which is included in some studies, to be consistent with the omission of all North Eastern states. Other North Eastern states are Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura.

data which does not allow for the identification of the district for the urban sample in all the rounds.

The spatial unit of analysis used in this essay is a "region". A region is a grouping of contiguous districts in any given state.[36, 37] In terms of hierarchy, the spatial unit as defined here is below the state level and above the district level.[38] These regions are defined in the household sample survey conducted by the NSSO and hence, the combination of districts to form regions is not arbitrary. Since some of the data used here is from the household sample survey, choosing regions as the unit of analysis was a natural choice. Also, the composition of regions in Assam changed over the period under study and is therefore dropped from the analysis. This gives a sample of 58 regions in 15 states and 2 union territories (Appendix B provides a list of regions included in the study).

We use two data sources to calculate the domestic market access i.e. distance weighted expenditure measure. First, the household survey data gives the monthly consumer expenditure. Second, the expenditure on intermediate inputs comes from the Annual Survey of Industries (ASI, an annual survey by a unit of Government of India, also maintained by the Circon Data Center). Distance between regions (in

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[36] One exception to this grouping of contiguous districts is the state of Gujarat (one of India's most industrialized states located on the west coast) where some districts have been split based on the location of dry areas and the distribution of the tribal population in the state.

[37] Though NSS data does not allow the district to be identified in the urban samples, it does provide separately the list of districts constituting each region. This is helpful in creating regional measure of institutions as discussed later in this section.

[38] Note that there is no level of government at the region. This classification is purely for data collection purposes by the NSSO. *If* region were to have an administration then in terms of hierarchy it would be between the state and the district.

kilometers) is calculated using the "great-circle" formula, latitudes and longitudes for which are obtained from www.mapsofindia.com.

For the domestic supply access, data on output produced is obtained from the ASI. This data is available at the 3-digit level of National Industrial Classification (NIC) and at the state level.[39] ASI covers only the registered manufacturing sector. There is no corresponding annual survey for either the unregistered manufacturing or the small scale industry sector. ASI data for 1982, 1986, 1992, and 1998 are used corresponding to the 38th, 43rd, 50th, and 55th NSSO rounds, respectively.

Data on consumer price indices and state-level GDP deflators is from the Central Statistical Organization (CSO), Government of India. Two different price deflators are used. First, due to the non-availability of consumer price index (CPI) at the district or region level, we use state-level CPI to deflate wages and consumer expenditure. The precise CPI measure used is the CPI for industrial workers, reported for various centers all over India.[40] We use simple average of CPI at various centers (within a state) to arrive at the state-level CPI. Another set of deflators, again at the state level, is the state GDP deflator. These are used for deflating intermediate inputs

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[39] ASI data for 1982 and 1986 uses NIC-1970 classification which is the same as the industry classification used in household survey data for 38th and 43rd rounds. For 1992 and 1998, the classification used in ASI and NSS data (50th and 55th rounds) is NIC-1998 respectively. Since at any point classification used in the two data sources is the same and also because I use total expenditure on intermediate inputs by *all* industries and the total value of output produced by *all* industries in a region, concordance between the two classifications is not required.

[40] "Centers" do not refer to any district or region. Information is collected from various locations (centers) all over the country to arrive at a national measure of CPI. Since these centers fall in different states, we average CPIs of various centers within a state to arrive at the state-level CPI. Further, not all regions (as defined for the purpose of this study) have a "center" where data on CPI is collected and some regions may have more than one "center."

expenditure and output.[41] We do robustness checks by using common deflators i.e., by deflating the consumer expenditure, intermediate input and the output with CPI or alternatively, by deflating all of them with the state GDP deflator.

Access to foreign markets and suppliers is measured by the inverse of the great-circle distance between the regions and the ports[42]. The latitude and longitudes for the latter are obtained from the respective website of the ports. For FMA based on GDP of other countries, GDP (in PPP) is obtained from the World Development Indicators website. GDP data for 1982, 1986, 1992, and 1998 are used corresponding to the 38th, 43rd, 50th, and 55th NSSO rounds, respectively. Geo-locations of various countries are taken from Centre d'Etudes Prospectives et d'Informations Internationales' (CEPII) website.[43] Table 2.1 provides summary statistics for the various variables.

We use the historically determined Banerjee and Iyer (2005) measure of non-landlord holdings in colonial India as the measure of institutions. This could be interpreted as a measure of the historical determinants of current institutions. The authors use the colonial land revenue system set up by the British in India and show that the differences in the historical property rights institutions lead to sustained differences in the economic outcomes. Areas where rights were given to the landlords have lower public investment in areas such as education and health as opposed to

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[41] For Chandigarh, the average of CPI of Haryana and Punjab is used while average of CPI of Haryana, Jammu and Kashmir, and Punjab is used for Himachal Pradesh.

[42] India's mainland coastline stretches approximately 5600 kilometers and is dotted with ports. For the purposes of this paper, we only consider the 12 major ports. These ports are Chennai, Cochin, Kandla, Kolkata-Haldia, Marmugao, Mumbai, JNPT, New Mangalore, Paradip, Tuticorin, and Vishakhapatnam.

[43] http://www.cepii.fr/anglaisgraph/bdd/distances.htm

areas where proprietary rights were given to the cultivators. They conjecture that these differences are a result of differences in the historical property rights leading to different policy choices.

The Banerjee-Iyer measure gives the proportion of land holdings in a district under the non-landlord revenue system. A value of one means the entire district was under the *raiyatwari* or cultivator-based revenue system. At the other extreme was the *zamindari* or landlord-based system, if the entire district was under this form of land tenure Banerjee-Iyer measure takes a value of zero. Values between zero and one mean that the whole district was not completely under either of the above two extreme systems or was under an alternative form of revenue system known as *mahalwari* which is village-based. In such cases, historical land records have been used to determine proportion of land under non-landlord holdings.

With information from NSS, which gives a list of districts falling in each region, we map the 1991 districts into various regions.[44] Further, the data does not comprehensively cover all the districts and states. In case of missing data, we use information provided in Banerjee and Iyer (2005) which classify states into "landlord" versus "non-landlord" states.[45] Based on this information, the missing districts are given a value of zero for landlord states and one for non-landlord states. Once the information is present for all the 1991 districts, the data is aggregated to the

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[44] Banerjee-Iyer data at the district level is in terms of districts in the year 1960. Their dataset provides a mapping of 1960 districts into 1991 districts. Using these 1991 districts, proportion of non-landlord area during colonial rule at the region level is calculated.

[45] This footnote comes from Banerjee-Iyer (2005, footnote 29): "Data on state-level land reforms comes from Besley and Burgess (2000). We classify Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, and West Bengal as "landlord" states, and Andhra Pradesh, Assam, Gujarat, Karnataka, Kerala, Maharashtra, Punjab, and Tamil Nadu as "non-landlord" states."

region level based on the share of the area of each district in the total area of that particular region.

2.6 Results and Discussion

2.6.1 Estimation of Wage Premia

Following the two-step estimation methodology discussed in Section 2.4.1, the first step uses the log of real weekly earnings as the dependent variable for *Mince*r-style wage regressions. The right hand side variables include individual characteristics such as age, age squared, dummies for education, marital status, gender, head of the household, and indicators for occupation, two-digit manufacturing industry and regions. Table 2.2 presents the first stage regressions where Equation 2.4.1.1 is estimated for each of the four rounds separately.[46] The coefficients of the variables for individual characteristics such as age, education, marital status, gender are statistically significant and signed as expected. This also reposes our faith in the quality of the survey data.

The bottom part of the table shows the R-squared for the regressions with and without the region dummies. For example, in 1983, the R-squared for the regressions excluding region dummies is 0.49 i.e., the worker characteristics and industry indicators explain 49 percent of the variation in log weekly earnings. Adding the

[46] NSS survey data has information on approximately 200,000-225,000 individuals in the urban sample. We provide here an example of how the sample size is reduced to less than 10,000 observations. For the 50th round (1993-94), we have 208,390 potential data points in the urban sample. We keep only those who are a part of the labor force, which reduces the sample to 77,701 (loss of 130,689 observations). Next, we keep individuals in the age group 15-65 reducing the sample further to 73,167. Of 73,167 individuals, only 37,803 report positive earnings. Further, restricting the sample to manufacturing sector results in a loss of 29,229 observations. This leaves us with 8,574 data points. Of these 342 are lost since we use data on 17 states (see *footnote* 33) only leaving us with 8232 observations. Finally three observations points are lost due to missing observations on some of the explanatory variables.

region dummies increases the R-squared to 0.57. In other words, 8 percent of the total variation in log weekly earnings is accounted for by the region indicators. In general, the region indicators explain about 4 to 8 percent of the variation in log weekly earnings. Region indicators are jointly statistically significant at 1 percent level with many of the wage premia being individually statistically significant as well. To the best of our understanding, there is no other paper which takes the region wage premia approach and hence, there is no benchmark to compare with. However, 4 to 8 percent explained by region indicators is comparable with what is explained by industry indicators in India, as shown in Kumar and Mishra (2007, also, Chapter 3 of this Dissertation).

Table 2.3 provides summary statistics on the estimated region wage premia. These region wage premia are the normalized wage premia i.e., expressed as deviations from the employment weighted average wage premium. Appendix E provides the normalized region wage premia and their standard errors for all the four rounds.

There is considerable dispersion in the wage premia across industries and standard deviations range from 0.25 to 0.29 for the different years as shown in Panel A of Table 2.3. Estimates show that in 1999-2000 (Round 55), regions with the three highest wage premia are 51 (Bihar-Southern), 143 (Maharashtra-Inland Northern), and 73 (Gujarat-Plains Southern); regions with the lowest premia are 53 (Bihar-Central), 23 (Andhra Pradesh-South Western), 262 (West Bengal-Eastern Plains). The reported estimates of the region wage premia imply that a worker with the same observable characteristics switching from, for example, region 53 to region 73 would see a 58% (0.342-(-0.239)) increase in earnings.

However, the structure of region wage premia has changed over time. Panel B of Table 2.3 presents year to year correlations in the region wage premia. The correlation between the wage premia in 1983 and 1999-2000 is 0.45 and 0.40 for the wage premia in 1983 and 1993-94.

Figure 2.2 provides average region wage premia by zones.[47] We see that the North Zone has a consistently high wage premia as opposed to the rest of the zones. Also, regions in Western India have a positive wage premia except for a small decline in 1993-94 (Round 50). Regions in Eastern and Central India have a negative wage premia during the entire twenty year period. These zones include the slow growing and the lagging states. However, negative average premia in Southern India for all the four rounds is somewhat surprising. Also, these wage premia are lower than the average wage premia in Central India. However, this trend might be on the reverse, for the latest period (1999-00, Round 55) wage premia in Southern India is higher than that in Central India.

Further, Figure 2.3 shows that there is a negative correlation between initial wage premia in 1983 and change in wage premia over the period 1983-2000. This is also consistent with falling year to year correlations in region wage premia shown in Table 2.3 (Panel B). With significant economic reforms during the sample period,

[47] North Zone includes regions in the states of Himachal Pradesh, Haryana, Chandigarh, Punjab and Delhi. West Zone includes Rajasthan, Gujarat and Maharashtra. West Bengal, Bihar and Orissa are in the East Zone. Madhya Pradesh and Uttar Pradesh form the Central Zone. South Zones includes the states of Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu. For a list of regions in each state, please see Appendix B.

economic geography and its changing role could potentially constitute an explanation for the changing structure of the region wage premia.

2.6.2 Location Characteristics and Wage Premia: Second Stage Regressions

In the second stage, the estimated region wage premia (expressed as deviations from the employment weighted average wage premium), which represents the portion of individual wages that accrue to the worker's location affiliation, are regressed on spatial features such as access to domestic markets/suppliers, foreign markets/suppliers, and institutions. All the second stage regressions are estimated using weighted least squares with weights being the inverse of the standard errors of the normalized wage premia which are calculated using the procedure from Haisken-DeNew and Schimdt (1997).

Results from estimating Equation 2.4.1.2 are presented in Table 2.4. Panel A shows the results for the case where the measure of *Access* used is *totalDMA* (i.e., including both *ownDMA* and *otherDMA*), and Panel B presents the estimation results where *Access* is defined as *totalDSA* (= *ownDSA* + *otherDSA*). All the regressions include state and year indicators. Robust standard errors clustered at the region level are reported. In all the regressions, state indicators are jointly significant and the p-values from the test of significance are reported for all the specifications.[48] The coefficient estimates obtained here reflect heterogeneity in region wage premia resulting from spatial characteristics.

In column 1 of Panels A and B in Table 2.4, state indicators are included to control for differences in economic activity across states resulting from different

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[48] In all specifications, which include state indicators interacted with time indicators, p-values for the joint significance of interaction terms are reported for the corresponding specifications in all the tables.

policies, state-level institutions, and other potentially unobserved state level characteristics. In addition, time indicators are also included to control for macroeconomic shocks and any other time varying but region invariant effects. In both the cases, coefficients on *totalDMA* (*totalDSA*) and *Port* are statistically significant and positive implying that greater access to markets and suppliers have a positive effect on wages associated with a region. However, with our definition of *Port* (distance to the closest port) we are unable to say whether this is foreign market or foreign supply access.

Estimation results reported in column 2 include institutions to control for omitted variable bias that could arise due to some regions having good access to each other and being prosperous not because of their proximity to markets but because of them having good institutions. In column 2 in both the Panels of Table 2.4, the coefficients of *totalDMA* (*totalDSA*) and *Port* continue to be positive and statistically significant. In addition, the coefficient of institutions is positive (as is expected because better institutions foster a better climate for growth, attract greater investment and result in higher wages being associated with a region).

In columns 3 and 4 (both Panels in Table 2.4), specifications from columns 1 and 2, respectively, are generalized further to include state varying time effects. The coefficients on *totalDMA* (*totalDSA*), *Port* and institutions continue to be positive and statistically significant.

However, it might be the case that the own-region component of *totalDMA* (*totalDSA*) is driving this significance of *totalDMA* (*totalDSA*). This is confirmed in

Panels A and B of Table 2.5 which reports the results for *otherDMA* and *otherDSA* respectively.

If we look at column 1 of Panel A (B), *otherDMA* (*otherDSA*) is no longer significant but *Port* continues to be statistically significant and signed as expected. *OtherDMA* and *otherDSA* continue to be insignificant in column 2 in both the Panels after including institutions. In columns 3 and 4 of Panels A and B (Table 2.5), estimation results after including interaction of state indicators with year indicators are reported. Domestic market and supply access continue to be statistically insignificant. *Port* measures the access to foreign markets (suppliers) and it continues to be statistically significant in both cases.

Thus, the proximity to internal markets as measured by *totalDMA* (or *totalDSA)* is significant but not when the own-region component is excluded and *otherDMA* (*otherDSA*) is used.

Referring to Equation 2.3.4 the reduced form specification includes both access to domestic markets and suppliers. Table 2.6 presents the results with both domestic market and supply access included in the same specification. However, due to the high correlation, 0.8, between the measures of market and supply access, it is difficult to identify their effects individually.[49] This can be seen from Panel A in

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[49] Redding and Venables (2004) in their analysis of the importance of market and supply access in explaining cross-country differences in per capita income, find that the high degree of correlation between market access and supplier access make it difficult to separately identify their individual effects. Similarly, Davis and Weinstein (2005) looking at the role of linkages in explaining cross-regional variation in productivity in Japan, find that the high-correlation between the demand and cost linkages measures makes it difficult to identify the effects of the two separately. They find that as a result of multicollinearity (correlation is 0.95), using both linkage terms in the same estimating equation does increase the standard errors (We find this to be true for results in Table 2.6 compared with results in Tables 2.4 and 2.5) and demand linkages have the wrong sign.

Table 2.6, where *totalDMA* is no longer significant and only *totalDSA* is statistically significant. Similar to the results in Table 2.5 using only the "other"-component leaves measures of market and supply access statistically insignificant as shown in Panel B of Table 2.6. However, coefficients on *Ports* and institutions are statistically significant and signed as expected.

Thus, because of the simultaneity bias arising from the *ownDMA* and *ownDSA* component of *totalDMA* and *totalDSA*, we use *otherDMA* and *otherDSA* as the preferred measures of domestic market and supply access respectively. Further, the preferred specification is the one with either the domestic market access or supply access but not both at the same time. In the next section, we instrument *totalDMA* (*totalDSA*) with *otherDMA* (*otherDSA*).

The period under study, 1980-2000, was a period of changes in the economic and political landscape of India and the year 1991 saw a sea-change in the economic policy-making in India. Table 2.7 examines whether the impact of spatial features on wages changes in the post-reform period. Both the Panels A and B use the preferred measure of proximity to markets and suppliers i.e., *otherDMA* and *otherDSA* respectively, and Equation 2.4.1.3 is estimated. The preferred measures of market and supply access are interacted with a dummy variable, *Postlib*, which equals one if year of household survey is after 1991 and zero otherwise. As a result, two of the time periods 1983 (NSS round 38) and 1987-88 (NSS round 43) are characterized as pre-

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Amiti and Cameron (2004), on the other hand, using disaggregated firm level data from Indonesia find that correlation between market access and supply access is 0.23 allowing them to identify the effect of the two separately.

reforms whereas 1993-1994 (NSS round 50) and 1999-2000 (NSS round 55) are characterized as falling in the post-reform period.

As before, compared with Panels A and B of Table 2.5, *otherDMA* (Panel A of Table 2.7) and *otherDSA* (Panel B of Table 2.7) are insignificant in all the columns. In all the columns, in the both Panels A and B, *Ports* and institutional quality are statistically significant. A greater proximity to ports and better institutional quality leads to higher wages being associated with that region.

*OtherDMA*Postlib* (*otherDSA*Postlib)* show if there is any heterogeneity in the role of domestic market access and supply access variables over time. In columns 1 and 2 in both the Panels of Table 2.7, the interactions of domestic market and supply with *Postlib* are insignificant. Columns 3 and 4 (in both the Panels), generalize the specification used in columns 1 and 2 respectively, and interactions of state and time indicators are included.

Looking at columns 3 and 4 in Panel A of Table 2.7, *otherDMA*Postlib* is positive (as expected) and statistically significant (at 1 percent level of significance) implying that there is a differential impact in the post-liberalization period of greater proximity to domestic markets. Similarly in Panel B of Table 2.7, the coefficient of *otherDSA*Postlib* is positive and statistically significant at the 1 percent level in columns 3 and 4. In other words, in the post-1991 period regions with greater access to domestic markets and suppliers have higher wages associated with them, whereas this was not the case in the pre-1991 period.

The statistical insignificance of the interaction term (*otherDMA*Postlib* or *otherDSA*Postlib*), in columns 1 and 2 (both Panels A and B, Table 2.7), could be due to the low power of the test resulting from the restrictions imposed which limit state level effects to be time-invariant. On other hand, columns 3 and 4 do not impose any such restriction and include time variant state level effects allowing for a more general specification. The more general estimations in column 3 and column 4 (in both Panels A and B, Table 2.7) are the preferred specifications.[50]

In columns 5 and 6 of Panels A and B (Table 2.7), we examine if there is any heterogeneity in the impact of access to ports and institutions. Only the specification including interactions of state and time indicators are reported. The interaction terms, *otherDMA*Postlib* (in Table 2.7, Panel A, columns 5 and 6) and *otherDSA*Postlib* (in Table 2.7, Panel B, column 5 and 6) continue to be statistically significant and positive. The coefficient on *Ports*Postlib*, though positive as expected, is not statistically significant at conventional levels and we do find proximity to foreign markets and suppliers becoming any more important post-reforms. Also, we do not find any additional effect of institutional quality post-liberalization as shown in column 6 of both the Panels by the coefficient of institutional quality interacted with *Postlib*.

Table 2.7 (Panel C) presents the results for the case where *otherDMA*, *otherDSA* and their interactions are included in the same specification. As before, (Table 2.6, Panel B) *otherDMA* and *otherDSA* are statistically insignificant when included in the same specification. Also, in this case there is no heterogeneity in the

[50] All tables examining the heterogeneity of the proximity terms include p-values from the test for the total effect of each proximity term in the post-liberalization period. While the total effect of domestic market access terms is positive post-reforms, there is only weak evidence of the total effect being positive in the case of the domestic supply access. However, what we are interested in is the interaction term so as to examine if there is any structural break in the relationship between proximity and wages after the reforms were introduced.

role of either *otherDMA* or *otherDSA* in the post-reform period. In all the columns, *Ports* and institutional quality are positive and statistically significant, but no additional effect (i.e. interaction with *Postlib* is statistically insignificant) in the post reform period as shown in the columns 3 and 4.

2.6.3 Robustness Checks

Our results show that proximity to ports is associated with higher region wage premia. On the other hand, greater proximity to domestic markets and sources of supply are not associated with higher region wage premia before liberalization. Interestingly, however, there is heterogeneity in their role over the time period under study. We find that post-reforms domestic market and supply access have a positive and statistically significant impact on wages associated with a region. The effect of greater access to ports and better institutional quality does not appear to have become any stronger post-reforms. In this section, we perform several robustness checks on our results.

First, we use an alternative measure of access to foreign markets and suppliers, *FMA_gdp*, as defined in Section 2.4.2.2. This measure takes into consideration the market (and supply) capacity of foreign regions rather than just using the inverse of the distance to the closest port. Since comparable measures of market and supply access tend to be highly correlated, we use *FMA_gdp* as a measure of access to foreign suppliers as well.

Results using this alternative measure of foreign market access are reported in Table 2.8 (Panels A and B). From both the Panels of Table 2.8, we see that our pattern of results hold with this new measure. However, the coefficient on *FMA_gdp*, is higher than those on *Ports* in comparable specifications in Table 2.7. This indicates that there could be a measurement error in using distance to the closest port as a measure of proximity to foreign locations.

It could be the case that using the distance to the closet port (*Ports*) is picking up the effect of regions associated with the big ports rendering *otherDMA* and *otherDSA* insignificant. We check for this, first, by using *FMA_gdp* as the alternative measure for access to foreign regions. This measure uses the distance of a region to a foreign country and not distance to the closest port as a measure of access to foreign markets. This should mitigate concerns that proximity to ports is capturing access to domestic markets. Results using *FMA_gdp*, reported in Table 2.8, show that *otherDMA* and *otherDSA* continue to be insignificant. Second, we drop the proximity to foreign markets and suppliers altogether and use only *otherDMA* and *otherDSA*. This does not lead to the coefficients on these terms becoming statistically significant. It is unlikely that *Ports* is picking up the effect of access to regions with big ports.

Our results show that post-reforms, access to domestic markets and suppliers that are significant and ports are not any more important than they were pre-reforms. Opposite to the previous paragraph, it could be the case that proximity to domestic markets and suppliers in the post reform period is in fact proximity to ports.

To answer this, we re-define *otherDMA* and *otherDSA* to leave out all the regions associated with the big ports in the calculation of market and supply access. We call them *otherDMA_minusports* and *otherDSA_minusports*, respectively. Table 2.9 (Panels A and B) shows the results with *Ports* as the measure of FMA and FSA. We continue to find that access to domestic markets and suppliers have a significant effect in the post reform period and there is no additional effect from greater access to ports. As an additional check (results not reported), we use *FMA_gdp* instead of *Ports* as a measure of access to foreign markets and suppliers with *otherDMA_minusports* and *otherDSA_minusports*. We find that our results are unchanged.

We have used *otherDMA* and *otherDSA* as the preferred measures of domestic market access and supply access due to the simultaneity bias arising out of the *ownDMA* and *ownDSA* components of *totalDMA* and *totalDSA*. Here, we instrument the latter with *otherDMA* and *otherDSA*.[51] Results from the second stage of the instrumental variable regression are reported in Table 2.10.[52] The results obtained in the respective panels of Table 2.7 continue to hold.

The measure of market capacity used to construct domestic market access includes both consumer expenditure and intermediate inputs. But due to the non-availability of intermediate inputs at the region level, expenditure on intermediate inputs has been calculated from the state level data. We modify the definition of market capacity to include only consumer expenditure. We find that restricting the definition of market capacity to include only the consumer expenditure does not alter our results. *OtherDCX* is insignificant in Table 2.11, and institutions and access to ports are significant with the expected sign as in Panel A of Table 2.7. Like in Panel A of Table 2.7, *otherDCX* continues to have a statistically significant and a positive

[51] Both *totalDMA* and its interaction with *Postlib* are instrumented. The instruments used are *otherDMA* and its interaction with *Postlib*.

[52] The first-stage regression results for the IV estimation are not reported here. For the IV estimation results reported in columns 1-4 of Table 2.10 (both the panels), the R-squared from the various first stage regressions are greater than 0.80. The partial R-squares for the excluded instruments are greater than 0.4.

impact post-liberalization. There is no additional effect in the post-reform period from greater proximity to ports and better institutional quality.

We expand the sample to include the rural manufacturing sector as well and the results shown in Panels A and B of Table 2.12 confirm that the choice of urban manufacturing sector does not seem to be driving the results.[53] As in Table 2.7, *otherDMA* and *otherDSA* have a statistically significant and a positive impact in the post-liberalization period. However, the magnitude of the coefficients on *Ports* is reduced, but they continue to be statistically significant, though at lower levels of significance. Also, the coefficients on institutional quality are higher than those reported in Panels A and B of Table 2.7. There is no heterogeneity in the role of both *Ports* and institutions over time.

The state level CPI has been used to deflate the consumer expenditure and the state GDP deflators are used for intermediate inputs and output. Instead of using different deflators for consumer expenditure and intermediate inputs, we use a common deflator for both. We check our results with both CPI and state GDP deflators. Results are shown in Panel A of Table 2.13 and the result are qualitatively similar compared to the corresponding specifications in Panel A of Table 2.7. Similarly, in the case of *otherDSA* (results reported in Table 2.13, Panel B) calculated using CPI as the deflator for output, instead of GDP deflators, the results from Panel B of Table 2.7 continue to hold.

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[53] First-stage regressions, from estimating Equation 2.4.1.1, for each of the four rounds of the household survey data are repeated to include the rural manufacturing sector. They are not reported here.

2.6.4 Discussion

We find that a greater access to the ports has a positive and a statistically significant effect on the region wage premia i.e., regions closer to the ports have higher wages associated with them. On the other hand, greater proximity to domestic markets and sources of supply are not associated with higher region wage premia before liberalization. However, there is heterogeneity in their role over the time period under study. We find that post-reforms the role of domestic market and supply access has become stronger and they have a positive and statistically significant impact on wages associated with a region. The effect of greater access to ports and better institutional quality does not appear to have become any stronger post-reforms.

Industrial and trade policy pursued after independence heavily restricted private sector activity and licensing requirements dictated, among other things, the investment location. Once private sector activity is deregulated and de-licensed, location-specific features are likely to play a more important role in the decisions of economic agents. As a result, post-reforms regions with greater market and supply access will attract more investment (a higher share of which is increasingly coming from the private sector). This will contribute to disparities in location of economic activity and outcomes such as income (as conjectured by Lall and Chakravorty (2005)). We find that post reforms regions with better access to domestic markets and suppliers have higher wage premia.

On the other hand, access to foreign markets and suppliers as measured by proximity to ports (*Ports*) are statistically significant and regions closer to ports have higher wage premia. However, for the post reform period, we do not find any statistically significant evidence of the ports being any more important. This is in contrast to the result found in the literature for the case of CEECs (Crozet and Koenig-Soubeyran (2004) for Romania, Forster et al. (2005)) for transition economies in CEECs) and Mexico (Hanson (1998)) where after reforms access to developed country markets became more important in the regional structure of wages and employment.

There could be several potential explanations for this result. First, this could be due to the fact that the measure of access to foreign markets and suppliers is time invariant and one expects little to change over time as distance remains constant. However, there is no change in this result when we use *FMA_gdp* (which is time variant) as a measure of proximity to foreign markets and suppliers. Hanson (1997) also finds no evidence of a differential impact of distance between the U.S. border and Mexican states on regional relative wages in the post-reform period.

Another potential explanation for no additional impact of proximity to ports could be that the external trade has not "taken off" the way it has for China and Mexico. To give an idea, trade in goods as a percentage of its GDP increased from 18 percent to 44 percent in China, from 21 percent to 60 percent in Mexico over the period 1980-2000, whereas in the case of India it increased from 13 percent to 20 percent over the same period.[54] Das (2006) notes India's pattern of growth has been unique. One of the differentiating patterns has been that it has relied more on domestic markets than exports. This could explain why post-reforms domestic

[54] Source: WDI (2003)

markets and suppliers have a positive effect on wage premia but not proximity to ports.

The manufacturing sector witnessed extensive reforms in the form of both domestic deregulation and trade reforms through reduction of tariff and non-tariff barriers. With no change in the role of ports and a stronger role of proximity to domestic markets (and suppliers) in the post-reform period, our results suggest that deregulation of manufacturing sector seems to have played a greater role in firm decisions rather than increased proximity to world markets. However, without better measures of de-licensing and trade liberalization it is not possible to test this directly.

Finally, better institutional quality leads to better provision of public goods, fosters a better investment climate and therefore, regions with stronger institutions have higher wages associated with them. However, there is no evidence that institutions have gained in importance in the post-reform period. One explanation for this result could be that the measure of institutions being used is a historical measure and its ideal use is as an instrument and not as a direct measure of current institutions as noted by Rodrik et al. (2004). They argue that, "while colonial history does not provide a satisfactory account of income differences in the world, it can still provide a valid instrument." Due to the lack of any direct measure of current level institutions at the region level, we use the Banerjee-Iyer measure directly as a measure of institutions and to that extent is a limitation of this study. However, post-independence districts have been brought under the control of state administration and it is the state level institutions that are important. To this end state level indicators have been included.

Additionally, there could be concerns that agglomeration of industrial activity resulted from the location bias in government policy. There are many reasons to believe that this is not the case. First, unlike Mexico where Mexico City benefited from subsidies and government favors leading to concentration of economic activity in and around the capital (Hanson (1997)), in India, the *Central* government controlled the location of production as a part of the licensing requirements to mitigate regional inequality.

Second, in the post-1991 period the *Central* government, with no control over the location of new investment, could (and in fact does) provide incentive packages favoring some locations over the others. However, these incentives are more likely to be given to regions lagging behind (for example, special development packages for North Eastern states by the *Central* government) rather than those attracting investment on their own. So if this was indeed the case, proximity to markets and suppliers should have either negative or statistically insignificant effect on wages associated with the region. On the contrary, we find post-reforms access to domestic markets and suppliers have a positive effect on wages associated with a region.

Third, as mentioned above, post-1991 states competed with each other to attract private investment and *State* governments offered incentives to locate investment in their respective states. To that extent, state indicators interacted with time indicators should account for differences in the state policies.

2.6.5 Quantification and Implications for Spatial Inequality

In this sub-section, we present implications of our results for spatial inequality. We are interested in quantifying the impact on spatial inequality from an improvement in proximity to markets and suppliers in the post-reform period. In doing so, we use the estimates reported in column 6 of Table 2.7 (Panels A and B). Calculations are shown in Table 2.14.

Results from column 6 in Panel A of Table 2.7 suggest that post-reforms an increase in the domestic market access from median to the 75th percentile increases wage premia by 44%. This increase is evaluated at the wage premia of the region corresponding to the median domestic market access[55].

Assuming this translates into an increase in the wages of the entire region, we find that the Gini Coefficient increases from 0.266 to 0.268 for the 55th round (Table 1.2). This is approximately equal to a 1% increase in regional inequality. Similarly, between-region component of total income inequality, as measured by Theil's index, increases by 0.13 percentage points from 23.56 percent to 23.69 percent, which is a 0.6% increase in spatial inequality.

Similarly, results from column 6 in Panel B of Table 2.7 suggest that an increase in the domestic supply access from median to 75th percentile increases wage premia by 61% in post 1991 period when evaluated at the wage premia of the region corresponding to the median domestic supply access. Doing a similar exercise as above implies an increase in the Gini-coefficient from 0.266 to 0.27, a 1.5% increase in regional disparities. In terms of Theil's measure this translates into an increase of 0.6 percentage points from 23.56 percent to 24.16, equal to a 2.5% increase in spatial inequality.

[55] If the median value for domestic market access (and domestic supply access and ports) does not match with any region (which is likely to be the case since there are even number of regions), the region wage premia used for the exercise here correspond to market (supply) access immediately higher than the actual median. The values used are for round 55.

A similar increase in proximity to ports evaluated at the wage premia corresponding to the median proximity to ports increases wage premia by 29%. This increase in proximity to ports does not have any effect on measures of inequality.

2.7 Conclusion

As developing countries liberalize there is a debate about the distributional implications of the reforms. It is important to examine what factors contribute to the uneven sharing of gains from reforms. In this chapter, using household survey data from India over the period 1980-2000, we investigated whether superior location features, as measured by proximity to markets and sources of supply, result in higher region wage premia. In addition, using the case of reforms implemented in 1991, we examined if there is any heterogeneity in their effect in the post-reform period. We use a two-step estimation methodology, which has not been used in the context of spatial inequality in the existing literature. This approach allows for comparing workers with similar observable characteristics.

We find that the proximity to ports has a positive and a statistically significant effect on wages associated with a region, whereas greater access to domestic markets and suppliers do not have any statistically significant effect on region wage premia before liberalization. However, there are differences in their impact over the time period under study. We find that post reforms domestic measures of proximity have a positive and statistically significant impact on region wage premia. This is consistent with greater freedom to private investment activity in the post-reform period. Private investment, which is increasing its share over time in total investment, is more likely to be guided by profit and therefore give more weight to location features. This is likely to increase inequalities in private investment which will contribute to inequalities in regional outcomes.

There is however weaker evidence of any additional effect on wages from greater proximity to ports in the post-1991 period. This is contrary to the results in the literature on industrial relocation in CEECs and Mexico, where studies have found increased importance of proximity to developed country markets after implementation of reforms. The results that we find here could be due to the time invariant measure of foreign market access. It could also be due to the fact that trade in goods has not increased as much as in the case of China or Mexico, and India's growth has relied more on the domestic markets than exports.

Spatial features such as proximity to ports, domestic markets and suppliers contribute to the between-region component of total income inequality. We find that post-reforms the role of domestic market and supply access has become stronger and they have a positive and statistically significant impact on wages associated with a region. The effect of greater access to ports does not appear to have become any stronger post-reforms. This suggests that the share of the between-region component in the total income inequality will be higher, resulting in an increase in spatial income inequality, in the post-reform period. This has serious implications and some of which are already being seen on the ground.

A continued low growth rate for the poorer states and regions will lead to an increase in inequality and a regional concentration of poverty. This in turn will lead to a socially and a politically explosive situation. Already, 1/3rd of districts, and 13 out of 31 states in India are witnessing Naxalite movements.[56] Further, there are increasing demands for autonomous regions and new states from different parts of the country (three new states were created in 2001). This can lead to serious concerns about the sustainability of the growth process itself and put a question mark on the economic policy in general. This will not only strain and slow down the liberalization process but will also add to social tension as only some groups are seen to benefit at the expense of other groups and more so if regional inequalities align with splits in socio-economic groups.

There are several potential extensions of this work. NEG models require the use of transport costs in measuring proximity to markets and suppliers. In this paper, we use distance between regions as a proxy for transport costs. One possible line for future research could be to use a more direct measure of transport costs or to use time taken to travel between regions. Another possible extension is to examine the extent of diffusion of externalities. Further, deflators used in this study are at the state level price indices. The spatial unit used is a sub-state unit and to the extent that there are variations in prices across regions within the same state, using regional price index is another area in which this work can be extended. Also, as discussed above the ideal use of Banerjee-Iyer (2005) measure is as an instrument. Using more recent data on institutional quality and instrumenting it with the Banerjee-Iyer measure is another area for improvement.

[56] Naxalite movement takes its name from a peasant uprising that took place in May 1967 at Naxalbari – a village in the state of West Bengal. Broadly, the objective of the movement is seizure of power through an agrarian revolution. Naxalite movement since its early days has been a violent struggle against landlords and the state machinery itself.

Chapter 3: Trade Liberalization and Wage Inequality: Evidence from India

3.1 Introduction

A growing body of research indicates that trade liberalization by developing countries has raised their aggregate incomes.[57] Academic and policy debates on the merits and demerits of liberalization have centered on the internal distributional consequences and on the question of how trade reforms affect labor markets. In this chapter we present new evidence from India on the impact of trade liberalization on wages.

India offers an excellent case to study the effects of trade liberalization for two reasons. First, the magnitude of trade liberalization in India was very big. In 1991, after decades of pursuing an import-substitution industrialization strategy, India initiated a drastic liberalization of its external sector. The average tariff in manufacturing declined from 117 percent in 1990–91 to 39 percent in 1999–2000. The reduction in tariffs was much more drastic in India than in the trade liberalization episodes in Latin American countries like Mexico, Colombia, and Brazil. In addition to tariffs, India has also reduced non-tariff barriers (NTBs) since 1991. The average import coverage ratio (the share of imports subject to non-tariff barriers) declined from 82 percent in 1990–91 to 17 percent in 1999–2000.

[57] For example, see Frankel and Romer (1999).

Second, the trade reforms in India were exogenous and came as a surprise to the policy makers. In response to a severe balance of payments crisis in 1991, India approached the International Monetary Fund for assistance. The IMF support was conditional on structural reforms including trade liberalization, which India launched. The government's objectives when reducing trade barriers were thus given by IMF conditionalities. From an industry perspective, the target tariff rates were exogenously predetermined and policymakers had less room to cater to special lobby interests. Hence, the Indian trade liberalization episode offers an excellent natural experiment to examine the impact of trade reforms on the labor market.

We use a dataset that combines micro-level data from the National Sample Survey Organization (NSSO) with data on international trade protection for the years 1980–2000. The empirical strategy employed uses variation in industry wage premia and trade policy across industries and over time. Industry wage premia are defined as the portion of individual wages that accrues to the worker's industry affiliation after controlling for worker characteristics. Since different industries employ different proportions of skilled workers, changes in wage premia translate into changes in the relative incomes of skilled and unskilled workers (Pavcnik et al. (2004), Goldberg and Pavcnik (2005)).

First, we analyze industry wage premia in the manufacturing sector in India. The main finding is that large differences in wages across industries exist for seemingly similar workers in terms of observable characteristics. Also, the structure of industry wage differentials in India has changed over time. Labor market rigidities seem to be a plausible explanation for the existence of wage premia in India.

Next, we examine empirically the impact of trade liberalization on industry wage differentials. The existing studies on the relationship between trade policy and industry wage premia in developing countries yield mixed conclusions (e.g. Goldberg and Pavcnik (2005), Pavcnik et al. (2004), Feliciano (2001)). These studies find a positive or a statistically insignificant relationship between changes in trade policy and changes in wage differentials over time. In contrast, we find a strong and negative relationship between changes in trade policy and changes in wage differentials. The negative relationship is robust to instrumenting for tariffs and to including measures of non-tariff barriers. Our result is similar to Goh and Javorcik (2005) who find, in the case of Poland, that reduction in tariffs within an industry is associated with an increase in wage premium within that industry. However, unlike Goh and Javorcik (2005), our results are robust to using an instrumental variables strategy.

We also find that the magnitude of tariff reductions is relatively larger in sectors with a higher proportion of unskilled workers. Since the sectors with the largest tariff reductions experienced an increase in wages relative to the other sectors, this implies that the unskilled workers benefited relative to skilled workers. This intuition is confirmed by analyzing empirically the impact of trade liberalization on skilled and unskilled workers separately. Thus, our findings suggest that trade liberalization, has led to decreased wage inequality through the wage premium channel in India.

3.2 Predictions of the Theoretical Models

Trade liberalization could affect industry wage premia in perfectly competitive product and factor markets if there is short-run immobility of labor (specific factors model). In this case, trade liberalization would reduce the relative returns to the factor specific to the sector in which tariffs are reduced more. Trade liberalization could also affect wages in perfect competition models if workers are heterogeneous. Reduction in tariffs could affect relative wages by changing the composition of workers.

Introducing imperfect competition in product and factor markets introduces additional channels through which trade liberalization can affect wage premia. Trade liberalization could affect wage premia by affecting capital or labor rents (Katz. et al. (1989)). It is also possible that unions extract part of the rents from protection in the form of more jobs rather than higher wages (McDonald and Solow (1981)). In this case, trade liberalization might not have any effect on relative wages but only affect employment. Grossman (1984) considers what happens when random layoff rules are replaced by seniority based layoff rules. Such a system induces senior workers to push for higher wages and junior workers to push for the low wages that prevent layoffs; the impact of trade liberalization then depends on the seniority structure of the union.

Liberalization induced productivity changes at the firm level may also impact industry wages. Most empirical work has established a positive link between liberalization and productivity (e.g., Harrison (1994) for Côte D'Ivoire, Krishna and Mitra (1998) for India, Pavcnik (2000) for Chile). The increased threat of foreign competition raises innovation incentives by domestic producers, forcing them to restructure and increase their productivity. To the extent that productivity enhancements are passed through onto industry wages, relative wages would be positively correlated with trade liberalization.

3.3 Empirical Strategy

The strategy to estimate the impact of trade policy on wages follows the industry wage premium methodology. The methodology has been used extensively in the trade and labor literature (Krueger and Summers (1988), Dickens and Katz (1987), Gaston and Trefler (1994), Goldberg and Pavcnik (2005), Pavcnik et al. (2004)). The idea is to exploit variation in wages and tariffs (and other trade policy measures) across industries and over time to identify the impact of trade on wages.

The estimation has two stages. In the first stage, the log of individual worker i's wages, $\ln(w_{ijt})$ (working in industry j and observed at time t) are regressed on a vector of the worker's characteristics (X_{ijt}) like education, age, gender, geographical location, occupation, dummy for whether the worker is self employed, and a set of industry indicators (I_{ijt}) reflecting the worker's industry affiliation:

$$\ln(w_{ijt}) = X_{ijt} b_{Xt} + I_{ijt} g_{jt} + e_{ijt} . \qquad (3.3.1)$$

The coefficient on the industry dummy, the wage premium (g_{jt}), captures the part of the variation in wages that is explained by the worker's industry affiliation. Following Krueger and Summers (1988), the estimated wage premia are expressed as deviations from the employment-weighted average wage premium. The normalized wage premium can be interpreted as the proportional difference in wages for a worker in a given industry relative to the average worker in all industries with the same observable characteristics. The exact standard errors for the normalized wage premia are calculated using the Haisken-DeNew and Schmidt (1997) two-step restricted least squares procedure. The first stage regressions are estimated separately for each year in the sample. In the second stage, the industry wage premia for different years are pooled, and then regressed on tariffs, and other trade-related measures. The second stage regression is specified in first differenced form as:

$$\Delta g_{jt} = h\Delta T_{jt} + d\Delta D_{jt} + p_t + e_{jt} \quad . \qquad (3.3.2)$$

Where, Δg_{jt} is the change in industry wage premium for industry j between $t-1$ and t, ΔT_{jt} is the change in tariffs in industry j between $t-1$ and t, ΔD_{jt} denotes the change in trade-related variables other than tariffs, p_t is a vector of year indicators. The first differenced specification controls for unobserved industry specific heterogeneity. An additional concern could be that because there were other reforms such as de-licensing which were implemented at the same time, these other reforms could be correlated with changes in tariffs. However, de-licensing was introduced in one go and was implemented across industries. To that extent this is taken care of by the time indicators. On the other hand, changes in tariffs were not a one time treatment and were lowered over time.

The second stage regression is estimated using weighted least squares. The inverse of the standard error of the wage premium from the first stage are used as weights. This puts more weight on industries with smaller variance in industry premia.

3.4 Data Description

The data on tariff and non-tariff barriers in India that we use is from Das (2003).[58] This database covers 72 three-digit manufacturing industries, according to the National Industrial Classification 1987 (NIC-1987) for the period 1980–81 to 1999–2000. Appendix C provides a list of industries for which tariff information is available. As discussed in Chapter 1 and shown in Figure 1.3 the percentage point reduction in average tariffs between 1990–91 and 1999–2000 was more drastic in India than in the Latin American countries. The level of protection also varied widely across industries. The standard deviation of the tariff rate was 0.23 in 1980–81 and this dropped to 0.06 in 1999-2000.

The trade reform also changed the structure of protection across industries. Figure 1.4 plots the tariffs in 1980–81 and 1999–2000 in various manufacturing industries. The tariffs declined in all the industries, and the decline differed across industries. Table 1.5 shows the correlations of tariffs over five-year periods since 1980-81.

In addition to tariffs, India also reduced non-tariff barriers (NTBs) since 1991. The measure of non-tariff barriers used is the "import coverage ratio" which is defined as the share of imports subject to non-tariff barriers. The average import coverage ratio declined from 82 percent in 1990–91 to 17 percent in 1999–2000 (Figure 1.5).

The household survey data is drawn from the Employment-Unemployment Schedule of the National Sample Survey Organization (NSSO) administered by the

[58] Special thanks to Deb Kusum Das of Indian Council for Research in International Economic Relations for sharing his database on tariffs and non-tariff barriers in India.

Government of India. We use data from four survey rounds conducted in 1983 (38th round), 1987–88 (43rd round), 1993–94 (50th round), 1999–2000 (55th round). The data are a repeated cross-section. The data provide information on weekly earnings, worker characteristics such as age, education, gender, marital status, occupation, industry of employment at three-digit National Industrial Classification (NIC-1987) and state of residence. We restrict attention to workers in the urban areas who work in the manufacturing sector. The reason for restricting attention to workers in urban areas is that the analysis focuses on manufacturing (since the tariff reductions were largest in manufacturing, whereas agriculture has been relatively closed to trade liberalization), which is largely located in urban areas. We include workers between the ages of 15 and 65, who are a part of the labor force and report positive weekly earnings. The measure of wages is weekly earnings in rupees, which are deflated by the consumer price index from the International Financial Statistics. Based on completed years of schooling, workers are divided into three categories ? (i) primary or less: at most 5 years of schooling (ii) middle or secondary: 6–10 years of schooling (iii) higher secondary or more: at least 11 years of schooling. Table 3.1 provides summary statistics.

3.5 Results

3.5.1 Estimation of Inter-industry Wage Premia

In the first stage, equation (3.3.1) is estimated separately for each round of the NSS. The logarithm of the individual worker's wages are regressed on the dummies for worker's industry affiliation, worker characteristics like age, age squared, dummies for education, marital status, gender, occupation, whether the individual is the head of the household and the state of residence. The first stage regression results are shown in Table 3.2.

The bottom part of the table shows the R-squared for the regressions with and without industry dummies. For example, in 1999–2000, the R-squared for the regression excluding industry dummies is 0.50 i.e., the worker characteristics and state indicators alone explain about 50 percent of the variation in log weekly earnings. Adding the industry indicators increases the R-squared to 0.55 i.e., the industry indicators account for 5 percent of the total variation in log weekly earnings after controlling for worker characteristics. In general, the industry indicators explain about 4 to 7 percent of the variation in log weekly earnings.

Appendix F shows the inter-industry wage premia for the 72 three digit industries for which we have tariff data. The wage premia are expressed as deviations from the employment weighted average wage premium. The standard errors are calculated by Haisken-DeNew and Schmidt (1997) procedure. The wage premia are jointly statistically significant at 1 percent level (p-value = 0.00) in all the years. Many of the wage premia are individually statistically significant as well.

There is, moreover, considerable dispersion in the wage premia across industries. The standard deviations range from 0.24 to 0.34 for the different years (see Table 3.1). In 1983, the three highest wage premium industries are zinc manufacturing, office, computing and accounting machinery, and ferro alloys, and the lowest wage industries are cotton spinning, matches, and weaving and finishing of cotton textiles on handlooms. For example, the estimate of wage premium in manufacture of fertilizer and pesticides (industry code = 301) is 0.314, and the estimate of wage premium in weaving and finishing of cotton khadi (industry code = 232) is –0.084. These estimates imply that a worker with the same observable characteristics switching from fertilizer and pesticides to khadi would observe a decline of 40 percent in weekly earnings (0.314-(-0.084)).

The structure of wage premia across industries has also changed over time. To examine the change in structure of the wage premia, we look at their year-to-year correlations in Table 3.3. The correlation between the wage premia in 1983 and 1999–2000 is 0.26, and the correlation between the premia in 1987–88 and 1999–2000 is 0.40. The Indian wage premia are much less correlated over time than the wage premia in United States and Brazil (Krueger and Summers (1998), Goldberg and Pavcnik (2005)). The correlation coefficients are of the order of 0.9 for the United States (between 1974 and 1984) and Brazil (between 1987 and 1998). The low correlation between the wage premia suggests that the structure of inter-industry wage premia changed significantly over time. Given that there were major trade reforms during the sample period, changes in trade policy could potentially constitute an explanation for the changing structure of the wage premia.

One possible explanation for the existence of wage premia in a developing country like India could be the lack of perfect mobility of labor across sectors. There is evidence of significant labor market rigidities in India (e.g., see Dutt (2003), Fallon and Lucas (1993), Topalova (2005)). India is ranked forty-fifth for the degree of labor market flexibility in the Global Competitiveness Report (GCR (1998)). Employment security in India is regulated mainly on the basis of the Industrial Disputes Act of

1947 (IDA). According to the 1982 amendment of the IDA, any firm employing 100 or more workers requires permission from the government before laying off or retrenching its workers.

To test for evidence of labor reallocation between sectors, we also regress employment share of each industry, on tariff rates, industry and year indicators. The coefficient is 0.001 and is statistically insignificant. Thus, we do not find evidence for any significant employment sensitivity to trade shocks. This is consistent with the existence of labor market rigidities in other developing countries. Various studies from other countries like Mexico and Colombia have found similar results (Revenga (1997), Hanson and Harrison (1999), Attanasio et al. (2004)).

Another potential explanation for industry wage differentials could be varying degrees of union bargaining power across industries. If the industry wage differences are due to "strong" unions that can increase wages without suffering severe employment losses in certain industries, we would expect to find less variability in wages across industries for nonunion workers (Krueger and Summers (1988)). However, this is not the case for India. In India, in 1993–94, non-union workers have slightly higher wage dispersion (=0.389) than union workers (=0.340).[59] Additionally, there is also evidence that unions are not very powerful in India (Dutt (2003)). The Trade Union Act of 1926 provides for the registration and operation of trade unions. This act allows any seven workers to register their trade unions. This has led to multiplicity of unions with outsiders playing a prominent role. There is no procedure to determine the representative union, which would serve as a single bargaining unit.

[59] Unfortunately, all the National Sample Survey rounds do not record the union/non-union status of the workers.

Also, the Industrial Disputes Act of 1947 confers upon the state the power to regulate labor-management relations. The inclusion of the state in the dispute settlement mechanisms complicates the bargaining process since the state itself is the dominant employer in the organized sector.

3.5.2 Industry Wage Premia and Trade Policy: Preliminary Evidence

First we look at simple scatter plots to examine the characteristics of industries which had the greatest reduction in tariffs. Figure 3.1 shows the scatter plot for tariff reductions between 1983–84 and 1999–2000 and the tariffs in 1980. The raw data shows a strong and positive relationship between the tariff reduction in the two decades and the initial tariffs (coefficient=0.66, standard error=0.09) i.e., the magnitude of tariff reductions were greater in those industries with the highest initial tariff in 1980. Figure 3.2 shows the scatter plot for tariff reductions between 1983–84 and 1999–2000, and the share of unskilled workers in 1983. Unskilled workers are defined as those having less than 11 years of completed schooling. The raw data show a strong and positive relationship between tariff reduction and share of unskilled workers i.e. the greatest tariff reductions were in sectors with the highest share of unskilled workers.

The tariff reductions were also the greatest in the low wage industries. Figure 3.3 shows the relationship between the magnitude of the tariff reductions and the wage premia in 1983. There is a strong and negative correlation between the two (coefficient=-0.19, standard error =0.12). Figures 3.1–3.3 are consistent with the evidence from Colombia, Brazil, and Mexico. The existing studies on Colombia, Brazil and Mexico have also found that the tariff reductions were the greatest in industries with high pre-liberalization tariffs, low wage premia, and high share of unskilled workers (Goldberg and Pavcnik (2005), Pavcnik et al. (2004), Hanson and Harrison (1999)).[60]

Before analyzing the relationship between wage premia and trade policy in a regression framework, we look at the scatter diagram (Figure 3.4) relating changes in tariffs and changes in industry wage premia (1983 to 1987–88, 1987–88 to 1993–94, 1993–94 to 1999-2000). Each point in the scatter plot represents the change in tariffs and the change in wage premia within an industry between two consecutive time periods. The plot illustrates a strong and negative relationship between changes in tariffs and wage premia. The raw data show that the change in wage premium is highest for those industries that had the greatest tariff reductions.

3.5.3 Second Stage Regressions: Wage Premia and Tariffs

In the second stage regression, the estimated industry wage premia are regressed on tariffs, along with additional controls. The sample consists of all industries with available tariff information (72 industries). The results are shown in Table 3.4. Specification I shows the results for the first differenced specification corresponding to Equation 3.3.2. The first differenced specification accounts for unobserved time-invariant industry specific factors. Specification II shows the results in levels without the industry indicators. Specification III shows the results in levels with industry indicators. Year indicators are included in all the specifications.

[60] In India, sectors with high share of unskilled workers which received more protection also had lower import penetration ratio. Grossman and Helpman (1994) political economy model of protection predicts a negative correlation between import penetration ratio and protection for organized sectors. (See Goldberg and Pavcnik (2005) for a similar explanation for Colombia).

The estimate of the coefficient of tariffs is negative and statistically significant (at 5 percent in specifications I and III, and at 1 percent in specification II). The negative coefficient on tariffs implies that increasing protection in a particular industry lowers wages in that industry. A coefficient of -0.17 in Specification I indicates that if the tariffs are reduced from 50 percent to 0 percent in a sector, average wage in that sector increases by 8.5 percent (0.17x0.5).

3.5.4 Controlling for Non-Tariff Barriers

As shown in Figure 1.5, non-tariff barriers (NTBs) were also an important part of the trade liberalization process in India. We augment the basic regression to include our measure of NTBs ? "import coverage ratio." However, non-tariff barriers are plagued with measurement errors, primarily due to the lack of detailed data (the presence of NTBs is measured as a dummy variable which takes a value of 0 or 1). Hence we focus on tariffs as our principal measure of trade policy and check the robustness of the coefficient on tariffs by including NTBs. Introducing NTBs controls for the fact that tariffs could be capturing other forms of protection. In the pre-liberalization period, during 1980-90, out of 72 manufacturing industries, only 10 had zero NTBs. All other industries had *both* NTBs and tariffs. After 1990, NTBs have been phased out and tariffs are the only form of protection for most industries.

We also augment the basic regression with import penetration ratios (MPR, defined as imports/(output+imports-exports). Some of the effects of NTBs may be captured indirectly through the import measures. The results are shown in Table 3.5. These regressions include only those industries for which we have data on tariffs, import coverage ratio and import penetration ratio. The coefficient on tariffs remain negative and statistically significant (at least at 5 percent level) in all the specifications. The coefficient on the import coverage ratio is statistically insignificant in all the specifications.

3.5.5 Endogeneity Issues

The industry fixed effects control for time-invariant unobserved industry specific heterogeneity. However, if there are unobserved time-varying industry specific factors that affect wages they are not controlled for in the empirical specification. If the time varying, industry-specific factors are uncorrelated with the tariff rates, then the coefficient of interest would be unbiased. However, if they are correlated with the tariff rates, then the estimates would be biased. Some examples could be political economy factors that simultaneously affect tariff formation and industry wages or tariff changes in other industries etc. To address this concern, we apply an instrumental variables strategy. An ideal instrument should be highly correlated with tariffs and uncorrelated with the industry specific time-varying unobserved component of wages.

To construct industry-specific time varying instruments, we look at what constitutes variation in tariffs across sectors, and over time. The post-1991 trade reforms in India were in response to a severe balance of payments crisis. By mid-1991, the foreign exchange reserves were only enough to sustain two-weeks of imports. India took external assistance from the IMF, and the trade reforms that followed were a part of the structural conditionalities agreed by India. Hence, the changes in foreign exchange reserves can be expected to be correlated with tariff changes over time, and this gives the rationale for using foreign exchange reserves as instrument. The variation in foreign exchange reserves is also likely to uncorrelated with the unobserved component of wages. Figure 3.5 shows the evolution of foreign exchange reserves in India over time.

To explain the variation in tariff changes across sectors, following Goldberg and Pavcnik (2005), we use pre-reform tariffs in 1980 (1980 is the earliest period for which we have the tariff data), and the share of unskilled workers by industry (in 1983) as a determinant of tariff changes. Figure 3.1 shows that the magnitudes of tariff reductions are positively correlated with the pre-reform tariff rates. Also, since we are using pre-reform tariffs, they are likely to be uncorrelated with wage changes in *future* periods from 1983-84 to 1999-2000. Similarly, the share of unskilled workers in 1983 is also correlated with the magnitude of tariff reductions (Figure 3.2). Since we are using the *initial* share of unskilled workers, it is likely to be uncorrelated with wage change in future periods. We construct two industry-specific time varying instruments for tariff reductions: (i) interactions of foreign exchange reserves with tariff rates in 1980, and (ii) interactions of foreign exchange reserves with share of unskilled workers in 1983.

Table 3.6 shows the results from the instrumental variable regressions. In the first stage, Table 3.6.A, we relate the changes in tariffs (1983 to 1987–88, 1987–88 to 1993–94, 1993–94 to 1999–2000) to the instruments. The first stage results indicate a strong and statistically significant relationship between the change in tariffs and the two instruments. The R-squared of the first stage regression is 0.64. The two identifying instruments are also jointly statistically significant in the first stage regression (F-statistic = 11.5, p-value =0.00).

Table 3.6.B shows the second stage results. The coefficient of tariff rate is negative and statistically significant at 1 percent. The magnitude of the estimate is bigger than the comparable non-IV estimate in Table 3.4 (Column I). Gaston and Trefler (1994) also find that the tariff coefficient becomes more negative when they instrument for trade protection using industry characteristics. We also do a test of over identifying restrictions to check the validity of the instruments. We fail to reject the over-identifying restrictions at 1 percent and 5 percent levels, thus supporting the validity of the instruments.[61]

3.5.6 Additional Robustness Checks

One time varying and industry specific variable which can be expected to affect wage premia and also be correlated with tariff changes is sector-specific capital. To check the robustness of the results, we include gross fixed capital formation by sector as an additional regressor. Goldberg and Pavcnik (2005) also use gross fixed capital formation as a measure of capital accumulation in their study on Colombia. The data on gross fixed capital formation is taken from the Annual Survey of Industries (2002). The results are shown in Table 3.7. Gross fixed capital formation is included in levels for 1983–84, 1987–88 and 1993–94. The coefficient on tariffs is very similar to those in Tables 3.4 and 3.5 (Specification I). The coefficient on our measure of non-tariff barriers is also very similar to that in Table 3.5 (Specification I).

[61] The chi-squared test statistic is 1.73 when we exclude difference in reserves interacted with share of unskilled workers in the IV regression, and is 1.28 when we exclude difference in reserves interacted with tariffs in 1980 in the IV regression. The critical values of chi-squared with one degree of freedom are 6.64 and 3.84 at 1 percent and 5 percent levels respectively.

Thus, the negative correlation between tariffs and wage premia is not driven by our measure of capital accumulation.

3.5.7 Discussion of the Results

The negative relationship between tariffs and wage premia we find is similar to the results for Poland and United States. Goh and Javorcik (2005) also find that a decrease in industry tariff is associated with an increase in wage premium within that industry. However, unlike Goh and Javorcik (2005), our results are robust to using an instrument for trade protection. Gaston and Trefler (1994) also find a negative relationship between protection and wage premia in the U.S. manufacturing industries in 1983. They also control for the simultaneity bias in the cross-sectional data by instrumenting for trade protection. The coefficient on tariffs becomes more negative in the instrumental variable regressions. However, unlike Gaston and Trefler who examine the relationship between trade and industry wage premia using cross sectional data, we exploit both the variation across industries and over time which allows us to control for industry specific heterogeneity.

The results here are in contrast to earlier work on Colombia, Mexico and Brazil. In case of Colombia, Goldberg and Pavcnik (2005) find a positive and statistically significant relationship between tariffs and wage premia. In the case of Mexico, there is mixed evidence using data on workers earnings from two different sources. Revenga (1997) finds a positive relationship between industry wages and tariffs whereas Feliciano (2001) finds a negative but statistically insignificant relationship between industry wage premia and tariffs. In their study of Brazil, Pavcnik et al. (2004) find a negative but statistically insignificant relationship between tariffs and wage premia.

Goldberg and Pavcnik (2005) find that the coefficient on tariffs is negative when industry indicators are not included in the estimation. When industry indicators are included, or when the regression is estimated in first differences, they find that the sign of the coefficient is reversed from negative to positive. The reversal of the sign of the coefficient when the model is estimated in first differences is interpreted as the importance of time invariant political economy determinants of tariffs. Similar to Goldberg and Pavcnik (2005), we also find that the coefficient is negative when we estimate the regression without differencing (i.e., without controlling for time invariant industry specific heterogeneity (see Table 3.4, Column II). However, unlike them, we find that the coefficient remains negative even after first differencing (Table 3.4, Column I), but the magnitude of the coefficient does in fact decrease.

Dutt (2003) also looks at the impact of trade liberalization on wages in India. Unlike this study which uses detailed micro level data allowing us to control for worker characteristics, Dutt (2003) uses highly aggregated data on wages by industry. He finds a negative and statistically significant relationship between growth rate of wages and tariffs within a sector. He finds that reduction in tariffs is associated with an increase in wage growth within a three-digit industry. However, he does not find a statistically significant relationship between changes in wage levels and changes in tariffs.

Why has the impact of trade reform on worker wages in India been different from Colombia, Brazil and Mexico? Unlike Mexico and Colombia, in Brazil, the structure of industry wages did not change over time. Pavcnik et al. (2004) suggest that this could be one possible explanation for the insignificant relationship between tariffs and industry wages in Brazil. Given that the structure of industry wage premia has changed over time in India as well, the significant relationship between trade policy and industry wage premia is not surprising. However, what is striking is the negative sign of the coefficient on tariffs unlike other developing countries.

The negative relationship between trade liberalization and industry wage differentials in the Indian case is consistent with liberalization induced productivity changes at the firm level. There is evidence that the 1991 trade reforms led to higher firm productivity in India (Krishna and Mitra (1998), Aghion et al. (2005), Topalova (2004)). Krishna and Mitra (1998) use firm-level data in the manufacturing sector from 1986-1993 and find some evidence of an increase in growth rate of productivity in the years following the reform. Aghion et al. (2005) use state-industry level data from 1980 to 1997 and find that the 1991 liberalization in India had strong inequalizing effects, by fostering productivity and output growth in 3-digit industries that were initially closer to the Indian productivity frontier and which were located in states with more pro-employer labor institutions. Both Krishna and Mitra (1998) and Aghion et al. (2005) use a post-reform dummy to capture the effect of liberalization. Topalova (2004) uses a panel of firm-level data and detailed trade data from 1989-2001 to examine the effect of India's trade reforms in the early 1990s on firm productivity in the manufacturing sector. She finds that a reduction in tariffs leads to higher levels and growth of firm productivity. To the extent that productivity enhancements are passed on to industry wages, reductions in trade barriers would be associated with increase in wages within an industry.

3.5.8 Implications for Wage Inequality between Skilled and Unskilled Workers

The relationship between trade policy and industry wage premia has important implications for the impact of trade liberalization on wage inequality. Since different industries employ different shares of skilled workers, changes in industry wage premia translate into changes in relative incomes of skilled and unskilled workers. Since the tariff reductions were relatively larger in sectors with a higher proportion of unskilled workers (Figure 3.2) and these sectors experienced an increase in wages relative to other sectors, this implies that the unskilled workers experienced an increase in incomes relative to skilled workers. Thus, our findings suggest that trade liberalization has led to decreased wage inequality through the wage premium channel in India.

The intuition is confirmed when we repeat the regressions 3.3.1 and 3.3.2 separately for skilled and unskilled workers. The results from the estimation of 3.3.2 are shown in Table 3.8 (only the results from the first differenced specification are shown, the results are qualitatively similar for the other specifications). The results suggest that a reduction in tariffs within an industry is associated with increased wage premium for unskilled workers, but it leads to a decrease in wage premium for skilled workers. This supports our intuition that trade liberalization has led to decreased wage inequality in India.

3.6 Conclusions

This chapter investigates the effects of trade policy on wages in Indian manufacturing industries in the last two decades. The data set combines micro labor market data from the National Sample Survey with data on tariff and non-tariff barriers. Our results suggest that there is a statistically significant relationship between trade policy and industry wage premia. We find that increasing protection in a sector lowers wages in that sector. In sectors with largest tariff reductions, wages increased relative to the economy-wide average. The results are consistent with liberalization induced productivity increases at the firm level, which get passed onto industry wages.

The findings of this essay are in contrast to studies on other developing countries like Colombia, Brazil, and Mexico, which have found either a positive or an insignificant relationship between trade policy and industry wage premia. Our result is similar to the Gaston and Trefler (1994) study for the United States and Goh and Javorcik (2005) analysis for Poland, who find a negative relationship between tariffs and industry wage premium. However, unlike Gaston and Trefler who use a cross-sectional data, our results are identified by using variation in wages and tariffs across industries as well as over time.

We also find that trade liberalization has led to decreased wage inequality between skilled and unskilled workers in India. This is consistent with our finding that tariff reductions were proportionately larger in sectors that employ a larger share of unskilled workers. Since the sectors with the largest tariff reductions experienced an increase in wages relative to the other sectors, this implies that the unskilled workers benefited relative to skilled workers.

Tables

Table 1.1: Annual Rates of Growth of Per Capita Gross State Domestic Product (per cent per annum)

States	1980-81 to 1990-91	1991-92 to 1997-98
Bihar	2.45	1.12
Rajasthan	3.96	3.96
Uttar Pradesh	2.6	1.24
Orissa	2.38	1.64
Madhya Pradesh	2.08	3.87
Andhra Pradesh	3.34	3.45
Tamil Nadu	3.87	4.95
Kerala	2.19	4.52
Karnataka	3.28	3.45
West Bengal	2.39	5.04
Gujarat	3.08	7.57
Haryana	3.86	2.66
Maharashtra	3.58	6.13
Punjab	3.33	2.8
14 states combined	3.03	4.02
Standard Deviation	0.67	1.84

Source: Ahluwalia (2000)

Table 1.2: Regional Disparities in Income: Gini Coefficient and Generalized Entropy Measure

Year	Gini Coefficient	Theil's Entropy Measure	
		Total	Between region (% of total)
1983	0.206	0.40	14.73
1987-88	0.297	1.13	13.50
1993-94	0.208	0.33	15.61
1999-00	0.266	0.44	23.56

Notes: Based on National Sample Survey (NSS) data for the urban manufacturing sector. Gini Coefficient is calculated assuming all individuals receive the average manufacturing wage of the region. Generalized entropy measure used for calculating inequality measure is the Theil entropy measure. Income shares are used as weights of the within-group component of the respective groups for decomposing total inequality into the within-region and between-region components.

Table 1.3: Spatial Decomposition of Total Income Inequality: Cross Country Comparison

Country	Number of Groups	Year	Total Inequality	Between %	Within %	Country	Number of Groups	Year	Total Inequality	Between %	Within %
Finland	4	1971	0.127	12.5	87.5	**Russia**	77	1994	0.297	25	75
	4	1981	0.076	6.3	93.7		77	1995	0.282	27	73
	4	1990	0.069	7.6	92.4		77	1996	0.316	26	74
	4	1993	0.075	7.3	92.7		77	1997	0.337	23	77
	4	1998	0.104	4.4	95.6		77	1998	0.314	28	72
							77	1999	0.329	31	69
India	58	1983	0.422	15.6	84.4	**United Kingdom**	11	1991	0.152	7.2	92.8
	58	1987/88	1.142	13.7	86.3		11	1995	0.213	12.2	87.8
	58	1993/94	0.340	16.3	83.7		11	1996	0.286	7.7	92.3
	58	1999/2000	0.441	23.6	76.4						

Source: Shorrocks and Wan (2005) for Finland, Russia, and United Kingdom. Author's calculations for India.

Table 1.4: Migration for Work/Employment

	All	**Intra-district**	**Intra-state (inter-district)**	**Inter-state**
Duration since migration	**(1)**	**(2)**	**(3)**	**(4)**
Panel A: TOTAL-All India Migration				
All	2.86	0.85	0.96	1.06
Less than 1 year	0.20	0.06	0.07	0.08
1-4years	0.68	0.20	0.22	0.26
5-9 years	0.51	0.16	0.17	0.19
Less than 10 years	1.39	0.42	0.45	0.52
(numbers represent migration as a % of total all India population)				
Panel B: Migration to Urban Areas from All India(Rural + Urban)				
All	7.09	1.53	2.52	3.03
Less than 1 year	0.23	0.05	0.08	0.10
1-4years	1.53	0.32	0.53	0.67
5-9 years	1.30	0.28	0.45	0.57
Less than 10 years	3.06	0.66	1.06	1.34
(numbers represent migration as a % of total urban population)				
Panel C: Migration from Urban to Urban areas				
All	2.24	0.40	0.92	0.91
Less than 1 year	0.07	0.04	0.01	0.03
1-4years	0.52	0.09	0.21	0.21
5-9 years	0.41	0.08	0.17	0.16
Less than 10 years	1.00	0.21	0.39	0.40
(numbers represent migration as a % of total urban population)				

Source: Based on author calculations with data from Census of India, 2001.

Table 1.5: Sectoral Shares in Value Added and Employment

	Value Added as Percent of GDP				Employment in Sector as Percent of Total Employment		
	1980						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Agriculture	Manufacturing	Industry	Services	Agriculture	Industry	Services
India	38.9	16.3	24.5	36.6	68.1	13.9	18.6
Brazil	11.0	33.5	43.8	45.2	29.3	24.7	46.1
China	30.1	40.5	48.5	21.4	68.7	18.2	11.7
Indonesia	24.0	13.0	41.7	34.3	55.9	13.2	30.2
Korea	15.1	28.6	40.5	44.4	34.0	29.0	37.0
Malaysia	22.6	21.6	41.0	36.3	37.2	24.1	38.7
Mexico	9.0	22.3	33.6	57.4	23.5	26.5	49.0
Thailand	23.2	21.5	28.7	48.1	70.8	10.3	18.9
Turkey	26.4	14.3	22.2	51.4	43.0	34.9	22.1
Low Income	36.4	14.8	24.4	39.2	74.6	8.7	16.5
Lower Middle Income	21.5	29.1	41.7	36.8	64.0	18.5	16.4
	2000						
India	24.6	15.9	26.6	48.8	59.3	18.2	22.4
Brazil	7.3	17.1	28.0	64.7	24.2	19.3	56.5
China	16.4	34.7	50.2	33.4	46.9	23.0	29.9
Indonesia	17.2	24.9	46.1	36.7	45.3	17.3	37.3
Korea	4.3	26.1	36.2	59.5	10.9	28.0	61.0
Malaysia	8.8	32.6	50.7	40.5	18.4	32.2	49.5
Mexico	4.2	20.3	28.0	67.8	17.5	26.9	55.2
Thailand	9.0	33.6	42.0	49.0	48.8	19.0	32.2
Turkey	15.4	15.7	25.3	59.4	34.5	24.5	40.9
Low Income	27.3	14.1	26.6	46.1	64.5	12.3	23.2
Lower Middle Income	12.5	24.2	38.3	49.1	43.2	18.5	38.3

Source: Kochhar et al. (2006)

Table 1.6: Correlation of Tariffs over Time

	1980-81	1985-86	1990-91	1995-96	1999-00
1980-81	1.00				
1985-86	0.72	1.00			
1990-91	0.68	0.87	1.0		
1995-96	0.61	0.63	0.62	1.0	
1999-00	0.51	0.62	0.61	0.78	1.000

Source: Das (2003)

Table 2.1: Summary Statistics

Table 5: Summary Statistics

Variable	Year	Observations	Mean	Standard Deviation	Minimum	Maximum
wage	1983	8962	1.145	1.742	0.009	73.781
	1987-88	8795	1.825	9.640	0.001	513.485
	1993-94	8229	1.531	1.622	0.002	57.307
	1999-00	7593	1.812	1.985	0.035	57.088
ownDMA	1983	58	0.000250	0.000273	0.000035	0.00131
	1987-88	58	0.000244	0.000297	0.000016	0.00153
	1993-94	58	0.000248	0.000257	0.000031	0.00131
	1999-00	58	0.000251	0.000248	0.000050	0.00172
otherDMA	1983	58	0.001410	0.00035	0.00071	0.0034
	1987-88	58	0.001402	0.00028	0.000704	0.0026
	1993-94	58	0.001439	0.00041	0.00074	0.0036
	1999-00	58	0.001404	0.00026	0.000756	0.0023
totalDMA	1983	58	0.001663	0.00045	0.000858	0.0036
	1987-88	58	0.001646	0.00038	0.000863	0.0030
	1993-94	58	0.001687	0.00050	0.000921	0.0039
	1999-00	58	0.001655	0.00037	0.000921	0.0036
ownDSA	1983	58	0.000255	0.000359	0.000009	0.00211
	1987-88	58	0.000251	0.000326	0.000005	0.00200
	1993-94	58	0.000248	0.000294	0.000020	0.00160
	1999-00	58	0.000254	0.000312	0.000007	0.00185
otherDSA	1983	58	0.001432	0.00050	0.000685	0.0043
	1987-88	58	0.001454	0.00052	0.000713	0.0042
	1993-94	58	0.001463	0.00054	0.000727	0.0046
	1999-00	58	0.001477	0.00066	0.000743	0.0056
totalDSA	1983	58	0.001688	0.00064	0.000852	0.0046
	1987-88	58	0.001705	0.00065	0.000911	0.0046
	1993-94	58	0.001711	0.00066	0.000913	0.0049
	1999-00	58	0.001731	0.00079	0.000831	0.0059
ownDCX	1983	58	0.000238	0.00019	0.00006	0.0010
	1987-88	58	0.000237	0.00036	0.00002	0.0022
	1993-94	58	0.000249	0.00023	0.00006	0.0015
	1999-00	58	0.000250	0.00025	0.00005	0.0017
otherDCX	1983	58	0.001392	0.00024	0.000741	0.0020
	1987-88	58	0.001370	0.00025	0.000694	0.0019
	1993-94	58	0.001398	0.00024	0.000751	0.0020
	1999-00	58	0.001402	0.00026	0.000756	0.0023
totalDCX	1983	58	0.001629	0.00032	0.000889	0.0030
	1987-88	58	0.001606	0.00042	0.000819	0.0031
	1993-94	58	0.001647	0.00034	0.000904	0.0034
	1999-00	58	0.001653	0.00037	0.000919	0.0036
Ports (km)		58	0.00561	0.01206	0.000863	0.0778
Institutional Quality		58	0.53	0.44	0	1

Notes: 1983, 1987-88, 1993-94 and 1999-00 correspond to 38th, 43rd, 50th, 55th rounds of NSS respectively.

Table 2.2: First Stage Results from Earnings Regression

	1983	1987-88	1993-94	1999-00
	Round 38	Round 43	Round 50	Round 55
Age	0.061***	0.068***	0.059***	0.058***
	(0.005)	(0.005)	(0.006)	(0.007)
Age squared	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	-0.662***	-0.571***	-0.639***	-0.449***
	(0.033)	(0.033)	(0.045)	(0.032)
Household head	0.152***	0.165***	0.209***	0.128***
	(0.021)	(0.024)	(0.028)	(0.023)
Married	0.109***	0.097***	0.072**	0.069***
	(0.022)	(0.027)	(0.034)	(0.025)
Self-employed	-0.262***	0.105	-0.351***	-1.416***
	(0.093)	(0.102)	(0.099)	(0.131)
Middle or secondary school	0.301***	0.356***	0.252***	0.243***
	(0.020)	(0.022)	(0.024)	(0.020)
Higher secondary or more	0.725***	0.741***	0.601***	0.633***
	(0.035)	(0.039)	(0.031)	(0.030)
Constant	-1.597***	-1.767***	-1.815***	-1.362***
	(0.096)	(0.105)	(0.124)	(0.124)
Region indicators	Yes	Yes	Yes	Yes
Occupation indicators	Yes	Yes	Yes	Yes
Industry indicators	Yes	Yes	Yes	Yes
Observations	8962	8795	8229	7460
P value for joint significance of region dummies	0.00	0.00	0.00	0.00
R-squared with region indicators	0.57	0.55	0.48	0.56
R-squared without region indicators	0.49	0.51	0.44	0.50

Notes: Dependent variable is the log of real wages and the specification estimated is equation 2.4.1.1. *Age* is the age of the individual in years, *Age squared* is the square of age, *Female* is a dummy variable which take the values 1 if the individual is a female and 0 otherwise, *Married* is a dummy variable for marital status of the individual and takes a value of 1 if married and 0 otherwise, *Self-employed* takes a value 1 if the individual is self-employed 0 otherwise, *household head* takes a value 1 if the individual is a household and 0 otherwise, *Middle or secondary school* and *Higher secondary or more* are education dummies, former take the value 1 if individual has completed grades 6^{th}-10^{th} in school, and the latter takes a value 1 if individual has completed more than 11^{th} grade or more (including college). ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.3: Estimated Region Wage Premia

Panel A: Summary Statistics

Round	Year	Observations	Mean	Standard Deviation	Minimum	Maximum
38	1983	58	-0.052	0.253	-0.609	0.485
43	1987-88	58	-0.069	0.245	-0.546	0.440
50	1993-94	58	-0.032	0.289	-1.240	0.649
55	1999-00	58	-0.066	0.254	-0.676	0.492

Panel B: Correlations over time

Round	Year	Round 38	Round 43	Round 50	Round 55
38	1983	1			
43	1987-88	0.65	1		
50	1993-94	0.40	0.47	1	
55	1999-00	0.45	0.55	0.52	1

Notes: Region wage premia are estimated region dummies obtained by estimating equation 2.4.1.1. Following Krueger and Summers (1988) they are expressed as deviations from the employment weighted average wage premium.

Table 2.4: Region Wage Premia and Total Market (Supply) Access as Measures of Proximity

	Panel A: using totalDMA				*Panel B: using totalDSA*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
ln(totalDMA)	0.251***	0.170**	0.397***	0.306**				
	(0.085)	(0.080)	(0.133)	(0.121)				
ln(totalDSA)					0.292***	0.213**	0.390***	0.317***
					(0.088)	(0.083)	(0.105)	(0.096)
ln(Ports)	0.131***	0.135***	0.122***	0.127***	0.113***	0.121***	0.105**	0.112***
	(0.041)	(0.037)	(0.045)	(0.042)	(0.036)	(0.034)	(0.039)	(0.038)
Institutional quality		0.386**		0.338**		0.339**		0.282*
		(0.153)		(0.161)		(0.157)		(0.163)
Constant	2.271***	1.455**	3.274***	2.427***	2.428***	1.686***	3.113***	2.443***
	(0.644)	(0.619)	(0.898)	(0.846)	(0.573)	(0.582)	(0.667)	(0.654)
State indicators	Yes	Yes			Yes	Yes		
Time indicators	Yes	Yes			Yes	Yes		
State indicators*Time indicators			Yes	Yes			Yes	Yes
Observations	232	232	232	232	232	232	232	232
R-squared	0.52	0.56	0.65	0.68	0.54	0.57	0.68	0.70
P-values:								
Joint significance of state dummies	0.00	0.00			0.00	0.00		
Joint significance of interaction dummies			0.00	0.00			0.00	0.00

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A and Panel B specification estimated is equation 2.4.1.2. *TotalDMA* includes both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). Deflator used in measures of supply access is state GDP deflator. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.5: Region Wage Premia and Other Market (Supply) Access as Measures of Proximity

	Panel A: using otherDMA				*Panel B: using otherDSA*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
ln(otherDMA)	0.030	-0.014	0.090	0.048				
	(0.101)	(0.102)	(0.128)	(0.125)				
ln(otherDSA)					-0.011	-0.069	0.041	-0.016
					(0.110)	(0.110)	(0.117)	(0.121)
ln(Ports)	0.149***	0.143***	0.159**	0.152***	0.143***	0.134***	0.153**	0.143***
	(0.051)	(0.043)	(0.061)	(0.053)	(0.051)	(0.043)	(0.061)	(0.052)
Institutional quality		0.446***		0.431**		0.458***		0.438**
		(0.157)		(0.168)		(0.157)		(0.169)
Constant	0.945	0.251	1.500	0.820	0.636	-0.177	1.135	0.338
	(0.819)	(0.810)	(1.035)	(0.983)	(0.877)	(0.861)	(0.961)	(0.960)
State indicators	Yes	Yes			Yes	Yes		
Time indicators	Yes	Yes			Yes	Yes		
State indicators*Time indicators			Yes	Yes			Yes	Yes
Observations	232	232	232	232	232	232	232	232
R-squared	0.49	0.55	0.61	0.65	0.49	0.55	0.61	0.65
P-values:								
Joint significance of state dummies	0.00	0.00			0.00	0.00		
Joint significance of interaction dummies			0.00	0.00			0.00	0.00

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A and Panel B specification estimated is equation 2.4.1.2. *OtherDMA* includes both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). Deflator used in measures of supply access is state GDP deflator. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.6: Region Wage Premia, Market and Supply Access

	Panel A: totalDMA and totalDSA as measures of proximity				*Panel B: otherDMA and otherDSA as measures of proximity*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
ln(totalDMA)	-0.013	-0.015	-0.338	-0.284				
	(0.141)	(0.133)	(0.305)	(0.281)				
ln(totalDSA)	0.300**	0.223*	0.638***	0.528**				
	(0.136)	(0.130)	(0.238)	(0.228)				
ln(otherDMA)					0.155	0.200	0.316	0.474
					(0.151)	(0.142)	(0.303)	(0.301)
ln(otherDSA)					-0.127	-0.220	-0.200	-0.380
					(0.175)	(0.163)	(0.272)	(0.280)
ln(Ports)	0.113***	0.121***	0.099**	0.107***	0.147***	0.139***	0.158**	0.151***
	(0.037)	(0.035)	(0.038)	(0.037)	(0.052)	(0.044)	(0.062)	(0.053)
Institutional quality		0.339**		0.270		0.464***		0.461***
		(0.157)		(0.167)		(0.156)		(0.164)
Constant	2.399***	1.651**	2.482***	1.942**	0.920	0.179	1.682	1.118
	(0.663)	(0.649)	(0.908)	(0.830)	(0.849)	(0.854)	(1.057)	(1.052)
State indicators	Yes	Yes			Yes	Yes		
Time indicators	Yes	Yes			Yes	Yes		
State indicators*Time indicators			Yes	Yes			Yes	Yes
Observations	232	232	232	232	232	232	232	232
R-squared	0.54	0.57	0.68	0.70	0.50	0.55	0.61	0.66
P-values:								
Joint significance of state dummies	0.00	0.00			0.00	0.00		
Joint significance of interaction dummies			0.00	0.00			0.00	0.00

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A and Panel B specification estimated is equation 2.4.1.2. *TotalDMA* and *otherDMA* include both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). Deflator used in measures of supply access is state GDP deflator. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.7.A: Region Wage Premium and Differential Impact of Market Access Post-liberalization

Panel A: otherDMA as measure of domestic market access						
	(1)	(2)	(3)	(4)	(5)	(6)
a) ln(otherDMA)	0.044	0.001	-0.079	-0.119	-0.127	-0.135
	(0.131)	(0.130)	(0.145)	(0.137)	(0.142)	(0.144)
b) ln(Ports)	0.150***	0.143***	0.158**	0.151***	0.146***	0.145***
	(0.051)	(0.043)	(0.060)	(0.052)	(0.054)	(0.054)
c) Institutional quality		0.446***		0.430**	0.430**	0.510***
		(0.158)		(0.167)	(0.168)	(0.179)
d) ln(otherDMA)*Postlib	-0.024	-0.025	0.377***	0.374***	0.391***	0.411***
	(0.099)	(0.097)	(0.128)	(0.123)	(0.138)	(0.145)
e) ln(Ports)*Postlib					0.010	0.013
					(0.036)	(0.036)
f) Institutional quality*Postlib						-0.195
						(0.138)
Constant	1.041	0.349	0.373	-0.296	-0.379	-0.503
	(0.969)	(0.961)	(1.113)	(1.045)	(1.109)	(1.135)
State indicators	Yes	Yes				
Time indicators	Yes	Yes				
State indicators*Time indicators			Yes	Yes	Yes	Yes
Observations	232	232	232	232	232	232
R-squared	0.49	0.55	0.62	0.67	0.67	0.67
P-values (F-test):						
Joint significance of state dummies	0.00	0.00				
Joint significance of interaction dummies			0.00	0.00	0.00	0.00
a) + d)=0	0.84	0.81	0.04	0.07	0.07	0.06
b) + e)=0					0.01	0.01
c) + f)=0						0.1

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A, 2.4.1.3 is estimated. *otherDMA* includes both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.7.B: Region Wage Premium and Differential Impact of Supply Access Post-liberalization

Panel B: otherDSA as measure of domestic supply access						
	(1)	(2)	(3)	(4)	(5)	(6)
a) ln(otherDSA)	0.019	-0.039	-0.103	-0.161	-0.165	-0.177
	(0.113)	(0.115)	(0.129)	(0.128)	(0.131)	(0.134)
b) ln(Ports)	0.145***	0.135***	0.151**	0.141***	0.138**	0.136**
	(0.052)	(0.044)	(0.061)	(0.052)	(0.053)	(0.052)
c) Institutional quality		0.457***		0.439**	0.439**	0.529***
		(0.158)		(0.168)	(0.168)	(0.178)
d) ln(otherDSA)*Postlib	-0.055	-0.053	0.308***	0.311***	0.321***	0.349***
	(0.063)	(0.062)	(0.105)	(0.095)	(0.100)	(0.105)
e) ln(Ports)*Postlib					0.007	0.012
					(0.034)	(0.033)
f) Institutional quality*Postlib						-0.220
						(0.136)
Constant	0.846	0.029	0.180	-0.627	-0.678	-0.846
	(0.897)	(0.896)	(1.015)	(0.994)	(1.030)	(1.061)
State indicators	Yes	Yes				
Time indicators	Yes	Yes				
State indicators*Time indicators			Yes	Yes	Yes	Yes
Observations	232	232	232	232	232	232
R-squared	0.50	0.55	0.62	0.67	0.67	0.67
P-values (F-test):						
Joint significance of state dummies	0.00	0.00				
Joint significance of interaction dummies			0.00	0.00	0.00	0.00
a) + d)=0	0.76	0.42	0.15	0.29	0.28	0.23
b) + e)=0					0.01	0.01
c) + f)=0						0.01

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. Deflator used in measures of supply access is state GDP deflator. For Panel B specification estimated is equation 2.4.1.3. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.7.C: Region Wage Premium and Differential Impact of Supply Access Post-liberalization

Panel C: otherDMA and Other DSA as measures of proximity				
	(1)	(2)	(3)	(4)
a) ln(otherDMA)	0.230	0.406	0.397	0.431
	(0.395)	(0.374)	(0.381)	(0.383)
b) ln(otherDSA)	-0.277	-0.474	-0.476	-0.513
	(0.336)	(0.321)	(0.324)	(0.328)
c) ln(Ports)	0.157**	0.150***	0.144***	0.143***
	(0.061)	(0.052)	(0.055)	(0.054)
d) Institutional quality		0.463***	0.463***	0.551***
		(0.163)	(0.164)	(0.173)
e) ln(otherDMA)*Postlib	0.244	0.206	0.227	0.155
	(0.478)	(0.464)	(0.482)	(0.486)
f) ln(otherDSA)*Postlib	0.123	0.160	0.160	0.242
	(0.381)	(0.364)	(0.364)	(0.364)
g) ln(Ports)*Postlib			0.013	0.016
			(0.035)	(0.034)
h) Institutional quality*Postlib				-0.215
				(0.135)
Constant	0.595	0.034	-0.066	-0.175
	(1.203)	(1.193)	(1.273)	(1.296)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.62	0.67	0.67	0.67
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + e)=0	0.21	0.11	0.11	0.13
b) + f)=0	0.65	0.37	0.37	0.43
c) + g)=0			0.01	0.01
d) + h)=0				0.07

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. *otherDMA* includes both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). Deflator used in measures of supply access is state GDP deflator. For Panel C specification estimated is equation 2.4.1.3. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.8.A: Robustness Checks with *FMA_gdp* as the Measure of Foreign Market Access

Panel A: otherDMA as measure of domestic market access				
	(1)	(2)	(3)	(4)
a) ln(otherDMA)	-0.102	-0.140	-0.130	-0.136
	(0.184)	(0.174)	(0.183)	(0.184)
b) ln(FMA_gdp)	2.853**	2.759**	2.880**	2.851**
	(1.390)	(1.118)	(1.149)	(1.139)
c) Institutional quality		0.446***	0.445***	0.509***
		(0.163)	(0.165)	(0.176)
d) ln(otherDMA)*Postlib	0.420***	0.415***	0.390**	0.403**
	(0.130)	(0.121)	(0.163)	(0.169)
e) ln(FMA_gdp)*Postlib			-0.263	-0.242
			(0.992)	(1.013)
f) Institutional quality*Postlib				-0.154
				(0.141)
Constant	24.963*	23.490**	24.643**	24.285**
	(12.748)	(10.171)	(10.582)	(10.519)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.59	0.64	0.64	0.64
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.07	0.10	0.14	0.13
b) + e)=0			0.05	0.06
c) + f)=0				0.06

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A, 2.4.1.3 is estimated. *otherDMA* includes both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). *FMA_gdp* is used as a measure of access to foreign markets. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.8.B: Robustness Checks with *FMA_gdp* as the Measure of Foreign Supply Access

Panel B: otherDSA as measure of domestic supply access				
	(1)	(2)	(3)	(4)
a) ln(otherDSA)	-0.127	-0.186	-0.178	-0.190
	(0.177)	(0.171)	(0.171)	(0.173)
b) ln(FMA_gdp)	2.725*	2.532**	2.641**	2.592**
	(1.423)	(1.138)	(1.100)	(1.083)
c) Institutional quality		0.455***	0.454***	0.531***
		(0.163)	(0.164)	(0.174)
d) ln(otherDSA)*Postlib	0.360***	0.360***	0.341***	0.364***
	(0.112)	(0.100)	(0.119)	(0.121)
e) ln(FMA_gdp)*Postlib			-0.245	-0.180
			(0.860)	(0.858)
f) Institutional quality*Postlib				-0.185
				(0.135)
Constant	23.644*	21.146**	22.175**	21.598**
	(13.054)	(10.347)	(9.996)	(9.864)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.59	0.64	0.64	0.64
P-values:				
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.20	0.32	0.37	0.34
b) + e)=0			0.08	0.09
c) + f)=0				0.07

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. Deflator used in measures of supply access is state GDP deflator. For Panel B specification estimated is equation 2.4.1.3. *FMA_gdp* is used as a measure of access to foreign sources of supply. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.9.A: Robustness Checks with Domestic Access Markets Excluding Regions with Big Ports (*otherDMA_minusports*)

Panel A: otherDMA as measure of domestic market access				
	(1)	(2)	(3)	(4)
a) ln(otherDMA_minusports)	0.026	0.031	0.040	0.040
	(0.110)	(0.111)	(0.111)	(0.112)
b) ln(Ports)	0.153***	0.152***	0.166***	0.166***
	(0.056)	(0.048)	(0.053)	(0.053)
c) Institutional quality		0.434**	0.434**	0.499***
		(0.166)	(0.166)	(0.176)
d) ln(otherDMA_minusports)*Postlib	0.242**	0.234**	0.218*	0.218*
	(0.110)	(0.115)	(0.113)	(0.116)
e) ln(Ports)*Postlib			-0.033	-0.032
			(0.036)	(0.036)
f) Institutional quality*Postlib				-0.157
				(0.133)
Constant	1.052	0.714	0.860	0.810
	(0.900)	(0.869)	(0.903)	(0.911)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.62	0.67	0.67	0.67
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.02	0.02	0.02	0.02
b) + e)=0			0.01	0.01
c) + f)=0				0.07

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A, 2.4.1.3 is estimated. *otherDMA_minusports* includes both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). *otherDMA_minusports* does not include access to regions associated with any of the big ports. *Ports*, which is the inverse of the distance to the closest port, is used as a measure of access to foreign markets. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.9.B: Robustness Checks with Domestic Supply Access Excluding Regions with Big Ports (*otherDSA_minusports*)

Panel B: otherDSA as measure of domestic supply access				
	(1)	(2)	(3)	(4)
a) ln(otherDSA_minusports)	0.018	0.005	0.009	0.007
	(0.088)	(0.086)	(0.085)	(0.086)
b) ln(Ports)	0.151***	0.149***	0.164***	0.164***
	(0.055)	(0.047)	(0.053)	(0.053)
c) Institutional quality		0.426**	0.426**	0.498***
		(0.167)	(0.167)	(0.177)
d) ln(otherDSA_minusports)*Postlib	0.201**	0.198**	0.190**	0.195**
	(0.095)	(0.094)	(0.092)	(0.094)
e) ln(Ports)*Postlib			-0.035	-0.034
			(0.036)	(0.035)
f) Institutional quality*Postlib				-0.174
				(0.133)
Constant	0.984	0.525	0.644	0.568
	(0.775)	(0.713)	(0.739)	(0.745)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.62	0.67	0.67	0.67
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.04	0.05	0.06	0.06
b) + e)=0			0.01	0.01
c) + f)=0				0.09

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. Deflator used in measures of supply access is state GDP deflator. For Panel B specification estimated is equation 2.4.1.3. *otherDSA_minusports* does not include access to regions associated with any of the big ports. *Ports*, which is the inverse of the distance to the closest port, is used as a measure of foreign supply access. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.10.A: Using *otherDMA* as an Instrument for *totalDMA*: Second Stage Regressions

Panel A: totalDMA as measure of domestic market access				
	(1)	(2)	(3)	(4)
a) ln(totalDMA)	-0.287	-0.371	-0.216	-0.238
	(0.281)	(0.297)	(0.185)	(0.191)
b) ln(Ports)	0.156***	0.159***	0.184***	0.185***
	(0.037)	(0.036)	(0.043)	(0.043)
c) Institutional quality		0.459***	0.442***	0.580***
		(0.115)	(0.104)	(0.151)
d) ln(totalDMA)*Postlib	0.788**	0.824**	0.542**	0.588***
	(0.397)	(0.401)	(0.215)	(0.226)
e) ln(Ports)*Postlib			-0.070	-0.071
			(0.052)	(0.052)
f) Institutional quality*Postlib				-0.332*
				(0.191)
Constant	-0.984	-1.894	-0.727	-0.976
	(1.708)	(1.853)	(1.148)	(1.204)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.00	0.00	0.01	0.00
b) + e)=0			0.00	0.03
c) + f)=0				0.01

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A, 2.4.1.3 is estimated. *totalDMA* is used as a measure of domestic market access and it is instrumented with *otherDMA*. They include both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). *Ports*, which is the inverse of the distance to the closest port, is used as a measure of access to foreign markets. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.10.B: Using *otherDSA* as an Instrument for *totalDSA*: Second Stage Regressions

Panel B: totalDSA as measure of domestic supply access				
	(1)	(2)	(3)	(4)
a) ln(totalDSA)	-0.269	-0.372	-0.238	-0.268
	(0.236)	(0.270)	(0.161)	(0.173)
b) ln(Ports)	0.158***	0.167***	0.198***	0.202***
	(0.040)	(0.042)	(0.050)	(0.051)
c) Institutional quality		0.483***	0.467***	0.627***
		(0.125)	(0.110)	(0.158)
d) ln(totalDSA)*Postlib	0.623*	0.667*	0.416**	0.479**
	(0.336)	(0.361)	(0.189)	(0.207)
e) ln(Ports)*Postlib			-0.087	-0.092
			(0.058)	(0.059)
f) Institutional quality*Postlib				-0.385*
				(0.203)
Constant	-0.846	-1.868	-0.800	-1.107
	(1.387)	(1.638)	(0.959)	(1.041)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.02	0.04	0.11	0.06
b) + e)=0			0.00	0.00
c) + f)=0				0.06

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. Deflator used in measures of supply access is state GDP deflator. For Panel B specification estimated is equation 2.4.1.3. *totalDSA* is used as a measure of domestic market access and it is instrumented with *otherDSA*. *Ports*, which is the inverse of the distance to the closest port, is used as a measure of foreign supply access. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.11: Robustness Checks with Only Consumer Expenditure as the Measure of Domestic Market Access

otherDCX as measure of domestic market access				
	(1)	(2)	(3)	(4)
a) ln(otherDCX)	-0.040	-0.050	-0.053	-0.054
	(0.156)	(0.149)	(0.157)	(0.158)
b) ln(Ports)	0.163***	0.160***	0.158***	0.158***
	(0.060)	(0.053)	(0.057)	(0.056)
c) Institutional quality		0.428**	0.428**	0.499***
		(0.167)	(0.168)	(0.179)
d) ln(otherDCX)*Postlib	0.381**	0.366**	0.373*	0.381*
	(0.172)	(0.169)	(0.200)	(0.206)
e) ln(Ports)*Postlib			0.003	0.005
			(0.040)	(0.041)
f) Institutional quality*Postlib				-0.172
				(0.138)
Constant	0.655	0.211	0.185	0.115
	(1.171)	(1.120)	(1.219)	(1.236)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.62	0.67	0.67	0.67
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.04	0.04	0.06	0.05
b) + e)=0			0.01	0.01
c) + f)=0				0.09

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. Equation 2.4.1.3 is estimated. *otherDCX* includes only consumer expenditure (deflated by state level CPI). *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.12.A: Robustness Checks including the Rural Sample with *OtherDMA* as Measure of Domestic Market Access

Panel A: otherDMA as measure of domestic market access				
	(1)	(2)	(3)	(4)
a) ln(otherDMA)	-0.177	-0.253*	-0.258*	-0.255*
	(0.160)	(0.147)	(0.148)	(0.149)
b) ln(Ports)	0.109*	0.100**	0.097**	0.098**
	(0.057)	(0.046)	(0.044)	(0.045)
c) Institutional quality		0.561***	0.562***	0.542***
		(0.089)	(0.090)	(0.106)
d) ln(otherDMA)*Postlib	0.390***	0.393***	0.402***	0.396***
	(0.109)	(0.096)	(0.103)	(0.104)
e) ln(Ports)*Postlib			0.005	0.004
			(0.020)	(0.020)
f) Institutional quality*Postlib				0.046
				(0.076)
Constant	-0.516	-1.518	-1.570	-1.529
	(1.201)	(1.116)	(1.113)	(1.130)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.61	0.71	0.71	0.71
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.14	0.31	0.31	0.32
b) + e)=0			0.05	0.04
c) + f)=0				0.00

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. For Panel A, 2.4.1.3 is estimated. *otherDMA* includes both intermediate inputs (deflated by state GDP deflator) and consumer expenditure (deflated by state level CPI). *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.12.B: Robustness Checks including the Rural Sample with *OtherDSA* as Measure of Domestic Supply Access

Panel B: otherDSA as measure of domestic supply access				
	(1)	(2)	(3)	(4)
a) ln(otherDSA)	-0.132	-0.248*	-0.252*	-0.250*
	(0.146)	(0.137)	(0.139)	(0.141)
b) ln(Ports)	0.111*	0.097**	0.094**	0.095**
	(0.058)	(0.045)	(0.044)	(0.044)
c) Institutional quality		0.575***	0.575***	0.568***
		(0.091)	(0.092)	(0.109)
d) ln(otherDSA)*Postlib	0.318***	0.342***	0.349***	0.346***
	(0.096)	(0.077)	(0.080)	(0.083)
e) ln(Ports)*Postlib			0.004	0.004
			(0.019)	(0.020)
f) Institutional quality*Postlib				0.017
				(0.076)
Constant	-0.201	-1.498	-1.538	-1.519
	(1.120)	(1.042)	(1.060)	(1.085)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.61	0.71	0.71	0.71
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.16	0.47	0.46	0.47
b) + e)=0			0.05	0.05
c) + f)=0				0.00

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. Deflator used in measures of supply access is state GDP deflator. For Panel B specification estimated is equation 2.4.1.3. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.13.A: Robustness Checks using Alternative Price Deflators with *OtherDMA* as Measure of Domestic Market Access

Panel A: otherDMA as measure of domestic market access								
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Using CPI as Deflator				Using state GDP Deflator			
a) ln(otherDMA)	-0.065	-0.095	-0.102	-0.107	-0.068	-0.093	-0.099	-0.103
	(0.152)	(0.144)	(0.150)	(0.151)	(0.152)	(0.144)	(0.150)	(0.151)
b) ln(Ports)	0.160**	0.155***	0.151***	0.150***	0.160**	0.155***	0.151***	0.151***
	(0.060)	(0.052)	(0.055)	(0.055)	(0.060)	(0.052)	(0.056)	(0.055)
c) Institutional quality		0.428**	0.428**	0.504***		0.426**	0.426**	0.503***
		(0.168)	(0.168)	(0.180)		(0.168)	(0.168)	(0.179)
d) ln(otherDMA)*Postlib	0.384**	0.376**	0.390**	0.406**	0.386**	0.372**	0.385**	0.400**
	(0.148)	(0.144)	(0.167)	(0.173)	(0.148)	(0.145)	(0.168)	(0.173)
e) ln(Ports)*Postlib			0.008	0.011			0.008	0.010
			(0.038)	(0.038)			(0.038)	(0.038)
f) Institutional quality*Postlib				-0.186				-0.186
				(0.138)				(0.137)
Constant	0.477	-0.113	-0.180	-0.283	0.457	-0.096	-0.159	-0.254
	(1.155)	(1.085)	(1.165)	(1.188)	(1.157)	(1.088)	(1.169)	(1.188)
State indicators*Time indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	232	232	232	232	232	232	232	232
R-squared	0.62	0.67	0.67	0.67	0.62	0.67	0.67	0.67
P-values (F-test):								
Joint significance of interaction dummies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
a) + d)=0	0.04	0.06	0.06	0.05	0.04	0.06	0.06	0.05
b) + e)=0			0.01	0.01			0.01	0.01
c) + f)=0				0.09				0.1

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium For Panel A estimating equation is 2.4.1.3. *otherDMA* includes both intermediate inputs and consumer expenditure (both deflated using the same deflators). *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.13.B: Robustness Checks using Alternative Price Deflators with *OtherDSA* as Measure of Domestic Supply Access

Panel B: otherDSA as measure of domestic supply access				
	Using CPI as Deflator			
	(1)	(2)	(3)	(4)
a) ln(otherDSA)	-0.102	-0.163	-0.169	-0.181
	(0.128)	(0.127)	(0.129)	(0.132)
b) ln(Ports)	0.151**	0.141***	0.137**	0.135**
	(0.061)	(0.052)	(0.053)	(0.052)
c) Institutional quality		0.441**	0.441**	0.532***
		(0.168)	(0.169)	(0.178)
d) ln(otherDSA)*Postlib	0.310***	0.315***	0.326***	0.355***
	(0.105)	(0.096)	(0.100)	(0.104)
e) ln(Ports)*Postlib			0.009	0.014
			(0.034)	(0.032)
f) Institutional quality*Postlib				-0.222
				(0.136)
Constant	0.183	-0.648	-0.709	-0.884
	(1.011)	(0.986)	(1.022)	(1.056)
State indicators*Time indicators	Yes	Yes	Yes	Yes
Observations	232	232	232	232
R-squared	0.62	0.67	0.67	0.67
P-values (F-test):				
Joint significance of interaction dummies	0.00	0.00	0.00	0.00
a) + d)=0	0.15	0.29	0.28	0.23
b) + e)=0			0.01	0.01
c) + f)=0				0.1

Notes: Dependent Variable is the normalized region wage premium. The regressions are weighted by the inverse of the standard errors of the normalized region wage premium. Deflator used in measures of supply access is CPI. For Panel B specification estimated is equation 2.4.1.3. *Postlib* is a dummy variable which takes the value 1 post 1991 and zero otherwise. Robust and clustered (at the region level) standard errors are reported. ***, **, * represent significance at 1%, 5%, and 10% respectively.

Table 2.14: Quantification of Estimates

Variable	Estimated coefficient	Median	Log of the median	75th percentile	Log of the 75th percentile	Region wage premia	Percentage Change (total effect)
			Results from Table 2.7, Panel A, Column 6				
otherDMA	0.276	0.001395	-6.575	0.001523	-6.487	-0.055	44%
Ports	0.158	0.002442	-6.015	0.004519	-5.399	-0.320	30.4%
			Results from Table 2.7, Panel B, Column 6				
otherDSA	0.172	0.001429	-6.551	0.001590	-6.444	-0.030	61%
Ports	0.148	0.002442	-6.015	0.004519	-5.399	-0.320	28.5%

Table 3.1: Summary Statistics

Variable	Survey Period	Observations	Mean	Standard Deviation	Minmum	Maximum
Inter-Industry Wage Premium	1983	72	0.129	0.278	-0.978	0.851
	1987-88	72	0.110	0.338	-1.081	0.858
	1993-94	72	0.135	0.283	-0.744	0.807
	1999-00	65	0.108	0.240	-0.381	0.689
Nominal Rate of Protection (NRP)	1983	72	1.109	0.261	0.600	1.560
	1987-88	72	1.122	0.260	0.555	1.900
	1993-94	72	0.692	0.152	0.350	0.850
	1999-00	65	0.394	0.055	0.273	0.467
Import Coverage Ratio (MCR)	1983	60	95.000	21.978	0	100
	1987-88	60	88.986	26.619	0	100
	1993-94	60	38.413	42.008	0	100
	1999-00	56	17.950	34.530	0	100
Import Penetration Ratio (MPR)	1983	60	0.180	0.248	0	1.341
	1987-88	60	0.123	0.145	0	0.494
	1993-94	60	0.149	0.177	0	0.733
	1999-00	56	0.161	0.177	0	0.641
Log of Gross Fixed Capital Formation (GFCF)	1983	65	7.213	2.196	0	11.370
	1987-88	69	7.712	1.868	1.609	11.693
	1993-94	72	8.957	1.718	4.263	13.225

Source: NSSO, Annual Survey of Industries (2002), Das (2003).

Table 3.2: Results from the Earnings Regression

	1983	1987-88	1993-94	1999-00
Age	0.055 ***	0.065 ***	0.055 ***	0.049 ***
	(0.004)	(0.004)	(0.005)	(0.004)
Age squared	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Female	-0.576 ***	-0.515 ***	-0.507 ***	-0.411 ***
	(0.023)	(0.025)	(0.028)	(0.024)
Married	0.111 ***	0.106 ***	0.091 ***	0.095 ***
	(0.018)	(0.021)	(0.024)	(0.020)
Self-employed	-0.215 ***	-0.058 ***	-0.335 ***	-1.294 ***
	(0.053)	(0.061)	(0.064)	(0.127)
Household head	0.177 ***	0.098 ***	0.194 ***	0.129 ***
	(0.017)	(0.019)	(0.022)	(0.018)
Middle or secondary school	0.281 ***	0.289 ***	0.246 ***	0.225 ***
	(0.015)	(0.017)	(0.020)	(0.016)
Higher secondary or more	0.685 ***	0.673 ***	0.613 ***	0.600 ***
	(0.032)	(0.030)	(0.028)	(0.022)
Constant	-0.160	-1.103 *	-0.692 ***	-0.393 ***
	(0.0320)	(0.6580)	(0.1730)	(0.094)
State indicators	Yes	Yes	Yes	Yes
Occupation indicators	Yes	Yes	Yes	Yes
Industry Indicators	Yes	Yes	Yes	Yes
R-squared with industry indicators	0.59	0.56	0.5	0.55
R-squared without industry indicators	0.52	0.5	0.44	0.5
Number of observations	9309	9083	8570	7855

Notes: Dependent variable is the log of weekly earning of each individual Equation estimated is equation 3.3.1. *Age* is the age of the individual in years, *Age squared* is the square of age, *Female* is a dummy variable which take the values 1 if the individual is a female and 0 otherwise, *Married* is a dummy variable for marital status of the individual and takes a value of 1 if married and 0 otherwise, *Self-employed* takes a value 1 if the individual is self-employed 0 otherwise, *household head* takes a value 1 if the individual is a household and 0 otherwise, *Middle or secondary school* and *Higher secondary or more* are education dummies, former take the value 1 if individual has completed grades 6^{th}-10^{th} in school, and the latter takes a value 1 if individual has completed more than 11^{th} grade or more (including college). ***, **, * denote statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

Table 3.3: Correlation Matrix for Industry Wage Premia

	1983	1987-88	1993-94	1999-00
1983	1			
1987-88	0.48	1		
1993-94	0.36	0.48	1	
1999-00	0.26	0.40	0.43	1

Notes: Based on Authors' calculations of inter-industry wage premia calculated using the Haisken-DeNew and Schmidt (1997) procedure.

Table 3.4: Tariffs and Industry Wage Premia

	I	II	III
NRP	-0.174 **	-0.435 ***	-0.153 **
	(0.07)	(0.10)	(0.07)
Year indicators	Yes	Yes	Yes
Industry indicators	No	No	Yes
First differencing	Yes	No	No
Observations	209	281	281

Notes: Dependent variable in all regressions is the inter-industry wage premium calculated from Mincer wage regressions. Equation 3.3.2 has been estimated here. *NRP* is the nominal rate of protection. ***, **, * denote statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

Table 3.5: Tariffs and Industry Wage Premia: Controlling for Non-Tariff Barriers (NTB) and Import Penetration Ratio (MPR)

	I	II	III
NRP	-0.198**	-0.386***	-0.146**
	(0.079)	(0.1)	(0.072)
MCR	-0.0004	0.0002	-0.0001
	(0.0003)	(0.0006)	(0.0004)
MPR	-0.129	0.114	0.081
	(0.101)	(0.118)	(0.119)
Year indicators	Yes	Yes	Yes
Industry indicators	No	No	Yes
First differencing	Yes	No	No
Observations	176	236	236

Notes: Dependent variable in all regressions is the inter-industry wage premium calculated from Mincer wage regressions. Equation 3.3.2 has been estimated here. *NRP* is the nominal rate of protection, *MCR* is the import coverage ratio (measure of Non-tariff barriers (NTBs)), *MPR* is the import penetration ratio. ***, **, * denote statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

Table 3.6.A: First Stage Results of the Instrumental Variable Regression

	First Stage Results
NRP in 1980*Foreign Exchange Reserves	-0.263***
	(0.078)
Share of Unskilled Workers in 1983*Foreign Exchange Reserves	-0.319*
	(0.185)
Year indicators	Yes
First differencing	Yes
Observations	168
R-squared	0.64

Notes: Dependent variable is the nominal rate of protection. Equation 3.3.2 has been estimated here. *NRP*, the nominal rate of protection is instrumented with NRP in 1980 interacted with foreign exchange reserves and share of unskilled workers in 1983 interacted with foreign exchange reserves. ***, **, * denote statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

Table 3.6.B: Tariffs and Industry Wage Premia: Instrumental Variable Regression (Second Stage)

	Second Stage Results
NRP	-0.536 **
	(0.234)
Year indicators	Yes
Industry indicators	No
First differencing	Yes
Observations	168

Notes: Dependent variable in all regressions is the inter-industry wage premium calculated from Mincer wage regressions. Equation 3.3.2 has been estimated here. *NRP*, the nominal rate of protection is instrumented with NRP in 1980 interacted with foreign exchange reserves and share of unskilled workers in 1983 interacted with foreign exchange reserves. ***, **, * denote statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

Table 3.7: Tariffs and Industry Wage Premia: Controlling for Gross Fixed Capital Formation

	I	II
NRP	-0.16 **	-0.2 ***
	(0.07)	(0.08)
MCR		-0.01
		(0.01)
MPR		-0.13
		(0.10)
Ln(GFCF)	-0.01	-0.01
	(0.01)	(0.01)
Year indicators	Yes	Yes
Industry indicators	No	No
First differencing	Yes	Yes
Observations	199	167

Notes: Dependent variable in all regressions is the inter-industry wage premium calculated from Mincer wage regressions (available from authors upon request). Equation 3.3.2 has been estimated here. *NRP* is the nominal rate of protection, *MCR* is the import coverage ratio (measure of Non-tariff barriers (NTBs)), *MPR* is the import penetration ratio, *GFCF* is the gross fixed capital formation. ***, **, * denote statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

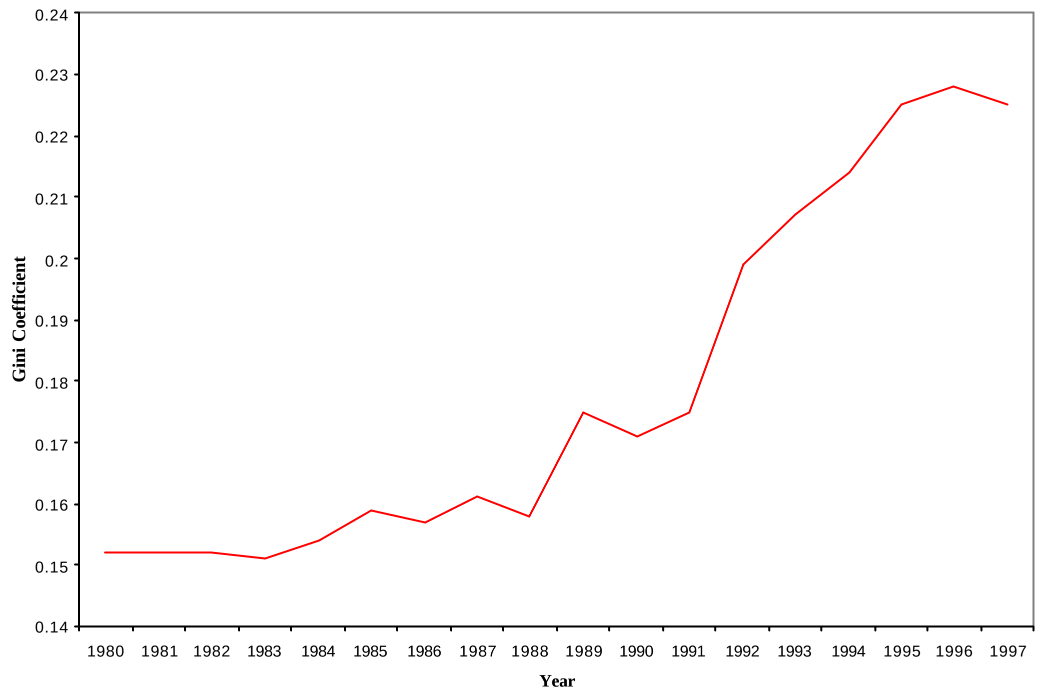
Table 3.8: Tariffs and Industry Wage Premia: For Skilled and Unskilled Workers

	I Skilled Workers	II Unskilled Workers
NRP	0.229 **	-0.235 ***
	(0.108)	(0.086)
Year indicators	Yes	Yes
Industry indicators	No	No
First differencing	Yes	Yes
Observations	183	209

Notes: Dependent variable in all regressions is the inter-industry wage premium calculated from Mincer wage regressions (available from authors upon request). Equation 3.3.2 has been estimated here. Mincer wage regressions are done separately for skilled and unskilled workers. *NRP* is the nominal rate of protection. *Specification I* is for skilled workers only and *Specification II* is for skilled workers only. ***, **, * denote statistical significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses.

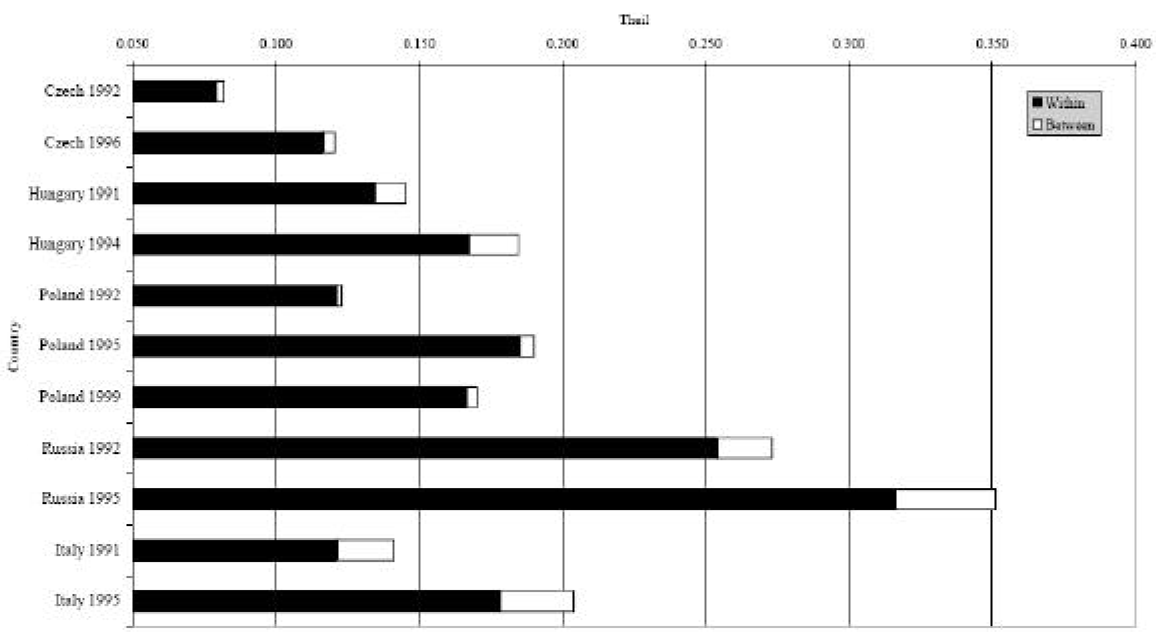
Figures

Figure 1.1: Trend in Inter-State Inequality



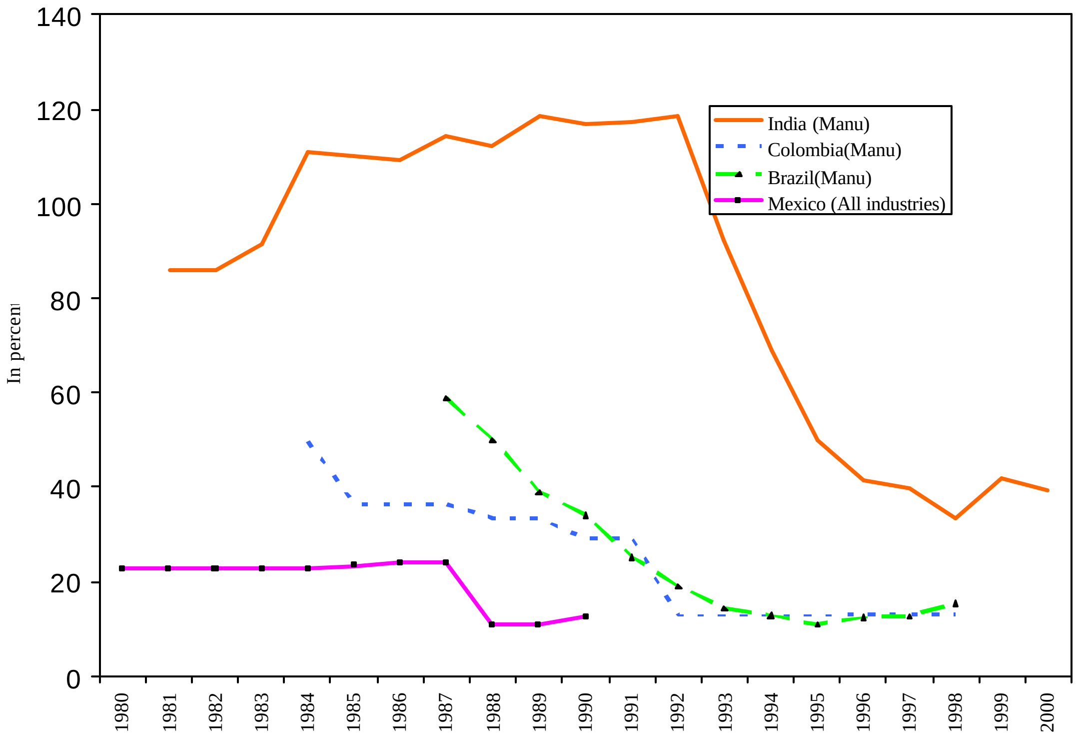
Source: Ahluwalia (2000). Gini coefficients are calculated assuming that all individuals within a state have a gross income equal to per capita GDP of the state.

Figure 1.2: Spatial Decomposition of Total Inequality in CEECs



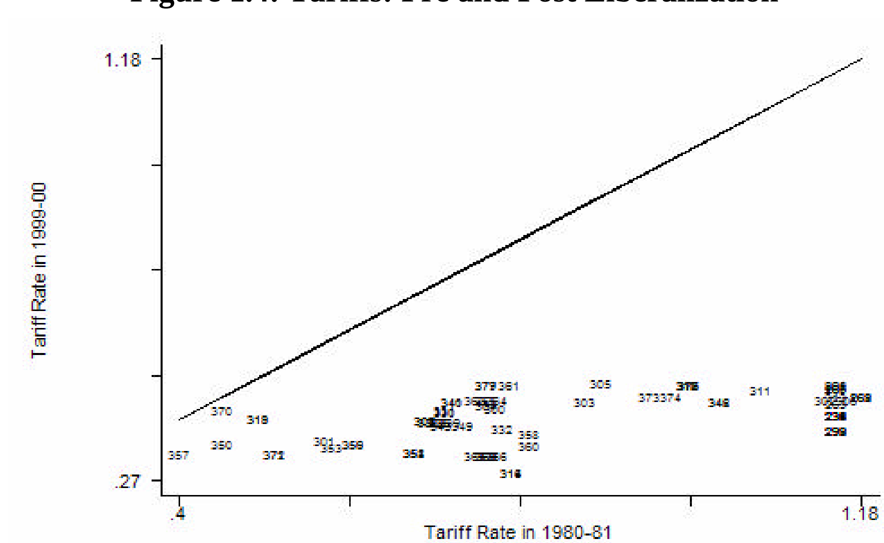
Source: Forster et al. (2005). Theil Index of inequality is decomposed into the between and within components. The ratio of within component to the total inequality is the preferred measure of spatial inequality.

Figure 1.3: Average Tariff Rates: India and Latin America (1980-81 to 1999-00)



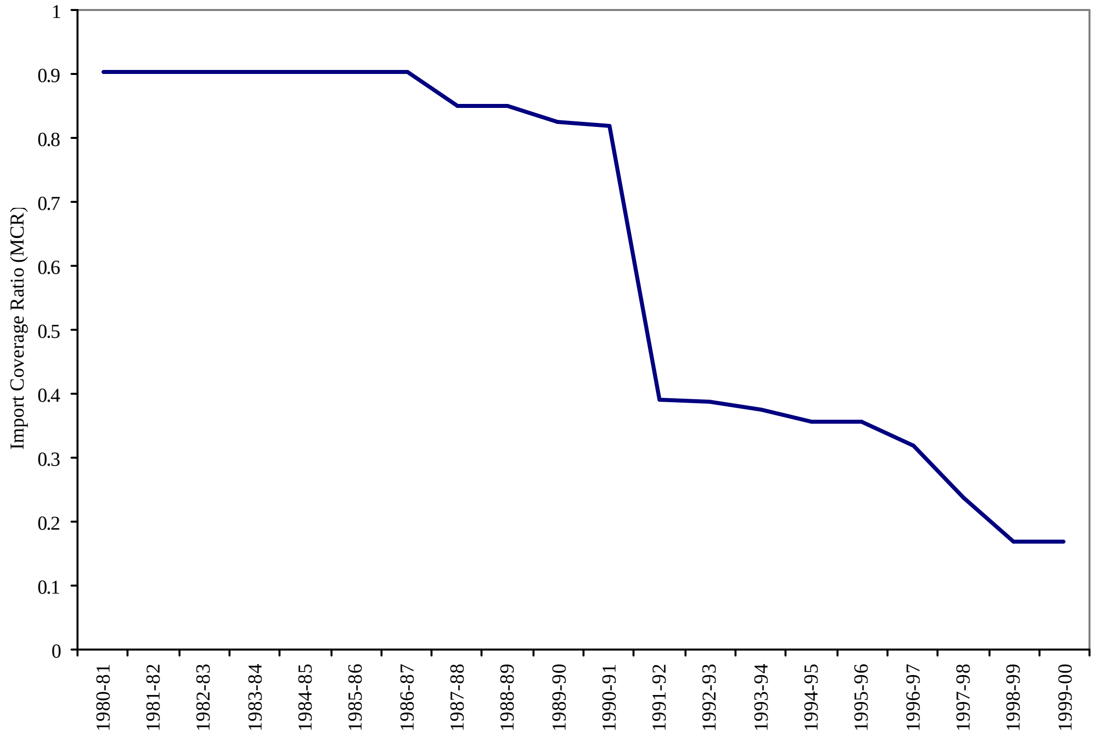
Notes: Data sources on tariffs are Pavcnik et al. (2004) for Brazil ; Goldberg and Pavcnik (2005) for Colombia, Das (2003) for India, and Revenga (1997) for Mexcio.

Figure 1.4: Tariffs: Pre and Post Liberalization



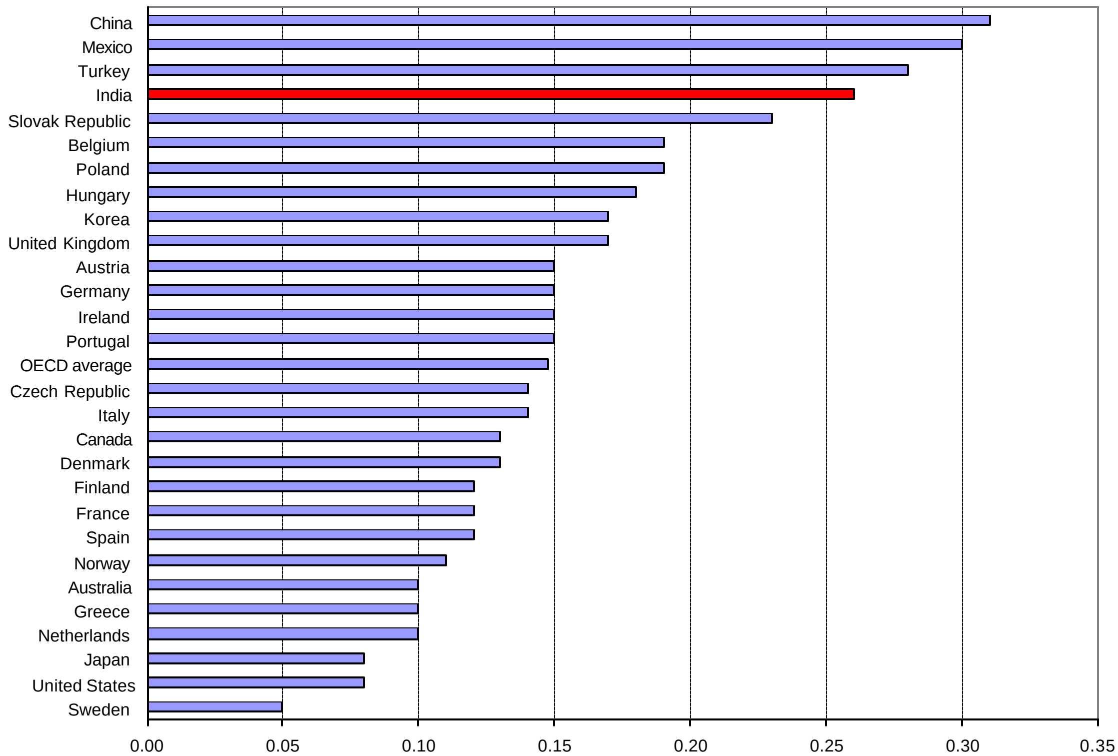
Notes: Data on tariffs is from Das (2003).

Figure 1.5: Non-Tariff Barriers: Average Import Coverage Ratio (1980-81 to 1999-00)



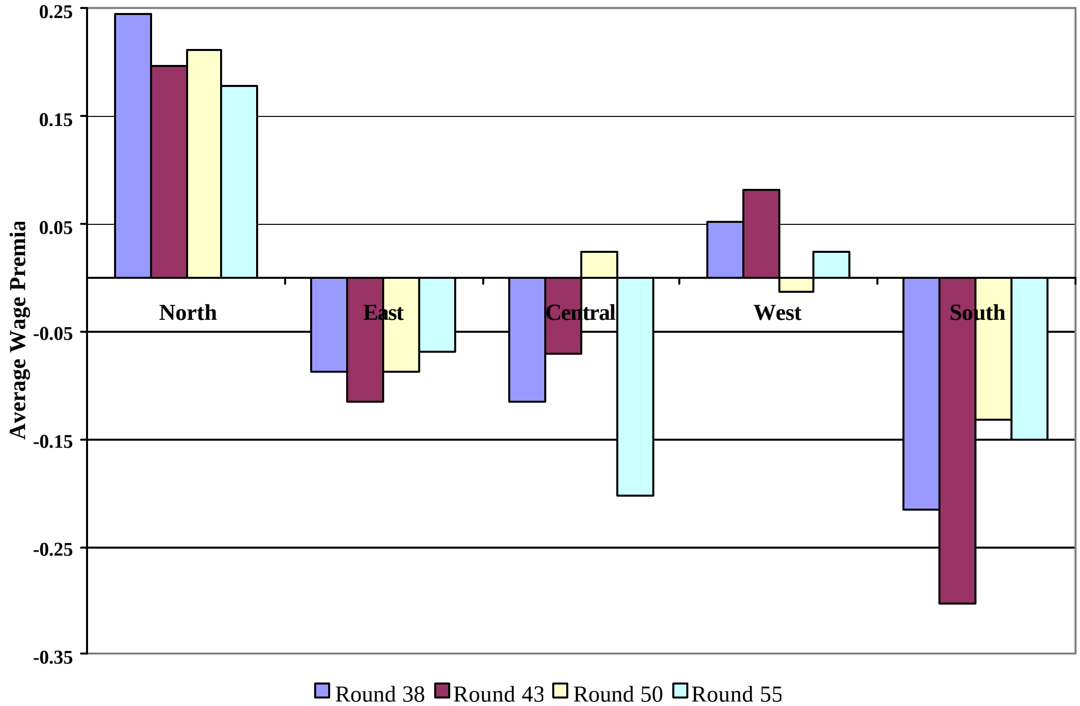
Notes: Data on import coverage ratio is from Das (2003). Import coverage ratio is defined as the share of imports subject to non-tariff barriers. The average import coverage ratios are for 72 three-digit manufacturing industries classified according to the National Industrial Classification 1987 (NIC-1987).

Figure 2.1: Gini Index of Regional Disparities



Notes: Data for OECD countries is for the year 2002 except for Solvak Republic which is for 2001. For China and India data is for the year 1999 and 2000 respectively.

Figure 2.2: Average Region Wage Premia by Zones

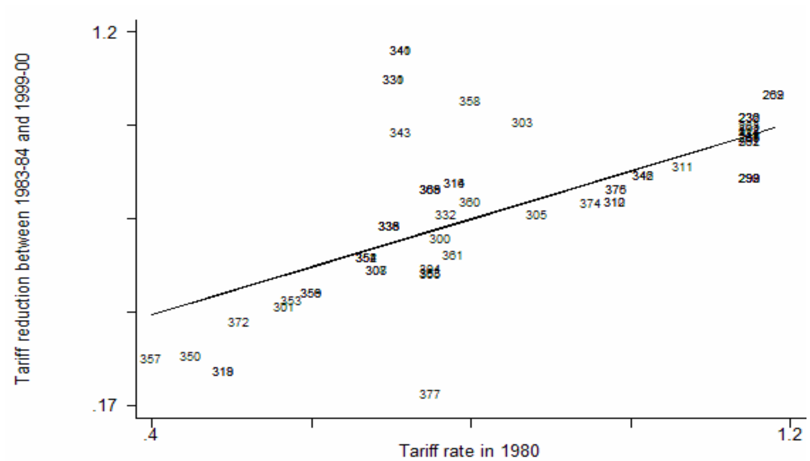


Notes: Please refer to footnote 47 to see which regions fall in the various zones. Appendix B provides a list of regions in the study. Round 38, 43, 50 and 55 correspond to 1983, 1987-88, 1993-94, and 1999-2000 respectively.

Figure 2.3: Change in Region Wage Premia between 1983 and 1999-00 and Region Wage Premia in 1983.

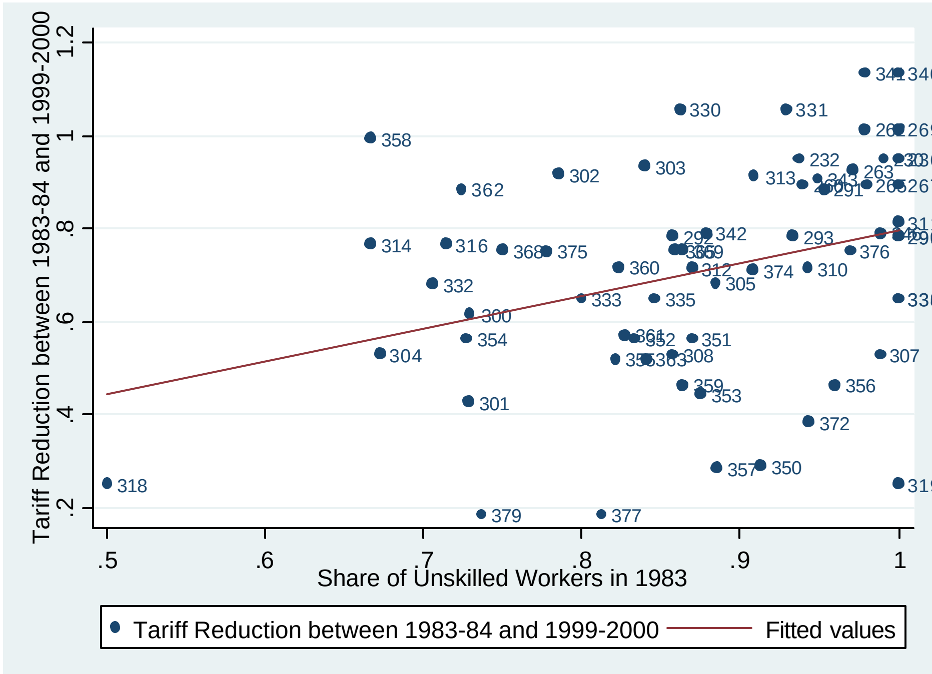
Notes: Coefficient from the regression of change in wage premia between 1983 and 2000 on initial wage premia in 1983 is -0.55. This is statistically significant at the 1% level.

Figure 3.1: Tariff Reduction and Pre-Liberalization Tariffs



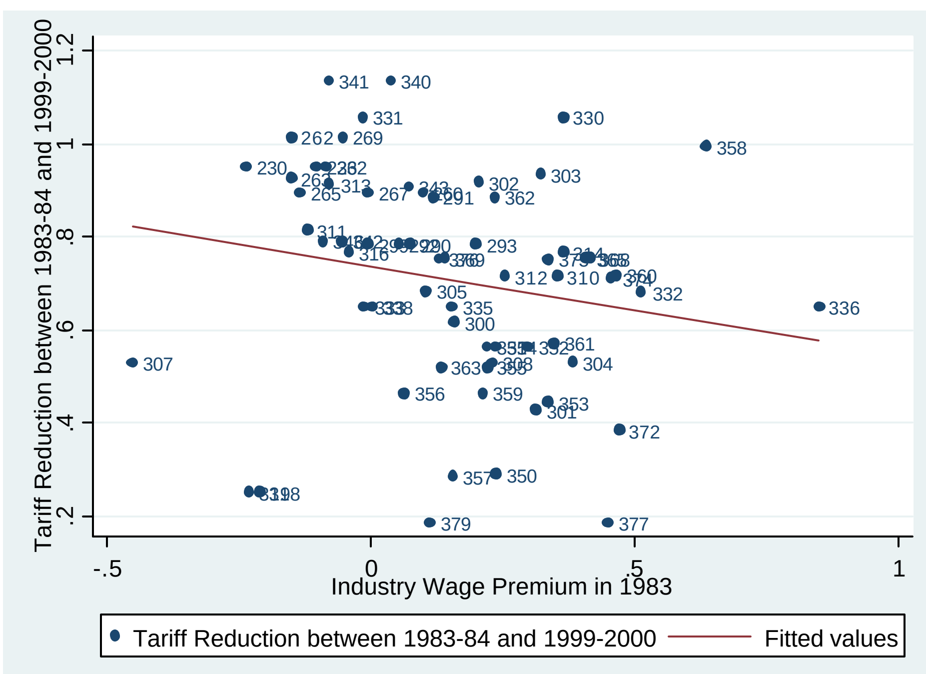
Notes: Data on tariffs is from Das (2003). Coefficient = 0.66 (se=0.09), statistically significant at 1 percent, number of observations = 72.

Figure 3.2: Tariff Reduction and Share of Unskilled Workers



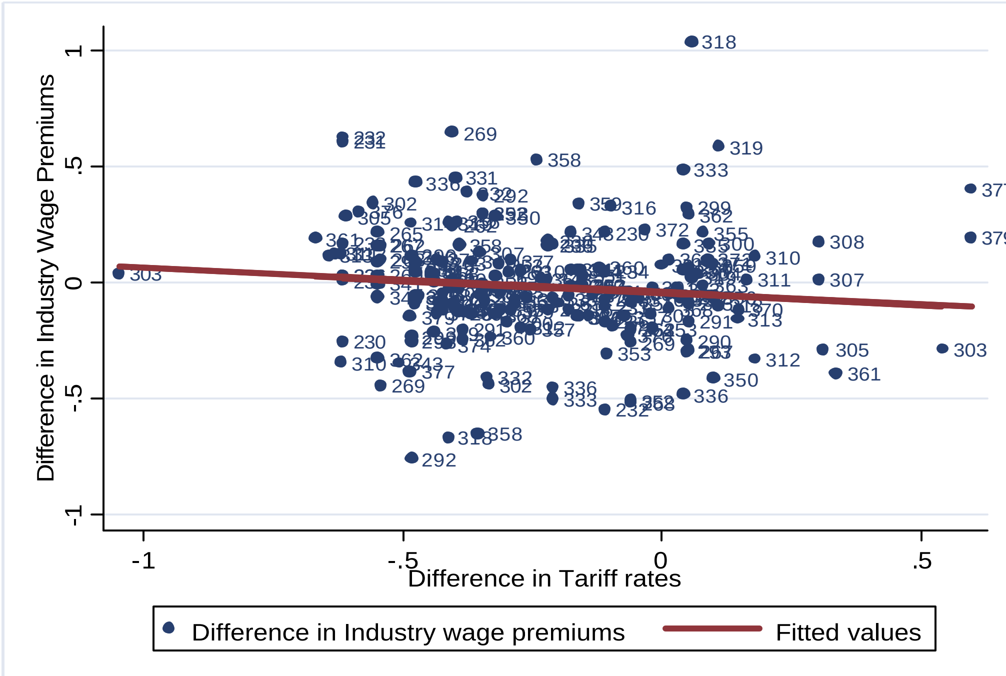
Notes: Data on tariffs is from Das (2003). Coefficient=0.71, standard error=0.25, statistically significant at 1 percent level, number of observations = 65. Unskilled workers are defined as those having less than 12 years of completed schoolin g.

Figure 3.3: Tariff Reduction between 1983and 1999-2000 and Industry Wage Premia in 1983



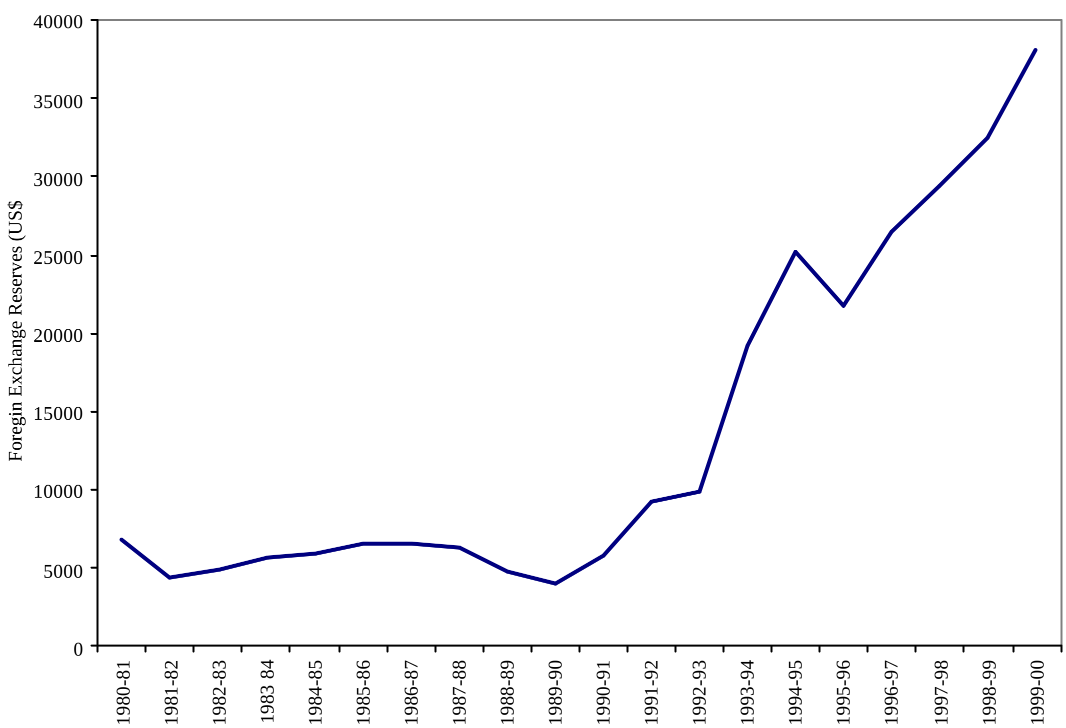
Notes: Data on tariffs is from Das (2003) and inter-industry wage premium is based on authors' calculations. Coefficient=-0.19, standard error=0.12 (statistically significant at 15 percent), number of observations = 65.

Figure 3.4: Differences in Wage Premia and Differences in Tariffs



Notes: Data on tariffs is from Das (2003) and inter-industry wage premium is based on author calculations. Coefficient=-0.10, standard error=0.02 (statistically significant at 5 percent), number of observations = 208.

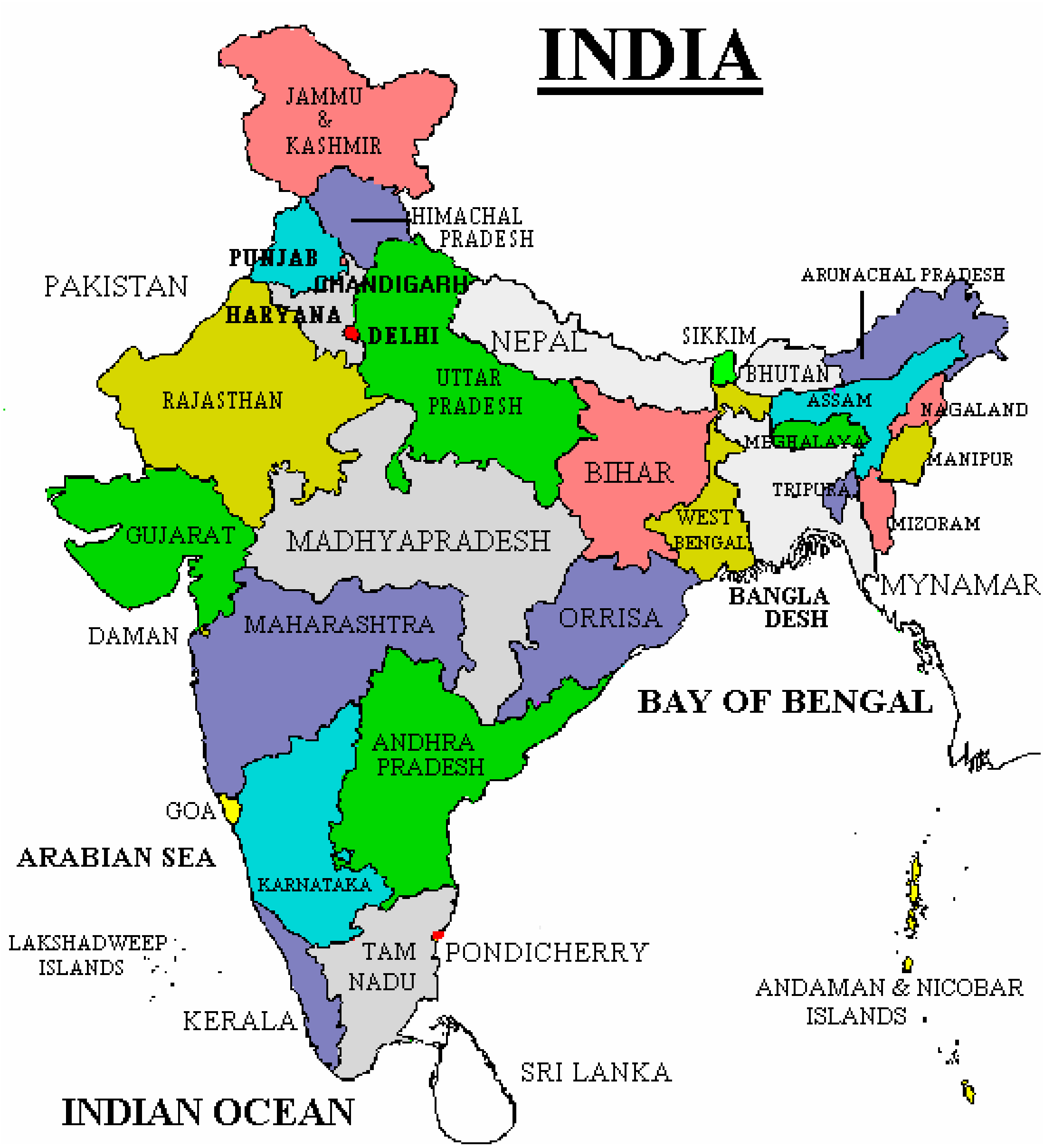
Figure 3.5: Foreign Exchange Reserves (in US$ million)



Data source: Reserve Bank of India.

Appendices

Appendix A: Map of India



Appendix B: List of Regions

Region Code	Region	State	Region Code	Region	State
21	Coastal	Andhra Pradesh	141	Coastal	Maharashtra
22	Inland Northern	Andhra Pradesh	142	Inland Western	Maharashtra
23	South Western	Andhra Pradesh	143	Inland Northern	Maharashtra
24	Inland Southern	Andhra Pradesh	144	Inland Central	Maharashtra
51	Southern	Bihar	145	Inland Eastern	Maharashtra
52	Northern	Bihar	146	Eastern	Maharashtra
53	Central	Bihar	191	Coastal	Orissa
71	Eastern	Gujarat	192	Southern	Orissa
72	Plains Northern	Gujarat	193	Northern	Orissa
73	Plains Southern	Gujarat	201	Northern	Punjab
74	Dry Areas	Gujarat	202	Southern	Punjab
75	Saurashtra	Gujarat	211	Western	Rajasthan
81	Eastern	Haryana	212	North Eastern	Rajasthan
82	Western	Haryana	213	Southern	Rajasthan
91	Himachal Pradesh	Himachal Pradesh	214	South Eastern	Rajasthan
111	Coastal & Ghats	Karnataka	231	Coastal Northern	Tamil Nadu
112	Inland Eastern	Karnataka	232	Coastal	Tamil Nadu
113	Inland Southern	Karnataka	233	Southern	Tamil Nadu
114	Inland Northern	Karnataka	234	Inland	Tamil Nadu
121	Northern	Kerala	251	Himalayan	Uttar Pradesh
122	Southern	Kerala	252	Western	Uttar Pradesh
131	Chhattisgarh	Madhya Pradesh	253	Central	Uttar Pradesh
132	Vindhya	Madhya Pradesh	254	Eastern	Uttar Pradesh
133	Central	Madhya Pradesh	255	Southern	Uttar Pradesh
134	Malwa	Madhya Pradesh	261	Himalayan	West Bengal
135	South	Madhya Pradesh	262	Eastern Plains	West Bengal
136	South Western	Madhya Pradesh	263	Central Plains	West Bengal
137	Northern	Madhya Pradesh	264	Western Plains	West Bengal
			281	Chandigarh	Chandigarh
			311	Delhi	Delhi

Notes: Region codes are from National Sample Survey Organization.

Appendix C: List of Industries with Tariff Information

Description of the Industry	NIC-87	Description of the Industry	NIC-87
Cotton ginning, spinning and bailing	230	Iron and steel in semi-finished form	331
Cotton spinning other than in mills	231	Manufacture of Ferro alloys	332
Weaving and finishing of cotton khadi	232	Copper manufacturing	333
Weaving and finishing of cotton textiles on handlooms	233	Aluminum manufacturing	335
Weaving and finishing of cotton textiles on powerlooms	234	Zinc manufacturing	336
Cotton spinning ,weaving and processing in mills	235	Processing of metal scraps except iron and steel scraps	338
Bleaching, dyeing and pruning of cotton textiles	236	Manufacture of fabricated structural metal products	340
Manufacture of knitted or crocheted textile products	260	Manufacture of fabricated metal products, n.e.c.	341
Embroidery works, zari works and ornamental trimmings	262	Furniture and fixtures primarily of metal	342
Blankets, shawls, carpets, and rugs etc	263	Hand-tools, weights, general hardware, metal products n.e.c.	343
Textile, garments and clothing accessories	265	Manufacture of Metal cutlery, utensils, kitchenware	346
Manufacture of made-up textiles; except apparel	267	Agriculture machinery and equipments and parts thereof	350
Manufacture of waterproof textile fabrics	268	Construction and mining-machinery and equipment	351
Textile products n.e.c.	269	Prime movers, boilers, steam generating plants and nuclear reactors	352
Tanning, curing, finishing, embossing of leather	290	Food and textile industry machinery	353
Leather Footwear	291	Other Machinery	354
Wearing apparel of leather and substitutes of leather	292	Refrigerators, air conditioners and fire fighting equipment	355
Leather Products and Substitutes	293	General purpose non electrical machinery/equipment	356
Manufacture of leather and fur products n.e.c.	299	Manufacture of machine tools, their parts and accessories	357
Organic and Inorganic Chemicals	300	Office, computing and accounting machinery and parts	358
Manufacture of fertilizers and pesticides	301	Sspecial purpose machinery/equipment,	359
Plastics, synthetic rubber and man-made fibers	302	Electrical industrial machinery, apparatus and parts thereof	360
Paints, varnishes and related products	303	Insulated wires and cables, optical fiber cables	361
Manufacture of drugs, medicines, and allied products	304	Accumulators, primary cells and primary batteries	362
Perfumes, cosmetics, lotions, toothpaste, and soaps etc.	305	Electric lamps, electric fans and domestic appliances	363
Manufacture of matches	307	Apparatus for radio broadcasting, television transmission	365
Manufacture of explosives, ammunition and fire works	308	Electronic valves, tubes and other electronic components n.e.c.	368
Tire and tube industries	310	Radiographic X-ray apparatus etc. and electrical equipment n.e.c.	369
Rubber and Plastic Footwear	311	Ship and boat building	370
Manufacture of rubber product n.e.c.	312	Manufacture of locomotives and parts	371
Manufacture of plastic products n.e.c.	313	Railway/tramway wagons coaches and other railroad equipment n.e.c.	372
Manufacture of refined petroleum product	314	Heavy motor vehicles, coach work, cars and other motor vehicles	374
Manufacture of refined petroleum products n.e.c.	316	Motor-cycles, scooters and parts (including three-wheelers)	375
Manufacture of coke-oven products	318	Manufacture of bicycles, cycle-rickshaws.	376
Manufacture of other coal and coal tar products n.e.c.	319	Manufacture of aircraft, spacecraft and their parts	377
Manufacture of iron and steel in primary/semi finished forms	330	Manufacture of transport and equipment and parts n.e.c.	379

Notes: NIC-87 is the 3 digit National Industrial Classification (NIC) 1987 version.

Appendix D: Theoretical framework for a NEG model

The theoretical framework used to derive the estimating equation comes from the NEG model developed by Krugman and Venables (1995), and the framework presented below is as developed by Redding and Venables (2004). Firms are assumed to operate under increasing returns to scale with each firm producing a differentiated variety.

Appendix D.1 Consumer's Problem

The model assumes intermediate inputs in production and therefore, the demand for the differentiated product of each firm comes not only in the form of final good from the consumer but also as an intermediate input from other firms. The utility function U_s, of a representative consumer in region *s*, is

$$U_s = M_s{}^m A_s^{1-m} \ . \qquad \text{(D.1)}$$

Where, A_s is the consumption of agricultural good, M_s is a sub-utility function of manufactured goods, m is the share of expenditure on manufactured goods, and $1-m$ is the share of expenditure on agricultural goods. M_s which is a sub utility function is in turn defined as

$$M_s = \left[\sum_r^R \int_{n_r} x_{rs}(z)^{(s-1)/s} \, dz \right]^{s/(s-1)} = \left[\sum_r^R n_r x_{rs}^{(s-1)/s} \right]^{s/(s-1)} . \qquad \text{(D.2)}$$

Where, n_r is the number of varieties produced in region *r*, x_{rs} is the region *s* demand for *z-th* variety produced in region *r*, and s is the elasticity of substitution between any two varieties. The second equality comes from the fact that because of complete symmetry all products produced in region *r* are demanded by region *s* in the same quantity. The optimization problem of the consumer is to maximize the utility subject to the total income Y_s. This gives us the dual to the quantity index in the form of a price index for the manufactures, defined as

$$G_s = \left[\sum_r^R n_r \, p_{rs}^{(1-s)} \right]^{1/(1-s)} \quad . \qquad \text{(D.3)}$$

Where, G_s is the price index for manufactures and p_{rs} is the price of individual varieties produced in r and sold in s and is defined as

$$p_{rs} = p_r t_{rs} \qquad \text{(D.4)}$$

Where, p_r is the free-on-board produced price. The transportation cost t_{rs} takes the form of an iceberg cost as modeled by Samuelson. This implies that a proportion of imported inputs $1 - \frac{1}{t_{rs}}$ are lost in shipping from r to s. Therefore, to deliver one unit of good from region r to s must be shipped as only a fraction $\frac{1}{t_{rs}}$ arrives. If $t = 1$ then trade is costless and if $t = \infty$ there is no trade.

Appendix D.2 Producer's Problem

Turning to the supply side, each representative producer in region s uses a composite input $(M_s^a l_s^b v_s^g)$ of labor (*l*) which is assumed to be immobile across region, (*M*) is the composite intermediate goods as defined in D.3 and a primary factor of production (*k*) which is mobile across regions (say, capital). The production function is given by:

$$M_s^a l_s^b k_s^g = (c_s F + c_s x_s) \qquad \text{(D.5)}$$

Where, a is the share of the composite intermediate input in the total expenditure of the firm, b is the share of labor, g is the share of the mobile primary factor of production and it is assumed that $a + b + g = 1$, $c_s F$ is the fixed cost of setting up a plant and this gives rise to increasing returns to scale.

Profit function of the representative firm in region s, is given by

$$p_s = \sum_{r}^{R} p_s x_{sr} - G_s^a w_s^b v_s^g c_s (F + x_s) \qquad \text{(D.6)}$$

The total cost function consists of the fixed cost $c_s F$ and c_s which is the variable cost. The price of the inputs is given by G_s which is the price index for manufactures as defined before, wage rate in region s is w_s. From the profit function we can say that lower the price index lower the total cost of production. Further, higher number of upstream firms lowers the price index and also the transport costs.

The producer's profit maximization problem, from the usual marginal revenue equal marginal cost, gives the free on board producer price which is a constant mark up over marginal cost given by

$$p_s = G_s^a w_s^b v_s^g c_s s \;/\; s - 1 \qquad \text{(D.7)}$$

Allowing for free entry and exit, firms break if they produce the level of output given by

$$x_s = \overline{x} = F(s - 1) \qquad \text{(D.8)}$$

Appendix D.3 Aggregate Demand

Summing up, we get the total demand from each region r for the products produced in region s as

$$x_{sr} = p_{sr}^{-s} E_r G_r^{s-1} \qquad \text{(D.9)}$$

$$E_r = mY_r + a\, n_r P_r \overline{x} \qquad \text{(D.10)}$$

Where E_r is the total expenditure on manufactured goods by region *r*. As mentioned above, demand for the differentiated product comes not only from the consumers in the form of final good as given by mY_r but also from the producers in the form of spending on intermediate goods as summarized in $a\, n_r P_r \overline{x}$ where n_r is the number of downstream firms in region *r*.

Appendix D.4 Wage Equation

The zero profit wage equation is derived by first summing up the demand from all regions *r* for region *s* products as given by Equation D.8. This gives us

$$p_s^s \overline{x} = \sum_r^R E_r G_r^{s-1} (t_{sr})^{1-s} \qquad \text{(D.11)}$$

This along with profit maximizing price as given by Equation D.7 gives us

$$\overline{x}(G_s^a w_s^b v_s^g c_s s /(s-1))^s = \sum_r^R E_r G_r^{s-1} (t_{sr})^{1-s} \qquad \text{(D.12)}$$

Following Fujita et al. (1999), we call this the *wage equation*. Rearranging, we can write equation as

$$(w_s^b v_s^g c_s)^s = A(SA_s)^{\frac{as}{s-1}} (MA_s) \qquad \text{(D.13)}$$

Where,

i) $$SA_s = \left[\sum_r^R n_r (p_r t_{sr})^{1-s} \right] = \left[\sum_r s_r (t_{sr})^{1-s} \right] \qquad \text{(D.14)}$$

gives the supplier access (*SA*). It is a distance weighted measure of the supply capacity of all the regions. Supply capacity as measured by s_r is a product of number of firms in other regions and their price competitiveness. Supplier access therefore measures the proximity of firms in a region to its suppliers. The better the supply access, which could be due either to physical proximity or as a result of there being a higher number of upstream firms, lower the total costs and higher the zero profit wages.

ii) $$MA_s = \left[\sum_r^R E_r G_r^{s-1} (t_{sr})^{1-s}\right] = \left[\sum_r m_r (t_{sr})^{1-s}\right] \quad \text{(D.15)}$$

gives the market access (*MA*). Analogous to supplier access it is a distance weighted measure of market capacity of all regions. Market capacity m_r in turn depends on the expenditure and the price index in region *r*. In other words, market capacity is nothing but purchasing power of the region. These two together give the position of the demand curve. As with supply access, market access has a positive effect on wages. The closer is the firm to its market (market comprising both of consumers and downstream firms) the higher is the zero profit wages.

From Equation D.13, we therefore have a positive relationship between wages in a region and economic geography variables in the form of market access and supply access. Taking logs on both sides in Equation D.13, we have:

$$\ln w_s = q_0 + q_1 \ln(SA_s) + q_2 \ln(MA_s) + h_s \quad \text{(D.16)}$$

Where $,q_0 = \left[\frac{A^{1/s}}{v_s^g}\right]^{1/b} ,q_1 = \frac{a}{b(s-1)} ,q_2 = \frac{1}{bs}.$

Appendix E: Estimated Region Wage Premia

Region	Round 38	Round 43	Round 50	Round 55	Region	Round 38	Round 43	Round 50	Round 55
21	-0.1751***	-0.2759***	-0.1924***	-0.2477***	**133**	-0.2013***	0.0759	-0.3973***	-0.2714***
	(0.0477)	(0.0582)	(0.0484)	(0.0628)		(0.0613)	(0.1056)	(0.1178)	(0.0805)
22	0.1236***	-0.1189**	-0.0739	-0.0336	**134**	-0.0365	-0.0155	-0.0433	-0.1656**
	(0.0351)	(0.0461)	(0.0553)	(0.0462)		(0.0658)	(0.0563)	(0.0487)	(0.0819)
23	-0.1241	-0.5151***	-0.4480***	-0.3504***	**135**	-0.0028	0.2334***	0.1581**	0.1555
	(0.0875)	(0.1047)	(0.0997)	(0.0878)		(0.0601)	(0.0598)	(0.0750)	(0.1156)
24	-0.3740***	-0.5360***	-0.0942	-0.4464***	**136**	0.0614	-0.1738**	0.0190	-0.6758***
	(0.0974)	(0.1020)	(0.1278)	(0.1537)		(0.1023)	(0.0722)	(0.0906)	(0.1172)
51	0.2301***	0.2534***	0.2674**	0.4923***	**137**	-0.1132	-0.2765**	0.1050	0.0560
	(0.0539)	(0.0539)	(0.1271)	(0.0644)		(0.1101)	(0.1127)	(0.0826)	(0.0869)
52	-0.5757***	0.0490	0.1728	-0.2720***	**141**	0.4320***	0.3826***	0.3480***	0.2242***
	(0.2037)	(0.1344)	(0.1051)	(0.0492)		(0.0209)	(0.0245)	(0.0262)	(0.0199)
53	-0.1404**	-0.0245	-0.5759***	-0.2389***	**142**	0.0934***	0.0198	0.0088	-0.0551
	(0.0706)	(0.1174)	(0.1809)	(0.0835)		(0.0324)	(0.0417)	(0.0351)	(0.0467)
71	0.2065	-0.0380	-0.0222	0.0083	**143**	-0.3218***	0.0257	-0.1715*	0.4407**
	(0.1568)	(0.0795)	(0.0921)	(0.0753)		(0.0686)	(0.0598)	(0.1038)	(0.2199)
72	0.3367***	0.1014***	-0.0027	-0.2276***	**144**	-0.2227***	-0.2169***	-0.0580	-0.3198**
	(0.0313)	(0.0364)	(0.0437)	(0.0367)		(0.0653)	(0.0792)	(0.1096)	(0.1433)
73	0.2295***	0.1928***	0.1763***	0.3421***	**145**	-0.2910***	-0.0787	-0.3138***	-0.3915***
	(0.0477)	(0.0450)	(0.0342)	(0.0564)		(0.0488)	(0.0665)	(0.0633)	(0.0797)
74	0.0303	0.2166**	-0.3935**	-0.0651	**146**	-0.4098***	-0.0036	-0.0002	0.2340*
	(0.0814)	(0.0890)	(0.1797)	(0.0897)		(0.1249)	(0.1054)	(0.1413)	(0.1403)
75	0.2294***	0.0058	-0.2245***	0.0997**	**191**	0.0824	-0.3041**	0.0738	-0.2022*
	(0.0667)	(0.0599)	(0.0777)	(0.0427)		(0.1187)	(0.1318)	(0.1675)	(0.1183)
81	0.1364***	0.0087	0.2594***	0.2880***	**192**	0.0353	-0.4252***	0.3554***	-0.0924
	(0.0509)	(0.0483)	(0.0810)	(0.0527)		(0.3293)	(0.0417)	(0.0837)	(0.1397)
82	0.1405**	0.0914	0.0273	-0.0073	**193**	0.2231***	0.2897***	0.2739***	0.1650**
	(0.0626)	(0.1050)	(0.2020)	(0.1371)		(0.0638)	(0.0528)	(0.0579)	(0.0745)
91	0.4854***	0.4398***	0.6485***	0.3038**	**201**	0.0166	0.0197	0.1449***	0.0549
	(0.0902)	(0.1663)	(0.1256)	(0.1417)		(0.0565)	(0.0542)	(0.0540)	(0.0394)
111	-0.0009	-0.2488**	0.4551***	0.2328**	**202**	0.0368	0.1965***	0.1269**	0.0759
	(0.0756)	(0.0988)	(0.0924)	(0.1003)		(0.0554)	(0.0603)	(0.0595)	(0.0681)
112	-0.0541	-0.2345	-0.3187***	-0.1261	**211**	0.3264***	0.2656***	-0.0336	0.0250
	(0.1729)	(0.1861)	(0.1109)	(0.1557)		(0.0540)	(0.0953)	(0.0723)	(0.0728)
113	0.0268	-0.0203	0.1344***	0.0080	**212**	-0.0246	-0.0351	-0.0651	0.0676
	(0.0419)	(0.0392)	(0.0403)	(0.0411)		(0.0509)	(0.0655)	(0.0788)	(0.0772)
114	-0.0963	-0.2359***	-0.3113***	-0.2692***	**213**	0.0463	-0.0142	0.2803	-0.1175
	(0.0668)	(0.0461)	(0.0783)	(0.0529)		(0.0859)	(0.1869)	(0.1805)	(0.1570)
121	-0.3132***	-0.3114***	-0.0333	-0.1326*	**214**	-0.0643	0.2939***	0.1698**	0.0966
	(0.0658)	(0.0663)	(0.0662)	(0.0671)		(0.0712)	(0.0870)	(0.0852)	(0.1419)
122	-0.3251***	-0.3936***	-0.1723**	-0.0855*	**231**	-0.3565***	-0.2104***	-0.1900***	-0.0680
	(0.0517)	(0.0796)	(0.0714)	(0.0466)		(0.0374)	(0.0439)	(0.0373)	(0.0423)
131	0.0446	0.1723***	0.1824***	-0.2239***	**232**	-0.3728***	-0.3354***	-0.0756	-0.2943***
	(0.0589)	(0.0651)	(0.0653)	(0.0747)		(0.1216)	(0.0708)	(0.0963)	(0.0797)
132	0.1094	-0.2196	0.0534	0.0119	**233**	-0.5150***	-0.5258***	-0.3450***	-0.3232***
	(0.1442)	(0.1458)	(0.0953)	(0.1472)		(0.0442)	(0.0410)	(0.0495)	(0.0514)

Appendix E: Estimated Region Wage Premia (...contd.)

Region	Round 38	Round 43	Round 50	Round 55
234	-0.2558***	-0.1749***	-0.2405***	-0.0400
	(0.0418)	(0.0461)	(0.0549)	(0.0374)
251	-0.2205***	-0.1238	0.1384	-0.3114
	(0.0706)	(0.1290)	(0.0916)	(0.2579)
252	-0.0412	-0.0790**	-0.0068	-0.1271***
	(0.0396)	(0.0398)	(0.0574)	(0.0318)
253	-0.0392	0.0780	0.0478	-0.4269***
	(0.0574)	(0.0523)	(0.0428)	(0.0773)
254	-0.2541***	-0.1516**	0.1858***	-0.0771
	(0.0676)	(0.0607)	(0.0671)	(0.0799)
255	-0.5013***	-0.2902***	-0.1767	-0.2817***
	(0.1244)	(0.0779)	(0.1262)	(0.0910)
261	0.0005	-0.3942***	-1.2398	-0.5145
	(0.1601)	(0.1275)	(0.7716)	(0.3735)
262	-0.6091***	-0.5460***	-0.4462***	-0.5399***
	(0.1155)	(0.1145)	(0.0764)	(0.1431)
263	0.0393	0.1079**	0.0021	0.0779***
	(0.0250)	(0.0412)	(0.0449)	(0.0293)
264	-0.2945**	-0.3375	-0.1229	0.3426***
	(0.1163)	(0.2966)	(0.1056)	(0.1132)
281	0.2719**	0.1678	0.1954***	0.1942***
	(0.1061)	(0.1597)	(0.0654)	(0.0723)
311	0.3021***	0.2234***	-0.0649	0.1905***
	(0.0341)	(0.0384)	(0.0785)	(0.0518)

Appendix F: Estimated Industry Wage Premia

NIC-87	1983	1987-88	1993-94	1999-00	NIC-87	1983	1987-88	1993-94	1999-00
230	-0.235***	-0.013	-0.264**	-0.078	**305**	0.105	-0.179***	0.111	-0.011
	(0.057)	(0.084)	(0.113)	(0.049)		(0.067)	(0.068)	(0.087)	(0.066)
231	-0.978***	-1.081***	-0.469***	-0.078	**307**	-0.452***	-0.436***	-0.51***	-0.378***
	(0.089)	(0.151)	(0.096)	(0.049)		(0.066)	(0.098)	(0.106)	(0.132)
232	-0.084	-0.628**	0.005	-0.107***	**308**	-0.231***	0.41***	0.355***	0.304***
	(0.564)	(0.267)	(0.236)	(0.029)		(0.068)	(0.09)	(0.11)	(0.117)
233	-0.411***	-0.513***	-0.338***	-0.107***	**310**	0.354***	0.47***	0.128	0.183***
	(0.036)	(0.045)	(0.059)	(0.029)		(0.101)	(0.094)	(0.094)	(0.062)
234	-0.317***	-0.268***	-0.234***	-0.107***	**311**	-0.12	-0.106	0.024	-0.05
	(0.042)	(0.049)	(0.044)	(0.029)		(0.128)	(0.134)	(0.163)	(0.115)
235	0.215***	0.145***	0.159***	-0.107***	**312**	0.255**	-0.072	0.06	-0.129
	(0.022)	(0.028)	(0.044)	(0.029)		(0.124)	(0.107)	(0.113)	(0.083)
236	-0.104	-0.269***	-0.237**	-0.074	**313**	-0.077	-0.231***	-0.11	-0.133***
	(0.064)	(0.09)	(0.098)	(0.064)		(0.064)	(0.068)	(0.071)	(0.042)
260	0.1	0.169**	0.203***	0.079	**314**	0.366***	0.325**	0.273*	0.534***
	(0.104)	(0.083)	(0.07)	(0.067)		(0.131)	(0.131)	(0.156)	(0.088)
262	-0.15*	-0.345***	-0.182*	0.072	**316**	-0.042	0.291*	0.18	0.295*
	(0.088)	(0.091)	(0.099)	(0.076)		(0.225)	(0.175)	(0.262)	(0.172)
263	-0.151**	-0.102	-0.186*	-0.095	**318**	-0.211	0.831*	0.735***	0.071
	(0.077)	(0.095)	(0.108)	(0.106)		(0.421)	(0.462)	(0.243)	(0.285)
265	-0.135***	-0.22***	0.000	-0.022	**319**	-0.23	-0.205	0.386**	0.649***
	(0.029)	(0.032)	(0.053)	(0.032)		(0.344)	(0.182)	(0.21)	(0.17)
267	-0.005	-0.292	-0.129	-0.153**	**330**	0.138***	0.359***	0.42***	0.312***
	(0.18)	(0.207)	(0.147)	(0.084)		(0.032)	(0.032)	(0.042)	(0.039)
268	0.216	-0.296	-0.191		**331**	-0.014	0.047	-0.041	0.414***
	(0.225)	(0.377)	(0.423)			(0.05)	(0.05)	(0.076)	(0.083)
269	-0.052	-0.306*	-0.744***	-0.09*	**332**	0.514***	0.449	0.044	0.439***
	(0.15)	(0.169)	(0.195)	(0.098)		(0.103)	(0.292)	(0.182)	(0.08)
290	0.075	-0.171	-0.226**	-0.104	**333**	-0.012	0.48**	0.57***	0.072
	(0.111)	(0.114)	(0.094)	(0.085)		(0.267)	(0.188)	(0.197)	(0.136)
291	0.119	-0.045	0.048	-0.15***	**335**	0.154	0.323***	0.269*	0.439***
	(0.075)	(0.068)	(0.08)	(0.048)		(0.096)	(0.102)	(0.148)	(0.108)
292	0.054	-0.005	0.375	-0.381**	**336**	0.851	0.372	0.807	0.361*
	(0.225)	(0.231)	(0.326)	(0.191)		(0.596)	(0.462)	(0.728)	(0.202)
293	0.199	-0.096	0.207	-0.043	**338**	0.002	0.06	0.108	0.045
	(0.164)	(0.115)	(0.144)	(0.088)		(0.188)	(0.188)	(0.258)	(0.127)
299	-0.005	0.321	0.305	0.076	**340**	0.038	0.033	-0.025	-0.14***
	(0.298)	(0.292)	(0.3)	(0.18)		(0.076)	(0.069)	(0.074)	(0.041)
300	0.159**	0.332***	0.163**	0.073	**341**	-0.079	-0.018	-0.02	-0.096
	(0.065)	(0.292)	(0.057)	(0.062)		(0.05)	(0.054)	(0.127)	(0.093)
301	0.314***	0.392***	0.376***	0.394***	**342**	-0.053	-0.075	-0.025	-0.156
	(0.079)	(0.079)	(0.083)	(0.059)		(0.104)	(0.103)	(0.106)	(0.103)
302	0.206	0.072	0.421**	-0.012	**343**	0.073	0.293***	-0.052	-0.034
	(0.16)	(0.133)	(0.163)	(0.18)		(0.081)	(0.082)	(0.075)	(0.037)
303	0.322***	0.04	0.083	0.042	**346**	-0.09	-0.137*	-0.105	-0.008
	(0.084)	(0.09)	(0.098)	(0.081)		(0.062)	(0.075)	(0.104)	(0.117)
304	0.384***	0.43***	0.288***	0.209***	**350**	0.238***	-0.171*	0.118	0.081
	(0.056)	(0.053)	(0.056)	(0.044)		(0.09)	(0.09)	(0.104)	(0.098)

Appendix F: Estimated Industry Wage Premia (...contd.)

NIC-87	1983	1987-88	1993-94	1999-00	NIC-87	1983	1987-88	1993-94	1999-00
351	0.22*	0.254***	0.255**	0.174*	**363**	0.133**	0.127**	0.091	-6E-04
	(0.125)	(0.097)	(0.114)	(0.103)		(0.064)	(0.062)	(0.159)	(0.065)
352	0.298***	0.292**	0.593***	0.087	**365**	0.408***	0.364***	0.372***	0.353***
	(0.1)	(0.119)	(0.118)	(0.105)		(0.069)	(0.063)	(0.131)	(0.074)
353	0.336**	0.145	0.23	-0.072	**368**	0.416**	0.306	0.348***	0.216***
	(0.149)	(0.188)	(0.14)	(0.101)		(0.212)	(0.189)	(0.126)	(0.084)
354	0.237	0.221*	0.187	-0.012	**369**	0.141	0.243**	0.031	0.061**
	(0.18)	(0.133)	(0.114)	(0.099)		(0.13)	(0.118)	(0.14)	(0.073)
355	0.221**	0.439***	0.328**	0.255	**370**	0.457***	0.393***	0.278**	
	(0.113)	(0.099)	(0.159)	(0.255)		(0.109)	(0.096)	(0.121)	
356	0.063	0.006	0.275**	0.134**	**371**	0.472***	0.563***	0.67***	
	(0.119)	(0.142)	(0.113)	(0.058)		(0.155)	(0.094)	(0.121)	
357	0.157***	0.218***	0.02	-0.121	**372**	0.472***	0.578***	0.453***	0.686*
	(0.053)	(0.05)	(0.062)	(0.093)		(0.086)	(0.104)	(0.141)	(0.403)
358	0.637*	-0.013	0.52**	0.689***	**374**	0.457***	0.425***	0.163	0.22***
	(0.344)	(0.16)	(0.231)	(0.255)		(0.044)	(0.053)	(0.122)	(0.052)
359	0.213***	0.298***	0.188**	0.53***	**375**	0.337***	0.2	0.149	0.099
	(0.064)	(0.079)	(0.087)	(0.058)		(0.115)	(0.123)	(0.1)	(0.096)
360	0.465***	0.4***	0.169**	0.237***	**376**	0.129	0.439**	0.254**	0.03
	(0.049)	(0.056)	(0.075)	(0.058)		(0.105)	(0.124)	(0.123)	(0.109)
361	0.348***	-0.04	0.153	0.173**	**377**	0.451***	0.858***	0.476***	0.579**
	(0.111)	(0.116)	(0.124)	(0.079)		(0.15)	(0.181)	(0.127)	(0.125)
362	0.236**	0.536***	0.214	-0.027	**379**	0.113	0.31***	0.166	0.048
	(0.111)	(0.154)	(0.172)	(0.152)		(0.137)	(0.1)	(0.115)	(0.572)

	1983	1987-88	1993-94	1999-00
F-statistic	F(181, 9085)=8.3	F(179, 8862)=7.63	F(185, 8340)=5.06	F(149, 7661)=5.64
p-value	0.00	0.00	0.00	0.00
Standard deviation	0.28	0.34	0.28	0.24

***, ** and * denote statistical significance at 1 percent, 5 percent, and 10 percent, respectively. The standard errors are denoted in parentheses.

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