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Intra-Industry Trade and Labour Market Adjustment: Indian Manufacturing Sector

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Abstract

The study investigates the role of trade, labor market regulations and institutions on labour adjustment costs. The study develops a linear dynamic panel model using quasi-maximum likelihood fixed effects estimator. Using a panel data of 40 Indian manufacturing sectors we find that the better labour market regulations and institutions reduce the labour market adjustment costs. This result using both the set of proxies for labour adjustment costs -job re-allocation rates as well as absolute employment change- supported this view. We find the same to be true when examining the male and female labour adjustment costs individually. Nonetheless, the study did not find any evidence to support the impact of trade expansion as well as the structure of trade expansion on labour market adjustment costs. The results are robust to static and dynamic panel methods.

JEL Classifications: D00, F16, J00, K00, L60
Keywords: India, Intra-industry trade, Labour force participation, Labour productivity, Panel data, Trade liberalization

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1. Introduction

While it is widely recognized that trade induces reallocation of factors of production within and between sectors at least in the short run, there is lack of consensus in the literature with respect to the true outcomes of trade liberalization on labour market adjustment. As per the smooth adjustment hypothesis, the expansion of trade in the form of intra-industry (simultaneous exports and imports within an industry) would not lead to a significant resource adjustment costs that take place with the displacement of resources from comparatively disadvantaged industries to export-oriented industries as in the case with inter-industry (simultaneous exports and imports across the industries) trade patterns. Therefore, the factor-market adjustment pressure induced by trade expansion is negatively related to the share of intra industry trade in the expanded trade flow (Brülhart et al. 2006).[1]

The specific factor model highlights two sources of adjustment costs- factor price rigidity and factor specificity, with the empirical manifestations as unemployment and factor-price (wages) disparities (Azhar and Elliott, 2003). In other words, the adjustment costs that are normally studied in the context of trade expansion are those welfare losses that arise in labour markets from temporary unemployment due to factor-price rigidity or from costs incurred through job search, re-location and re-training (Ferto and Soos, 2010).

Trade *per se* cannot be treated as a cause for incurring adjustment cost. The impact of trade is not exogenous. The trade expansion in a particular form can be driven by many underlying demand and supply side factors. Additionally, the nature and dimensions of labour market adjustment can also be influenced by the country's existing labour market regulations and institutions. Better regulations and institutions may nullify the negative effects of trade induced adjustment costs. Examining the link between trade and labour adjustment costs in the context of prevailing labour market regulations and institutions of a country assumes

[1] There have been many empirical attempts to test the smooth adjustment hypothesis by analysing the link between marginal intra industry trade (MIIT) and labour market adjustment costs. The first set of studies that used econometric methods to test the SAH include Brülhart and Elliott (1998), Sarris et al. (1999) and Tharakan and Calfat (1999). Studies by Faustino and Leitão (2010), Faustino (2010), Fertő and Soos (2008), Brülhart et al. (2006), Cabral and Silva (2006) and Brülhart and Elliott (2002) have supported the SAH. On the other hand Fertő (2008), Brülhart et al. (2004), Erlat and Erlat (2003) and Brülhart and Thorpe (2000) have not provided any support for the SAH.

greater significance from the policy perspective. There are plenty of studies analyzing the impact of trade on labour market adjustment (eg. Milner and Wright, 1998; Stone et al., 2013; Dix-Carneiro, 2014) as well as the impact of institutions on labour market and adjustment cost (eg. D'Souza, 2008; Leschke and Watt, 2010; Nataraj et al., 2012). There are few studies in the context of analyzing the impact of intra industry trade on labour market adjustment as well(Faustino and Leitão, 2010; Faustino, 2010; Fertő and Soos, 2008; Brülhart et al., 2006; Cabral and Silva, 2006; Brülhart and Elliott, 2002; Fertő, 2005; Brülhart et al., 2004; Erlat and Erlat, 2003; and Brülhart and Thorpe, 2000). Nonetheless, there are hardly any attempts to analyse the impact of trade on labour market adjustment along with the role of regulations and institutions.[2] The present study is intended to fill this gap.

The present study make use of the two measures - job re-allocation rate as well as absolute employment change-as proxies for labour market adjustment costs. The labour market freedom is used as a proxy to capture the impact of labour regulations. Similarly, we include better rule of law, better control on corruption, better regulatory quality of the government, political stability, greater voice and accountability of the citizens and better government effectiveness etc. as measures for better institutions. The study uses a panel data on 40 Indian manufacturing sectors.

The paper is organised as follows. Section 2 reviews the studies that have looked at the institutions of labour market and governance and how they impact its participants. Section 3 introduces the description and the methodology behind the institutional and trade variables incorporated in this study. We study the trend in India of our variables of interest in section 4. In section 5, we describe our econometric specification and hypothesis to be tested. The results of our study are presented in section 6. The final section presents the concluding observations of our study.

[2] As highlighted by De Barros and Corseuil (2004), labour market regulations serve two objectives: one, improving labour force welfare even at the cost of some degree of economic inefficiency; two, efficiency improvement with the presence of labour market imperfections.

2. Labour market institutions and governance

Labour market flexibility has a positive impact on its participants. Garibaldi (1998) has shown that tightening the firing restrictions reduces job destruction volatility as well as reduces the level of job reallocation, while keeping unemployment at a constant level. As evident in Di Tella and MacCulloch (2005), increase in labour market flexibility leads to a rise in employment rate as well as labour participation rate. Flexibility in the labour reduces unemployment rate and reduces long-term unemployment. The authors also prove the hypothesis that inflexibility in labour market persists unemployment and produces "jobless recoveries".

Labour force is an integral part of the resource asset. A well-regulated labour market institution can reap positive benefits on its labour force. Gindling et al (2015), examined that the program of the Costa Rican Government to increase compliance with legal minimum wages led to increase in wages of those who were paid less than the minimum wage as well as a large increase in wages of women, young workers and less-educated workers. Gindling et al (2015), also observed that such compliance to minimum wage led to compliance in broader set of labour standards such that an increase in the probability was observed in receiving legally mandated nonwage benefits (pension, health insurance), etc. Ham(2015) finds that countries that set high minimum wages but fail in their commitment to enforce it tend to experience efficiency losses than gains. Rani et al. (2013) show that countries have higher compliance rate to minimum wages when it is a national minimum wage system and that information and awareness is needed to ensure compliance. In examining the reasons behind India's low female labour force participation rates in urban India, Klasen and Pieters (2015) have suggested that supply side factors especially policies that improve women's safety, that promote the acceptability of women employment outside the public sectors will help in increasing women labour force participation.

Governance indicator like better control on corruption can reduce labour adjustment costs. Corruption has been shown to have a negative effect on private investment and growth (Mauro 1995) while Ades and Di Tella (1999) have studied the causes of corruption across countries – high rent-seeking behavior and lower exposure to foreign competition. Ades and Di Tella therefore suggest that policies that target markets to be more competitive can be a way to combat corruption. With respect to political uncertainty, Julio and Yook (2012) study

supports the hypothesis that uncertainty in political structure of a country makes firms reduce their expenditure on investment until stability is brought into the political dimension. Julio and Yook (2012) therefore assert that political instability is a major channel through which political process impacts real economic decisions and outcomes. To delve deeper into the social institution of an economy, since a link between economic inequality and conflict has been proven in economic studies, Esteban, Mayoral and Ray (2012) prove the link of conflict intensity to three factors – ethnic polarization, fractionalization and inter-group differences. To sum, the literature reviewed above shows that the better institutions have a positive impact on agents.

3. Data and Methodology

Labour market freedom index is measured by the Fraser Institute's sub-indicator index of Labour Freedom (Gwartney et al. 2008; Freeman 2009) from the broad measure of Fraser Institute's index of The Economic Freedom of the World (EFW). EFW index measures the extent to which the policies and institutions of countries are supportive of economic freedom for over 157 countries worldwide. The five broad areas measured by the EFW index are:

1. Government size: expenditures, taxes, and enterprises;
2. Legal structure (judiciary) and security of property rights;
3. Access to sound money;
4. Freedom to trade internationally;
5. Regulation of credit, labor, and business.

Labour market freedom index summarises labour freedom from a scale of 0-10 from the following 6 sub-index measures: Hiring regulations and minimum wage; Hiring and firing regulations; Centralized collective bargaining; Hours regulations; mandated cost of worker dismissal; Conscription. According to Gwartney et al. (2015), a country is scored higher marks (with higher rating) on the labour market regulations component indicating that a country allows the market forces to determine wages and establish the conditions and structure of hiring and firing laws and these countries refrain from the use of conscription. We use the data on the labour market regulations to indicate labour market freedom index for the years 2000-2012, the period under study.

To analyse the institutional differences across India over the period of 2000-2012, we use a set of aggregate governance indicators developed by Kaufmann et al (2007, 2009, 2010, and

2011) called as "The Worldwide Governance Indicators (WGI)". WGI measure different aspects of governance for 215 economies for the period beginning 1996 to the current period available for 2014. The WGI data, through a worldwide survey, reflects the opinions and sentiments pertaining to the perception of governance of a country through the responses of the public sector, NGOs, thousands of citizens and firms worldwide[3]. Governance can be perceived broadly according to the following three perspective:

1. The process by which governments are selected, monitored and replaced.
2. The capacity of a country's government to formulate and implement sound policies that are effective.
3. The respect of the citizens of a country and the state for the institutions that govern economic and social interactions among them.

Kaufmann et al. (2009, 2010, 2011) have aggregated the sub-indicators of governance perception to the following broad six dimensions on the above governance perception of the agents (refer Table 1). These indicators can be understood as the regulatory environment or the governance of a country. As highlighted in Table 1, VAC (voice and accountability) indicates the extent to which the citizens of the country have a voice and freedom in selecting their government. A PSV (political stability and absence of violence) indicator is a measurement of the likelihood of political instability, i.e. whether the ruling government will be overthrown by unconstitutional and violent means. The GEF (government effectiveness) indicator reflects the perception of the quality of the public services as well as the quality of formulation and implementation of sound policies. A REQ (regulatory quality) indicator measures the ability of the government to formulate and implement sound policies. The RLE (rule of law) indicator summarizes the extent to which agents have confidence in and abide by the rules and laws of the society. A COC (control of corruption) indicator reflects the perception of corruption in the country, i.e. the exercise of public power for private gains.

The WGI indicators use a scale of approximately -2.5 to +2.5, where a value of -2.5 corresponds to a very weak institutional environment and higher values towards +2.5 indicate to a "better" or stronger institutional or regulatory environment. Overall, we predict that better institutions, as indicated by higher values of the six dimensions of the WGI indicators, reduces labour adjustment cost in the transition to finding employment from one job to another.

[3] The aggregate indicators, as well as the disaggregated underlying indicators, are available at www.govindicators.org.

The data for imports and exports for India with world as a partner is obtained from the World Integrated Trade Solution (WITS) database- a database jointly developed by the World Bank, United Nations Conference on Trade and Development (UNCTAD) and Ministry of Commerce. For identifying the manufacturing products, we have used the definition of world development indicators. Accordingly product codes 15 to 36 have been taken from Section D of the International Standard Industrial Classification (ISIC), revision 3 of WITS for the purpose of the analysis. The level of disaggregation considered for the calculation of Marginal Intra Industry Trade (MIIT) is at the 3-digit level of classification. The total number of products under 3 digit levels was around 43.

As far as the industry level data is concerned, Annual Survey of Industries (ASI) is the principal source for industrial statistics in India. The plant level ASI data provide data at the factory level. The ASI classification of industries based on National Industrial Classification (NIC) matches with the trade data obtained from WITS based on ISIC. However, industrial statistics database available from United Nations Industrial Development Organisation (UNIDO) has reproduced the industry data from ASI in the form of 3 and 4 digit level of ISIC. The ISIC revision 3 and 4 were available from 1998 to 2010. Due to the easy access to the data, the present study has made use of the ISIC 3 and 4 digit level data available from UNIDO from 2000-2012. The latest 2 years of data is obtained from ASI's yearly publications available from the website of Ministry of Statistics and Programme Implementation, Government of India. However there has been a change in the classification of industries since 2008. From 2008-09 onward NIC-2008 has been introduced. The classification of industries under NIC 2008 is slightly different from the previous classification. Subsequently a concordance table between NIC 2004 and NIC 2008 is used to match and select the industries both at the 3 and 4 digit level. The industry data needed and obtained for analysis were wage, output and employment.

We define a sector at 3 digit level. Therefore job re-allocation rates are calculated using the data at 4 digit level to obtain job re-allocation rates at 3 digit sectoral level. Each 3 digit sector has several plants within the sector either experiencing job creation or job destruction or none. The job re-allocation rates is calculated by taking the sum of both job creation and job destruction. Accordingly, we have finally identified 40 industry categories at the 3 digit

level for the purpose of analysis. We had to omit few sectors from our analysis due to the non-availability of data.

Several indices of Marginal Intra Industry Trade (MIIT) have been developed, but the most popular measure used in recent empirical literature is the one that proposed by Brulhart (1994) (for example, Faustino and Leitao, 2010; Thorpe and Leitao, 2012; Rasekhi and Ghaderi; 2012). The index is a dynamic measure of IIT. The index does not suffer from the trade imbalance bias that we see in the case of IIT index[4]. The MIIT index can be expressed as follows:

$$MIIT = 1 - \left| \frac{(X_t - X_{t-n}) - (M_t - M_{t-n})}{|X_t - X_{t-n}| + |M_t - M_{t-n}|} \right| = 1 - \frac{|\Delta X - \Delta M|}{|\Delta X| + |\Delta M|}$$

The above index takes the value between 0 and 1. A value closer to 1 indicates MIIT. Only the absolute value or the real value of new trade is considered for the construction of MIIT[5]. This study uses the above index for measuring MIIT.

The job reallocation rate is calculated based on the methodology developed by Davis and Haltiwanger (1991) and applied by Banerjee and Veeramani (2014). Let employment in plant k in sector *j* in year *t* be *xkjt* and the average employment (a_{kjt}) be defined as follows

$$a_{kjt} = \frac{X_{kjt} + X_{kjt-1}}{2}$$

[4] The concern over the measurement of adjustment cost and the insufficient dynamic properties of Grubel Lyod (GL) index paved the way for a variant of GL, called the marginal intra-industry trade (MIIT) index. This index was developed by Hamilton and Kniest in 1991. The same can be expressed in the following form:

$$MIIT = \{for\ M_t - M_{t-n} > X_t - X_{t-n} > 0$$

$$MIIT = \begin{cases} \frac{M_t - M_{t-n}}{X_t - X_{t-n}} for\ X_t - X_{t-n} > M_t - M_{t-n} > 0 \end{cases}$$

Undefined if $X_t < X_{t-n}\ or\ M_t < M_{t-n}$

The above index captures the proportion of increase in exports (imports) within an industry with a corresponding increase in imports (exports) within the same industry.

[5] Brulhart (1994) has also suggested another method for measuring MIIT and this index will capture the trade induced gains and losses between the trading countries. This index can be written as

$$\text{MIIT} = \frac{|\Delta \text{X} - \Delta \text{M}|}{|\Delta \text{X}| + |\Delta \text{M}|}$$

Unlike the previous indices, this index takes the value between -1 and 1. An index which is closer to 0 indicates higher MIIT, whereas an index which is closer to 1 indicates higher marginal inter-industry trade. This means, if $\Delta X > \Delta M$, MIIT > 0 and if $\Delta X < \Delta M$, MIIT < 0. Therefore, values of MIIT > 0 indicates that exports are increasing and MIIT2 < 0 indicates that imports are increasing.

The growth rate of employment (g_{kjt}) in plant k in sector j in the time period t can be calculated as follows;

$$g_{kjt} = \frac{X_{kjt} - X_{kjt-1}}{a_{kjt}}$$

g_{kjt} is symmetric around zero and lies in the interval of [-2,2]. G_{kjt}= 2 refers to the birth of a new plant, whereas G_{kjt}=- 2 refers to the death of a plant.

The gross job creation and destruction rates can be calculated using the above variables. Gross job creation, M*jt* is a sum of employment gains at expanding and new establishments within sector *j*. The gross job creation rate in sector j at time *t* is given by

$$M_{jt} = \sum_i g_{kjt} \quad ; \; g_{kjt>0}$$

Similarly, Where Djt is a sum of employment losses at shrinking and dying plants within a sector j.

$$D_{jt} = \sum_i |g_{kjt}| \; ; \; g_{kjt<0}$$

The job reallocation rate is the sum of job-creation rate and job destruction rate.

4. Results: Preliminary Analysis

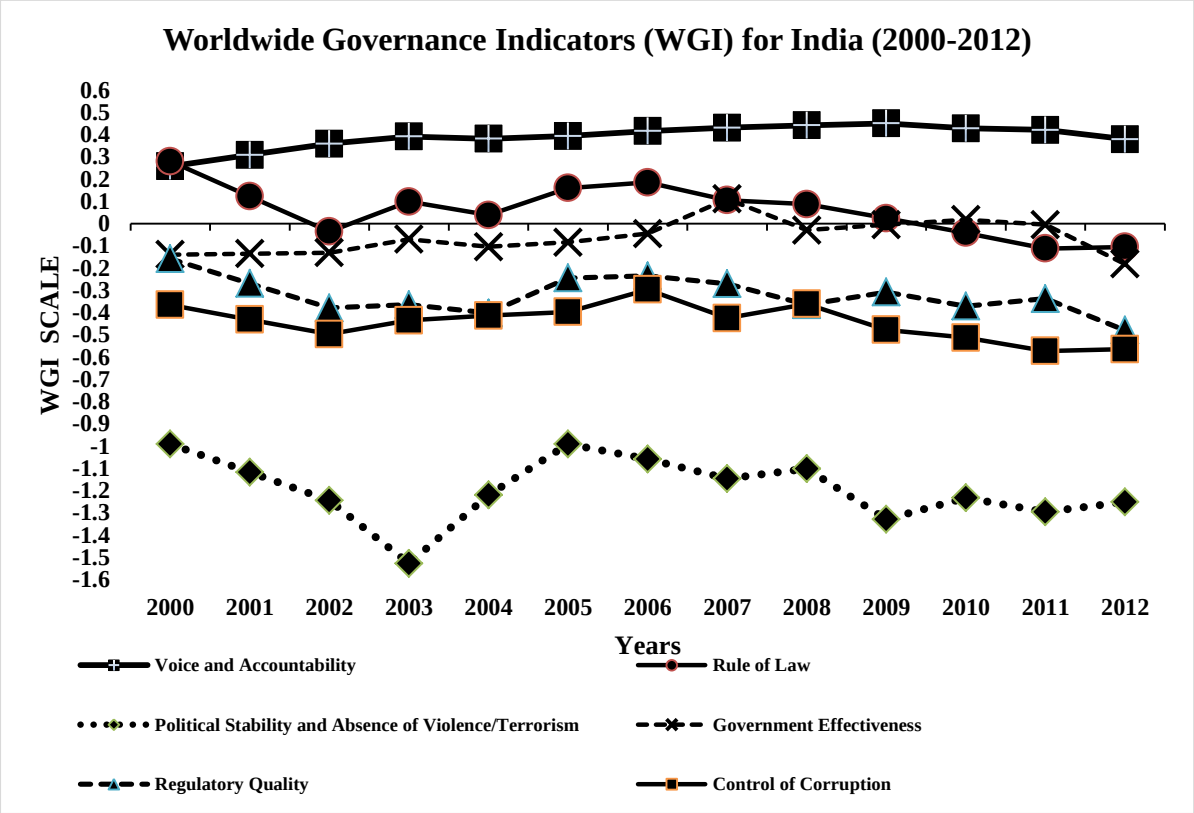
Table 2 shows the EFW data available for India for the labour market regulation component of the EFW index measured on a scale of 0-10, where higher values indicate "better" regulations. Column 8 of table 2 is the overall labour market regulations index that is constructed using the sub-index indicators from column 2- column 7. Also in table 2, column 1 shows what India scores in the overall Economic Freedom summary index that comprises the five broad areas of the EFW, as noted above. For the period of 2000-2012, column 1 shows that n the overall EFW index India stands in the range of 6 while we do see an upward trend in the labour market regulations (column 8) from 6.05 to 8.11.

Examining the data on governance of India, we look at the scenario of the regulatory environment for India. Figure 1 - Figure 7 graphically describes India's performance trajectory with respect to these WGI dimensions. Figure 1 shows how India has performed on the actual scale of the six WGI institutional indicators for the time period of our study (2000-2012). However, Figure 2 – Figure 7 shows the percentile rank of India for the full period for which WGI data for the six indicators are available, i.e 1996, 1998, 2000, and 2002 till 2014.

From figure 1, the PSV indicator has been in the range of -1.0 in 2000 to -1.25 in 2014, with a major dip in the year 2003 (scale of -1.5) - also reflected in figure 3 where India's percentile rank for the political stability indicator fell to approximately 8 percentile. This weakening political instability perception can be understood via the occurrence of the Gujarat riots of 2002 and the terrorist attack on the Indian Parliament in 2001. Although the PSV indicator seems to remain at consistent level from 2009 onwards but still its rank is in the 13th percentile rank as of 2014 (refer figure 3). Figure 1 shows that India has stood firm on the VAC indicator, ranging from +0.27 in the year 2000 to +0.37 in 2012. While India's rank (refer figure 2) on the VAC indicator shows that it has managed to almost retain the percentile rank of approx. 62 it had in 1996 to a rank of approx.61 as of 2014.

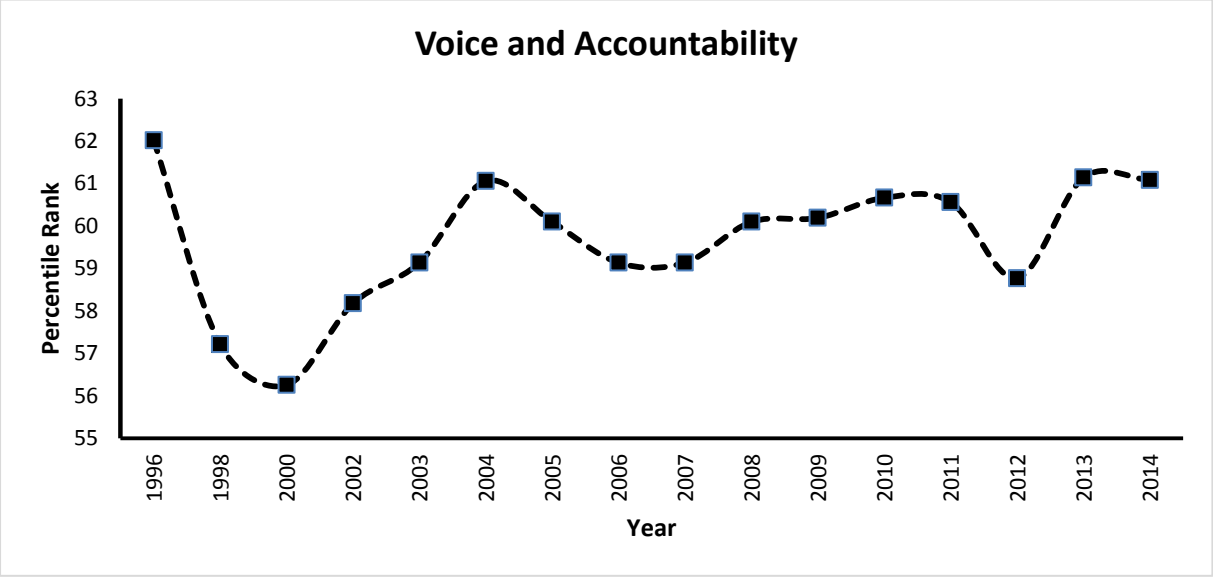
The interesting point of the WGI indicator is reflected in the COC indicator for control of corruption. Figure 1 shows that the COC indicator for India has always, for the period of 2000-2012, been on a negative scale of -0.36 (2000) to -0.56 (2012). While India's percentile rank on the COC indicator (refer figure 7) has seen great volatility for the period of 1996-2014. This is evident to the Indian people's perception of the weakness of the country's control on corruption which fell drastically from the year 2008 to 2011 owing to the Common Wealth Games scam and the telecom and the coal auction scam.

Figure 1: Governance indicators trend for India (2000-2012)



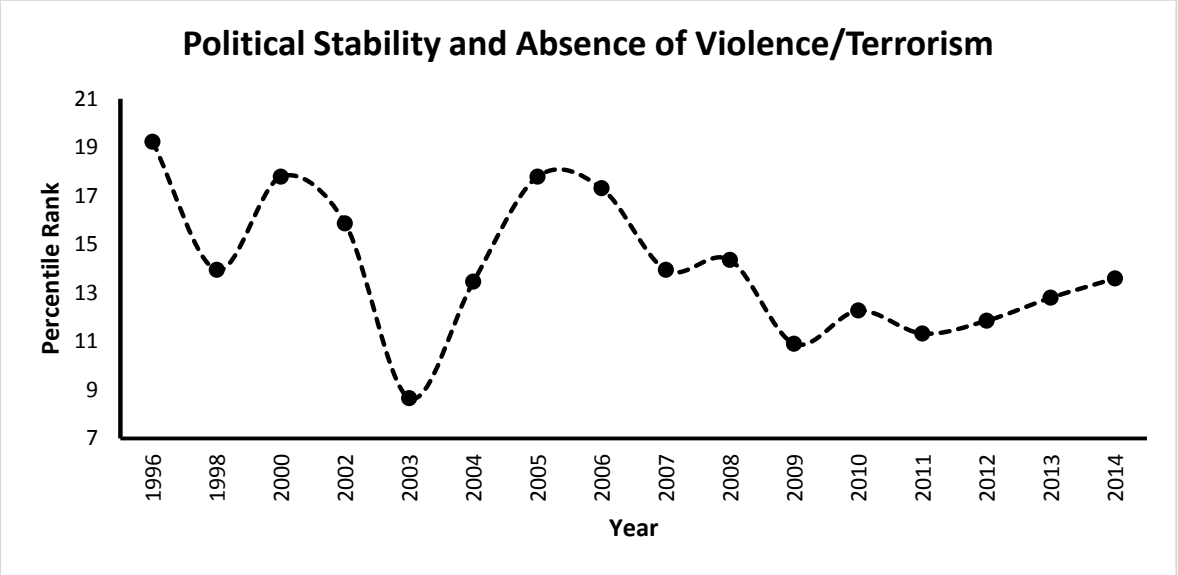
Source: Author's own calculations using WGI data.

Figure 2: Percentile rank of India (1996-2014): Voice and accountability



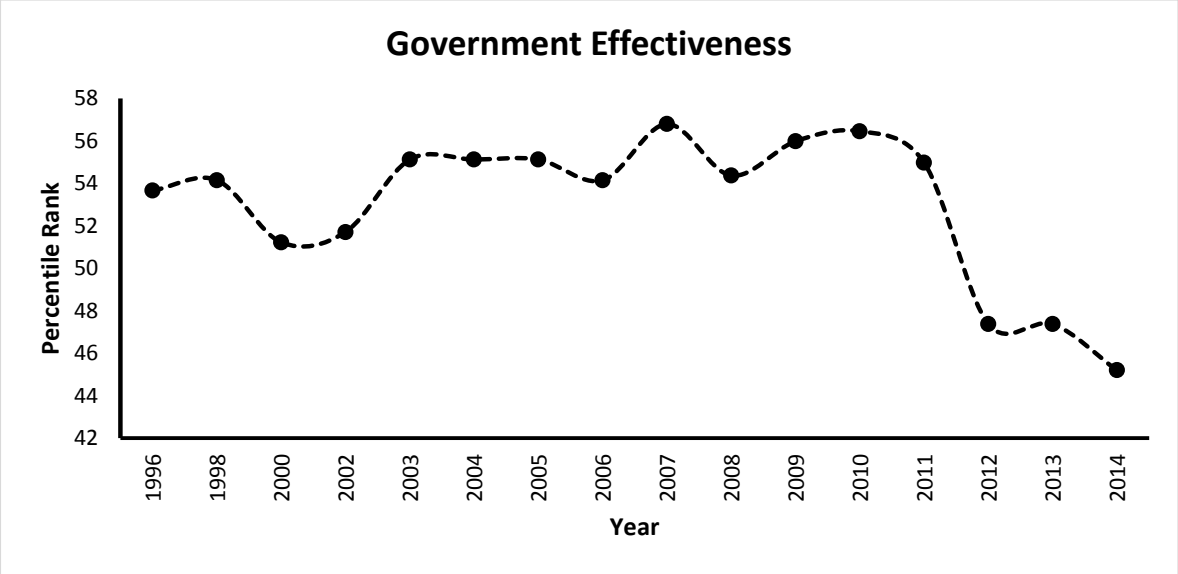
Source: Author's construction using the WGI data

Figure 3: Percentile rank of India (1996-2014): Political stability and absence of violence



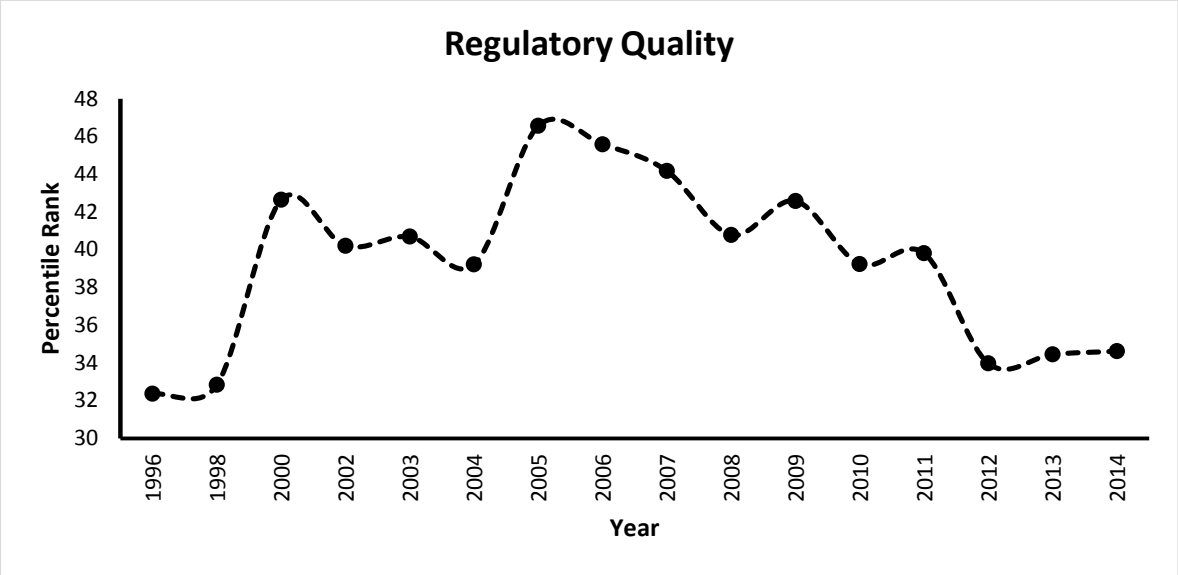
Source: Author's construction using the WGI data

Figure 4: Percentile rank of India (1996-2014): Government effectiveness



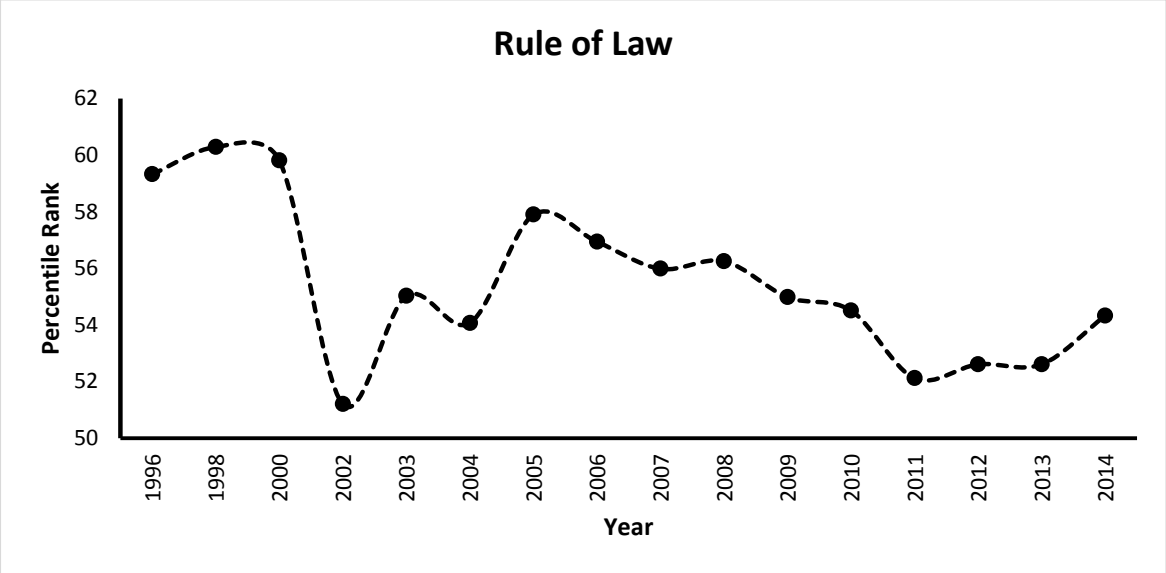
Source: Author's construction using the WGI data

Figure 5: Percentile rank of India (1996-2014): Regulatory quality



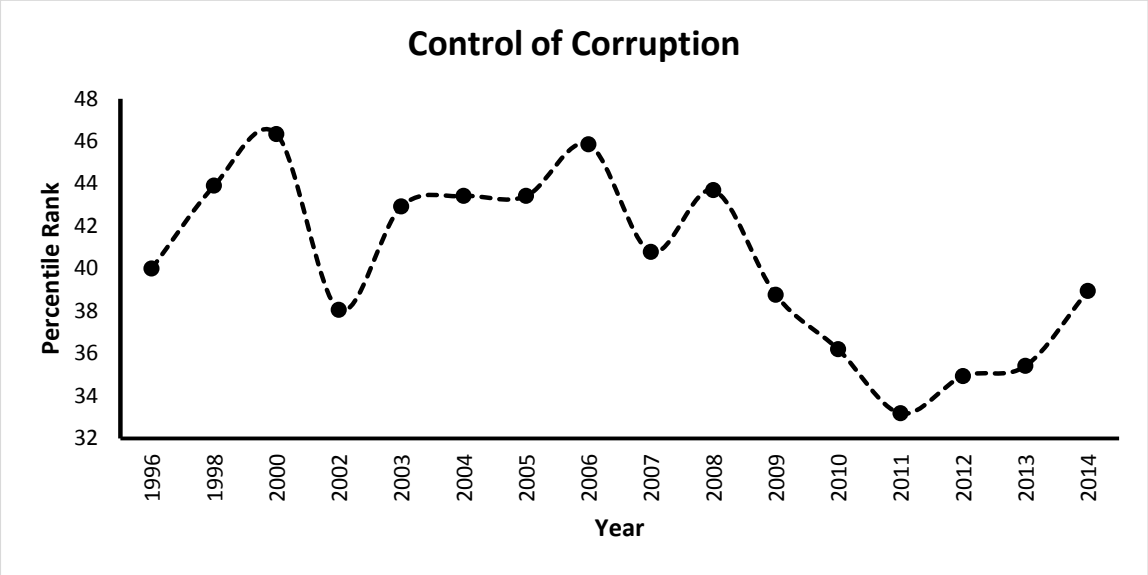
Source: Author's construction using the WGI data

Figure 6: Percentile rank of India (1996-2014): Rule of law



Source: Author's construction using the WGI data

Figure 7: Percentile rank of India (1996-2014): Control of corruption

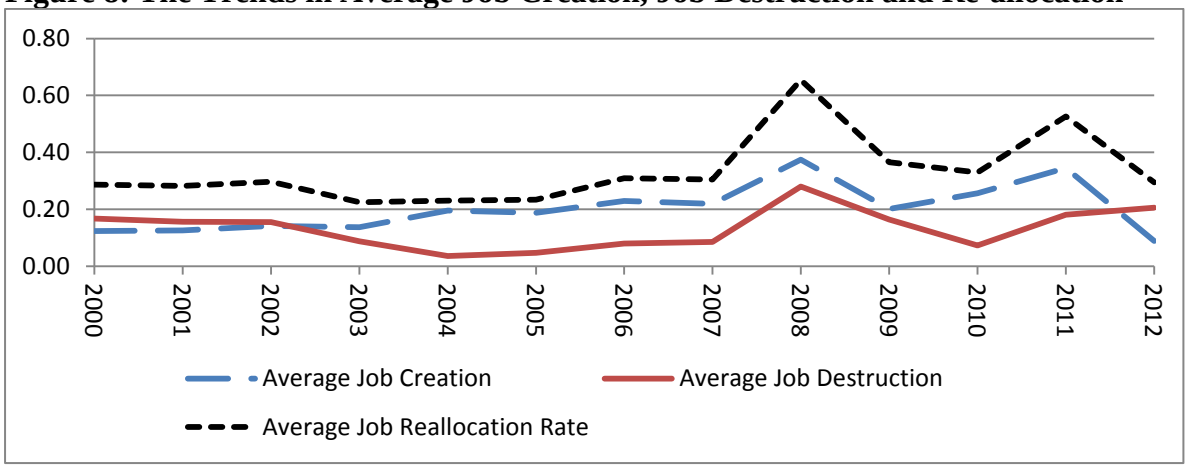


Source: Author's construction using the WGI data

To work with these above different indicators of regulatory environment differences we first compute the correlation matrix of these six indicators and observe that they are highly correlated (Table 3). Hence, we applied the principal component analysis and included two factors that cumulatively explain more than 80% of the variation in all six indicators where the first component explains approx. 55 % of the variation and the second component explains 27% of the variation (see Table 4A and 4B)

The average job creation was slightly less than the average job destruction during 2000 to 2002. Since 2002 the average job creation started increasing and was higher than average job destruction until mid- 2011. Since 2011 the average job creation was declining so as the average job reallocation rate. It was only average job destruction which showed an increase since 2010 (see figure 8).

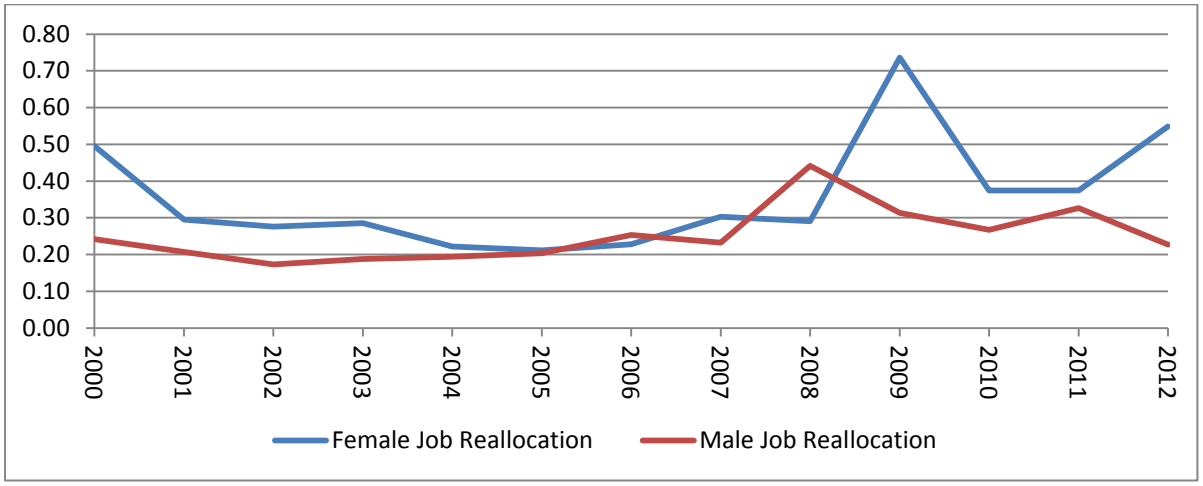
Figure 8: The Trends in Average Job Creation, Job Destruction and Re-allocation



Source: Author's own construction

When we look at the male and female job re-allocation rates separately, we understand that average job reallocation rates for female were higher than male reallocation rates during most of the period under study. The difference between the two had narrowed down during 2005-2008 but since 2008 the female employment reallocation began increasing and became much higher than male employment reallocation (see figure 9).

Figure 9: Average Job Reallocation Rates

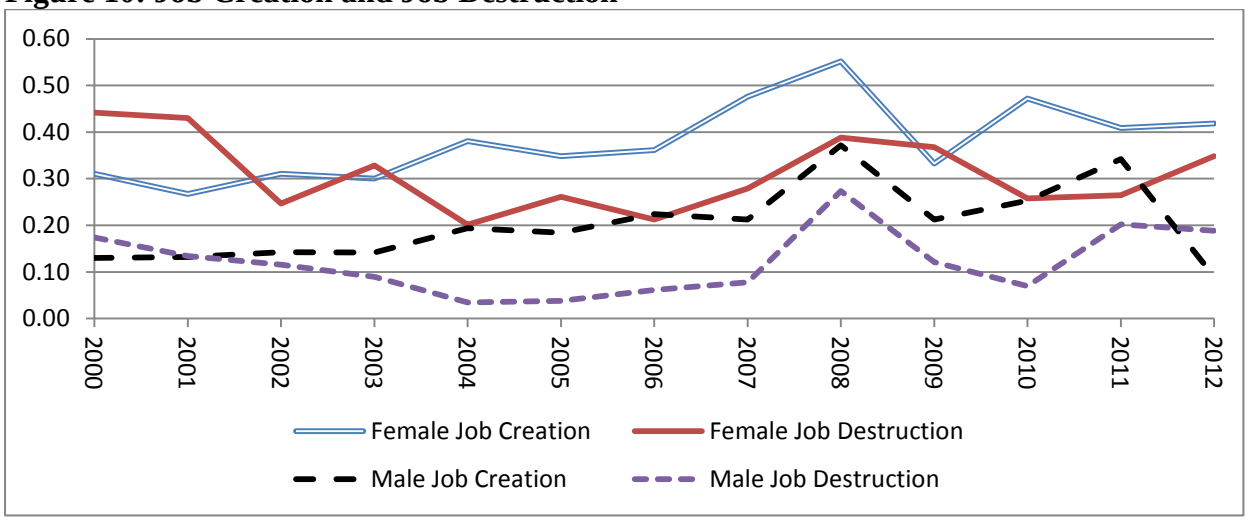


Source: Author's own construction

The higher female job reallocation rate was nothing but a result of higher job destruction rates as well as higher job creation rates. Both the male as well as female job creation was slightly lower than job destruction in the initial period and then improved until mid-2011. Since around 2010 we observe a tendency of job destruction to increase (see figure 10). This

is reflected in total job creation and destruction with a tendency for job creation to decline whereas the job destruction to increase.

Figure 10: Job Creation and Job Destruction



Source: Author's own construction

5. Econometric Model and Hypothesis

The study will make use of two dependent variables – the absolute change in employment and the job re-allocation rates. The absolute change in employment in each industry is a commonly used proxy for adjustment cost. This is suggested by Brulhart (2000). The absolute change in employment can be calculated using the simple formula given below;

$$\Delta Employment = 2 * \frac{(Employment_t - Employment_{t-1})}{(Employment_t + Employment_{t-1})}$$

In addition to this the study will make use of the job re-allocation rate which is discussed in the previous section as a proxy to measure adjustment cost. As far as the explanatory variables in the model are concerned, the study proposes the following hypothesis:

1. Labour market freedom index (**LMFI**): We hypothesize that the coefficient on the labour market freedom index is negative. That is, better labour market regulations reduces the labour adjustment costs in their transition from one employment to another.
2. Institutional variables (**PC1 and PC2**): Our hypothesis is that "better" institutions as indicated by higher values of the six governance indicators reduces the labour

adjustment costs. Hence, we predict a negative coefficient on the principal component of these 6 institutional variables. We use the two components of the principal component analysis of the 6 governance indicators as explained above.

3. Change in apparent consumption (**Log (|ΔC|)**): Changes in labour allocation may reflect changes in domestic demand as well as external demand. Employment adjustment is expected to be more intense in declining sectors than in expanding ones. Therefore we expect a positive correlation between change in apparent consumption and employment adjustment. ΔConsumption is the absolute value of change in apparent consumption(C=(Q+M-X)) between t and t-n. Q is total output (Brulhart (2000): Brulhart and Thorpe, 2000; Leitao, 2001; Erlat and Erlat, 2006; Ferto, 2008 and Chemsripong, 2014).
4. Lagged employment is the employment in years before. (**Yt-1**) The expected sign of the coefficient of this variable is positive (Greenaway et al. 1995; Ferto; 2008; Erlat and Erlat, 2006; and Chemsripong, 2014).
5. Wage per worker (**Log (|ΔW|)**): the expected sign of the coefficient of this variable is negative (Greenaway et al. 1995; Rasekhi and Ghaderi, 2012). This variable will be used to control for the impact of wage differences on the labour movements (Faustino and Leitao, 2010).
6. Higher MIIT means the adjustment costs is lower. Therefore we expect a negative relationship between MIIT and change in employment (Brulhart 2000; Leitao, 2001; Erlat and Erlat, 2006; Ferto, 2008; Chemsripong, 2014).
7. Trade openness (**Log (|ΔT|)**): Trade openness is expected to increase the competitiveness of the firm. Trade openness is calculated taking exports plus imports between t and t-n. Followed by Brulhart (2000, Leitao, 2001, Erlat and Erlat (2006) and Ferto, 2008, we also expect a positive relationship between changes in employment adjustment and trade openness.
8. Productivity (**Log (|ΔP|)**): The relationship between productivity and employment changes can be ambiguous. Ferto (2008) and Derbel et al (2013) hypothesized a positive relationship between labour productivity changes and employment changes. This is possible if the industry is expanding. However Erlat & Erlat , 2006; Faustino and Leitao , 2010; Faustino, 2010; Rasekhi and Ghaderi, 2012, considered a negative coefficient for this variable. This is possible when an increase in labour productivity results in labour substitution.

5.1 Model Specification

To examine the relationship of institutions and MIIT on labour adjustment costs represented by either 'job reallocation rate' or 'absolute employment changes', we present a linear dynamic panel regression to test our hypothesis:

a) Job Reallocation Rate as a proxy for labour adjustment costs:

$$Log(Job\ Reallocation\ Rate)^{m}_{it} = \beta_0 + \beta_1 Log(Job\ Reallocation\ Rate)_{it-1} + \beta_2 MIIT_{it} + \beta_3 LabourMarketFreedomIndex_t + \beta_4 Institutions_t + \beta_5 Log(Absolute\ Change\ in\ Wages)_{it} + \beta_6 Log(Absolute\ Change\ in\ Productivity)_{it} + \beta_7 Log(Absolute\ Change\ in\ Apparent\ Consumption)_{it} + \beta_8 Log(Absolute\ change\ in\ Trade\ openness)_{it} + \eta_i + \varepsilon_{it} \quad \ldots\ldots \forall i = 1 \ldots . N;\ \ \forall t = 1, \ldots T$$

b) Absolute Employment Changes as a proxy for labour adjustment costs:

$$Log|Employment\ Changes|^{k}_{it} = \beta_0 + \beta_1 Log|Employment\ Changes|_{it-1} + \beta_2 MIIT_{it} + \beta_3 LabourMarketFreedomIndex_t + \beta_4 Institutions_t + \beta_5 Log(Absolute\ Change\ in\ Wages)_{it} + \beta_6 Log(Absolute\ Change\ in\ Productivity)_{it} + \beta_7 Log(Absolute\ Change\ in\ Apparent\ Consumption)_{it} + \beta_8 Log(Absolute\ change\ in\ Trade\ openness)_{it} + \eta_i + \varepsilon_{it} \quad \ldots\ldots \forall i = 1 \ldots . N;\ \ \forall t = 1, \ldots T$$

In the above equations, *i* denotes the industries and *t* denotes the time period of 13 years from 2000-2012. The superscripts *m* above the dependent variables denotes total, male and female employment. η_i, is the unobserved time-invariant individual specific effects. ε_{it}, is the random error term assumed to be normal and identically distributed with $E(\varepsilon_{it}) = 0$ and $Var(\varepsilon_{it}) = \sigma^2 > 0$.

6. Estimation Results

Table 6 provides the descriptive statistics of the variables involved. The variables in the table are in their original form (without logs), to understand the properties of the variables. Table 6 provides the mean, standard deviation, median, minimum and maximum of the variables involved in panel data regressions.

The study caries out pre-estimation test of stationarity and non-stationarity via the first generation (Maddala and Wu, 1999) and second generation (Pesaran, 2007) panel unit root tests. The results of the panel unit root tests are reported in table 7. According to the results of the panel unit root tests, we observe that all our variables prove the existence of the series to be stationary in both specifications with trend and without trend.

We estimate the linear dynamic panel data model using a quasi-maximum likelihood (ML) estimator[6]. We use the fixed-effects transformed ML estimator by Hsiao, Pesaran, and Tahmiscioglu (2002) to our quasi-maximum likelihood estimation for dynamic panel regressions. Dynamic panel data methods are used to show the persistence of the dependent variable and such dynamic models are evident in microeconomic wage regressions as well as macroeconomic growth regressions. The quasi-ML estimator is appropriate for us as we examine a short time horizon with the number of cross-sectional units being large. While empirical work has used the generalized method of moments (GMM) because of its easy implementation and flexibility we use the quasi-ML estimator with fixed effects estimation to "reap efficiency benefits".

6.1 Labour market regulations and the regulatory environment

The importance of labour market regulations and the regulatory environment is observed in the estimation results of table 8 and 9.

The results in table 8, using the job re-allocation rate as a proxy for labour adjustment costs, show that for the labourers in the Indian manufacturing sector 'better' labour market regulation (variable *LMFI* in table 8) reduces the labour adjustment costs. This relationship that is evident in the overall job re-allocation rate in model 1 of table 8 is supported even

[6] We use the Stata user-written command ***xtdpdqml*** developed by Kripfganz (2015). The advantages and the limitations of the quasi-ML estimator is explained in Kripfganz (2015).

when we look at male reallocation rate and female re-allocation rate separately (model 2 and model 3 of table 8). Furthermore, along with the labour market regulations we also observe the importance of the institutional variables on labour adjustment costs as indicated by **PC1** in table 8. **PC1** is the first principal component of the 6 institutional variables in table 3. In model 1 of table 8 negative coefficient of **PC1** indicates that "better" institutions or regulatory environment reduces the job reallocations rates. Moreover, we can say that "weaker" institutions or "weaker" governance of a country as indicated by either political stability (PSV), rule of law (RLE), regulatory quality (REQ) and control of corruption (COC) would burden the labourers as the labour adjustment costs would be higher.

The results in table 9, using the absolute employment change as a proxy for labour adjustment costs, also provides evidence to our labour market freedom index hypothesis that for the labourers in the Indian manufacturing sector 'better' labour market regulation (variable *LMFI* in table 9) reduces the labour adjustment costs. Here too we find this relationship to be supported even when we look at male reallocation rate and female re-allocation rate (model 2 and model 3 of table 9). Moreover, institutional variables have a negative relationship with labour adjustment costs as indicated by **PC1** in table 9. In model 1 of table 9 negative coefficient of **PC1** indicates that "better" institutions or regulatory environment recuses absolute employment change. Moreover, we can say that "weaker" institutions or "weaker" governance of a country as indicated by either political stability (PSV), rule of law (RLE), regulatory quality (REQ) and control of corruption (COC) would burden the labourers as the labour adjustment costs would be higher. As observed in table 8 for the job reallocation rate, here also in table 9 institutional variables have a significant effect on the female reallocation rate. Thereby suggesting that females would benefit more relative to males with better overall regulatory environment.

6.2 Marginal Intra Industry Trade

The analysis in table 8 and table 9 is based on two types of labour market adjustment measures - employment reallocation rates as well as absolute employment changes. We carried out our analysis for total (model 1), male (model 2) and female employment (model 3). For each one of these we analysed the impact of trade structure on employment by taking MIIT as the explanatory variable. The results showed that MIIT is insignificant in all the

models. Our study does not find evidence to support the smooth adjustment hypothesis that higher intra-industry trade lowers the labour adjustment costs.

Nonetheless, the two proxies that we have used to measure labour adjustment costs have produced more or less the same results indicating the results are not very sensitive to the kind of proxy that we employ.

As far as the results for other variables are concerned, absolute changes in wages (**Log(|ΔW|))** is significant and positive in majority of the model specification in tables 8 and 9. This indicates an increase (decrease) in wage is leading to higher (lower) employment changes. The results are similar to Rasekhi and Ghaderi (2012). Similarly, productivity (**Log(|ΔP|))** was significant and negative only for the total reallocation rate of model 1 in table 8 indicating that higher (lower) the productivity lower (higher) is the employment changes. Thus, our results for this variable are similar to Erlat and Erlat, 2006 whereas it contradicts with the findings of Ferto, 2008, Rasekhi and Ghaderi, 2012 and Chemsripong, 2014. The variable absolute changes in apparent consumption (**Log(|ΔC|))** were mostly positive but insignificant. The positive relationship between apparent consumption and employment changes were also found by Chemsripong, 2014, The variable trade openness (**Log(|ΔT|)**) was also positive but insignificant. However, lag of the dependent variable (**Yt-1**) shows a positive and significant effect for most of the specification which indicates the persistence effect of the labour adjustment costs (see model 3 of table 8 and model 2 and model 3 of table 9).

6.3 Robustness test

We test our model specification with a static model of the linear panel data model using Ordinary least squares (OLS). The results of the estimation are presented in tables 10 and 11.

Table 10, where we use job re-allocation rate as a proxy for labour costs in a static OLS fixed effects panel data model, shows a similar results as observed in its dynamic panel model in table 8. Both labour market regulations and institutional variables are important in labour adjustment costs. Table 11, where we use absolute employment changes as a proxy for labour adjustment costs in a static OLS fixed effects panel data model, also corroborates the results as evident in its dynamic model counterpart in table 9.

7. Concluding Observations

The study investigates the impact of trade, labor market institutions and regulations on labour adjustment costs based on a linear dynamic panel model using quasi-maximum likelihood fixed effects estimator. Using a panel data on 40 Indian manufacturing sectors we find that the labour market regulations and the regulatory environment of India have a greater impact on the job re-allocation rate as well as absolute employment change (the two proxies for labour adjustment costs). Less restrictive labour regulations are associated with lower labour adjustment costs in Indian manufacturing sector when labor market is examined as a whole, however, we find the same to be true when examining the male and female labour adjustment costs individually. Although, we do not find evidence to support the smooth adjustment hypothesis arising from the transition to more intra-industry trade, this study is further strengthened by the importance that institutional variables (regulatory environment or governance indicators) place on labour adjustment costs. We find that "weaker" institutions can impose heavy burden on the labourers and increase the labour adjustment costs. The study also indicates the possibility for differential impact of trade expansion, institutional and labour market regulations on men and women employment. The results are robust to static and dynamic panel methods as well as the two proxies for labour adjustment costs.

Table 1: Description of the Governance indicators

Abbreviation	Governance indicator	Description
VAC	Voice and accountability	This measures the degree to which citizens of a country are able to select their government as well as their freedom of expression, freedom of media and freedom of association.
PSV	Political stability and absence of violence.	The perception that the ruling government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
GEF	Government effectiveness	Perception of the quality of public services and facilities, quality of civil services and its independence from political pressures, the quality of policy formulation and implementation of sound policies, and the credibility of the government's commitment to the formulated policies.
REQ	Regulatory quality	Perception of the government's ability to formulate and implement sound policies and regulations that permit and promote private sector development indicated by the level of market-unfriendly policies and the burdens imposed by excessive regulations.
RLE	Rule of law	The extent to which people have confidence in and abide by the rules of society, the quality of contract enforcement, property rights, the police, and the courts, as well as the perceptions of the incidence of crime and violence.
COC	Control of corruption	The extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Source: Kaufmann et al. (2009)

Table 2: India's labour market regulations index and its components

Year	*Economic Freedom Summary Index (1)*	*Hiring regulations and minimum wage (2)*	*Hiring and firing regulations (3)*	*Centralized collective bargaining (4)*	*Hours Regulations (5)*	*Mandated cost of worker dismissal (6)*	*Conscription (7)*	***Labor market regulations (8)***
1970	5.19						10	
1975	4.33						10	
1980	5.15			6.21			10	
1985	4.83			6.21			10	
1990	4.89		2.555	6.21			10	6.255
1995	5.76	6.233333	2.555	6.21	5.55		10	6.109667
2000	6.34	4.34987	1.70034	7.71821	6.5		10	**6.053684**
2001	6.17	4.34987	1.805555	7.71821	6.5		10	**6.074727**
2002	6.25	8.9	2	7.71821	8	4.808451	10	**6.904443**
2003	6.34	8.9	2.166667	6.833333	8	4.808451	10	**6.784742**
2004	6.34	10	2.6	7.306397	8	4.808451	10	**7.119141**
2005	6.71	10	3.308458	7.474747	8	4.808451	10	**7.265276**
2006	6.52	10	3.559885	7.129728	8	4.808451	10	**7.249677**
2007	6.59	10	3.687831	7.14325	8	4.808451	10	**7.273255**
2008	6.51	10	3.713224	7.216252	8	4.808451	10	**7.289654**
2009	6.46	10	4.490817	7.052573	10	6.026875	10	**7.928378**
2010	6.41	10	4.976474	7.024667	10	6.299741	10	**8.050147**
2011	6.6	10	4.93029	6.903777	10	6.299741	10	**8.022301**
2012	6.59	10	5.237702	7.152098	10	6.299741	10	**8.114923**
2013	6.43	7.766667	5.22923	5.71619	6	6.299741	10	6.835305

Note: The shaded area is the period of our study.

Source: Author's construction using The Economic Freedom of the World data from The Fraser Institute.

Table 3: Correlation matrix of the WGI indicators.

	Voice and accountability	Political stability and absence of violence	Government effectiveness	Regulatory quality	Rule of law	Control of corruption
Voice and accountability	1.000					
Political stability and absence of violence.	**-0.3357***	1.000				
Government effectiveness	**0.7057***	**-0.1019***	1.000			
Regulatory quality	**-0.3725***	**0.6141***	**0.1631***	1.000		
Rule of law	**-0.4415***	**0.5815***	-0.054	**0.8288***	1.000	
Control of corruption	**-0.1560***	**0.5659***	0.031	**0.6264***	**0.8874***	1.000

*Note: ***** indicates the 5% level of significance of the correlation coefficient.*
Source: Author's own calculations using the WGI data.

Table 4A: Principal components analysis of the WGI indicators

Component	*Eigenvalue*	*Difference*	*Proportion*	*Cumulative*
Comp1	**3.27204**	**1.65436**	**0.5453**	**0.5453**
Comp2	**1.61768**	**1.10694**	**0.2696**	**0.815**
Comp3	0.510738	0.0311511	0.0851	0.9001
Comp4	0.479587	0.385313	0.0799	0.98
Comp5	0.0942735	0.0685911	0.0157	0.9957
Comp6	0.0256824	.	0.0043	1.000

Source: Author's own calculations using the WGI data.

Table 4B: Weights of the principal components analysis of the WGI indicators

Abbr.	**Variable**	**Component 1 (PC1)**	**Component 2 (PC2)**
VAC	Voice and accountability		0.6030
PSV	Political stability and absence of violence.	0.4274	
GEF	Government effectiveness		0.7387
REQ	Regulatory quality	0.4782	
RLE	Rule of law	0.5253	
COC	Control of corruption	0.463	

Source: Author's own calculations using the WGI data.

Table 6: Descriptive Statistics of the variables of the model.

Variable	Mean	Standard Dev.	Median	Min.	Max.
MIIT	0.35	0.34	0.26	0.00	0.99
Absolute employment changes	0.13	0.19	0.08	0.00	1.73
Male absolute employment changes	0.26	0.33	0.15	0.00	1.97
Female absolute employment changes	0.26	0.33	0.16	0.00	1.97
Absolute change in apparent consumption	1263683.00	3014410.00	351645.20	26.29	28600000.00
Absolute change in productivity	8.47	32.09	1.98	0.01	398.81
Absolute change in trade intensity	934915.10	2830242.00	155670.90	66.50	34500000.00
Absolute change in wages	26106.68	42021.42	10467.00	0.00	405808.00
Institutional Variables					
Labor Market Freedom index (EFW)	7.24	0.66	7.27	6.05	8.11
Voice and accountability index (WGI)	0.39	0.05	0.39	0.26	0.45
Political Stability (WGI)	-1.19	0.14	-1.22	-1.53	-0.99
Government Effectiveness (WGI)	-0.06	0.08	-0.07	-0.18	0.11
Regulatory Quality (WGI)	-0.32	0.08	-0.34	-0.48	-0.16
Rule Of Law	0.06	0.11	0.09	-0.11	0.28
Control of Corruption (WGI)	-0.44	0.08	-0.43	-0.57	-0.30
Time Period	2000-2012				
Number of industries	40				

Source: Authors' own calculations using data.

Notes: EFW- refers to the Economic Freedom of the World from the Fraser Institute. WGI- refers to The Worldwide Governance Indicators

Table 7: First and Second Generation Panel Unit Root Test.

	(A) Maddala and Wu (1999) Panel Unit Root test (MW)			(B) Pesaran (2007) Panel Unit Root test (CIPS)		
	Specification without trend					
Variable	lags	Chi Sq.	P-value	lags	Zt-bar	p-value
Log job re-allocation rate	0	433.4	0.000	0	-10.3	0.000
Log female employment reallocation rate	0	452.5	0.000	0	-9.7	0.000
Log male employment reallocation rate	0	332.9	0.000	0	-7.5	0.000
Log absolute employment changes	0	410.2	0.000	0	-8.2	0.000
Log male absolute employment changes	0	378.6	0.000	0	-8.4	0.000
Log female absolute employment changes	0	380.8	0.000	0	-8.5	0.000
MIIT	0	403.0	0.000	0	-9.1	0.000
Log absolute change in wages	0	186.8	0.000	0	-12.4	0.000
Log absolute change in apparent consumption	0	250.0	0.000	0	-7.9	0.000
Log absolute change in productivity	0	309.7	0.000	0	-8.0	0.000
Log absolute change in trade intensity	0	141.1	0.000	0	-8.4	0.000
	Specification with trend					
Variable						
Log job re-allocation rate	0	398.6	0.000	0	-8.3	0.000
Log female employment reallocation rate	0	391.3	0.000	0	-6.2	0.000
Log male employment reallocation rate	0	247.8	0.000	0	-5.2	0.000
Log absolute employment changes	0	382.5	0.000	0	-4.6	0.000
Log male absolute employment changes	0	302.8	0.000	0	-6.3	0.000
Log female absolute employment changes	0	279.5	0.000	0	-5.8	0.000
MIIT	0	335.0	0.000	0	-7.0	0.000
Log absolute change in wages	0	374.2	0.000	0	-8.9	0.000
Log absolute change in apparent consumption	0	305.0	0.000	0	-4.4	0.000
Log absolute change in productivity	0	367.2	0.000	0	-4.4	0.000
Log absolute change in trade intensity	0	290.4	0.000	0	-6.2	0.000

Source: Authors' own calculations using data.

Note: Null hypothesis of MW and CIPS panel unit root test is that the series is I(1), i.e non-stationary. MW test assumes cross-section independence. The CIPS test assumes cross-section dependence via a single unobserved common factor.

Table 8: Results of the dynamic linear panel data model for job re-allocation rate

	Model 1 Dependent Variable – Overall Job Reallocation Rate (1)	Model 2 Dependent Variable – Male Job Reallocation Rate (2)	Model 3 Dependent Variable –Female Job Reallocation Rate (3)
Yt-1	0.082	0.030	**0.172****
	(0.056)	(0.059)	**(0.074)**
MIIT	0.059	0.156	0.209
	(0.142)	(0.203)	(0.127)
LMFI.	**-0.510****	**-0.630****	**-0.644*****
	(0.236)	**(0.277)**	**(0.214)**
PC1	**-0.173*****	-0.087	**-0.153****
	(0.063)	(0.087)	**(0.075)**
PC2	0.071	-0.010	-0.002
	(0.065)	(0.085)	(0.102)
Log(|ΔW|)	**0.212*****	**0.305*****	0.093
	(0.054)	**(0.064)**	(0.063)
Log(|ΔC|)	0.061	0.055	-0.001
	(0.044)	(0.060)	(0.036)
Log(|ΔP|)	**-0.059***	-0.065	0.037
	(0.031)	(0.047)	(0.039)
Log(|ΔT|)	0.047	0.066	0.003
	(0.036)	(0.054)	(0.044)
Constant	-1.267	-1.639	2.905*
	(1.624)	(1.997)	(1.764)
Year Effects	Yes	Yes	Yes
No. of Obs.	444	468	468
No. of Groups	37	39	39
Loglikelihood	-603.1	-760.5	-664.7

*Notes: *****, **, *** denotes statistical significance at 1%, 5%, 10% respectively. Yt-1 is the one year lag of the dependent variable. **LMFI** refers to the labour market freedom index. **PC1 and PC2** are the first and the second principal components of institutional variables, respectively. Parentheses are robust standard errors clustered at the industry level.*

Table 9: Results of the dynamic linear panel data model for absolute employment change

	Model 1 Dependent Variable – Overall Absolute Employment Change (1)	Model 2 Dependent Variable – Male Absolute Employment Change (2)	Model 3 Dependent Variable – Female Absolute Employment Change (3)
Yt-1	0.056	**0.176****	**0.148***
	(0.050)	**(0.081)**	**(0.076)**
MIIT	0.011	0.203	0.202
	(0.180)	(0.166)	(0.172)
LMFI.	**-0.692*****	**-1.056****	**-0.407***
	(0.221)	**(0.493)**	**(0.234)**
PC1	**-0.246****	-0.253	**-0.146****
	(0.104)	(0.159)	**(0.070)**
PC2	0.074	0.258	-0.024
	(0.110)	(0.249)	(0.075)
Log(|ΔW|)	**0.293*****	**0.137***	**0.138***
	(0.070)	**(0.083)**	**(0.080)**
Log(|ΔC|)	0.069	-0.015	0.037
	(0.057)	(0.046)	(0.047)
Log(|ΔP|)	-0.039	0.043	0.024
	(0.051)	(0.045)	(0.046)
Log(|ΔT|)	0.016	0.028	0.064
	(0.051)	(0.049)	(0.052)
Constant	-1.252	4.424	-1.434
	(1.901)	(3.708)	(1.320)
Year Effects	Yes	Yes	Yes
No. of Obs.	468	468	468
No. of Groups	39	39	39
Loglikelihood	-757.9	-770.9	-770.7

*Notes: *****, **, *** denotes statistical significance at 1%, 5%, 10% respectively. Yt-1 is the one year lag of the dependent variable. **LMFI** refers to the labour market freedom index. **PC1 and PC2** are the first and the second principal components of institutional variables, respectively. Parentheses are robust standard errors clustered at the industry level.*

Table 10: Results of the static OLS model for job re-allocation rate

	Model 1 Dependent Variable – Overall Job Reallocation Rate (1)	Model 2 Dependent Variable – Male Job Reallocation Rate (2)	Model 3 Dependent Variable –Female Job Reallocation Rate (3)
MIIT	-0.065	0.004	0.109
	(0.124)	(0.168)	(0.115)
LMFI.	**-0.424****	-0.260	**-1.246****
	(0.173)	(0.188)	**(0.561)**
PC1	**-0.115****	-0.030	**-0.218***
	(0.052)	(0.071)	**(0.128)**
PC2	0.058	-0.024	-0.082
	(0.068)	(0.058)	(0.138)
Log(|ΔW|)	**0.137*****	**0.225*****	0.046
	(0.047)	**(0.057)**	(0.053)
Log(|ΔC|)	0.057	0.045	-0.014
	(0.041)	(0.055)	(0.032)
Log(|ΔP|)	0.004	0.011	0.002
	(0.042)	(0.047)	(0.035)
Log(|ΔT|)	0.031	0.026	0.014
	(0.038)	(0.054)	(0.044)
Constant	-1.066	-3.087**	7.918*
	(1.291)	(1.319)	(4.601)
Year Effects	Yes	Yes	Yes
No. of Obs.	517	519	519
No. of Groups	40	40	40
R.sqd. (Adj.)	0.065	0.045	0.009
R.sqd.(within)	0.096	0.075	0.04
Loglikelihood	-640.1	-763.9	-664.1
F-value	3.292	4.191	2.157
Prob>F	0.001	0.000	0.025

*Notes: *****, **, *** denotes statistical significance at 1%, 5%, 10% respectively. **LMFI** refers to the labour market freedom index. **PC1 and PC2** are the first and the second principal components of institutional variables, respectively. Parentheses are robust standard errors clustered at the industry level.*

Table 11: Results of the static OLS model for absolute employment change

	Model 1 Dependent Variable – Overall Absolute Employment Change (1)	Model 2 Dependent Variable –Male Absolute Employment Change (2)	Model 3 Dependent Variable –Female Absolute Employment Change (3)
MIIT	-0.050	0.006	0.041
	(0.168)	(0.163)	(0.160)
LMFI.	**-0.670*** **	**-0.822** **	**-1.253** **
	(0.212)	**(0.380)**	**(0.519)**
PC1	**-0.200***	**-0.165***	**-0.330** **
	(0.107)	**(0.095)**	**(0.156)**
PC2	0.155	0.190	0.424
	(0.110)	(0.180)	(0.269)
Log(|ΔW|)	**0.164*** **	**0.116***	0.111
	(0.060)	**(0.066)**	(0.067)
Log(|ΔC|)	**0.113** **	-0.059	-0.036
	(0.055)	(0.041)	(0.043)
Log(|ΔP|)	0.060	0.072	0.059
	(0.050)	(0.048)	(0.048)
Log(|ΔT|)	0.033	0.015	0.014
	(0.050)	(0.050)	(0.051)
Constant	-1.081	3.308	6.218
	(1.823)	(2.778)	(3.912)
Year Effects	Yes	Yes	Yes
No. of Obs.	519	519	519
No. of Groups	40	40	40
R.sqd. (Adj.)	0.069	0.003	0.004
R.sqd.(within)	0.100	0.034	0.037
Loglikelihood	-764.2	-784.7	-783.3
F-value	4.627	2.08	2.038
Prob>F	0.000	0.031	0.033

*Notes: *****, **, *** denotes statistical significance at 1%, 5%, 10% respectively. **LMFI** refers to the labour market freedom index. **PC1 and PC2** are the first and the second principal components of institutional variables, respectively. Parentheses are robust standard errors clustered at the industry level.*

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