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## Article

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RESEARCH

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# Impact of trade liberalisation on formal–informal interlinkages in India: does sectoral labour mobility matter?

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## Abstract

Existing study argues that labour market flexibility accompanied by trade liberalisation helped in building complementary relationship between formal and informal sectors in India. However, no direct relation is established between the labour market flexibility and trade liberalisation with respect to inter- and intra-sectoral movement of labour. The present study enquires whether the extent of labour mobility between and within formal–informal sectors affects the formal–informal growth linkages due to the tariff cut on traded goods, as a part of trade liberalisation in India. The findings based on static CGE analysis indicate that in absence of labour market segmentation (i.e. in absence of both wage rigidity and skill specificity) with full mobility of labour, formal sector growth is higher vis-à-vis the growth of those activities under segmented labour market with full mobility of labour. Amongst growing informal sector activities, output growth is lower in absence of segmented labour market with full mobility of labour. Finally, restricted labour mobility leads to largest expansion of formal activities, but further exacerbates the growth of informal activities. The study reveals that improvement in functional income distribution is mixed across households, depending on the degree of labour mobility, which implies labour market adjustment is costly due to structural reforms, that pitches for government intervention.

**Keywords:** Formal–informal interlinkages, Trade liberalisation, Segmented labour market, Labour mobility, Static CGE model

**JEL Classification:** O17, F62, F66, J62, C63

## 1 Introduction

Since a large mass of workforce in India is employed within informal segment of the economy,<sup>1</sup> enhancing income of the people engaged with this sector and bringing this sector out of poverty trap becomes crucial from a policy perspective (NCEUS 2007). It is argued that one way of reaching this goal is to attach this sector to the dynamic formal sector through linkages (Meagher 2013). Generally, informal sector is linked with formal sector either through vertical supply linkages by providing intermediate goods and

<sup>1</sup> According to official estimates almost 93% of the Indian workforce is confined to unorganized (informal) segment which includes entire agricultural sector as well (NCEUS 2009).

services to the formal sector; or the informal sector operates independently by providing non-traded final goods and services meant for final consumption to the masses (Marjit and Maiti 2005:1). However, in the context of liberalised open economy, economic reforms, such as trade liberalisation, and deregulation of formal labour market, have transformed the inter-relationship between formal and informal sectors of the economy (Marjit and Maiti 2005). Empirical studies based on India show that trade openness and the consequent competitive pressure on Indian manufacturing bring about two forms of relation between formal–informal sectors due to the presence of wage rigidity in regulated formal labour market. These two forms are production outsourcing to informal sectors (e.g. Sundaram et al. 2012), and increasing trends of hiring contractual (informal) labour within formal sector<sup>2</sup> (e.g. Sen et al. 2010), respectively. Increasing pressure from international competition along with strict labour laws leads to adoption of flexibility in production organisation as a means of cost-cutting measures within formal enterprises in India, which allows formation of subcontracting relationship between formal–informal enterprises (Ramaswamy 1999; Mazumdar and Sarkar 2008; Siggel 2010). Recent findings reveal that the share of informal labour within formal (organised) sector has increased from 41% in 1999–2000 to around 48% during 2004–05, and further the figure reaches to 58% in 2011–12 (India Labour and Employment Report 2014: 31). Sundaram et al. (2012) argue that rigid labour laws in India disrupts the process of intra- and inter-sectoral labour mobility following trade liberalisation, which affects the formal sector to reap the benefit of trade liberalisation. However, no direct relation is established between the labour market flexibility, trade liberalisation and the consequent inter- and intra-sectoral labour mobility. Empirical evidence also shows that manufacturing growth could drive the growth of the informal services as well, due to trade liberalisation in India (Dehejia and Panagariya 2014). In Indian context, it is argued that benefits of economic reforms could be beneficial to a section of informal workforce engaged in high-income elastic informal services, such as construction, trade and transportations; and these growth-oriented informal services in turn absorb the labour from the low-productive sector such as agriculture, which ensures the overall growth of the economy (Kotwal et al. 2011:1156). Hence, the mobility of labour from low-productive to high-productive sectors is essential to ensure the overall growth of the Indian economy (Nayyar 2013: 165; Rada and von Arnim 2014:2). Sectoral labour mobility is critical for formal–informal sectors' growth linkages since movement of labour within and between the sectors acts as a supply-side factor facilitating expansion of the sectors concerned, as the availability of cheap labour gives supply-side boost (Kar and Marjit 2001; Marjit 2003; Marjit and Kar 2009, 2011a). Besides, theoretical literature also, in the context of trade liberalisation and deregulation of formal labour market, depicts that mobility of labour between formal–informal sectors plays a crucial role in explaining growth linkages between these sectors of an economy (e.g. Agenor and Aizenman 1994; Marjit 2003; Marjit and Maiti 2005; Chaudhuri and Banerjee 2007, Marjit, Kar and Beladi 2007; Marjit and Kar 2009, 2011b).<sup>3</sup> However,

<sup>2</sup> Informal labour in formal sector is defined as those workers employed in formal sector without employment stability and social security.

<sup>3</sup> These theories are majorly general equilibrium in nature and explain the impact of various policies (except Agenor and Aizenman 1994) on formal–informal interlinkages in presence of imperfect factor mobility. In this regard, study of Marjit and Kar (2009); and Chaudhuri and Banerjee (2007) worth mentioning since these studies analyse the implication of (perfect and imperfect) mobility of capital on formal–informal interlinkages.

lack of availability of longitudinal data on labour force survey in India deters us to analyse empirically the transmission mechanism of inter-sectoral labour mobility and its concomitant impact on the formal–informal linkages due to exogenous policy shock such as trade liberalisation. The present study explores whether and to what extent the degree of growth linkages between these two broad segments of the Indian economy varies with the varying degree of labour mobility across formal–informal sectors.

In the present analysis, Computable General Equilibrium (CGE) tool is used to capture the degree of labour mobility under assumed alternative labour market scenarios where segmentation in labour market is considered as one important binding constraint for expansion of the sectors.

In India, increasing occupational segmentation and information asymmetry hinders free mobility of labour; at the same time, social and cultural differences create segmentation in the labour market with imperfect labour mobility, which further constraints the evolution of common national labour market (Indian Labour and Employment Report 2014:35). Hence, there is a need for considering these aspects to conceptualise the labour market segmentation going beyond the formal–informal skill-specific segmentation in our analysis.<sup>4</sup>

Present study has its own importance in relation to public policy in India with special reference to trade liberalisation in India. Trade liberalisation, as a part of economic reforms in India, was initiated during 1991 through various measures like easing of quantitative restrictions on imports and reduction in import duties across all the segments of the industry and agriculture. Although quantitative restrictions on all capital goods, consumer goods and agricultural products were phased out completely by 2001, process of reduction of tariff duty was relatively slow (Ahluwalia 2002). For instance, the weighted average tariff rate declined from 72.5% during 1991–92 to 24.5% during 1996–97, although with a significant upward revision in between years; and finally, it is proposed to be reduced by 15% in 2004 (Ahluwalia 2002: 4–5). Reduction of import duty through trade liberalisation becomes more crucial for last two decades due to India's commitment to multilateral trade agreements in Uruguay Round of WTO; also at the bilateral level, India embarked on bringing down the import duty to zero on imports from Sri Lanka, Singapore, Korea, Japan, Malaysia, SAFTA and ASEAN countries (Banga and Das 2012a:X). Empirical evidence suggests that ease of import duty, abolition of import quota and licensing helped the growth of India's export during 2000s due to the import of intermediate inputs at competitive prices by export-oriented firms (Banga and Das 2012a:1). However, external demand (export growth) did not ensure the overall growth of the Indian economy; it is rather domestic demand induced by gradual tariff liberalisation and the subsequent increase in competition in domestic market facilitated the growth of the economy (Banga and Das 2012b).

Lower tariff on final goods and inputs induced rising firm-level productivity of the Indian manufacturing, especially the import competitive industries and the industries where degree of regulation is relatively low (Topalova and Khandelwal 2011). Several other studies also support the view that trade liberalisation in India enhances the

<sup>4</sup> I capture the imperfect labour mobility, the outcome of labour market segmentation due to social, cultural and other barriers (such as information asymmetry), in the base SAM without explicitly modelling these aspects.

firm-level productivity of the formal sector firms (e.g. Krishna and Mitra 1998; Harrison et al. 2011). Albeit, other studies such as Pushpangadan et al. (2000) found no evidence of productivity growth of the formal sector due to trade liberalisation. On the contrary, empirical evidence shows that tariff liberalisation enhanced the average productivity of the informal firms in India which holds 80% of the manufacturing employment; however, this productivity augmentation occurred at the cost of the exit of least-productive informal firms from the industry (Nataraj 2011). Obviously, the question arises whether exit of the least efficient informal firms from the industry leads to reallocation of labour from low-productive informal firms to high-productive formal–informal firms/sector of the economy; otherwise, informal sector would experience an immiserizing growth (see, for example, Chakrabarti 2016). Hence, the degree of labour mobility becomes critical whilst examining the impact of tariff liberalisation on Indian manufacturing sector; and this becomes more relevant in the context of growth linkages between formal–informal sectors in India, since the latter sector is considered as the driving force of the former one to bring this sector out of poverty. In other words, the structure of the Indian labour market needs special focus whilst considering the impact of tariff liberalisation on inter-linkages between formal–informal sectors in India. I envisage this issue in a counterfactual scenario analysis taking help of the CGE method, so that these scenarios could help in designing appropriate public policy to make growth inclusive.

Apart from wage employment, a large segment of population is engaged in informal self-employed activities in India; and thus, tariff reduction on traded goods (mostly formal sector's goods and vast agricultural commodities) affects the earnings of the informal self-employed as well. According to the official statistics, the proportion of self-employed in Indian workforce has declined from 61% in 1972–73 to 52% in 2011–12 (India Labour and Employment Report 2014:31). However, the proportion of regular wage/salary earners, both formal and informal<sup>5</sup> together, in the total workforce has increased marginally from 15.4% in 1972–73 to 17.9% during 2011–12; and around 65% of the regular wage/salary earners belong to organised (formal) sector which consists of production units of secondary and tertiary sectors of the economy (Indian Labour and Employment Report 2014:31). Within the unorganised sector, the composition of self-employed is 62% of total workforce followed by 31% casual labour and 7% regular labour (India Labour and Employment Report 2014:34). Hence, the impact of exogenous policy shocks on formal–informal interlinkages also determines the income of the informal self-employed as a substantial share of informal workforce is confined to the self-employed category.

I capture the income of the self-employed, both formal and informal, through the sources of households' income. To assess the impact of exogenous policy shocks on the economy that consists of various entities, such as formal–informal activities, formal–informal households, government and rest of the world, I use Computable General Equilibrium (CGE) modelling technique based on the Social Accounting Matrix for India (SAM-India) for the year 2003–04. Although recent SAM for India is available for

<sup>5</sup> Regular wage/salary earners in informal sector refer to workers who engaged in informal sector receive salary/piece wages (both full-time and part-time) on a regular basis, i.e. not on a daily or periodical-renewal of contractual basis. This is contrary to casual labour who receives wages on daily or periodic contract basis.

the year 2007–08; however, formal–informal disaggregation across sectors and various labour types are not provided in this SAM. On the contrary, I constructed the SAM for the year 2003–04 with the help of Input Output Transaction Table 2003–04 and disaggregated the SAM in terms of formal–informal activities and other relevant features specific to the research question using other supporting databases. The organisation of the study is as follows. First, Sect. 2 briefly explains the concept of segmented labour market and the notion of labour mobility that is applied in the scenario analysis. Second, Sect. 3 depicts the core structure of the CGE model, broadly in the line of PEP 1-1 model developed by Decaluwé et al. (2009); however, this model is tailored to the Indian scenario. Third, Sect. 4 describes briefly the Indian SAM used for the analysis. Model calibration, sensitivity analysis and simulation results are presented in Sect. 5, followed by conclusion in Sect. 6.

## 2 Labour market segmentation and labour mobility

Segmentation in labour market arises either due to the skill specificity across various categories of labour (Agenor and Aizenman 1994) or due to the imposition of minimum wage leading to labour market rigidity in some segment of the labour force in the economy (Marjit and Kar 2009, 2011a). Whilst skill specificity restricts the movement of labour from low-productive to high-productive sectors; wage rigidity (due to the adherence to minimum wage) to a specific group of labour (formal regular labour in our case) may induce less mobility of labour (Cornelißen and Hubler 2005:5). However, skill acquisition could reduce the barriers to entry and facilitates sectoral labour mobility (e.g. see Marjit and Kar 2011b). Minimum wage legislation (mainly in formal sector) does not necessarily ensure compliance across the board; it is found that the degree of minimum wage compliance varies across enterprises and between permanent and contractual workers in India (ILO 2018: 86); also, minimum wage legislation does not ensure that it would reach to the low-paid workers (Murgai and Ravallion 2005). As it is true that labour market segmentation can be defined in terms of permanent and contractual workers, imposition of minimum wage through collective bargaining by formal regular labour gives rise to another form of segmentation in the labour market as the casual labour in formal sector may sometime left out of the coverage. Hence, the level of governance (or lack of implementation of common minimum wage) is the defining characteristic of broader labour market segmentation in India.<sup>6</sup> Keeping this view in mind, I consider two forms of labour market conditions in this study: segmented labour market and absence of segmentation in the labour market. Within segmented labour market framework, I allow separately wage rigidity (in absence of skill specificity) and skill specificity (in absence of wage rigidity) at the sectoral level; whilst absence of segmentation (i.e. absence of wage rigidity and skill specificity) is also considered assuming perfect inter-sectoral mobility of informal labour as a separate scenario.

One important point to note that the constructed base SAM reflects the inherent existence of segmentation of Indian labour market, where absence of mobility of formal regular labour is considered from formal to informal sectors; this is done primarily

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<sup>6</sup> I am indebted to one of the anonymous reviewers who pointed out this aspect.



due to the lack of statistical evidence showing mobility of formal regular labour from formal to informal sector; and hence, this labour type is not linked with informal sector in the SAM. However, growing phenomenon of informalisation within formal sector in India results in the mobility of the informal labour to formal activities; and this is captured in the base SAM. Hence, absence of segmentation in our counterfactual scenario also implies the free mobility of informal labour from informal sectors to formal sectors, given the inherent structural segmentation within Indian labour market. Free mobility leads to competition between informal and formal labour for getting absorbed within expanding formal sectors. On the contrary, skill specificity at the sectoral level depicts the absence of mobility of formal sector-specific labour to other formal sectors; however, informal labour is fully mobile.

### 3 Computable general equilibrium model

In this section, I explained the CGE model with specific features, and the key variables, that are compatible to the Indian scenario; however, the overall model is the replica of PEP 1–1 model developed by Decaluwé et al. (2009) with minor modification. It is assumed that both formal and informal sector production function of an output is a nested function, as depicted in the standard neo-classical CGE model (e.g. see Decaluwé et al. 2009): at the top level sectoral output is a fixed-coefficients Leontief production function of value-added and aggregate intermediate consumption; at the bottom level value added of a sectoral output is a constant elasticity of substitution (CES) production function of composite labour and capital/land (in case of agricultural production). In my constructed SAM, formal–informal sectors, including agricultural sector, produce intermediate goods and services and all the sectors are interlinked (both intra- as well as inter-sectoral) through forward and backward production linkages. Hence, informal sector produces intermediates for the formal sector and vice versa. Technically speaking, aggregate intermediate demand for a sector's output (formal or informal) is captured through Leontief production function of individual input demand from each activity (formal and informal). Hence, no substitution is possible in case of consumption of intermediate input demand. Only the possibility of substitution arises at the top level where various types of labour are imperfectly substitute to each other. Hence, the source of flexibility in informal sector, which provides intermediate goods and services to formal sector, emerges from the substitution between the informal regular and casual labour.<sup>7</sup>

In this study, composite labour has three categories: formal regular labour, informal regular and casual labour; however, both land and capital are sector-specific. Throughout the analysis, I considered that capital is immobile across sectors. It is hardly accepted notion in the context of developing economies that capital is mobile across sectors; it is rather assumed that sectoral capital stock is fixed within a short-period of analysis (Robinson 1989:908). Further, Robinson (1989):910 argues that so far as developing economies are concerned, the vast segment of agriculture and service sectors uses

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<sup>7</sup> There is no substitution between composite labour and capital since capital is sector-specific in our model.

quite different kinds of capital goods as compared to manufacturing sector. Hence, it is a plausible assumption to consider capital is sector-specific in the model.<sup>8</sup> No distinction is made between land and capital used in agricultural production. So land is also considered as specific factor used in agricultural production. Land is not mobile; hence, each agricultural activity uses specific type of land with certain agro-ecological conditions that is unique for each type of crop (Wong 2012). These are the standard features suitable in India scenario. Informal (non-agricultural) sector's output is non-traded; on the contrary, both agricultural and formal sector's products are traded. Hence, agricultural and formal sector products face competition in both domestic and foreign markets. Aggregate output is expressed in terms of constant elasticity of transformation aggregation function between domestic supply and export. India is considered as the small country and hence, formal sector and agricultural produce are supplied infinitely at the exogenously given world price of export in this CGE model. Demand for domestically produced imports competing goods and services, and their imported counterparts are imperfectly substitute and follow Armington function. There are 13-household class depicted in my constructed India-SAM and there are three sources of households' income: labour income, capital (or land) income and transfer income received from Government and rest of the world as remittances. Consumption demand function of the households follows Linear Expenditure System. Gross domestic product (GDP) at basic and market prices are calculated based on the base-level SAM data.

Macroeconomic closures that are used in the model are as follows. In external sector, current account balance is allowed to vary with the fixed real exchange rate. For government closure, government savings is flexible, whilst tax rates imposed on households' income and enterprise income are considered as fixed. Also government expenditure on goods and services is considered as exogenous. In savings-investment front, investment is savings driven. Change in stock (i.e. inventory accumulation or decumulation) is exogenous in our model.

#### 4 Social accounting matrix for India used in CGE analysis

Base-level India-SAM is constructed for the year 2003–04 based on Input Output Transaction Table (IOTT) provided by Central Statistical Office, Government of India. However, methodology of constructing SAM is beyond the purview of this article. India-SAM consists of 18 formal–informal production activities, which are food crops sector, cash crops sector, horticulture crops sector, agro-allied and resource-based sector (AGALD); formal and informal segment of food and beverages (FodBvrF and FodBvrI); formal and informal counterpart of textiles and wearing apparel (TextF and TextI); agro-based formal (AGROMF) and informal sectors (AGROMI), excluding food and beverages and textiles and wearing apparel; non-agro-based manufacturing products, excluding capital goods sector (NAGF and NAGMI respectively for formal–informal counterpart); formal and informal capital goods sector (CAPMF and CAPINF respectively); infrastructure services, including construction for both formal and informal counterpart (INFRF and

<sup>8</sup> Marjit and Kar (2011a):91 explain the reason behind immobility of (circulating) capital from formal to informal sector. Lack of transparency, collaterals and legal status of the informal sector make difficult for banks to disburse loans and other formal source of credit to this sector. Empirical study by Taiwo (2013) on households of Ghana also shows that credit-constrained individual draws self-employed (informal) capital from family assets.



INFRI); and finally, formal–informal other services (OTSRF and OTSRI). Agro-allied and resource-based activities (AGALD) is the combined entity of three broad sectors specified in the initial constructed SAM, which are animal husbandry, forestry-logging and fishing, i.e. agriculture and allied activities; and mining and quarrying activities, i.e. other primary sectors' activity as termed as resource in our constructed SAM. Apart from formal–informal classification of food and beverages, and textiles' (including wearing apparel) industries, three other agro-based industries such as tobacco products, wood products and leather products are merged into one category of other agro-based manufacturing activities with their respective formal–informal segmentation (AGROMF and AGROMI). Primary reason of identifying food and beverages and textiles as separate activities rather than including in the aggregative agro-based industries is due to the fact these are the two sectors where majority of informal (or unorganised) manufacturing activities are confined. According to the unorganised manufacturing survey conducted by National Sample Survey Office (NSSO), Government of India, during 2005–06, 49% of the entire manufacturing activities are dominated by textiles (including wearing apparel) and food and beverages' products (NSSO 2007:21). Manufacturing of paper and printing products, chemical and allied products, metal products and miscellaneous manufacturing products are further grouped under non-agro-based manufacturing products, excluding capital goods sector (NAGF and NAGMI respectively for formal–informal counterpart). Electrical and non-electrical, including transportation equipment are clustered together under the capital goods-producing sector separately for formal and informal counterpart (CAPMF and CAPINF). Infrastructure services and construction activities are further aggregated under the broad heading of formal–informal infrastructure services (INFRF and INFRI) in my aggregate SAM. Finally, under the heading of other services, we merge both other services and trading services specified in my disaggregate SAM. There are 13-household classes in the SAM, which are rural marginal and small agricultural self-employed household (MSA-HH); rural medium and large agricultural self-employed household (MLA-HH); rural agricultural labour household (AL-HH); formal capitalist household (Cap-HH); rural own account household (ROA-HH); rural establishment household (REstb-HH); urban own account household (UOA-HH); urban establishment household (UEstb-HH); rural formal wage labour household (RFWL-HH); rural informal wage labour household (RIWL-HH); urban formal regular wage labour (UFRWL-HH); urban informal regular wage labour (UIrWL-HH) and urban informal casual wage labour household (UIcWL-HH).

## 5 Model calibration, sensitivity analysis and simulation results

The simulation results are obtained based on the CGE model depicted above with specific rigidities in capital and land market. Model calibration is performed using the values of elasticity parameters obtained from other studies. Besides, most of the parameters are estimated endogenously from the base-level SAM. Goldar et al. (2013) estimate the elasticity of substitution (EOS) between labour and capital across Indian manufacturing industries using CES production function. To keep the parity with the aggregate sectors specified in the SAM, I compute the average values of the relevant elasticities by combining the corresponding industries under aggregate industrial sectors. Further, the similar procedure is followed to obtain the elasticity of substitution across agricultural activities

and various services. Information on elasticity values of the agriculture and services is collected from Pradhan and Sahoo (2008). However, equal elasticity values are assigned across formal and informal segments of the respective sectors. Appendix: Tables 15, 16 provides respectively the EOS across various sectors and other associated parametric values. For sensitivity analysis I perform the simulation by imposing three values of elasticity of substitution amongst three categories of labour: casual labour, informal regular labour and formal regular labour. This will help to capture the representative firm's degree of substitutability of various categories of labour due to changing relative wages.

Under the segmented labour market assumption, I consider that nominal wage rate in formal regular labour market is fixed and institutionally determined by bargaining. Hence, nominal wage does not respond due to changing labour demand and labour supply; Keynesian involuntary unemployment in formal regular labour market exists in the model in few cases.<sup>9</sup> It is noteworthy that the model does not depict the explicit role of trade union, such as wage bargaining process and the decisive role of trade union during recession to withhold the retrenched formal labour. In CGE model absolute values of commodity and factor prices are determined in terms of model numéraire. Since nominal wage is fixed with respect to model numéraire which is domestic consumer price index (CPI) in our model, it is equivalent to fixing the real wages; further, the nominal wage is implicitly indexed to consumer price index (Boeters and Savard 2011: 52–53). Fixing real wage in formal regular labour market characterises the labour market rigidities, which gives rise to involuntary unemployment. On the contrary, wage in informal labour market is considered as market determined with full-employment condition prevails in both categories of informal labour market (i.e. regular and casual). This is indeed an appropriate assumption of full employment in informal labour market on the ground that informal labour, for survival, get absorbed in some activity; or in other words, they cannot stay unemployed without doing any activity although it might be insignificant and under-remunerative (Marjit 2003; Marjit and Kar 2011a:4).

At the initial scenario analysis which is termed as segmented labour market-1, I consider the segmented labour market with respect to wage rigidity in formal regular labour market along with full mobility of informal labour from formal to informal sectors and perfect mobility of formal regular labour within the formal sub-sectors.<sup>10</sup> This is particularly important in the present scenario of Indian labour market where regular labours in formal sectors are protected by minimum wage legislation and the formal labour market is segmented. Although wage fixation comes through collective bargaining by labour union (regular labour in formal sector in our case) which ensures minimum wage amongst permanent/regular labour; it does not necessarily ensure in case of casual/contractual labour employed in formal sector. This is the question of the degree of governance. I accommodated this aspect of governance in the CGE analysis through the defining characteristics of segmented labour market-1; where wage rate of the formal regular labourer is fixed rather than market determined, contrary to the case of informal regular and casual labour where wages are market determined, irrespective of their

<sup>9</sup> Market clearing wages equilibrate labour demand and labour supply in a competitive market setting. Demand–supply mismatch under fixed nominal wages brings forth involuntary unemployment.

<sup>10</sup> This is the standard assumption in many theoretical literature such as Marjit 2003, Chaudhuri and Banerjee 2007, Marjit et al. 2007, and Marjit and Kar 2009, 2011b (chapter7).

origin of employment (formal/informal). In the analysis of second scenario of segmented labour market, which is termed as segmented labour market-2, I impose a condition of labour immobility from formal capital goods sector to other formal sub-sectors due to skill specificity of this category of labour at sectoral level.<sup>11</sup> However, in this model wage rate in formal regular labour market is not fixed; wage rate is allowed to be determined according to the force of demand–supply in labour market. Skill specificity is one important aspect that creates large differences in endowments amongst labourers and in this respect labour is not considered as homogeneous. In the analysis of third scenario, I assume absence of segmentation in labour market; however, full employment prevails across three categories of labour market; only wage rate is allowed to clear the market.

In all the scenario analyses, I consider differential wage rates across three categories of labour at the base category; and the wage rates are assumed in descending order respectively for formal regular labour, informal regular labour and casual labour. This is done to reflect the observed wage differential across said categories of labour in India where formal regular labour receives relatively higher wage than contractual casual and informal labour. For example, in 2004–05 regular workers received an average daily wage of Rs. 307 as compared to casual workers at Rs. 99 (Indian Labour and Employment Report 2014: 96). To introduce the wage differentials, I normalise the wage rate of informal casual labour to unity at the baseline level and then I increase the baseline value of informal regular wage rate by 10 percentage point from the initial value of casual labour and 20 percentage increment is assigned to the wage of formal regular labour with respect to the baseline value of informal casual labour wage rate.<sup>12</sup>

I summarise below the scenario analysis under alternative labour market settings undertaken in this study.

Scenario-A1: 50% tariff cut on imported goods under segmented labour market-1 (full mobility of informal labour) settings;

Scenario-A2: 50% tariff cut on imported goods under no segmentation of labour market settings;

Scenario-A3: 50% tariff cut on imported goods under segmented labour market-2 (partial mobility of formal labour but full mobility of informal labour) settings;

Each scenario analysis is performed with respect to three different values of CES elasticity of substitution of composite labour parameter of each activity/sector ( $\sigma_j^{LD}$ ). The values of the elasticity parameter are considered as 0.2, 1.2 and 2.5, respectively. However, these values are chosen on ad-hoc basis. These values are taken to undertake the sensitivity analysis. Empirical estimates show the elasticity of substitution (EOS) between workers with different skills (where skill is reflected on difference in educational attainment) varies between 1.5 and 2 (Wingender 2015: 272). However, Wingender's estimates show that although EOS is fixed at 1.5 in non-agricultural sector, the values are specified as 2.25 and 3 in case of agricultural sector in two different scenarios (Wingender 2015: Table 2). I assumed the above-mentioned three values of composite labour elasticity keeping in mind the skill specificity of each category of labour, notably

<sup>11</sup> In the case of segmented labour market-2 relevant formal activities are destined to hire the observed base-year quantity of labour, allowing labour supply free to adjust accordingly.

<sup>12</sup> I did not use the actual wage differentials across labour types based on empirically estimated values. This is due to the fact that for analytical purpose, model needs to be converged in the baseline scenario.

**Table 1 (Scenario A1–S1) Change (%) in quantity and price due to 50% tariff reduction (segmented labour market-1,  $\sigma_j^{LD} = 0.2$ ). Source: based on simulation analysis**

	Aggr. Output XST	Com. Com. dd Q	Dom. dd for locally prod. DD	Int.dd for com. DIT	Basic price of output PT	Price of local prod. PD	Unit cost of pr. PP	Price of Q PC	Int. Cons. PINDEX PCI
Food crop	0.39	0.45	0.44	0.30	1.01	1.04	1.01	1.04	0.05
Cash crop	0.04	0.09	0.03	0.22	−0.17	−0.18	−0.17	−0.20	−0.58
Hort. crop	0.26	0.48	0.30	0.25	0.97	0.99	0.97	0.90	−0.10
AGALD	0.40	0.51	0.44	0.17	1.10	1.12	1.10	1.08	0.27
FodBvrF	0.07	1.34	0.09	0.09	0.09	0.10	0.09	−0.52	0.10
TextF	0.57	1.20	0.46	0.34	−0.08	−0.13	−0.08	−0.49	−0.52
AGROMF	0.02	0.43	−0.24	−0.57	−0.24	−0.37	−0.24	−0.70	−0.44
NAGMF	−0.79	−0.81	−1.46	−0.77	−1.50	−1.83	−1.50	−2.15	−1.47
CAPMF	−3.18	−0.97	−3.70	−1.65	−2.43	−2.69	−2.43	−4.03	−1.57
INFRF	−1.93	−2.03	−2.03	−1.09	−0.86	−0.91	−0.86	−0.91	−0.98
OTSRF	0.21	0.19	0.19	−0.80	−0.09	−0.09	−0.09	−0.09	−0.61
FodBvrl	0.68	0.68	0.68	0.30	0.87	0.87	0.87	0.87	−0.06
Textl	0.83	0.83	0.83	0.52	0.55	0.55	0.55	0.55	−0.70
AGROMI	0.06	0.06	0.06	−0.28	0.09	0.09	0.09	0.09	−0.36
NAGMI	−0.39	−0.39	−0.39	−0.35	−1.58	−1.58	−1.58	−1.58	−1.70
CAPINF	−0.58	−0.58	−0.58	−0.72	−1.82	−1.82	−1.82	−1.82	−1.88
INFRI	−0.26	−0.26	−0.26	−0.74	−1.01	−1.01	−1.01	−1.01	−1.72
OTSRI	0.11	0.11	0.11	−0.70	0.45	0.45	0.45	0.45	−0.50

Composite commodity demand for informal activities is equivalent to its domestic demand

formal–informal regular labour and casual labour. It is noteworthy that there are no studies in India that empirically estimate the elasticity values. Hence, the values I chose reflect three cases of mobility, namely rigid, moderate and flexible across all the sectors of the economy.

### 5.1 Tariff cut and segmented labour market with full mobility of labour

In this simulation exercise (A1–S1), I examine the effects of 50% tariff cut on imported goods, which is shown in Table 1. First set of simulations (Scenario A1–S1 to A1–S3) is obtained at the backdrop of segmented labour market-1 allowing full mobility of informal labour within and between formal and informal sectors. No skill specificity is assumed in formal sector.

Table 1 depicts that there is a rise in aggregate output (XST) and value added (VA) across all traded goods and services except non-agro-based (NAGMF) and capital goods (CAPMF) industries and infrastructure services (INFRF) in the formal segment. Similar sectoral growth pattern is followed in corresponding informal non-traded goods and services as well. This is partially due to the production (input) linkages between and within the formal and informal segments of the economy, which is observed from increasing intermediate demand (DIT) for the informal goods and services depicted in Table 1. Dehejia and Panagariya (2014) show that during 2001–02 and 2006–07, trade liberalisation and the consequent expansion in manufacturing growth increases the derived demand for transport, communication and business services (these are the part

of infrastructural services in the SAM, except business services) which are relatively large in firm size; whilst significant negative impact on GVA is found for small service enterprises.<sup>13</sup> This result corroborates the empirical findings of Dehejia and Panagariya (2014) in the sense that growth of informal services (INFRI) during the aforementioned period declines, which majorly consist of own account enterprise (83% and 85% during 2001–02 and 2006–07, respectively). Moreover, the analysis reveals that non-agro-based and capital goods industries contracts. Contraction of these industries leads to reduction in derived demand for infrastructural services as well.

Manufacturing and agricultural activities demand various kinds of other services (OTSRF and OTSRI in our SAM) apart from infrastructure services (INFRF and INFRI) that consist of electricity and water supply, various transport services, storage and communication services. One major component of other services in the SAM is trading services; and the source of expansion of the trading service depends on the increasing derived demand from other sectors, such as agriculture and industry. Hence, it can be argued that growth in both formal–informal services (OTSRF and OTSRI) depicted in this analysis is due to the derived demand generated from agriculture and few expanding manufacturing sectors such as food and beverages, textile and other agro-based industries. Further, benefit of tariff reduction is reflected on declining unit cost of production (PP) in most of the formal manufacturing.<sup>14</sup> This is due to the import of cheap imported inputs used in production. Our result is in conformity with the empirical findings by Nataraj (2011) which shows that input-tariff reduction enhances productivity in Indian formal manufacturing. Declining unit cost of production leads to concomitant decline in basic price (PT) of the relevant formal segments of the industries.

Considering food and beverages, textiles and other agro-based industries in formal sector, it can be observed that despite tariff cut, cost of production in the food and beverages industry does not decline, whilst the later two industries experience the falling unit cost and price. It is the increasing price of food crops that enhances the cost of production in the food and beverages industry; whilst declining price of cash crops attributes to the decreasing unit cost of production in the latter two industries. This also indicates the reliance of these industries on the primary sector for agro raw materials. Similarly, impact of agricultural price rise and the concomitant increase in cost of agro-based raw materials, including the price of agro-allied activities, increases the unit cost of production and price level in informal industries (food and beverages, textiles and other agro-based manufacturing industries).

Import tariff cut increases the demand for imported goods and services as shown in Table 2. Due to small country assumption, producers can export as much as possible to the world market with the given world price of export (PWX). Moreover, domestic demand for goods and services is met by reducing export and vice versa. It is clear from Table 1 that fall in domestic demand (DD) for AGROME, NAGMF and CAPMF

<sup>13</sup> Large enterprises are those which hire at least five workers (i.e. establishments). According to NSSO (2003) survey on service sector during 2001–02, 83% of the surveyed enterprises are own account (i.e. enterprises that does not hire any worker with the payment at a regular basis); whilst 17% are establishments. During 2006–07, the share of the own account enterprises increases to 85% (NSSO 2009).

<sup>14</sup> Unit cost of production (PP) is the weighted sum of value-added price (PVA) and price of intermediate consumption (PCI).

**Table 2 (Scenario A1: S1–S3) Change (%) in export–import due to 50% tariff reduction (segmented labour market-1)**

	$\sigma_f^{LD} = 0.2$		$\sigma_f^{LD} = 1.2$		$\sigma_f^{LD} = 2.5$	
	Export EX	Import M	Export EX	Import M	Export EX	Import M
Food crop	− 1.61	3.27	− 1.67	3.31	− 1.68	3.31
Cash crop	0.38	12.49	0.32	12.55	0.30	12.56
Hort. crop	− 1.65	12.36	− 1.70	12.40	− 1.72	12.41
AGALD	− 1.78	6.14	− 1.79	6.15	− 1.79	6.15
FodBvrF	− 0.10	21.75	− 0.12	21.76	− 0.12	21.76
TextF	0.72	9.80	0.72	9.80	0.72	9.80
AGROMF	0.50	6.72	0.51	6.71	0.51	6.70
NAGMF	2.25	0.63	2.25	0.62	2.25	0.61
CAPMF	1.69	10.46	1.70	10.43	1.70	10.42
INFRF	− 0.22	− 3.80	− 0.24	− 3.81	− 0.25	− 3.82
OTSRF	0.38	0.00	0.38	0.00	0.37	0.00

increases the supply of these industrial products to the export market. Sensitivity analysis by simulating the elasticity of substitution amongst various categories of labour does not alter our inferences. Simulated figures of quantity–price changes due to changing parametric values depict the similar results as shown in Table 1 and hence, avoided from display.

Changing CES elasticity of substitution across various types of labour reflects the degree of hiring one type of labour (say, formal regular labour) relative to the other type (say, informal regular labour) due to change in marginal rate of substitution between these two categories of labour. Analytically, marginal rate of substitution between two categories of labour is equal to the initial wage ratios, which is derived from the firm's wage-bill minimisation problem.<sup>15</sup> Hence, elasticity of substitution portrays the degree of substituting one category of labour to other with the changing relative wage. Table 3 depicts the changing sectoral composition of various categories of labour demand with respect to increasing values of CES. With the expansion of the formal and informal activities, all categories of labour, i.e. informal regular (IRL) and casual (CL) labour and formal regular labour (FRL), are being absorbed; whilst contracting sectors retrench labour. Retrenched labour from contracting formal–informal segments is absorbed in the expanding sectors. This is confirmed by the fact that given the full employment in labour market,<sup>16</sup> the residual supply is being met by absorbing retrenched labour from contracting formal–informal sectors. When we allow high values of elasticity of composite labour (from 0.2 to 1.2 to 2.5), we observe that there is a relative shift in labour demand away from FRL to IRL and further towards CL demand in expanding sectors.<sup>17</sup> Similarly, so far as contracting sectors are concerned, absolute demand for labour across all categories declines; however, the fall in demand for FRL is steeper than that of IRL

<sup>15</sup> In the PEP 1-1 analysis of Decaluwé (2009), relative demand for each type of labour is derived from minimising wage bill subject to given composite labour demand.

<sup>16</sup> Full-employment condition prevails in informal labour market with wage is market-determined. In formal labour market we consider that unemployment exists with fixed wage.

<sup>17</sup> However, there is an absolute increase in labour demand across all the expanding sectors.



**Table 3 Change (%) in labour demand across sectors due to 50% tariff reduction (segmented labour market-1)**

	$\sigma_j^{LD} = 0.2$			$\sigma_j^{LD} = 1.2$			$\sigma_j^{LD} = 2.5$		
	IRL	FRL	CL	IRL	FRL	CL	IRL	FRL	CL
Food crop	2.04		2.09	1.93		2.03	1.90		2.01
Cash crop	0.14		0.20	0.07		0.17	0.04		0.15
Hort. crop	1.34		1.39	1.24		1.34	1.21		1.32
AGALD	1.61	1.62	1.66	1.59	1.55	1.69	1.58	1.48	1.69
FodBvrF	0.10	0.11	0.16	0.13	0.09	0.22	0.16	0.06	0.27
TextF	1.61	1.62	1.67	1.65	1.60	1.74	1.68	1.58	1.79
AGROMF	0.11	0.12	0.16	0.14	0.10	0.24	0.16	0.06	0.27
NAGMF	− 2.41	− 2.40	− 2.36	− 2.39	− 2.43	− 2.30	− 2.36	− 2.46	− 2.26
CAPMF	− 6.76	− 6.76	− 6.71	− 6.74	− 6.78	− 6.65	− 6.71	− 6.80	− 6.61
INFRF	− 2.94	− 2.94	− 2.89	− 2.94	− 2.98	− 2.84	− 2.91	− 3.01	− 2.81
OTSRF	0.35	0.36	0.40	0.38	0.34	0.48	0.42	0.32	0.53
FodBvrl	5.33		5.39	5.31		5.42	5.30		5.41
Textl	3.25		3.31	3.26		3.36	3.25		3.36
AGROMI	0.40		0.45	0.36		0.46	0.34		0.45
NAGMI	− 1.34		− 1.29	− 1.38		− 1.28	− 1.40		− 1.29
CAPINF	− 1.49		− 1.43	− 1.51		− 1.41	− 1.52		− 1.42
INFRI	− 0.62		− 0.57	− 0.68		− 0.58	− 0.70		− 0.60
OTSRI	0.82		0.88	0.86		0.95	0.85		0.95

**Table 4 (Scenario A1–A2:S1–S3) change in economy-wide wage rate across various categories of labour and involuntary unemployment rate (%) due to 50% tariff cut**

	Segmented labour market-1			No segmentation		
	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
Labour type	Wage rate W	Wage rate W	Wage rate W	Wage rate W	Wage rate W	Wage rate W
IRL	0.04	− 0.03	− 0.04	0.76	0.19	− 0.06
FRL	−	−	−	− 1.81	− 1.16	− 0.90
CL	− 0.23	− 0.12	− 0.08	0.79	0.15	− 0.10
Involuntary unemployment	1.1	1.13	1.15	−	−	−

− stands for no change. Sectoral wage rates are not considered in our analysis. In our model set-up we consider economy-wide average wage rates across all sectors

and CL. Shifting demand away from FRL to IRL and further towards CL is due to presence of relatively higher wage rate in FRL market compared to the wage rates in other two markets. Hence, during expansion, higher substitutability allows industry to hire relatively more casual labour compared to regular labour.

Contrary to segmented labour market approach which advocates that excess supply of labour in the informal sector invariably brings down the wage rate of informal labour, I found that wage rate of IRL does not necessarily decline (at least for the lower value of elasticity, see Table 4); however, wage rate of CL declines irrespective of degree of substitution (Table 4). Higher value of elasticity depicts higher degree of substitution of one category of labour for the other, due to changing relative wage between these two.

**Table 5 (Scenario A1–A2:S1–S3) Change (%) in sectoral rental rate due to 50% tariff cut**

		Segmented labour market-1			No segmentation		
		$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
		Rental rate R	Rental rate R	Rental rate R	Rental rate R	Rental rate R	Rental rate R
Food crop	Land	2.47	2.49	2.49	2.93	2.81	2.77
Cash crop	Land	0.06	0.09	0.09	0.94	0.76	0.70
Hort. crop	Land	1.59	1.60	1.60	1.91	1.86	1.84
AGALD	Land	2.02	2.02	2.02	2.20	2.21	2.21
AGALD	Capital	2.02	2.02	2.02	2.20	2.21	2.21
FodBvrF	Capital	0.09	0.08	0.08	−0.80	−0.48	−0.35
TextF	Capital	1.81	1.80	1.79	1.86	1.93	1.96
AGROMF	Capital	0.13	0.13	0.13	0.23	0.27	0.29
NAGMF	Capital	−2.28	−2.30	−2.30	−2.28	−2.14	−2.08
CAPMF	Capital	−7.48	−7.50	−7.52	−8.15	−7.66	−7.46
INFRF	Capital	−1.87	−1.88	−1.88	−2.77	−2.37	−2.21
OTSRF	Capital	0.28	0.28	0.27	−0.17	0.06	0.16
FodBvrl	Capital	4.85	4.83	4.82	5.41	5.26	5.19
Textl	Capital	3.65	3.64	3.64	4.31	4.06	3.95
AGROMI	Capital	0.42	0.40	0.39	0.78	0.87	0.90
NAGMI	Capital	−1.29	−1.33	−1.34	−0.44	−0.69	−0.80
CAPINF	Capital	−1.63	−1.71	−1.72	−0.91	−1.13	−1.24
INFRI	Capital	−0.52	−0.48	−0.46	0.51	0.02	−0.17
OTSRI	Capital	0.69	0.67	0.66	1.11	1.07	1.05

Hence, exogenous change in relative wage of IRL vis-à-vis CL increases the degree of hiring more CL per unit of IRL. In this situation, excess supply of IRL in the labour market brings down the equilibrium real wage rate. As the real (and nominal) wage rate in FRL market is fixed as set by unions, the declining demand for labour in the prevailing wage rate causes involuntary unemployment in FRL market. It is evident from Table 4 that involuntary unemployment increases with the increasing degree of elasticity of substitution.

Expanding sectors demand both labour and capital. Due to capital specificity at the sectoral level, rental rates (R) of capital employed in the respective industries go up. This is clearly shown in Table 5. On the contrary, due to immobility of industry-specific capital, as assumed in the model, contracting industries experience rising capital-output ratio; it eventually leads to excess supply of capital at the sectoral level that ultimately brings down the rental rate.

It is indicative that declining real wage across various categories of informal labour brings down the non-agricultural wage labour households' income. Despite the rising demand for FRL in few agro-based industries, the fall in labour demand in non-agro-based formal sector outweighs the positive impact, which ultimately brings down the wage income of formal households. Major source of income of rural–urban informal self-employed households, designated as own account household (ROA-HH and UOA-HH) and establishment household (REstb-HH and UEstb-HH), is capital (or net surplus) income apart from a portion of wage income and transfer income. Dwindling capital income and the following decline in overall households' income of non-agricultural

self-employed is evident. Dwindling income leads to declining base of savings as shown in Appendix: Table 17. Since informal households' savings is the major source of capital for investment in informal enterprises, the entire process can stifle further growth of informal sector. Nonetheless, agricultural self-employed households (i.e. MSA-HH and MLA-HH) show improvement in their respective income level.

Macroeconomic indicators are depicted in Table 7. Noticeably, government budget deficit as a share of nominal GDP increases by 25 percent; it is mainly due to forgone tariff revenue at the onset of tariff cut. Similarly, real gross domestic product (GDP) respectively at basic price (i.e. factor cost) and market price declined. Hence, even though there is a growth of some part of formal–informal segments of the economy, the overall GDP has been declining due to sharp fall in output of rest of the segments. It is particularly due to the sharp fall in capital goods and other non-agro-based industries. Investment is savings driven in our model; hence, fall in households' savings brings down overall savings and it is reflected through declining GFCF share to GDP.

## 5.2 Tariff cut and absence of segmentation in labour market with full mobility of labour

Comparing the pattern of sectoral growth between two scenarios: segmented labour market-1 (Table 1) vis-à-vis absence of segmentation (Table 8), the study finds that absence of labour market segmentation gives rise to relatively high growth in the expanding formal sectors such as food and beverages, textiles, other agro-based manufacturing and other services; on the contrary, amongst growing informal activities, such as all the agricultural activities including agro-allied activity, food and beverages, textiles, other agro-based manufacturing and other services, output growth is lower when labour market is not segmented as compared to segmented labour market.<sup>18</sup> This apparent dichotomy can be explained comparing the unit cost of production in two scenarios (segmented labour market-1 and absence of segmentation). Higher unit cost of production translates to higher product price (PD) which subsequently lowers the domestic demand (DD) in the latter scenario as compared to the earlier one. In the former case (segmented labour market-1), due to lower unit cost of production, the product price is also lower that spurs domestic demand (DD) for those informal sector's products. Besides, primary cause of increasing unit cost of production is increasing wage rates of informal labour in homogeneous labour market as compared to the declining wage rates of those categories under segmented market (Table 4).<sup>19</sup> Hence, we can argue that mobility of labour, the supply-side factor, is not the only determining factor to growth of the industry; but the lower unit cost of production accompanied by increasing domestic demand for the locally produced goods and services, the demand-side factor, also plays a significant role. This aspect is not touched upon in theoretical literature. Export demand for NAGMF, CAPMF and INFRF increases following declining domestic demand (see Appendix: Table 18).

Absence of labour market segmentation increases demand for all types of labour across growing formal–informal activities (see Table 9). However, there is a distinct

<sup>18</sup> Tables depicting scenarios A2-S2 and A2-S3 yield similar pattern of changes across sectors and hence, these are intentionally avoided from depiction.

<sup>19</sup> This is reflected on price of value added (PVA) of those growing informal activities, which is higher in the latter case (Table 8) as compared to the scenario under segmented labour market-1 (Table 1).

change in composition of labour demand. Within formal sector, demand for FRL is comparatively higher than that of informal labour (IRL and CL). This is primarily due to the following reason: retrenched FRL from contracting formal sector brings down the market-determined real wage in this labour market (see Table 4: no segmentation scenario) that provides a cost advantage to expanding sectors leading to increase in absorption of FRL compared to informal labour. This is supported by the fact shown in Table 4, where FRL experiences a drastic fall in real wage. However, both types of informal labour experience rise in real wage, at least up to a certain extent of higher value of elasticity. Higher value of elasticity of substitution (in our case 2.5) brings down the wage in informal labour market due to higher responsiveness in hiring FRL relative to either type of informal labour with respect to small rise in relative price of informal labour to that of FRL. In other words, as there is an absolute fall in real wage in FRL compared to that of rise in informal labour market, it leads to rise in relative price of either type of informal labour vis-à-vis the price of FRL. In such situation, higher elasticity allows formal activities to demand more FRL compared to informal labour; under full employment in the labour market, released informal labour creates excess supply that leads to bringing down the market-determined wage rate in the informal labour market. Finally, phenomenon of involuntary unemployment does not arise in absence of fixed wage rate in FRL market. So it is clear from our sensitivity analysis that absence of segmentation in labour market may increase the wage rate across all categories of informal labour; albeit, it depends on the sensitivity of the value of elasticity of substitution of composite labour demand at the industry level.

Expanding activities in formal and informal segments drive up the returns to land and capital due to sector-specificity of capital (Table 5). Similarly, declining growth of output amongst sectors brings down the rental rates. Overall functional income distribution of households does not change under homogeneous labour market scenario compared to its segmented counterpart. However, absence of segmentation improves the income distribution of informal wage labour households, agricultural households including agricultural labour households (see Table 6). Further, income deterioration of the non-agricultural informal self-employed households is lower under absence of segmentation than that under segmented labour market.

### 5.3 Tariff cut and segmented labour market with partial mobility of labour

In the analysis of third scenario (A3-S1), I impose the partial restriction on mobility of FRL; however, FRL wage is deregulated and is market-determined. Precisely, I introduce the skill specificity of FRL employed in capital goods industry in formal sector (CAPMF). Since formal labour is specific to the required skill in this industry, labour cannot be retrenched from this sector. It implies that labour is immobile from the formal capital goods sector. However, FRL is allowed to move freely across formal to informal activities for rest of the activities. Full-employment condition is applicable for informal labour market, whilst unemployment exists in formal labour market. Wage in the informal labour is market-determined and labour is allowed to move freely between formal and informal segments of the activities. Table 10 depicts the change in quantity and price due to tariff reduction across all the sectors of the economy. It can be noticed by comparing Tables 1, 8 and 10 that skill specificity and the consequent restricted labour

**Table 6 (Scenario A1–A2:S1–S3) Change (%) in income of households due to 50% tariff cut**

Type of HH	Segmented labour market-1			No segmentation		
	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
MSA-HH	1.59	1.60	1.60	1.92	1.86	1.83
MLA-HH	1.49	1.50	1.50	1.81	1.74	1.71
AL-HH	−0.11	−0.07	−0.06	0.70	0.15	−0.07
Cap-HH	−0.34	−0.35	−0.36	−0.24	−0.19	−0.17
ROA-HH	−0.30	−0.31	−0.32	−0.17	−0.15	−0.14
REstb-HH	−0.31	−0.32	−0.33	−0.19	−0.16	−0.15
UOA-HH	−0.29	−0.31	−0.31	−0.15	−0.14	−0.14
UEstb-HH	−0.31	−0.32	−0.33	−0.19	−0.16	−0.15
RFWL-HH	−0.95	−0.97	−0.98	−1.55	−1.00	−0.77
RIWL-HH	−0.14	−0.08	−0.06	0.64	0.13	−0.07
UFRWL-HH	−0.93	−0.95	−0.97	−1.48	−0.97	−0.76
UIrWL-HH	0.03	−0.03	−0.03	0.63	0.16	−0.05
UIcWL-HH	−0.06	−0.04	−0.03	0.41	0.09	−0.04

**Table 7 (Scenario A1–A2:S1–S3) Observed change (%) in various macro-indicators due to 50% tariff reduction**

	Segmented labour market-1			No segmentation		
	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
Govt. budget deficit/GDP*	25.10	25.26	25.28	25.37	25.03	24.89
GDP at basic price (real)	0.00**	−0.24	−0.24	0.00**	0.00**	0.00**
GDP at market price (real)	−0.62	−0.85	−0.85	−0.62	−0.62	−0.61
GFCF/GDP*	−5.41	−5.32	−5.33	−6.01	−5.61	−5.45

Real GDP is calculated applying GDP deflator computed from SAM

\* GDP at basic price (nominal); \*\* very small change

mobility from formal capital goods industry have the largest positive impact on growth of the agro-based and non-agro-based formal activities including other services. On the contrary, it is evident from Table 10 that restricted labour mobility further dwindles the growth of already contracting informal activities (such as agro-based, non-agro-based and capital goods industries along with infrastructure and other services). These are the activities that either experience positive growth or the growth deceleration is slower in the earlier scenarios characterised by full mobility of labour with or without segmentation in labour market (see Tables 1 and 8). It is noteworthy that informal textile sector growth under this scenario is lowest as compared to earlier scenarios, despite the strongest growth in its formal counterpart. It implies that formal sector growth cannot necessarily drive up the growth of its informal counterpart to the similar extent under all scenarios. This is due to fact that domestic demand (DD) for informal textiles has drastically reduced in the present scenario as compared to the earlier cases; due to rising unit cost of production and the price of this industry. The reason behind the associated sharp increase in production cost (highest across all scenarios) is the rising price of cash crop which faces dwindling growth. Skill specificity and the associated sharp increase in wage rates in IRL and CL enhance the cost of production in the cash crop sector, which

**Table 8 (Scenario A2-S1) Change (%) in quantity and price due to 50% tariff reduction (no segmentation labour market,  $\sigma_j^{LD} = 0.2$ )**

	Aggr. Output XST	Com. Com. dd Q	Dom. dd for locally prod. DD	Int. dd for com. DIT	Basic price of output PT	Price of local prod. PD	Unit cost of pr. PP	Price of Q PC	Int. Cons. PINDEX PCI
Food crop	0.31	0.39	0.38	0.27	1.39	1.43	1.39	1.42	0.23
Cash crop	0.02	0.10	0.04	0.34	0.52	0.53	0.52	0.49	-0.34
Hort. crop	0.17	0.41	0.21	0.25	1.36	1.38	1.36	1.28	0.05
AGALD	0.37	0.49	0.41	0.19	1.33	1.35	1.33	1.31	0.52
FodBvrF	0.20	1.47	0.22	0.20	0.09	0.10	0.09	-0.52	0.31
TextF	0.90	1.43	0.71	0.63	-0.14	-0.23	-0.14	-0.59	-0.49
AGROMF	0.09	0.51	-0.16	-0.40	-0.23	-0.35	-0.23	-0.68	-0.44
NAGMF	-0.34	-0.65	-1.12	-0.52	-1.73	-2.12	-1.73	-2.35	-1.62
CAPMF	-2.85	-0.99	-3.48	-1.43	-2.93	-3.25	-2.93	-4.47	-1.79
INFRF	-1.73	-1.88	-1.87	-0.77	-1.32	-1.39	-1.32	-1.38	-1.09
OTSRF	0.95	0.78	0.80	-0.41	-0.89	-0.96	-0.89	-0.95	-0.77
FodBvrl	0.65	0.65	0.65	0.31	1.14	1.14	1.14	1.14	0.13
Textl	0.79	0.79	0.79	0.65	0.92	0.92	0.92	0.92	-0.53
AGROMI	0.00	0.00	0.00	-0.19	0.42	0.42	0.42	0.42	-0.20
NAGMI	-0.37	-0.37	-0.37	-0.25	-1.54	-1.54	-1.54	-1.54	-1.80
CAPINF	-0.59	-0.59	-0.59	-0.64	-1.91	-1.91	-1.91	-1.91	-2.02
INFRI	-0.19	-0.19	-0.19	-0.45	-0.51	-0.51	-0.51	-0.51	-1.77
OTSRI	0.06	0.06	0.06	-0.42	0.88	0.88	0.88	0.88	-0.30

0.00 implies marginal increase. Composite commodity demand for informal activities is equivalent to its domestic demand

**Table 9 Change (%) in Labour Demand across Sectors Due to 50% Tariff Reduction (No Segmentation in Labour Market)**

	$\sigma_j^{LD} = 0.2$			$\sigma_j^{LD} = 1.2$			$\sigma_j^{LD} = 2.5$		
	IRL	FRL	CL	IRL	FRL	CL	IRL	FRL	CL
Food crop	1.66		1.66	2.01		2.07	2.14		2.23
Cash crop	0.13		0.12	0.43		0.49	0.54		0.63
Hort. crop	0.88		0.87	1.28		1.34	1.43		1.52
AGALD	1.41	1.93	1.40	1.44	3.12	1.50	1.45	3.61	1.54
FodBvrF	-0.06	0.46	-0.06	-0.84	0.79	-0.79	-1.18	0.93	-1.09
TextF	2.21	2.74	2.21	1.26	2.93	1.32	0.86	3.02	0.96
AGROMF	0.26	0.78	0.25	-0.13	1.52	-0.07	-0.29	1.84	-0.20
NAGMF	-1.44	-0.93	-1.45	-2.62	-1.01	-2.57	-3.11	-1.04	-3.02
CAPMF	-6.50	-6.02	-6.51	-7.42	-5.89	-7.37	-7.81	-5.84	-7.72
INFRF	-2.99	-2.49	-2.99	-3.68	-2.09	-3.62	-3.97	-1.92	-3.88
OTSRF	1.18	1.70	1.17	-0.13	1.52	-0.08	-0.68	1.44	-0.59
FodBvrl	5.03		5.03	5.52		5.58	5.72		5.82
Textl	3.13		3.12	3.42		3.48	3.55		3.65
AGROMI	0.01		0.00	0.57		0.63	0.80		0.90
NAGMI	-1.26		-1.27	-0.93		-0.88	-0.80		-0.71
CAPINF	-1.49		-1.50	-1.20		-1.14	-1.07		-0.98
INFRI	-0.43		-0.44	-0.26		-0.20	-0.20		-0.11
OTSRI	0.42		0.42	1.07		1.12	1.35		1.44

0.00 implies marginal increase



**Table 10 (Scenario A3-S1) Change (%) in quantity and price due to 50% tariff reduction (segmented labour market-2,  $\sigma = 0.2$ )**

	Aggr. Output XST	Com. Com. dd Q	Dom. dd for locally prod. DD	Int. dd for com. DIT	Basic price of output PT	Price of local prod. PD	Unit cost of pr. PP	Price of Q PC	Int. Cons. PINDEX PCI
Food crop	−0.37	−0.13	−0.15	0.03	4.51	4.62	4.51	4.61	1.79
Cash crop	−0.09	0.20	0.07	1.27	6.39	6.48	6.39	6.41	1.72
Hort. crop	−0.64	−0.19	−0.49	0.24	4.56	4.64	4.56	4.49	1.30
AGALD	0.07	0.30	0.17	0.27	3.22	3.27	3.22	3.20	2.54
FodBvrF	1.16	2.48	1.20	1.05	0.19	0.21	0.19	−0.42	2.08
TextF	3.67	3.33	2.75	3.08	−0.65	−1.10	−0.65	−1.38	−0.21
AGROMF	0.58	1.08	0.39	1.01	−0.17	−0.26	−0.17	−0.60	−0.39
NAGMF	3.58	0.56	1.73	1.57	−3.79	−4.65	−3.79	−4.10	−2.89
CAPMF	−0.27	−1.58	−2.03	0.23	−7.25	−8.07	−7.25	−8.28	−3.64
INFRF	−0.33	−0.97	−0.93	1.91	−5.04	−5.33	−5.04	−5.31	−1.97
OTSRF	7.67	5.98	6.14	2.87	−7.53	−8.19	−7.53	−8.12	−2.07
FodBvrl	0.29	0.29	0.29	0.36	3.40	3.40	3.40	3.40	1.67
Textl	0.48	0.48	0.48	1.73	3.96	3.96	3.96	3.96	0.88
AGROMI	−0.51	−0.51	−0.51	0.51	3.03	3.03	3.03	3.03	1.05
NAGMI	−0.33	−0.33	−0.33	0.54	−1.22	−1.22	−1.22	−1.22	−2.68
CAPINF	−0.81	−0.81	−0.81	−0.07	−2.70	−2.70	−2.70	−2.70	−3.28
INFRI	0.32	0.32	0.32	1.96	3.74	3.74	3.74	3.74	−2.17
OTSRI	−0.41	−0.41	−0.41	1.90	4.42	4.42	4.42	4.42	1.36

Composite commodity demand for informal activities is equivalent to its domestic demand

is translated to rising price of cash crop. Contrary to earlier scenarios (segmented labour market-1 and non-segmentation), aggregate output and value added decline across all the sub-sectors of agriculture. CAPMF also declines; however, the fall is less than that in earlier cases. Hence, it is apparent that restricted labour mobility in one key sub-sector of the economy may hinder the growth across informal sub-sectors of the economy.

Sensitivity analysis shows that rising elasticity of substitution across various types of labour indicates higher flexibility of industries to substitute one category of labour with the other one due to exogenous change in relative wage rate (see Table 11). Hence, this study finds that agricultural and non-agricultural activities in informal sector show a positive growth with the rising elasticity of substitution (see Appendix: Tables 19 and 20) as compared to lower value (Table 10). Declining wage growth in informal labour market, with higher values of elasticity (see Table 12), give cost advantage boosting expansion in those informal activities.

Agricultural activities under recession release informal labour which moves to other growing sectors. Despite positive growth of few formal industries, composition of labour absorption varies. Employment of FRL is more than that of IRL and CL despite the higher wage in formal labour market compared to its informal counterpart. This is contrary to earlier cases where labour mobility is not restricted at the sectoral level. Rise in wages of IRL and CL makes costly to hire more informal labour. In the present situation wage rate in FRL falls drastically (Table 12). Higher responsiveness to substitute informal labour for FRL due to changing relative wage of FRL

**Table 11 Change (%) in labour demand across sectors due to 50% tariff reduction (segmented labour market-2)**

	$\sigma_j^{LD} = 0.2$			$\sigma_j^{LD} = 1.2$			$\sigma_j^{LD} = 2.5$		
	IRL	FRL	CL	IRL	FRL	CL	IRL	FRL	CL
Food crop	− 1.48		− 1.96	2.50		2.29	3.51		2.29
Cash crop	− 0.09		− 0.59	2.79		2.58	3.55		2.58
Hort. Crop	− 2.90		− 3.38	1.49		1.28	2.67		1.28
AGALD	− 0.43	4.61	− 0.92	0.46	14.01	0.25	0.50	17.33	0.25
FodBvrF	− 1.57	3.42	− 2.06	− 7.06	5.48	− 7.25	− 9.07	6.17	− 7.25
TextF	7.31	12.75	6.78	− 1.25	12.07	− 1.46	− 4.07	12.00	− 1.46
AGROMF	1.26	6.39	0.76	− 1.93	11.31	− 2.13	− 3.13	13.10	− 2.13
NAGMF	7.14	12.57	6.61	− 4.13	8.80	− 4.33	− 7.68	7.79	− 4.33
CAPMF	− 4.82	−	− 5.29	− 11.89	−	− 12.07	− 14.35	−	− 12.07
INFRF	− 3.90	0.97	− 4.37	− 8.52	3.82	− 8.71	− 10.35	4.67	− 8.71
OTSRF	8.83	14.35	8.30	− 3.41	9.62	− 3.61	− 7.18	8.37	− 3.61
FodBvrl	2.38		1.88	6.80		6.58	8.24		6.58
Textl	2.00		1.50	4.47		4.26	5.32		4.26
AGROMI	− 3.40		− 3.88	1.88		1.67	3.54		1.67
NAGMI	− 0.97		− 1.46	1.91		1.70	2.77		1.70
CAPINF	− 2.00		− 2.49	0.77		0.56	1.60		0.56
INFRI	1.08		0.59	2.50		2.29	2.83		2.29
OTSRI	− 2.92		− 3.40	2.44		2.23	4.36		2.23

‘−’ no change

allows absorbing more FRL. We can notice such trends with the increasing elasticity values despite the fact that wage rate of FRL is higher than that of both informal regular and casual labour. Informal activities including agriculture, which experience growth deceleration, retrench informal labour at the lower values of elasticity. At the latter stage with higher values of elasticity, we find increasing demand for both categories of informal labour due to their expansionary mode. Hence, comparing all the scenarios, we can argue that nature of labour absorption across activities depends, on the one hand, on nature of labour mobility and on the elasticity of substitution across various categories of labour, on the other. Change in return to sector-specific land and capital with the sensitivity analysis is furnished in Appendix Table 21.

Functional income distribution across households class shows (Table 13) that there is an improvement in income level across agricultural and informal non-agricultural wage labour households. However, sensitivity analysis shows that higher values of elasticity of substitution between IRL and CL bring down the equilibrium wage rates in both categories of labour market; this is reflected on the declining income of informal wage labour households. Declining wage in FRL brings down the income of the rural–urban formal wage labour households at the initial stage with lower elasticity of substitution; latter with the higher values of elasticity, market-determined wage rate of FRL improves despite there is an absolute fall in wage rate from the base-level scenario. This causes improvement in income of the respective formal wage labour households.

Macroeconomic indicators depicted in Table 14 show that real GDP at factor cost and market price improves despite falling trends in growth of agriculture and a

**Table 12 (Scenario A3:S1–S3) Observed change (%) in economy-wide wage rates of various categories of labour due to 50% tariff cut**

	Segmented labour market-2		
	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
Labour type	Wage rate W	Wage rate W	Wage rate W
IRL	6.93	1.68	− 0.14
FRL	− 16.48	− 8.50	− 6.14
CL	9.60	1.86	− 0.15

**Table 13 (Scenario A3:S1–S3) Observed change (%) in total income of households due to 50% tariff cut**

	Segmented labour market-2		
	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
MSA-HH	4.59	3.49	3.21
MLA-HH	4.37	3.29	3.00
AL-HH	7.64	1.60	− 0.13
Cap-HH	0.57	0.86	0.93
ROA-HH	0.84	0.90	0.90
REstb-HH	0.80	0.91	0.93
UOA-HH	0.97	0.91	0.87
UEstb-HH	0.82	0.91	0.93
RFWL-HH	− 6.86	− 1.24	0.44
RIWL-HH	7.40	1.49	− 0.12
UFWL-HH	− 6.33	− 1.14	0.43
UIrWL-HH	5.78	1.40	− 0.12
UIcWL-HH	4.49	0.94	− 0.08

**Table 14 (Scenario A3:S1–S3) Observed change (%) in various macro-indicators due to 50% tariff reduction**

	Segmented labour market-2		
	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
Govt. budget deficit/GDP*	26.76	23.61	22.67
GDP at basic price (real)	1.93	1.54	1.44
GDP at market Price (real)	1.20	0.88	0.80
GFCF/GDP*	− 12.48	− 7.61	− 6.23

Real GDP is calculated applying GDP deflator computed from SAM

\* GDP at basic price (nominal)

few non-agricultural activities. However, gross investment–GDP ratio declines across all the sensitivity analyses.

## 6 Conclusion

This study reveals that labour mobility based on the extent of labour market segmentation gives rise to varied outcomes in terms of linkages between formal–informal sectors under tariff reduction; and also, the degree of expansion amongst the growing non-agricultural sectors, both formal and informal, varies. The study found a one-to-one correspondence between the growth of the similar activities that belong to formal and informal segments of the economy due to introduction of unilateral tariff reduction under both the scenarios of segmented labour market-1 and absence of labour market segmentation. The study also found that absence of labour market segmentation (i.e. absence of wage rigidity and skill specificity) with full mobility of labour gives rise to relatively higher growth in expanding formal sector activities vis-à-vis the growth of the similar activities under segmented labour market with full mobility of labour. In case of informal sector, output growth is lower when labour market is not segmented as compared to segmented labour market. However, the growth of the expanding informal activities is further worsened due to the restriction imposed on labour mobility from capital goods industry as it reflects skill specificity; however, restricted labour mobility has highest impact on the expansion of the formal activities. Hence, the study argues that the nature of labour mobility, which depends on the structure of the labour market, has differential implication on the growth of the formal–informal sectors in India in the backdrop of trade liberalisation. This study has profound implication in relation to public policy. Cost of labour market adjustment due to trade shock is assessed by analysing changing functional income distribution across households. This study also found dwindling functional income distribution across informal non-agricultural households under both the initial scenarios irrespective of the nature of labour mobility. Although skill specificity in capital goods sector improves the functional income distribution across all the types of informal households, the functional income distribution of formal wage labour households goes down further. The findings of the study emphasise on designing appropriate social welfare schemes by the government to support specific groups of the households as a part of compensation due to introduction of structural policy through trade liberalisation.

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### Author's contributions

Author read and approved the final manuscript.

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### Availability of data and materials

Social Accounting Matrix 2003-04 (in PEP model format), is available upon request from the author.

### Competing interests

There is no competing of interest.

## Appendix

See Tables [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#).

**Table 15 CES elasticity of transformation parameter ( $\sigma_j^{VA}$ ) of value added. Source: calculation is based on the estimates provided by Pradhan and Sahoo (2008) and Goldar et al. (2013)**

Activity	$\sigma_j^{VA}$		$\sigma_j^{VA}$
Food crops	0.78	Non-agro-based industry (F)	1.06
Cash crops	0.78	Non-agro-based industry (I)	1.06
Horticulture crops	0.78	Capital goods industry (F)	0.9
Agro-allied activities	0.78	Capital goods industry (I)	0.9
Food and beverages (F)	1.09	Infrastructure services (F)	1.6
Food and beverages (I)	1.09	Infrastructure services (I)	1.6
Textile and wearing apparel (F)	0.89	Other services (F)	1.22
Textile and wearing apparel (I)	0.89	Other services (I)	1.22
Other agro-based industry (F)	0.86		
Other agro-based industry (I)	0.86		

**Table 16 Values of relevant parameters**

Description of elasticity parameters	Value
CES elasticity of substitution of composite labour	0.2/1.2/2.5
CET elasticity of transformation between local sales and exports	2
CES elasticity of substitution of composite commodity	2
Income elasticity of Consumption across commodities	0.7
Frisch parameter	− 1.5
Wage rate of formal regular labour (at the base level)	1.2
Wage rate of informal regular labour (at the base level)	1.1
Wage rate of casual labour (at the base level)	1
Rental rate across sectors (at the base level)	1
Price of local product (at the base level)	1
Price elasticity of indexed transfers and parameters	1
Exchange rate (at the base level)	1
Export price (at the base level)	1
World price of import (at the base level)	1

Parametric values are exogenously determined

**Table 17 Change (%) in household savings due to 50% tariff reduction (segmented labour market-1)**

Type of HH	$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
MSA-HH	1.59	1.60	1.60
MLA-HH	1.49	1.50	1.50
AL-HH	−0.11	−0.07	−0.06
Cap-HH	−0.34	−0.35	−0.36
ROA-HH	−0.30	−0.31	−0.32
REstb-HH	−0.31	−0.32	−0.33
UOA-HH	−0.29	−0.31	−0.31
UEstb-HH	−0.31	−0.32	−0.33
RFWL-HH	−0.95	−0.97	−0.98
RIWL-HH	−0.14	−0.08	−0.06
UFrWL-HH	−0.93	−0.95	−0.97
UIrWL-HH	0.03	−0.03	−0.03
UIcWL-HH	−0.06	−0.04	−0.03

**Table 18 (Scenario A2: S1–S3) Change (%) in export–import due to 50% tariff reduction (no segmentation labour market)**

	$\sigma_j^{LD} = 0.2$		$\sigma_j^{LD} = 1.2$		$\sigma_j^{LD} = 2.5$	
	Export EX	Import M	Export EX	Import M	Export EX	Import M
Food Crop	−2.42	4.00	−2.06	3.75	−1.92	3.66
Cash Crop	−1.01	14.09	−0.54	13.69	−0.36	13.55
Hort. Crop	−2.50	13.15	−2.14	12.92	−2.00	12.83
AGALD	−2.25	6.61	−2.02	6.50	−1.92	6.45
FodBvrF	0.02	21.92	0.06	21.89	0.07	21.88
TextF	1.18	9.84	1.08	9.87	1.04	9.88
AGROMF	0.54	6.84	0.53	6.94	0.52	6.97
NAGMF	3.21	0.38	2.87	0.62	2.74	0.72
CAPMF	3.10	9.44	2.63	10.07	2.44	10.32
INFRF	0.91	−4.58	0.70	−4.18	0.61	−4.02
OTSRF	2.77	−1.13	1.98	−0.65	1.66	−0.45



**Table 19 (Scenario A3-S2) Change (%) in quantity and price due to 50% tariff reduction (segmented labour market-2,  $\sigma_j^{LD} = 1.2$ )**

	Aggr. Output XST	VA	Com. dd Q	Dom. dd for locally prod. DD	Int. dd for com. DIT	Basic price of output PT	Price of VA PVA	Price of local prod. PD	Unit cost of pr. PP	Price of Q PC	Int. Cons. PINDEX PCI
Food crop	-0.37	-0.37	-0.13	-0.15	0.03	4.51	7.16	4.62	4.51	4.61	1.79
Cash crop	-0.09	-0.09	0.20	0.07	1.27	6.39	8.53	6.48	6.39	6.41	1.72
Hort. crop	-0.64	-0.64	-0.19	-0.49	0.24	4.56	5.41	4.64	4.56	4.49	1.30
AGALD	0.07	0.07	0.30	0.17	0.27	3.22	3.54	3.27	3.22	3.20	2.54
FodBvrf	1.16	1.16	2.48	1.20	1.05	0.19	-9.26	0.21	0.19	-0.42	2.08
TextF	3.67	3.67	3.33	2.75	3.08	-0.65	-1.91	-1.10	-0.65	-1.38	-0.21
AGROMF	0.58	0.58	1.08	0.39	1.01	-0.17	0.22	-0.26	-0.17	-0.60	-0.39
NAGMF	3.58	3.58	0.56	1.73	1.57	-3.79	-5.67	-4.65	-3.79	-4.10	-2.89
CAPMF	-0.27	-0.27	-1.58	-2.03	0.23	-7.25	-14.28	-8.07	-7.25	-8.28	-3.64
INFRF	-0.33	-0.33	-0.97	-0.93	1.91	-5.04	-10.23	-5.33	-5.04	-5.31	-1.97
OTSRF	7.67	7.67	5.98	6.14	2.87	-7.53	-9.60	-8.19	-7.53	-8.12	-2.07
FodBvrl	0.29	0.29	0.29	0.29	0.36	3.40	9.61	3.40	3.40	3.40	1.67
Textl	0.48	0.48	0.48	0.48	1.73	3.96	9.22	3.96	3.96	3.96	0.88
AGROMl	-0.51	-0.51	-0.51	-0.51	0.51	3.03	4.17	3.03	3.03	3.03	1.05
NAGMl	-0.33	-0.33	-0.33	-0.33	0.54	-1.22	6.89	-1.22	-1.22	-1.22	-2.68
CAPINf	-0.81	-0.81	-0.81	-0.81	-0.07	-2.70	5.68	-2.70	-2.70	-2.70	-3.28
INFRI	0.32	0.32	0.32	0.32	1.96	3.74	9.12	3.74	3.74	3.74	-2.17
OTSRI	-0.41	-0.41	-0.41	-0.41	1.90	4.42	4.91	4.42	4.42	4.42	1.36

**Table 20 (Scenario A3-S3) Change (%) in quantity and price due to 50% tariff reduction (segmented labour market-2,  $\sigma_j^{LD} = 2.5$ )**

	Aggr. Output XST	VA	Com. dd Q	Dom. dd for locally prod. DD	Int. dd for com. DIT	Basic price of output PT	Price of VA PVA	Price of local prod. PD	Unit cost of pr. PP	Price of Q PC	Int. Cons. PINDEX PCI
Food crop	0.66	0.66	0.78	0.76	0.80	2.02	3.52	2.07	2.02	2.06	0.49
Cash crop	0.67	0.67	0.83	0.74	1.26	2.55	3.55	2.58	2.55	2.54	0.36
Hort. crop	0.51	0.51	0.80	0.58	0.93	2.15	2.64	2.19	2.15	2.07	0.27
AGALD	0.91	0.91	1.06	0.97	0.84	1.82	2.18	1.85	1.82	1.80	1.08
FodBvrf	1.12	1.12	2.36	1.11	1.10	-0.05	-3.97	-0.06	-0.05	-0.67	0.74
TextF	2.32	2.32	2.52	1.85	2.02	-0.34	0.31	-0.56	-0.34	-0.89	-0.57
AGROMF	0.64	0.64	1.42	0.67	0.88	0.02	0.50	0.04	0.02	-0.33	-0.25
NAGMF	1.54	1.54	0.84	0.60	1.11	-2.03	-2.21	-2.48	-2.03	-2.59	-1.94
CAPMF	-0.74	-0.74	0.60	-1.57	0.33	-3.70	-6.44	-4.11	-3.70	-5.14	-2.30
INFRF	0.46	0.46	0.14	0.16	1.15	-2.62	-4.54	-2.77	-2.62	-2.76	-1.48
OTSRF	3.65	3.65	3.09	3.15	1.58	-2.84	-3.41	-3.08	-2.84	-3.05	-1.34
FodBvrl	1.04	1.04	1.04	1.04	0.93	1.83	6.36	1.83	1.83	1.83	0.57
Textl	1.34	1.34	1.34	1.34	1.65	1.58	4.28	1.58	1.58	1.58	0.00
AGROMl	0.48	0.48	0.48	0.48	1.04	2.25	3.41	2.25	2.25	2.25	0.24
NAGMl	0.81	0.81	0.81	0.81	1.09	-1.34	1.69	-1.34	-1.34	-1.34	-1.88
CAPINf	0.62	0.62	0.62	0.62	0.76	-2.05	0.93	-2.05	-2.05	-2.05	-2.26
INFRl	1.25	1.25	1.25	1.25	1.31	-0.42	0.83	-0.42	-0.42	-0.42	-1.81
OTSRl	0.58	0.58	0.58	0.58	1.26	2.50	2.92	2.50	2.50	2.50	-0.07

**Table 21 (Scenario A3:S1–S3) Change (%) in sectoral rental rate due to 50% tariff cut**

		Segmented labour market-2		
		$\sigma_j^{LD} = 0.2$	$\sigma_j^{LD} = 1.2$	$\sigma_j^{LD} = 2.5$
		Rental rate R	Rental rate R	Rental rate R
Food crop	Land	6.66	4.86	4.39
Cash crop	Land	8.40	5.25	4.43
Hort. crop	Land	4.55	3.55	3.30
AGALD	Land	3.63	3.41	3.37
AGALD	Capital	3.63	3.41	3.37
FodBvrF	Capital	− 8.29	− 4.19	− 2.98
TextF	Capital	2.12	2.74	2.92
AGROMF	Capital	0.89	1.16	1.25
NAGMF	Capital	− 2.49	− 1.18	− 0.80
CAPMF	Capital	− 14.54	− 8.84	− 7.21
INFRF	Capital	− 10.41	− 5.68	− 4.26
OTSRF	Capital	− 3.96	− 1.32	− 0.53
FodBvrl	Capital	9.90	8.00	7.38
Textl	Capital	9.81	6.79	5.85
AGROMI	Capital	3.55	3.88	3.99
NAGMI	Capital	6.56	3.51	2.46
CAPINF	Capital	4.73	2.55	1.63
INFRI	Capital	9.34	3.30	1.62
OTSRI	Capital	4.55	3.71	3.41

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**References**

- Agenor PR, Aizenman J (1994) Macroeconomic adjustment with segmented labor markets. NBER Working Paper No. 4769
- Ahluwalia MS (2002) Economic reforms in India since 1991: has gradualism worked? *J Econ Perspect* 16:67–88
- Banga R, Das A (2012a) Twenty years of india's liberalization: experiences and lessons. UNCTAD Publication, Geneva
- Banga R, Das A (2012b) Role of trade policies in growth of Indian manufacturing sector (chapter 2). In: Banga R, Das A (eds) Twenty years of india's liberalization: experiences and lessons. UNCTAD Publication, Geneva
- Boeters, S and Savard L (2011) The labour market in CGE models. CPB Discussion Paper No. 201
- Chakrabarti S (2016) Inclusive growth and social change: formal–informal–agrarian relations in India. Oxford University Press, New Delhi
- Chaudhuri S, Banerjee D (2007) Economic liberalisation, capital mobility and informal wage in a small open economy: a theoretical analysis. *Econ Model* 24:924–940
- Cornelißen T, Hubler O (2005) Downward wage rigidity and labour mobility. IZA Discussion Paper No. 1523
- Decaluwé B, Lemelin A, Maisonnave H, Robichaud V (2009) "The PEP standard computable general equilibrium model single-country, static version. PEP-1-1". Poverty and Economic Policy (PEP) Research Network, Second Revised Edition, October 2009
- Dehejia R, Panagariya A (2014) Trade liberalization in manufacturing and accelerated growth in Services in India. NBER Working Paper No. 19923
- Goldar B, Pradhan BK, Sharma AK (2013) Elasticity of Substitution between capital and labour inputs in manufacturing industries of the Indian economy. *J Ind Stat* 2:169–194
- Harrison AE, Martin LA, Nataraj S (2011) Learning versus stealing: how important are market-share reallocations to India's productivity growth. NBER Working Paper 16733
- ILO (2018) Indian Wage Report: Wage policies for decent work and inclusive growth. ILO, Geneva
- India Labour and Employment Report (2014) India labour and employment report 2014—workers in the era of globalization. Academic Foundation and Institute for Human Development, New Delhi
- Kar S, Marjit S (2001) Informal sector in general equilibrium: welfare effects of trade policy reforms. *Int Rev Econ Finance* 10:289–300
- Kotwal A, Ramaswami B, Wadhwa W (2011) Economic liberalization and Indian economic growth: what's the evidence? *J Econ Lit* 11:1152–1199

- Krishna P, Mitra D (1998) Trade liberalization, market discipline and productivity growth: new evidence from India. *J Dev Econ* 56:447–462
- Marjit S (2003) Economic reform and informal wage—a general equilibrium analysis. *J Dev Econ* 71:371–378
- Marjit S, Kar S (2009) A contemporary perspective on the informal labour Market: theory, policy and the Indian experience. *Economic and Political Weekly* XLIV, No. 14
- Marjit S, Kar S (2011a) *The outsiders: economic reform and informal labour in a developing economy*, 1st edn. Oxford University Press, New Delhi
- Marjit S, Kar S (2011b) The extended heckscher-ohlin framework with the informal sector' (chapter 7). In: Marjit S, Kar S (eds) *The outsiders economic reform and informal labour in a developing economy*, 1st edn. Oxford University Press, New Delhi
- Marjit S, Maiti DS (2005) Globalization, reform and the informal sector. WIDER Working Paper Series 012, World Institute for Development Economic Research (UNU-WIDER)
- Marjit S, Kar S, Acharyya R (2007) Agricultural prospects and informal wage in general equilibrium. *Econ Model* 24:380–385
- Marjit S, Kar S, Beladi H (2007) Trade reform and informal wages. *Rev Dev Econ* 11:313–320
- Mazumder D, Sarkar S (2008) *Globalization, Labour markets and inequality in India*. International Development Research Centre, Routledge, London/New York
- Meagher K (2013) Unlocking the informal economy: a literature review on linkages between formal and informal economies in developing countries. WIEGO Working Paper No. 27
- Murgai R, Ravallion M (2005) Employment guarantee in rural India: what would it cost and how much would it reduce poverty? *Econ Political Weekly* 40:3450–3455
- Nataraj S (2011) The impact of trade liberalization on productivity: evidence from India's formal and informal manufacturing sectors. *J Int Econ* 85:292–301
- Nayyar G (2013) Inside the Black box of Services: evidence from India. *Camb J Econ* 37:143–170
- NCEUS (2007) Report on conditions of work and promotion of livelihoods in the unorganized sector. National Commission for Enterprises in Unorganized Sector, Government of India
- NCEUS (2009) *The Challenge of Employment in India: An Informal Economy Perspective*. Volume-I, Main Report, National Commission for Enterprises in Unorganized Sector, Government of India
- NSSO (2003) Unorganised Service Sector in India 2001–02: salient features, National Sample Survey Organisation Report No. 482(57/2.345/1), Government of India
- NSSO (2007) Operational characteristics of unorganised manufacturing enterprises in India, National Sample Survey Organisation Report No. 524 (62/2.2/1), Government of India
- NSSO (2009) Service sector in India, 2006–07: economic characteristics of enterprises, National Sample Survey Organisation Report No. 529 (63/2.345/2), Government of India
- Pradhan BK, Sahoo A (2008) The impact of trade liberalization on household welfare and poverty in India. In: Cockburn J, Decaluwé B, Robichaud V, editors. *Trade liberalization and poverty: a CGE analysis of the 1990s experience in Africa and Asia*. Poverty and Economic Policy (PEP) Research Network
- Pushpangadan K, Babu MS, Balakrishnan P (2000) Trade liberalisation and productivity growth in manufacturing. *Econ Political Weekly* 35:41
- Rada C, von Arnim R (2014) India's structural transformation and role in the world economy. *J Policy Model* 36:1–23
- Ramaswamy KV (1999) The search for flexibility in Indian manufacturing: new evidence on outsourcing activities. *Econ Political Weekly* 34:363–368
- Robinson S (1989) Multi Sectoral Model. In: Chennery H, Srinivasan TN editors. *Handbook of development economics*, vol 2. North-Holland, pp 885–947
- Sen K, Saha B, Maiti D (2010) Trade openness, labour institutions and flexibilisation: theory and evidence from India, Brooks World Poverty Institute Working Paper No.123, The University of Manchester, UK
- Siggel E (2010) The Indian informal sector: the impact of globalization and reform. *Int Labour Rev* 149:93–105
- Sundaram A, Ahsan RN, Mitra D (2012) Complementarity between Formal and Informal Manufacturing in India: the role of policies and institutions. SIPA Working Paper No. 2012-1
- Taiwo O (2013) Employment choice and mobility in multi-sector labour markets: theoretical model and evidence from Ghana. *Int Labour Rev* 152:469–492
- Topalova P, Khandelwal A (2011) Trade liberalization and firm productivity. *Rev Econ Stat* 93:995–1003
- Wingender AM (2015) Skill complementarity and the dual economy. *Eur Econ Rev* 74:269–284
- Wong S (2012) Short-term macroeconomic and poverty impacts of the global economic crisis on the ecuadorian economy. [http://ecomod.net/system/files/Wong\\_EcoMod\\_March2012.pdf](http://ecomod.net/system/files/Wong_EcoMod_March2012.pdf). Accessed 21st February 2017

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