Volume 4 Number 2 September 2015 ISSN 2278-4667

The Journal of Industrial Statistics

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Central Statistics Office
Industrial Statistics Wing
Government of India

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EDITORIAL

Data provided by the *Annual survey of Industries* (ASI) have been extensively used for academic research on various facets of Indian manufacturing, besides being an important source of information for policy making for the industrial sector. While the bulk of the academic research on Indian manufacturing has been based on published ASI data, a number of studies on Indian manufacturing have been undertaken in recent years with the help of unit level data of ASI. Important issues that have been investigated using published ASI data include growth and structural change in Indian manufacturing, productivity growth, employment growth, wages and income inequality between skilled and unskilled workers, growing use of contract workers in manufacturing plants, price elasticity of demand for labour, energy and other inputs in manufacturing, and price-cost margins and energy intensity of manufacturing industries. Studies on the impact of economic reforms on Indian manufacturing have mostly been based on published ASI data. In comparison with the number of studies undertaken on the basis of published ASI data, there have been relatively much fewer studies based on unit-level data of ASI. Studies based on unit-level ASI data have investigated issues related to scale economies, substitution possibilities among inputs, inter-plant variation in technical efficiency, spatial location pattern of industries, etc.

One difficulty that researchers have been facing while using ASI data in conjunction with data on exports and imports published by the Directorate General of Commercial Intelligence & Statistics (DGCI&S) is that the product classifications used in the two data source differ vastly. This does not pose a serious problem if one wants to construct a dataset on domestic production, imports and exports for broad categories of industrial products. But, considerable difficulties are faced when such a dataset has to be constructed at a fairly disaggregated level, say at three-digit level of National Industrial Classification. A few years ago, the NPC-MS (National Product Classification for the Manufacturing Sector) was brought into use for the collection of ASI data. This has greatly improved comparability between production data obtained from the ASI and trade data obtained from the publications of DGCI&S. It is hoped that detailed studies on export orientation of Indian industries and import penetration of Indian markets of manufactures, and other trade related issues will now be undertaken by academic researchers with the availability of comparable (or, by and large comparable) data on industrial production and trade.

The current empirical literature on international trade is paying a great deal of attention to the global value chains. Studies have been undertaken on the domestic and foreign value added content in a country's exports, which has considerable significance for policy. There have been only a few studies on this aspect in the context of India. Non-availability of data on import flows to different industries is a major constraint in this regard. While input-output transaction tables showing commodity flows are being prepared by the Central Statistics Office, there is no officially published import flow matrix. Some crude approximations are being done by researchers, by proportionally allocating the imports of a particularly commodity among the user industries. Needless to say that this is at best an approximation, and if the imports of goods by different industries are properly accounted for in the commodity flow tables, these will provide useful insights for policy. The ASI data contain a wealth of information on imports of commodities being done by the industrial plants belonging to different industries. This information is still not being adequately used for the preparation of import flow matrix or for other research on import behaviour of industrial plants. Indeed, the trade related data contained in ASI has so far found very little use in academic research, although a few studies have used these data to judge how plant performance is impacted by improved access to import inputs.

Pollution caused by factories and efforts made by them for containment of pollution are important aspects on which data are needed for environmental policy making and for the computation of "green GDP". The energy data collected under ASI provides a good source of information on fuel use that can be used for estimating carbon di-oxide emissions from manufacturing. ASI also provides data on the investments made by industrial plants for containment of water and air pollution. However, at present, not enough data are collected on wastewater generation and the extent of reduction in water pollution level achieved by factories through their effluent treatment plants. If such data are collected for industrial plants under ASI, especially for large plants in water polluting industries, it will open up possibilities of carrying out valuable research on the pollution control behaviour of industrial plants.

This Journal is mandated to provide a meaningful data-based picture on the Indian industry. It also aims at being a forum for discussion on methodological aspects of data collection on Indian industries and estimation of parameters of interest. The articles contained in this issue of the Journal offer useful suggestions on methodology as well as provide a data-based picture of Indian industry. In *Measuring Outsourced Manufacturing Process in India - its Relevance in National Accounts Compilation,* Aloke Kar and Mrinal Bhaumik examine the prevalence of and changes in outsourced manufacturing processes, for which they suggest and apply some innovative methodologies. They call attention to possible presence of under-coverage, misclassification and reporting bias in the estimates of outsourcing, which according to them are likely to affect the estimates of domestic product. The paper on *Growth and Prospects of Non-farm Employment in India: Reflections from NSS data* by Jajati Keshari Parida analyses trends in non-farm employment with a particular focus on occupation, types of employment and the level of education. In *Exploring an Alternative Index of Industrial Production,* G.C. Manna proposes an alternate method of construction of the Index of Industrial Production and shows that the proposed method has certain advantages over the method currently in use. In *Trade Costs between India and the European Union*, Abhishek Gaurav and S. K. Mathur present estimates of trade costs between India and the European Union, and make an attempt to trace the inter-temporal changes in India's trade with the EU countries to the changes that have occurred in trade costs. In *Financial Structure, Financial Development and Industrial Growth: Evidence from Indian States*, Saibal Ghosh looks into the factors determining industrial growth. The growth performance across states and industries is considered. The paper shows how state and industry characteristics interact with financial characteristics to influence industry growth. The regional dimension of Indian manufacturing is studied also by Panchanan Das and Anindita Sengupta in *Wages, Productivity and Employment in Indian Manufacturing Industries: 1998-2010*. They analyze State-wise variations in growth rates in output, employment and productivity in the organized manufacturing sector with a view to indentifying structural changes. They also examine growth rates in profits and wages in manufacturing in different Indian States.

September 2015 — Bishwanath Goldar
Kolkata — Member, Editorial Board

SECTION I : ARTICLES

Measuring Outsourced Manufacturing Process in India – its Relevance in National Accounts Compilation

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Abstract

Outsourcing manufacturing processes involves three kinds of manufacturing units. The 'principals' outsource parts of or complete production process to 'contractors' or 'job work units'(JWUs), while the ownership of the physical raw materials as well as the output lies with the former. There is another category of players, called 'agents' in the present study. An agent takes delivery of raw materials from a principal and engages JWUs to get the job done. The study attempts to measure the prevalence of and changes in outsourcing activities in different non-repairing manufacturing activities, in terms of their shares in total number of units, workforce and contribution to domestic product. The estimates for the combined registered and unregistered segments of the manufacturing sector, used for this purpose, are derived from the data drawn from the Annual Survey of Industries (ASI) and the Enterprise Survey (ES) of the NSSO. Based on these estimates, representing the entire manufacturing sector, the present paper examines certain issues of relevance in the context of compilation of national accounts. It demonstrates possible presence of under-coverage, misclassification and reporting bias that are likely to affect the estimates of domestic product. It also examines the treatment of outsourced manufacturing processes in Input-Output Transaction Tables (IOTT) compilation and, as a result, likely overestimation of private final consumption expenditure (PFCE) on products of manufacturing industries featuring significant outsourcing activities. In conclusion, the paper stresses on the need of developing methods of collecting data on production and use of manufacturing services, in general, and job work, in particular, for measuring outsourcing activities in Indian manufacturing.

I. Introduction

1.1 Driven by the economic liberalisation policies adopted since the early 1990s and the modern phase of globalisation, the practice of business outsourcing has grown rapidly in the last two decades. Existing literature deals extensively on the issues of domestic businesses' growth and advantages of the foreign companies providing offshore assignments that mostly operate in the service-sector industries, such as finance, banking, information technology, and tele-communication. But, outsourcing of manufacturing processes, whether contracted within the domestic economy or with overseas parties, has so far drawn only a little attention.

1.2 Indian manufacturing is characterised by presence of a very large unorganised segment. What is even more significant is that over a third of the manufacturing sector

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workforce (Item1,*Table1*) is exclusively engaged in providing manufacturing services, which is defined as the services of transforming physical inputs owned by units other than the units carrying out the transformation. Such services of transforming supplied materials, if provided on contract by other enterprises, typically represent outsourcing of manufacturing processes. The rest of the manufacturing services are mainly carried out for direct consumption of the households.

1.3 There is a limited number of studies on production of manufacturing services in the Indian context. Banga and Goldar (2004) investigate the impact of services inputs on output growth, but it relates to only the organised segment of the manufacturing sector (registered factories) and is severely constrained by absence of data on manufacturing services input. Sahu (2007, 2011) examines the incidence and characteristic features of subcontracting firms among small and micro manufacturing enterprises, based on primary data collected through field survey and secondary data of Unorganised Manufacturing Enterprises Survey conducted in the 56th (2000-01) and 62nd (2005-06) rounds of NSSO. These studies adopt 'working on contract' as the criterion for identifying the subcontracting firms and explore the problems and prospects of such enterprises. Vishnu Kumar *et. al.* (2007), Chaudhury *et. al.* (2008) and Basole *et. al.* (2014) have identified substantial presence of manufacturing service producers (*MSP*s) in the unregistered segment of the manufacturing sector, based on respectively 56th round and 62nd round surveys of the NSSO. Vishnu Kumar *et. al.* (2007) and Chaudhury *et. al.* (2008) use a set of criteria involving receipts of service charges and absence of physical output, in addition to 'working on contract', for identifying such manufacturing service producing units, which also comprise the subcontracting firms. Vishnu Kumar *et. al.* (2007) dwells mainly with the implications of not distinguishing manufacturing services from other manufacturing activities in estimating sectoral distribution of domestic product.

1.4 The domain of all the studies cited above is confined to either the organised or unorganised segment of the manufacturing sector. Measuring the prevalence of outsourcing in India's manufacturing, on the other hand, requires a comprehensive account of the level and trend in production of manufacturing services for the manufacturing sector as a whole. In view of that, the present paper attempts to measure the share of outsourced manufacturing activities in domestic production and examines the methodological aspects relating to its treatment in compilation of national accounts aggregates relating to production and final use. The basic data used for this purpose are drawn from the Annual Survey of Industries (ASI) and the Enterprise Surveys (ES) of the NSSO covering manufacturing sector for 2000-01 and 2010-11. The pooled data from these two sources virtually represents the Indian manufacturing in its entirety[3].

1.5 Outsourcing manufacturing processes has been an established practice in India since long. At present, it is found to be quite common in both traditional as well as high-skill industries. In fact, contrary to the observed growth of outsourcing in the service-sector

[3] The ES of the 67th Round of NSSO, conducted in 2010-11, in fact excluded the manufacturing establishments belonging to the corporate sector. However, according to the Fourth All-India Census of Micro, Small and Medium Enterprises (2006-07) only a negligibly few (just about a thousand) unregistered manufacturing units belonged to private companies. (Ministry of Micro, Small and Medium Enterprises, 2008)

industries, the results of recent surveys on manufacturing industries① reflect a sharp decline in relative importance of outsourcing of manufacturing process in the first decade of the present millennium.

1.6 The indicators and ratios presented in *Table 1* reflect the changing importance of outsourcing of manufacturing processes in India. While the share of MSPs in workforce remained unchanged, that of JWUs declined sharply during the decade. Yet, the shares of manufacturing service providers (*MSP*s), in general, and job work units (*JWU*s) or *contract manufacturers*[4], in particular, in the gross value added (*GVA*) of manufacturing sector (excluding repairing services) show sharper decline during the period 2000-01 to 2010-11. Possibly, this owes mainly to shift towards relatively less remunerative activities of the un-registered *MSP* units apart from the evident decline in the share of *JWU*s in the workforce. The observed changes in material input-output ratios (Item 5, *Table 1*) may as well be attributed to changing relative prices rather than to any significant technological change. The ratio of receipts of manufacturing service charges to ***value of goods output*** (*VGO*) reflects the extent of outsourcing of manufacturing process[5]. For all non-repairing manufacturing activities, this ratio declined from 9.5% in 2000-01 to 6.6% in 2010-11.

1.7 Exploring for underlying factors for the decline in outsourcing activities is, however, beyond the scope of the present paper. Its main purpose is to bring certain measurement issues to the fore and examine their effects on estimates of national accounts aggregates. Though the level of outsourcing in manufacturing activities has been fairly low, the observed changes in its relative share may as well leave a marked effect on the growth rates of domestic production and consumption. The study in fact focuses on the three following compilation issues relating to outsourcing of manufacturing process in the Indian context:

- (i) Possible presence of reporting bias affecting GVA estimates of manufacturing activities;
- (ii) Methodological treatment of outsourced manufacturing processes in compilation of Input-Output Transaction Tables (IOTT); and
- (iii) Likely overestimation of private final consumption expenditure (PFCE) of the products for which manufacturing activities feature significant outsourcing activities.

1.8 The rest of the paper is organized as follows. Section II provides a discussion on different forms of manufacturing services and defines the terms used in the paper for different kinds of players involved in outsourcing activities. Section III lays down the exact

[4] Contract manufacturers are the units carrying out job work for other enterprises. This is discussed in some more detail in Section II.

[5] Olsen (2006) cites a number of commonly used measures of offshore outsourcing. Of these, a 'narrow' measure of outsourcing developed by Feenstra and Hanson restricts the base to only those inputs – both goods and services - that are purchased from the same industry as that in which the good is being produced. A narrower measure of offshore outsourcing that is also used is restricted to outward processing. This measure includes only the intermediate exports for processing that are re-imported. The ratio used here is a measure of outsourcing (within and outside the domestic economy) of the second kind, which includes only the value of job work, i.e. the receipts for manufacturing (processing) services provided to other enterprises, as a component of the value of goods produced by the same industry as that of the service provider.

procedure of identifying the units providing, receiving and mediating manufacturing services, while clearly indicating the data from ASI and ES used for this purpose. To assess the importance of outsourcing in the manufacturing sector, Section IV examines the roles of *principals* (those who outsource), *MSP*s, *JWU*s and *agents* (the mediating agencies) in terms of their percentage shares in the number of units, workforce and gross value added (GVA) of the manufacturing sector. Next, Section V deals with prevalence of manufacturing services providing and outsourcing in individual manufacturing activities. This is followed by a discussion, in Section VI, on the reporting bias the estimates of payment for *job work* are possibly subject to. Then, in Section VII & VIII, the main attention shifts towards methodological aspects relating to use of data in compilation of national accounts. Section VII is a critical examination of how manufacturing services are treated in compilation of Input-Output Transaction Tables (IOTT) in India. That the present treatment may lead to overestimation of private consumption expenditure (PFCE) is illustrated in Section VIII. The concluding section summarizes some of the key findings of the study and suggests the data to be collected for developing an effective method of estimating value added of the job production related activities and adjustments required to be made in the estimates of final consumption of the resulting products.

II. Manufacturing Services – different forms

2.1 Manufacturing services comprise output of those manufacturing activities that are performed on the physical inputs owned by entities other than the units providing the service. Some manufacturing services such as custom tailoring and flour milling are provided directly to consumer households. Most of the other activities, such as bidi making, manufacture of all types of textile garments and clothing accessories, weaving, manufacture of cotton and cotton mixture fabrics, of the MSPs are carried out for other businesses. Often, these constitute the outsourced part of a total production process of another manufacturing firm.

2.2 Whether provided for final use of consumer households or intermediate use of other manufacturing firms, the activity of producing manufacturing services, according to the International Standard Industrial Classification (ISIC), is included in manufacturing. The ISIC, Rev.4, (UNSD 2008) identifies three forms of 'outsourcing', namely (a) outsourcing of support functions, (b) outsourcing of parts of the production process and (c) outsourcing of the complete production process. In form (a), the *principal* carries out the core production process (of a good or a service) but outsources certain support functions, such as accounting or computer services, to the *contractor*. In such cases, the contractor is not treated as a *MSP*. In case of both the forms (b) and (c), the *contractor* is invariably treated as a *MSP*, more specifically, a *Job Work Unit*, while the *principal* outsourcing the manufacturing activity is also treated as a manufacturer, if it owns the material inputs and thereby has economic ownership of the outputs.[6]

2.3 There are several terms, such as outsourcing, offshoring, sub-contracting, contract manufacturing, job production, that relate to *manufacturing services* in the literature.

[6]The *principal* is treated as a wholesaler if the material inputs are owned by the contractors and not by the *principal*.

'Outsourcing', in its broadest sense, refers to relocation of jobs and processes to external providers regardless of whether the raw material inputs are procured by the providers or supplied by the outsourcing firm. The principal production unit (the *principal*) contracts another production unit (the *contractor*) to carry out specific functions constituting the whole or a part of the *principal*'s activity of producing a good or a service. The external providers are called 'contract manufacturers' when the contracts are for component or products for further use in its production by the outsourcing firm. *Job production* is a kind of contract manufacturing where only a part of the production process is outsourced by the outsourcing firm. Nagraj (1984) categorises all 'contract manufacturing' as 'sub-contracting', which is a type of inter-firm relationship. Under sub-contracting, typically, a large firm procure manufactured products, on contract, from one or more small firms. Often, the parent firm provides necessary raw materials to the sub-contracted firm. In the present study, only the sub-contracting with the necessary (main) raw materials supplied by the parent firm is treated as job production.

2.4 The term *principal* used in this study is for only those units that outsources manufacturing process and supplies the main raw material to the *contractors*. Two other distinct terms, viz. 'manufacturing services' and 'job work', are used in a somewhat different connotation. It is important to note that the ownership of the physical raw materials does not lie with the *manufacturing service provider* (*MSP*) but with the one receiving the service, i.e. the *principal*. 'Job work' is a subset of manufacturing service where the material transformed by the *MSP* is used for further production by the outsourcing firm. In this study, the term 'job work' is used for all kinds of contract manufacturing carried out for a *principal*, outsourcing whole or part of its production processes. The activities of providing manufacturing services for intermediate use of the *principal* is called *job work* and the unit carrying out the job work is called a *job work unit* (*JWU*). The services provided directly to households for their final consumption as well as to other enterprises for capital formation are reckoned as merely *manufacturing services* and not as *job work*.

2.5 ILO (1996) distinguishes a category of self-employed individuals as 'home workers', who are in fact *contractors*. A self-employed individual to whom a job work is subcontracted under putting-out system is called a 'homeworker'. In fact, the 'homeworker' provides manufacturing services based on the specifications of the parent enterprise, which also supplies the raw material. Though the 'homeworkers' are often required to purchase, repair, and maintain their own tools or machines, or incur expenditure for some inputs and transportation, they neither bear the cost of the main raw materials nor market the final physical output, or negotiate its price. Besides the self-employed 'homeworkers', there are small establishments who work for *principals* under putting out system. All such units are treated as *JWU*s in this study.

2.6 There is another category of players in the context of outsourcing. They play the role of middlemen between the *principals* and *JWU*s. These units take delivery of raw materials from a *principal* and engage *JWU*s to get the job done. Such intermediary units are referred to as 'agents' in the present study. The principal's payment of manufacturing service charges gets distributed to the *JWU*s through the *agents*, who in turn retain a margin. This is called agents' margin in the rest of the study.

2.7 Most often, the *principal*, *agents* and *contractors* are expected to have the same economic activity or at least vertically related activities. When the material input is provided by a *principal* to a *contractor*, whether directly or through an *agent*, the former is assigned activity code for the entire production process, while the latter the code for the portion of the production process that it undertakes. The *principal* and the *contractor*, in most cases, are therefore likely to belong to the same industry – at least at the 2-digit level of National Industrial Classification (NIC). The hierarchical way of combining the NIC codes for determining the main activity code, in case of multiple activities (CSO, 2008[a]), makes it more likely that a *principal* and its manufacturing service providing *JWU* would have the same NIC division (2-digit code).

III. Identification of Units Receiving and Providing Manufacturing Services

3.1 This study is based exclusively on data available from secondary sources of two kinds, namely unit-level data of

a. Annual Survey of Industry (ASI) 2000-01 and 2010-11; and

b. Unorganised (non-factory) sector Enterprise Surveys (ESs) of the National Sample Survey Organisation (NSSO), 56th Round (2000-01), and 67th Round (2010-11);

3.2 The data on manufacturing sector are collected through ASI, covering the registered factories, and ESs covering the unregistered manufacturing units. Thus, for the entire manufacturing sector, estimates are obtained by pooling the estimates from the corresponding ASI and ES, ignoring the slight mismatch in the reference periods of the two surveys (End note 1).

3.3 The data on payment and receipts of manufacturing service charges and expenditure on main raw material (goods) and value of goods output are required for measuring outsourcing activities. Both in the ASI and ES, these are regularly collected, but cannot always be separated from other payments and receipts of service charges. Payment of exclusively manufacturing service charges are collected separately in the ASI. The item for recording receipts of manufacturing service charges, however, also includes charges for non-industrial services, such as business, computer-related and legal services. These are not expected to be of significant proportion in most cases. Thus, in general, the entire amount of receipts for services is assumed to be manufacturing services. The validity of the assumption is, however, examined while taking closer look at a few selected groups of economic activities in Section VI.

3.4 In the ES, however, data on manufacturing service charges are not available separately. The data collected on receipts and payments are inclusive of all kinds of service charges. Thus, the estimates of manufacturing services obtained from the ES are based on assumptions, which are expected to be largely valid.

3.5 The measures of production and use of manufacturing services discussed here are based on analyses of the unit-level data of the ASIs and ESs mentioned above. Repairing services, though included in the manufacturing sector according to the NIC, is excluded ② from the purview of the present study, since repairing services are by their very nature manufacturing services. The rest of the discussion in this paper therefore concerns only the non-repair manufacturing activities.

3.6 First, it is necessary to specify the basic characteristics of the *principals*, *MSP*s, *JWU*s and *agents* that follow from the definitions discussed in Section II. The *principals*, whether outsourcing the entire or part of the production process, must report positive intermediate consumption of main raw materials (goods) and material output. In addition, it should be paying manufacturing service charges for work done by other enterprises on materials supplied by the unit.

3.7 The *MSP*s are characterised by positive receipts of income for manufacturing services provided to others and nil material output and input. Typically, they should not be paying any manufacturing service charges. The *JWU*s should have the same features and, in addition, the receipts of service charges should be from other enterprises and not households.

3.8 Like the *MSP*s, the agents are characterised by positive receipts of income for manufacturing services provided to others and nil material output and input. In addition, they should also have positive payment of manufacturing service charges for work done by other enterprises on supplied materials. .

3.9 Since the payment and receipt of manufacturing services are strictly speaking not always separable from payment and receipt for other services, the criteria adopted for the present study are set under a few assumptions that are expected to hold good in most cases. Keeping in mind the basic definitions and the data collected in the surveys, the criteria adopted for the study are discussed below.

Identification of Principals

3.10 In the ASI dataset, the establishments reporting positive material (goods) output, positive material input, and positive payment of manufacturing service charges are identified as *principals* in this study. The *principal* units in the ASI coverage are thus identified by the following criteria:

- positive goods output, i.e. VGO > 0,
- positive intermediate consumption of main raw materials or goods, i.e. $IC_{goods} > 0$, and
- positive payment of manufacturing service charges or intermediate consumption of manufacturing services, i.e. $IC_{JW} > 0$

3.11 In the ES datasets, principals are identified using similar conditions. But, as service charges paid includes payment for all kinds of services, a more restrictive additional condition on intermediate consumption of manufacturing services (expenses on job work) is included for identification. In the ES dataset, the criteria adopted for identifying the *principals* are thus as follows:

- VGO > 0,
- $IC_{goods} > 0$,
- $IC_{JW} > 50\%$ of the expenses other than on raw materials. and
- nil receipts of manufacturing service charges, i.e. $GVO_{MS} = 0$.

3.12 In fact, the cut off 50% is arbitrarily set, in absence of any other auxiliary information about the kind of services actually purchased.

Identification of Manufacturing Services Producing Units (*MSP*s)

3.13 The criteria used by Vishnu Kumar *et. al.* (2007) for identification of *MSP* establishments from the data set of the ES'56 are also used for the present study in a slightly modified form. The establishments reporting no material (goods) output, no material input, positive receipts of service charges and no payment of service charges are taken as the establishments engaged solely in production of manufacturing services. In the ES dataset, the criteria adopted for identifying the *MSP*s are thus as follows:

- VGO = 0,
- $IC_{goods} = 0$,
- $IC_{JW} = 0$, and
- $GVO_{MS} > 0$.

3.14 Clearly, the estimates based on these criteria would be conservative ones, as there would also be other units providing manufacturing services.

Identification of JWUs

3.15 Registered factories covered in the ASI are not expected to provide manufacturing services directly to the households. Thus, all units providing manufacturing services are assumed to be *JWU*s. In the ASI datasets, the *JWU*s are identified simply by

- VGO = 0,
- $IC_{goods} = 0$,
- $IC_{JW} = 0$,
- $GVO_{MS} > 0$

3.16 On the other hand, many of the *MSP*s covered in the ES directly serve the households. Identifying the *JWU*s consists of distinguishing the *MSP*s serving other businesses.

3.17 The criteria used for identification of *JWU*s in the ES dataset are as follows:

- VGO = 0,
- $IC_{goods} = 0$,
- $IC_{JW} = 0$,

- $GVO_{MS} > 0$
- having prior marketing agreement with other units
- other units provide raw material and
- the unit has no secondary activity.

3.18 The last three conditions are used for identifying the job work units from among those providing manufacturing services, either to households or businesses. The units receiving raw materials from other units, with whom it has prior marketing agreement, in most cases would be job work units. To ensure that they do not provide any services other than manufacturing services, the condition of 'no secondary activity' is included.

Identification of Agents

3.19 Agents have the distinguishing feature of both provider and recipient of manufacturing services. Thus, for both ASI and ES datasets, the criteria used for identification of *JWU*s are as follows:

- $VGO = 0$,
- $IC_{goods} = 0$,
- $IC_{JW} > 0$,
- $GVO_{MS} > 0$.

IV. Contribution of Outsourcing Activities in Domestic Product

4.1 The estimates presented in *Table 2* relate to units engaged either in production of manufacturing services or providing *job work* to other units.[7] These are obtained using the criteria of identifying the units playing different roles in outsourcing activities set out in the preceding section. According to these criteria, only those exclusively engaged in production of manufacturing services are identified as *MSP*s. Evidently, there would be establishments providing manufacturing services as well as producing goods output on their own accord. In absence of a separate code for manufacturing services and provision for separately recording receipts from manufacturing services in the ASI and ES schedules of enquiry, these could not be identified. Thus, the estimates of *MSP*s and their workers presented in *Table 2* should be regarded only as lower limits.

4.2 In spite of this, *Table 2* reveals that about a half of the non-repairing manufacturing establishments have been solely engaged in production of manufacturing services during the first decade of the millennium. During this period, their share in non-repairing manufacturing sector employment has remained just over one-third. Characteristically, the *MSP*s are small and are run without hired workers. Thus, they are more common in the

[7] The estimates of GVA, in nominal terms, shown in the table are survey estimates and are different from those presented in the National Accounts Statistics (NAS) published by the CSO. In the NAS, while the estimates for the registered segment are based on the ASI results, those for the unregistered segment are derived using results of the ES 2005-06 of the NSSO and the Fourth All India Census on Micro, Small and Medium enterprises, 2006-07 released by the Office of the Development Commissioner. (CSO 2012[a])

unorganised (unregistered) segment of the manufacturing sector and have a share of over a third in the GVA of unorganised manufacturing. It is seen that *MSP*s are also found among the registered establishments, though in a much smaller proportion. By assumption, all these carry out job work, i.e. work for other businesses and do not directly serve the households.

4.3 The organised and unorganised segments taken together, the *JWU*s constitute over a third of the *MSP*s and have a share of over a half in the GVA of the *MSP*s in 2010-11. The table reveals that there were about 26%, i.e. about 9.5 million, workers engaged in job work in unorganised non-repairing manufacturing in 2000-01. Most of them, being own-account workers, ought to be considered as 'home workers' as defined by the ILO. Based on the Employment and Unemployment Survey, NSSO 55th round (1999-2000), the National Commission for Enterprises in the Unorganised Sector NCEUS (2007) arrived at an estimate of 7 million home workers for 1999-2000. This evidently conforms well with the estimate of workers engaged in job work obtained in the present study, given that some job work is also carried out in unorganised manufacturing enterprises run by employers.

4.4 The *principals*, who provide the *JWU*s with job work assignments, are naturally more common among the registered units. More than a fourth of the registered units are found to outsource production process. In the entire non-repairing manufacturing, the *principals* have a close to 50 per cent share of the GVA. The *agents*, through whom the *principals* distribute the job work to the *JWU*s, too have a significant presence. About 5 per cent of the manufacturing workforce is engaged in intermediation of job work distribution.

4.5 An observation of significance that can be readily made from the table is that while there was little change in the share of *MSP*s in the number of non-repairing manufacturing units and their workforce, there was a drastic fall in their share in the GVA – from about 12% in 2000-01 to just 4.5 % in 2010-11. But, at the same time, the share of the *principals* in the non-repairing manufacturing GVA moved up from 34% in 2000-01 to 46% in 2010-11, with their share in the workforce showing a small upward change. These are issues that deserve further investigation. What is relevant for the present study is that the increasing share of *principals* in the non-repairing manufacturing GVA reflects growing dependence of the entire manufacturing sector on outsourcing of manufacturing process.

V. Outsourcing in Different Industries

5.1 Outsourcing of manufacturing processes is more common in certain specific industries. In addition, there are activities in which large amount of manufacturing services are produced for direct consumption of the households. The specific non-repairing manufacturing activities in which the activity of outsourcing is carried out predominantly can be identified from the pooled data of ASI and ES. *Table 3* presents the estimates of service charges paid and received as percentage of the value of goods output (*VGO*) for the economic activities (at 5-digit level of NIC) with high participation (either as *principals* or *JWU*s) in outsourcing activities as well as providing manufacturing services directly to the households in 2010-11.

5.2 For working out the ratios given in the table, the service charges paid by the *principal* unregistered units and all 'payments for work done by other units on materials supplied' by the outsourcing registered units is taken as payment for manufacturing services. On the receipts side, service charges received by all registered units and those received only by the unregistered *MSP*s are considered for computing the ratios. All the ratios are presented as percentages of the value of goods output of the respective segments. The payment-related ratio is an indicator of relative level of outsourcing involved in carrying out an economic activity.

5.3 Of the activities listed in the table, the activities, such as custom tailoring, and flour milling (*aata chakkis*), are carried out mainly for direct final consumption of the households. Among the rest, the *MSP* units pursuing activities like manufacture of all types of textile garments and clothing accessories, weaving, manufacture of cotton and cotton mixture fabrics, manufacturing match boxes and diamond cutting and polishing and other gem cutting and polishing are mostly carried out as job work for other businesses. For many of these activities, however, the *MSP*s serve both the households and businesses. For instance, the activities of embroidery and *zari* work, knitted and crocheted cotton & woollen fabrics, jewellery making, making wooden furniture, are carried out both as job work for other manufacturing units as well as for direct consumption of the households.

5.4 Typically, registered *principals* outsource manufacturing processes to the *JWU*s, who are mostly unregistered. Thus, the ratio of manufacturing service charges received to *VGO* is mostly much higher for unregistered units in the industries where outsourcing is common. For instance, the unregistered units engaged in '*bidi* making', being mostly *JWU*s, do not have much physical output but large receipts for manufacturing services they provide. The *Bidi* making factories account for most of the physical output and thus the payment-related ratios are relatively high for registered units. The higher payment-related ratio for the unregistered units, in this case, owes to substantial presence of agents, who are mostly unregistered. There are, however, registered units carrying out job work.

5.5 Evidently, most of the receipts and payments for most of the job work are expected to be transacted within the industry (5-digit level NIC) or within the vertically-related manufacturing activities. There are, however, a few activities like manufacturing of wooden agricultural implements, hand tools for agricultural/horticulture and structural wooden goods, for which job work are carried out for capital formation in non-manufacturing industries.

VI. Reporting Bias in Manufacturing Services Data

6.1 *Table 3* reveals that the ratio of manufacturing service charges receipts to *VGO*, pooled over registered and unregistered non-repairing manufacturing, is higher than that of the payment to *VGO* ratio for most of the industries (5-digit level NIC). This raises the issue of incomplete coverage of *principals* in the ASI and ES. It is evident from the way they are worked out, the payment-related ratio is not expected to be seriously affected by non-inclusion of manufacturing service charge payments. The receipt-related ratio, on the other hand, is expected to be affected by the approximations made in determining manufacturing service charge receipts. The receipts of manufacturing service charges for the unregistered segment include those of only the units engaged solely in production of manufacturing services and, thus, are likely to be on the lower side. On the other hand, the receipts considered for the registered segment include receipts for non-industrial services like financial, legal and business consultancy services as well. However, since the establishments registered as factories are rarely involved in providing such non-industrial services, the measure used for receipts of manufacturing service charges in the study, if at all affected by over inclusion, is not expected to be much on the higher side.

6.2 Notwithstanding the approximations, the estimates of receipts for manufacturing services (GVO_{MS}) ought to be close to the sum of estimates of their uses, namely intermediate consumption within ($IC_{JW\text{-}WI}$) and outside ($IC_{JW\text{-}OI}$) the industry and their final use (FU_{MS}). The last term includes final consumption, capital formation and net exports. As both the ratios have *VGO* as the base, the difference between the two owes to difference between GVO_{MS} and $IC_{JW\text{-}WI}$.

6.3 As expected, the difference between the two estimates for industries like custom tailoring (NIC 14105)[8], flour milling (NIC 10611), *zari* work (NIC 13992) and jewellery making (NIC 32111) is very high, since the manufacturing services produced in these industries are mostly consumed by the households. For manufacture of builders' carpentry (NIC 16229) & structural wooden goods (NIC 16221) and agricultural implements (16293), the manufacturing services are mainly used respectively by construction industry and farmers for capital formation and thus have a large difference between the two ratios. Further, the difference noted for diamond cutting industry (NIC 32112) can be explained by presence of unregistered units in significant number who carry out job work for overseas firms.

6.4 These apart, for most of the industries with high prevalence of *MSP*s, the difference is inexplicably high. Needless to say, the manufacturing services are not likely be transacted only between units belonging to narrowly-defined (5-digit level NIC codes) non-repairing manufacturing industries. The narrowly-defined industries can, however, be clubbed to form broader groups of industries that transact manufacturing services only within themselves. For example, the industry group "Manufacture of glass bangles" (NIC 23106) has a manufacturing services receipt to VGO ratio as high as 32.4% while the manufacturing services payment by the units of this industry is found to be nil. According to the ES'67 results, there is a large number of *MSP*s engaged in making glass bangles. But, no *principal* with this NIC code is captured in the sample of ASI 2010-11 or ES'67. The *principals* contracting job work may quite likely be engaged in other vertically-related industries. It should be possible to define a "closed" group of 5-digit level NIC codes for manufacturing activities that includes glass bangles making and within which all the payments and receipts for job work are made. Henceforth, such sets of 5-digit level NIC codes are called 'closed groups'.

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[8]By definition 'custom tailoring' includes only the activities of making and altering dresses according to individual specifications or needs. Custom tailoring units are therefore expected to be small unregistered units serving only the households. The ASI data show presence of a few factories carrying out custom tailoring, some of which get job work done by others. The ES data also indicate presence of *principal* and *agent* unregistered units in custom tailoring. These as it appears should be assigned the NIC code '14101' for garments making and not that for custom tailoring.

6.5 Even for 'closed groups', the difference between the two ratios are found to be too high to explain. ***Table 4*** shows the order of difference between the estimated receipts and payments for job work for a few selected identifiable 'closed groups'. The 'closed groups' presented here are, however, for illustration and are not claimed to be perfectly closed.

6.6 The estimates of payments presented in col.(5) of the table, besides the payments made by the *principals,* include those paid by the *agents* net of their receipts. Thus, the negative payment figure for the group 'Jewellery and precious stone work' indicates that presence of agents who receive contracts from overseas firms and get job work done by local *JWU*s. In case of 'carpets and floor coverings', the entire receipts for manufacturing services may actually be for job work. Some of the job work receipts might have been unduly excluded owing to the criteria adopted for identifying *JWU*s. Thus, the receipts and payments, in this case, appears to be fairly well balanced.

6.7 For the rest of the groups, receipts for job work by far exceed the payments. The reasons for the observed differences can be attributed to the following:

(i) Misclassification: The 'factory-less manufacturers', as the *principals* who do not undertake any manufacturing activity on their own accord are often called, may be erroneously assigned codes for trading activity.

(ii) Under-coverage of *principals*: The factory-less manufacturers may altogether have been missed in the surveys of unregistered manufacturing. For instance, the producers of branded shirts or shoes, may only have office establishments that manages the supply-chains, job work allocations and distribution of the final products to retail outlets. These, by definition, should be recognised as *principals,* but in all likelihood are prone to under-enumeration during field work of the surveys.

(iii) Under-reporting of outsourcing activities: This may be caused by the tendency of under-reporting of outsourcing activities by the *principals* to evade legal provisions. Evidently, the estimates on outsourcing in case of *bidi* making are seriously affected by such under-reporting. This may also be caused by *principals* misreporting service charges paid as labour cost.

VII. Treatment of Manufacturing Services in SUTs and IOTTs

7.1 In the framework of the System of National Accounts (SNA), Supply-Use Tables (SUTs) is the first set of global tables from which the rest of the national accounts statistics, including Input-Output Transaction Tables (IOTTs), is recommended to be derived. This captures all transactions in goods and services and helps in verification and reconciliation of the estimates as well as estimating the missing values. The SUTs are founded on commodity balance identity involving estimates of production and imports on the supply-side and those of intermediate and final consumption, investment in fixed capital and inventories, and exports on the uses-side. This identity, in fact, holds good for each individual goods and services. In its general form, the commodity balance identity is as follows:

$$GVO_{mp} + M = \text{supply} \equiv \text{use} = IC + PFCE + GFCE + GFCF + CII + \textit{acquisition } \underline{\textit{less}} \textit{ disposal of valuables} + X$$

where

GVO_{mp}	Gross value of output at market prices
IC	Intermediate Consumption
$GFCF$	Gross Fixed Capital Formation
CII	Change in Inventories
GCF	Gross Capital Formation (= $GFCF + CII$)
$GFCE$	Government Final Consumption Expenditure
$PFCE$	Private Final Consumption Expenditure
M	Imports (valued at *fob* without import duties)
X	Exports

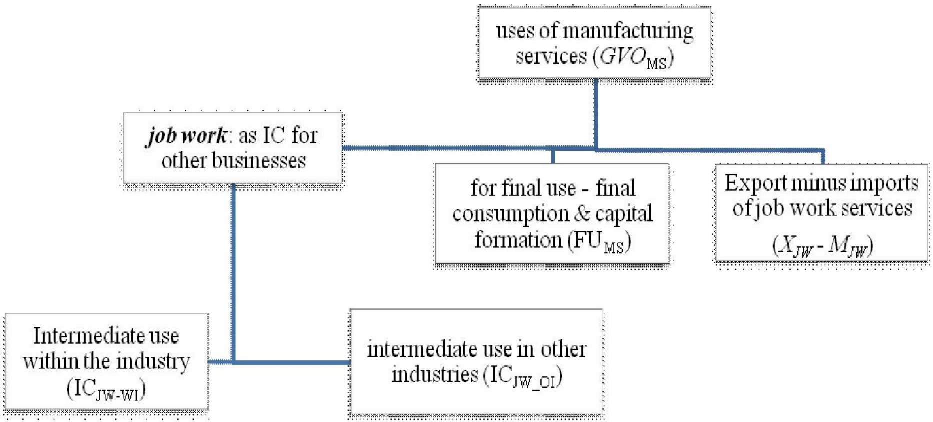
7.2 There could be as many commodity balance identities as the number of distinct products (goods and services) or product categories used in national accounts compilation. In most cases, the manufacturing services are not used for acquisition of valuables. Thus, ignoring the 'valuables', the commodity balance identity reduces to

$$GVO_{mp} \equiv IC + PFCE + GFCE + GCF + (X - M)$$

7.3 For the discussion on manufacturing services in what follows, it is necessary to distinguish between production of 'goods' and 'services', particularly from the standpoint of the various uses of 'manufacturing services'. Primarily, the gross value of output at *basic price* (GVO_{bp}) can be divided into output of manufacturing services (GVO_{MS}) and output of goods and other services (henceforth the symbol VGO is used to denote goods output plus output of services other than manufacturing services at basic prices), both the components valued at basic prices. Symbolically,

$$GVO_{bp} = VGO + GVO_{MS}$$

7.4 Manufacturing services are used both by the households (mainly for final consumption) and businesses (mainly for further production). Thus, for a particular industry (a 5-digited NIC code or a group of such codes), assuming exports and imports of manufacturing services for direct use of households to be negligible, the uses of GVO_{MS} can be classified as follows:



7.5 For ease of expression, henceforth (X_{JW} - M_{JW}) is combined with final use of manufacturing services and denoted as FU_{MS}. Thus, for a particular industry (a 5-digited NIC code or a group of such codes), the identity for the manufacturing services takes the following form:

$$GVO_{MS} \equiv IC_{JW\text{-}WI} + IC_{JW\text{-}OI} + FU_{MS}$$

ignoring direct final use of manufacturing services produced abroad by the residents and that produced in the domestic economy by non-residents.

7.6 The ASI and ESs provide estimates of gross value of output at basic prices. At market prices, gross value of output is written as follows:

$$GVO_{mp} = VGO + GVO_{MS} + \text{product taxes} - \text{product subsidies.}$$

7.7 The datasets of ASI 2010-11 and ES'67 reveal that the *MSP*s and agents do not pay any product tax (i.e. excise duty, VAT, sales tax etc.) or receive any subsidy. The difference between GVO_{bp} and GVO_{mp} thus owes entirely to product taxes (*minus* subsidies) charged on the *VGO*. In view of this, the gross value of output at market prices can be written as

$$GVO_{mp} = (1+T).VGO + GVO_{MS}$$

or $$GVO_{mp} = (1+T).(VGO_{WI} + VGO_{OI}) + GVO_{MS}$$

where T is the average rate of (product taxes *minus* product subsidies) and sub-scripts 'WI' and 'OI' denotes within industry and outside industry respectively.

7.8 Now, denoting goods output for final use by $FU_{GO,}$ the supply use identity for the goods output is

$$(1 + T).\ VGO \equiv (1 + T).\ VGO_{WI} + (1 + T).\ VGO_{OI} + (1 + T).\ FU_{GO}$$

and the sectoral output at market prices can be written as

$$(1+T).VGO - (1+T).VGO_{WI} + GVO_{MS} - IC_{JW\text{-}WI}$$

which should be same as outside -industry use

$$(1 + T).\ VGO_{OI} + (1 + T).\ FU_{GO} + IC_{JW\text{-}OI} + FU_{MS}$$

7.9 This is the amount available for intermediate consumption and final use in other industries and households. What needs to be taken special note of is that the sectoral output excludes within-industry intermediate consumption of manufacturing services.

Treatment of Manufacturing Services in IOTTs

7.10 Treatment of manufacturing services in compilation of Input-Output Transaction Tables involves issues relating to balancing the supply and uses sides discussed above. Derivation of the Commodity x Commodity Input-Output (CxC I-O) Table involves separating the output and inputs associated to the by-products and joint products from those of the main product of an I-O sector and transferring them to the I-O sector to which they characteristically belong. Vishnu Kumar *et. al.* (2007) points towards a possibility of introducing severe inconsistencies in IOTTs, if the standard methods of separating data on output and associated inputs of main and secondary products (UN 1999) are not applied appropriately.

7.11 For compilation of IOTTs in India, manufacturing services are treated as secondary product of all individual I-O sectors of manufacturing industries and are clubbed with different kinds of services in an I-O sector called 'other services'. While deriving the Commodity x Commodity (CxC I-O) matrices of IOTTs for 1993-94 and 1998-99 (CSO 2000, CSO 2005), all payments and receipts of commission and service charges for job work are treated respectively as input and output of I-O sector '114', i.e. 'other services'. In these IOTTs, the I-O sector '114', as a group of industries, is constituted of real estate, religious, legal, recreation and entertainment, domestic laundry, cleaning and dying, barbers and beauty shops and other personal services, sanitary services etc., wrapping packing and filling of articles and information & broadcasting services. Separating output and associated input of manufacturing services from manufacturing and transferring them to "other services" is based on the "industry technology" assumption (inputs are consumed in the same proportions by every product produced by a given industry), while manufacturing services are produced without the main raw materials input. Vishnu Kumar ***et. al.*** (2007) observe that the input structure of the ***MSP*** units is characteristically different from that of the entire manufacturing sector.

7.12 The IOTTs compiled for 2003-04 (CSO 2008) and 2007-08 (CSO 2012) exhibit considerable improvement over the earlier IOTTs. For instance, the unduly high ratio of PFCE to GVA for 'other services' in IOTT 1993-94 has come down to a reasonable level in IOTT 2007-08 (***Table 5***). The number of I-O sectors has increased to 130 sectors, as against 115 in 1998-99 IOTT. The I-O sector "Other Services" (Sector114) of the IOTTs of 1993-94 and 1998-99 are now disaggregated into seven separate I-O sectors[9]. The one designated as sector 129 is called 'other services' in the last two IOTTs and includes only (a) sanitary services, (b) recreation & entertainment, (c) radio & TV broadcasting services (d) international and other territorial bodies and (e) services not elsewhere classified.

7.13 Besides the disaggregartion of the 'other services' I-O sector, the treatment of manufacturing services seems to have undergone significant modification in the latter IOTTs. In the description of use of data available from the ASI for IOTT compilation, CSO (CSO 2008) states that the value of 'work done by others on materials supplied ...' and that of 'income from services' are allocated to 'other services' sector in the input and output flows respectively. Thus, manufacturing services are all treated as 'services not elsewhere classified'. This again poses the problem of determining the input structure of the sector, which also includes a wide variety of services other than manufacturing services.

7.14 That the values of manufacturing services (as a part of 'work done by others on materials supplied ..' and that of 'income from services') are allocated to 'other services', however, is not reflected in the Make Matrix I-O table of 2007-08. In IOTT 2007-08, most of

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[9] The "other services" sector of IOTT 1998-99 has now been separated into the following seven sectors: "Business Services" (Sector 123), "Computer related Services" (Sector 124), "Legal Services" (Sector 125), "Real Estate Services" (Sector 126), "Renting of Machinery & Equipment" (Sector 127), "Other Community, Social & Personal Service (Sector 128) and "Other services" (Sector 129).

the figures in the column for I-O sector 129 for Manufacturing I-O sectors are rather low, as compared to those of IOTT 1993-94. In fact, in IOTT 2007-08, these are too low to represent the manufacturing services produced as by-product of the manufacturing I-O sectors. For instance, for the sector 'tobacco products', which includes 'manufacture of *bidi*' that has a very high manufacturing services to *VGO* ratio, there is no value in the column for I-O sector 'other services' in the Make Matrix of 2007-08. The Make Matrix I-O table of 1993-94, on the other hand, show significant positive value in the corresponding entry. The figures presented in *Table 5* illustrates that the treatment of manufacturing services has been modified significantly in the latter IOTTs..

7.15 The ratios derived from CxC I-O Table 2007-08, presented in *Table 5*, are based on two different definitions of 'other services'. The "new' definition refers to the one adopted for IOTT 2007-08 and the "old" refers to that adopted for IOTT 1993-94, which consists of seven I-O sectors of IOTT 2007-08. Evidently, ratios worked with 'old' definition for IOTT 2007-08 are comparable to those of IOTT 1993-94. All the ratios presented in the table have GVA of 'other services' as the base, since, unlike GVO, GVA of a group of economic activities is invariant to splitting into or merging of its sub-groups.

7.16 What is most striking about the comparable ratios in cols. (3) & (4) of *Table 5* is that the value of 'other services' produced by the Manufacturing I-O sectors differ significantly between the two IOTTs. While the comparable ratios for the intermediate consumption of 'other services' in Manufacturing I-O sectors are by and large of similar order in the two IOTTs, that for GVO of 'other services' in Manufacturing I-O sectors in IOTT 2007-08 (as per "old" definition) is by far lower than that of IOTT 1993-94. This and the observation made from the Make Matrices suggest that the GVO_{MS} produced in individual manufacturing I-O sectors is not appropriately included in its intermediate consumption.

VIII. Is Private Final Consumption Expenditure (PFCE) overestimated?

8.1 The CSO's follows the "commodity flow" approach for deriving estimate of *private final consumption expenditure*. This approach consists of obtaining the quantum and value of different commodities flowing finally into the consumption process of the households and the private non-profit institutions serving households (NPISHs), from the quantum and value of the commodities produced and available during the accounting year. Generally speaking, in this approach, the following are netted out from the quantum and value of the total output of a commodity or a commodity-group to arrive at the estimate of its *net availability* in the domestic economy:

(i) The part used up in the process of further production (*intermediate consumption*),

(ii) Change in stocks and

(iii) Exports net of imports.

An amount is also discounted for the wastage of agricultural produce.

8.2 Having thus arrived at the estimate of *net availability*, the part used for capital formation and that used by the general government administration for current consumption are deducted from it to arrive at the commodity-wise estimates of the quantum and value of *private final consumption expenditure* (PFCE) at current market prices.

8.3 Thus, by commodity-flow approach, the private consumption expenditure of a commodity ought to be derived as

$$PFCE = \{(1+T).VGO - (1+T).VGO_{WI} + GVO_{MS} - IC_{JW\text{-}WI}\} - \text{(intermediate use of goods \& services in other industries)} - GCF - (X - M)$$

8.4 Clearly, if the within-industry intermediate consumption of manufacturing services, $IC_{JW\text{-}WI}$, is not deducted from the value of output – of both goods and services - of the associated industry, there is a possibility of overestimating *PFCE*. While working out the net availability of a commodity, CSO considers only its physical output. But, the procedure followed for estimating gross value of output for unregistered manufacturing [CSO 2012[a]] does not seem to have provision of distinguishing output of goods and manufacturing services. Thus, in absence of proper accounting of associated manufacturing services, there remains the possibility of arriving at an inflated figure of PFCE.

8.5 The possible impact of improper reckoning of within-industry intermediate use of manufacturing services while working out sectoral output on PFCE estimates is examined in *Table 6*, for a few selected ‘closed groups’. For each of the ‘closed groups’, col. (2) is derived from the pooled data of ASI 2010-11 and ES’67. The within-industry intermediate consumption to GVO and PFCE to GVO ratios, given in cols. (3) & (4), are worked out from the CxC I-O Table 2007-08. Likely over-estimation of PFCE, given in col.(5), is worked out as the ratio of col.(2) to col.(4) – expressed in percentages – under the assumption that the within-industry intermediate consumption of manufacturing services ($IC_{JW\text{-}WI}$) has been unduly included in the net availability owing to its improper treatment of manufacturing services in compilation of IOTT. The last column provides the percentage differences between the discrepant estimates of private final consumption – those obtained from Household Consumption Expenditure Survey of NSSO set against those from NAS - for the year 2004-05 (CSO 2008[b]). The figures in col.(5) indicate how much of the percentage difference between NSSO and NAS estimates of private final consumption given in col.(6) may possibly owe to inappropriate treatment of manufacturing services in compilation of NAS. Needless to say, the ratios in cols. (2), (3) & (4) are assumed to change little in the short run.

8.6 The ratios in cols.(2) & (3) for tobacco products and carpets & other floor covering clearly indicates that the IC_{WI} does not include $IC_{JW\text{-}WI}$. Thus, if in the process of compilation the manufacturing services produced in these industries are included in the GVO, the PFCE estimates would certainly be overestimated. This warrants a critical review of the IOTT compilation procedure for manufactured products, which, in turn, is expected to reduce the difference between the two sets of estimates.

IX. Concluding Remarks

9.1 The practice of outsourcing manufacturing processes in India is undergoing rapid change. In fact, the results of recent surveys on manufacturing industries reflect a sharp decline in the share of *JWU*s in the workforce and GVA of manufacturing sector during the first decade of the present millennium. At same time, the increasing share of *principals* in the non-repairing manufacturing GVA reflects growing dependence of the entire manufacturing sector on outsourcing of manufacturing processes.

9.2 The Committee on Unorganised Sector Statistics, in its report (National Statistical Commission, 2012), emphasised the need for data to understand and gauge the links between the formal and informal sector. The Committee noted that the phenomenon of outsourcing by manufacturing firms for industrial products to smaller firms constitute the links between the registered and unregistered manufacturing sector and recommended compilation IOTTs for the latter. Compiling IOTTs for the unregistered units from the available data sets would require assumptions of the kind made in the present study.

9.3 One way of representing the manufacturing services in the Input-Output Transaction Tables could be to treat the manufacturing services exclusively as a separate I-O sector. While compiling the IOTTs with manufacturing services as a product, produced as a bye-product in the manufacturing I-O sectors, the receipts for manufacturing services of k^{th} industry, $GVO_{MS}(k)$, ought to be included in the column for manufacturing services in the Make Matrix and $IC_{JW\text{-}WI}(k)$ as intermediate consumption of manufacturing services in the Absorption Matrix.

9.4 This warrants greater attention towards collection of data relating to outsourcing and adequate care in using the data for compilation of national accounts. Evidently, there are establishments providing manufacturing services as well as producing goods output on their own accord. In absence of a separate provision for recording manufacturing services and provision for recording receipts from manufacturing services in the ASI and ES schedules of enquiry, these are at present not clearly identifiable. Thus, for clearer understanding of outsourcing activities in manufacturing sector, it is necessary to collect data separately for the manufacturing services.

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***Table 1*: Indicators Relating to Outsourcing in Non-repairing Manufacturing Sector - Changes during last decade**

Indicators	**2000-01**			**2010-11**		
	registered	**un-registered**	**all**	**registered**	**un-registered**	**all**
1. Percentage share of *MSP*s in workforce	4.6	42.0	**35.5**	3.8	44.0	**33.8**
2. Percentage share of *JWU*s in workforce	4.6	26.0	**22.3**	3.8	17.3	**13.9**
3. Percentage share of *MSP*s in GVA	1.8	37.2	**11.8**	2.0	33.0	**4.5**
4. Percentage share of *JWU*s in GVA	1.8	23.8	**8.0**	2.0	9.7	**2.6**
5. Material input to VGO ratio	0.75	0.70	**0.74**	0.81	0.73	**0.80**
6. Percentage share of imports in raw material input	27.3	neg.	**22.0**	42.4	neg.	**38.7**
7. Service charges receipts to VGO ratio (%)	5.3	30.3	**9.5**	4.1	39.1	**6.6**
8. Service charges payments to VGO ratio (%)	2.3	3.8	**2.6**	1.7	2.4	**1.8**

***Table 2*: Percentage Shares of Outsourcing-related Units in Employment and Gross Value Added of Non-repairing Manufacturing - Changes during last decade**

	Parameter	**2000-01**			**2010-11**		
		registered	**un-registered**	**all**	**registered**	**un-registered**	**all**
All non-repairing Manufacturing Establishments							
1	Number of establishments (000)	161	17012	17173	190	16786	16976
2	Number of workers (000)	7722	37050	44772	11510	33871	45381
3	Gross Value Added (Rs. 000 Crores)	154	60	214	1554	140	1693
Non-repairing Manufacturing Service Producing (MSP) units							
4	Number of establishments (%)	6.2	48.6	48.2	6.3	53.2	52.6
5	Number of workers (%)	4.6	42.0	35.5	3.8	44.0	33.8
6	Gross Value Added (%)	1.8	37.2	11.8	2.0	33.0	4.5
Non-repairing Manufacturing Service Producing job-work units (JWU)							
7	Number of establishments (%)	6.2	26.6	26.4	6.3	19.5	19.3
8	Number of workers (%)	4.6	26.0	22.3	3.8	17.3	13.9
9	Gross Value Added (%)	1.8	23.8	8.0	2.0	9.7	2.6
Non-repairing Manufacturing establishments providing job-work assignments- Principals							
10	Number of establishments (%)	24.8	3.3	3.5	28.9	0.9	1.0
11	Number of workers (%)	45.8	4.1	11.3	51.2	1.4	14.0
12	Gross Value Added (%)	44.8	5.5	33.8	50.1	2.1	46.2
Agent units for job-work assignments							
13	Number of establishments (%)	1.9	5.8	5.7	2.1	3.8	3.8
14	Number of workers (%)	1.4	6.9	6.0	2.3	5.8	4.9
15	Gross Value Added (%)	1.1	9.0	3.3	1.2	8.7	1.8

***Table 3*: Service Charges to Goods Output Ratios for Non-repairing Manufacturing Industries with High Prevalence of *MSPs* in 2010-11**

Sl. No.	NIC 2008 code	Industry description (Manufacturing)	Ratio of receipts and payments for manufacturing services to goods output (%)					
			Payment			Receipts		
			Registered	Unregistered	Entire sector	Registered	Unregistered	Entire sector
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	14105	Custom tailoring	2.5	1.6	**1.7**	35.1	1096.4	**1027.0**
2	12002	Manufacture of *bidi*	20.0	31.1	**21.3**	3.9	457.4	**58.3**
3	10611	Flour milling	0.2	0.0	**0.2**	1.4	241.6	**23.9**
4	14101	All types of textile garments and clothing accessories	14.2	2.5	**13.6**	11.1	40.4	**12.6**
5	13991	Embroidery work and making of laces and fringes	13.3	3.4	**12.7**	59.6	3544.4	**290.4**
6	13992	Zari work and other ornamental trimmings	1.5	0.0	**0.7**	5.4	1234.0	**664.1**
7	31001	Furniture made of wood	4.9	0.1	**0.9**	5.6	19.0	**16.7**
8	13121	Weaving, manuf. of cotton and cotton mixture fabrics.	3.9	8.4	**4.6**	4.6	71.2	**14.4**
9	13111	Preparation and spinning of cotton fibre	1.5	0.0	**1.5**	3.2	7.8	**3.3**
10	16221	Manufacture of structural wooden goods	2.3	0.1	**0.5**	7.8	74.0	**62.7**
11	10612	Rice milling	0.3	0.5	**0.3**	4.1	19.6	**5.8**
12	32111	Jewellery of gold, silver & other precious metal	0.7	0.2	**0.6**	1.6	14.0	**5.1**
13	23921	Manufacture of bricks	0.1	0.5	**0.4**	1.2	0.2	**0.4**
14	23931	Articles of porcelain or china, earthenware, imitation	0.0	0.1	**0.1**	0.6	0.7	**0.6**
15	21002	Allopathic pharmaceutical preparations	0.9	0.0	**0.9**	4.9	0.0	**4.9**
16	32120	Imitation jewellery and related articles	0.7	1.8	**1.6**	5.3	60.6	**51.4**
17	15201	Leather footwear	5.7	1.8	**5.3**	6.8	8.7	**7.0**
18	10793	Processing of edible nuts	4.4	0.2	**3.7**	9.2	10.1	**9.4**
19	25111	Doors, windows and their frames, shutters and rolling	17.9	0.1	**3.6**	130.0	8.8	**33.0**
20	14301	Knitted or crocheted wearing apparel etc.	19.1	0.0	**19.1**	9.8	37.1	**9.8**
21	13134	Finishing of man-made and blended textiles.	6.5	23.9	**14.8**	77.9	2.1	**41.8**
22	13119	Preparation & spinning of jute, and other natural fibres	0.4	0.5	**0.4**	0.6	134.0	**1.5**
23	20238	Manufacture of *agarbatti* and other preparations	1.4	2.3	**1.6**	1.8	49.8	**13.7**
24	13122	Weaving, manufacture of silk and silk mixture fabrics	1.9	9.2	**5.1**	2.6	25.6	**12.7**
25	25932	Manufacture of hand tools for agricultural/horticulture	6.6	0.0	**4.1**	2.5	51.3	**20.9**
26	13131	Finishing of cotton and blended cotton textiles.	5.9	0.0	**5.8**	48.0	145.8	**49.3**
27	25920	Machining; treatment and coating of metals	4.9	0.0	**4.5**	35.4	358.2	**64.4**
28	13114	Preparation and spinning of man-made fiber	0.7	0.0	**0.7**	2.1	2.0	**2.1**
29	32112	Working of diamonds & other precious stones	4.9	0.0	**4.9**	5.5	4492.6	**10.7**
30	21001	Medicinal substances used for pharmaceuticals	0.9	0.0	**0.9**	5.6	3.5	**5.6**
31	18112	Printing of magazines and other periodicals, books etc.	5.4	2.2	**4.5**	25.1	3.7	**18.6**
32	13124	Weaving, manufacturing of man-made fiber etc.	7.0	0.2	**3.2**	6.3	2.4	**4.1**

***Table 3*: Service Charges to Goods Output Ratios for Non-repairing Manufacturing Industries with High Prevalence of *MSPs* in 2010-11**

Sl. No.	NIC 2008 code	Industry description (Manufacturing)	Ratio of receipts and payments for manufacturing services to goods output (%)					
			Payment			Receipts		
			Registered	Unregistered	Entire sector	Registered	Unregistered	Entire sector
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
33	14309	Other knitted and crocheted apparel including hosiery	5.9	3.7	**5.8**	4.1	68.6	**6.1**
34	16293	Wooden agricultural implements	0.0	0.1	**0.1**	0.0	369.9	**369.9**
35	25994	Metal household articles	1.6	1.4	**1.5**	1.3	106.4	**33.8**
36	29302	Parts and accessories of bodies for motor vehicles	1.6	0.0	**1.5**	1.4	33.7	**1.6**
37	13932	Carpets and other floor coverings made of wool	39.1	31.1	**38.3**	3.2	245.5	**26.4**
38	14109	Wearing apparel n.e.c.	13.9	2.8	**11.7**	4.7	57.7	**15.3**
39	20291	Manufacture of matches	2.5	0.1	**2.2**	7.5	25.3	**9.9**
40	13911	Knitted and crocheted cotton fabrics	12.1	0.0	**11.7**	17.0	49.7	**18.0**
41	16229	Builders carpentry and joinery n.e.c.	15.7	0.0	**11.2**	50.5	617.5	**211.2**
42	13139	Other activities relating to finishing of textile n.e.c.	13.0	0.0	**12.9**	47.8	1007.5	**59.9**
43	15122	Purse, ladies' handbags, artistic article made of leather	7.4	1.3	**7.0**	6.7	70.2	**11.3**
44	13931	Carpets and other floor coverings made of cotton	15.8	10.3	**15.4**	2.7	205.7	**18.9**
45	32901	Stationery articles such as pens and pencils of all kinds	3.5	6.0	**3.6**	4.3	372.8	**20.7**
46	23106	Manufacture of glass bangles	0.0	0.0	**0.0**	1.8	83.1	**32.4**
47	14104	Wearing apparel made of leather and substitutes	14.3	0.0	**14.3**	6.1	1575.0	**7.9**
48	12003	Manufacture of cigarettes, cigarette tobacco	0.3	0.0	**0.3**	1.4	4358.4	**1.4**
49	13912	Manufacture of knitted and crocheted woollen fabrics	11.4	0.0	**7.9**	0.8	212.6	**65.6**
50	13133	Finishing of wool and blended wool textiles.	1.9	0.0	**1.9**	24.7	2148.6	**26.5**

***Table 4*: Receipts and Payments for manufacturing services in Selected 'Closed Groups'**

(Rs. Crore)

Constituent 5-digit NIC codes	Broad description of the 'closed group'	Receipts for		Payments for job work
		Manufacturing services	Job work	
(1)	(2)	(3)	(4)	(5)
12001 to 12006, 12008 & 12009	Tobacco products	4137	3214	1471
13931 to 13935 & 13939	Carpets and other floor coverings	853	638	877
14101 to 14105, 14109 & NIC Div. 13	Textile and wearing apparel	36014	27414	4354
15111 to 15116, 15119, 15122, 15123, 15129 & 15201	Leather product	2157	1967	955
28110, 28132, 28162, 29199, 28221, 28223 & 28229	Machines, engines etc. and their parts	13478	13300	2298
32111 to 32113, 32119 & 32120	Jewellery and precious stone work	6310	2957	-1016

Table 5 : **Ratios of Selected Aggregates relating to Manufacturing I-O Sectors and PFCE to Gross Value of Added (GVA) of 'Other Services'.**

Ratios (as percentage of GVA of 'other services')	**IOTT 2007-08**		**IOTT 1993-94**
	'New' definition	**'Old' definition**	
(1)	(2)	(3)	(4)
1. GVO of 'other services' in Manufacturing I-O sectors	14.2	8.2	46.0
2. Intermediate consumption of 'other services' in Manufacturing I-O sectors	29.2	21.1	32.6
3. PFCE of 'other services'	32.3	30.1	103.6

Table 6 : **Likely Overestimation of PFCE – based on Comparison of Input-Output Ratios obtained from ASI & ES of 2010 and IOTT 2007-08**

Broad description of the 'closed group'	IC_{JW-WI} / GVO (%) (ASI & ES 2010-11)	IC_{WI} / GVO (%) (IOTT 2007-08)	PFCE /GVO (%) (IOTT 2007-08)	Likely over-estimation of PFCE (%)	NAS-NSS diff. (%) 2004-05
(1)	(2)	(3)	(4)	(5)	(6)
1. Tobacco products	10	10	84	12	45
2. Carpets & other floor coverings	10	Neg.	32	31	95
3. Textile and wearing apparel	8	15	50	17	57
4. Leather product	7	24	41	18	33
5. Wooden furniture	1	2	34	3	57

End Notes

① The manufacturing establishments covered under the Factories Act are surveyed annually under a scheme called *Annual Survey of Industries* (ASI). It provides statistical information on the organized manufacturing sector. In addition to activities relating to manufacturing processes and repair services, it also covers activities relating to gas and water supply and cold storage.

The Enterprise Surveys (ESs) on unorganised manufacturing is meant for collection of data on those manufacturing enterprises that are not regulated under Sections 2m(i) and 2m(ii) of the Factories Act. For the other economic activities, viz. trade, transport, hotel & restaurant, storage & warehousing and services, the ESs cover all the private (not public) enterprises. The Enterprise Surveys conducted by the NSSO are nationwide sample surveys and are carried out on different non-agricultural economic activities. Each of these surveys covers the entire geographical area of the country, except a few inaccessible pockets. The Enterprise Survey on unorganised manufacturing conducted in the 56th round was carried out for collecting data only on the unregistered manufacturing, i.e. those that are not regulated under Sections 2m(i) and 2m(ii) of the Factories Act. The enterprise survey of the 67th round however had a wider coverage. Besides the unregistered manufacturing units, defined the same way as above, it covered all unincorporated enterprises in the non-agricultural sectors, excluding those engaged in construction and electricity, gas & water supply.

The primary manufacturing units enumerated in both enterprise surveys and ASI is an establishment - a factory in the case of ASI and a manufacturing unit located whether within or outside the owners' household for the enterprise surveys.

Throughout this paper, the results of ASI and ES are combined to obtain estimates of the manufacturing sector as a whole, notwithstanding that the reference periods of the two surveys are different. While the data in ASI are collected with financial year (April to March) as the reference period, the ESs are always conducted with a moving reference of one month during survey period extending over agricultural year (July to June).

② *Exclusion of Repairing Services from the Datasets*: The NIC 2008, used both in the ASI 2010-11 and ES'67, provides for a separate 2-digit code (33) for repairing services. Thus, the units with repairing services as their main activity could easily be detected and excluded from the datasets of ASI 2010-11 and ES'67. But, it was difficult to remove such units from the datasets of ASI 2000-01 and ES'56, since in the NIC 1998 used for these surveys, the activity of repairing services was included in a few of 5-digit level codes for manufacturing activities, namely 35111, 35112, 35113, 35121 and 35122. Thus, the identification and elimination of the repairing units from the data sets of ASI 2000-01 and ES'56 are based on an assumption that units reporting the above NIC codes and value of sale of products less than 10 per cent of the income received from services were repairing units. Though the cut-off of 10 per cent is rather arbitrary it ensures that the main activity of the units thus identified would be repairing services.

Growth and Prospects of Non-farm Employment in India: Reflections from NSS data

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Abstract

This paper attempts to explore the recent trends of non-farm employment in India and to identify the employment generating sectors that would absorb the rapidly growing labour force using various rounds of NSS unit level data. Major findings of this study suggest that a structural change in employment has been taking place since 2004-05, that could be rightly named as a Lewisan transition. Construction, services and labour intensive manufacturing sectors together continued to absorb the workers who left agriculture during the post 2004-05 periods. Given the demographic scenario and huge participation in education (particularly secondary and above level), about 11 million skilled, 9 million low-skilled and 43 million unskilled job seekers are expected to join the labour force by 2019-20. Thus, along with the skill development initiatives the government has to give top priority for generating employment in manufacturing and service sectors.

1. Introduction

1.1 Indian economy has been experiencing structural changes in both output and employment with falling share of agriculture and increasing share of both industry and service sectors output and employment in recent years. The structural change in employment shows an absolute decline in agriculture employment (about 5 million per annum) and increasing number of construction, manufacturing (particularly in the low skilled labour intensive subsectors) and service sector (trade, communication and social services etc.) employment (Mehrotra et al.,2014). During this transition phase an increase of low skilled employment including informal workers within organized sectors is observed (Mehrotra et al., 2014). The distribution of labour force by level of skill revealed that about 27 percent of the labour force were illiterates and about 40 percent having below secondary level of education and more importantly among the non-agricultural workforce (age group 15 to 59 years) only about 11 percent had either received or were receiving formal vocational training during 2009-10 in India (Mehrotra et al.,2013).

1.2 The increasing participation in education in recent years (Kannan and Raveendran, 2012; Rangarajan et al., 2011; and Thomas, 2012), would cause an increase of demand for non-agricultural jobs. Furthermore, skill development measures of the government (for example: formulation of the National Skills Development Policy, delivery of Modular Employable Schemes, upgradation of existing institutions through World Bank, upgradation of training institutes under Public Private Partnership mode, setting up of the National Skill Development Corporation, and the plan to establish 50,000 Skill Development Centres) would increase the number of vocationally trained people in the labour force in the next few years. This would also cause an increased demand for non-agricultural jobs. Given this, it is important to know the sectors that could drive the industrial and service sector employment

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in India so as to sustain the Lewisian transition that took place during the post 2004-5 periods in India.

1.3 This paper is organized in five sections. Section two provides the sources of data and methodology. Section three provides trends and patterns of non-farm employment in India and identifies the sectors that could drive non-farm employment in India. Section four provides the projected labour force size and its skill composition (for the year 2019-20) for which adequate number of jobs needs to be created. And section five provides the concluding remarks.

2. Data and Methodology

2.1 This study is based on secondary data taken from National Sample Survey (NSS) and Census of India. Variables like workforce and labour force and current participation in education are estimated using various rounds of NSS unit level data. Sectoral employment is estimated using the National Industrial classification (NIC, 2008) codes. Occupational structure of the work force is estimated using National Classification of Occupation (NCO, 2004) codes. Census population data are used for assigning weights to estimate absolute employment from the NSS employment estimates. The volume of current employment (UPSS[2]), and number of students currently participating in education are used to project the future labour force. The size of future labour force has three main components (see ILO, 1984): (1) The labour force newly entering (or expected) from within or outside the educational system; (2) The number of persons currently in the labour force and are expected to stay in the labour force and (3) The number of persons expected to be go out of the labour force on account of health constraints, retirement or death etc.

2.2 The new entrants into the labour force includes the inflow of both illiterate as well as literate (at various levels of general and technical education) persons. The volume of new entrants is estimated by multiplying the age (7 to 24 years), sex and education specific labour force participation rates with the number of persons currently not in the labour force (they are enrolled in both general and technical education). The number of persons likely to go out of labour force is estimated from the age distribution of the work force by their industry of employment. The attrition rate in agriculture and non-farm sector would be different. Persons currently (in 2011-12) working in agriculture belonging to the age group 65 and above would turn into 73 years and above by the end of 2019-20. Assuming this group of workers in agriculture would go out of labour force during 2019-20. The persons currently (in 2011-12) working in non-farm industry sectors (manufacturing and non-manufacturing) belonging to the age group 55 and above would turn into 63 years and above by the end of 2019-20. All these workers would retire from their respective jobs and hence would be out of labour force. Though retirement age in service sector is same as industry, those who are engaged in self-employed activities are less likely to go out of the labour force. To adjust this miniscule difference we assume that the persons belonging to the age group 65 and above (during 2011-12) working in the service sectors would go out of labour force by the end of 2019-20. Labour force is estimated using the following formula:

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[2]Considering both usual principal status (UPS) and subsidiary status (SS) of employment together.

$$LF_t = \sum_e ELF_t^e + LF^1 + (1-d) * LF_{t-1} \qquad (1)$$

where $ELF_t^e = P^e \times ENR_t^c$

P^e= Age and sex specific labour force participation rate by level of education *e*.

ENR_t^c= Enrolment of students in class *c* in the year *t*

LF_t= Labour force in year *t*

ELF_t^e= New Entrants by level of education *e* in year *t*

LF^1= New entrants without any education in the year *t*

d = Rate of attrition due to death or retirement

ELF_{t-1} = Labour force in the year *t-1*

2.3 This is a standard formula used by ILO (1984) for labour force projection. Before projecting the labour force and the number of new entrants for whom non-farm jobs need to be created, it is important to know the sectors that had been driving non-farm employment in India.

3. Trends and patterns of non-farm employment in India

3.1 Sectoral employment trends in India since 1993-94

3.1.1 Indian economy has been experiencing a structural change in employment during the period of high growth. During 2004-5 and 2009-10, about 24 million (4.8 million per annum) workers have left agriculture. This happened first time in the history of Indian economy. Additional 13 million workers (6.5 million per annum) have left agriculture during 2009-10 and 2011-12. Majority of the workers who left agriculture were found either in construction sector or in manufacturing and service sectors (see Table 1). This sectoral shift of workforce from agriculture to non-farm sectors is popularly known as the Lewisan transition (Lewis, 1954).

3.1.2 The non-farm employment increased about 3.7 million per annum during 1993-4 to 1999-00. The rate of increase in non-farm employment is much faster (about 7.5 million per annum) during 1999-00 and 2004-5. However, it has come down to about 5 million per annum during 2004-5 and 2009-10. During this period manufacturing sector employment declined about 3 million. Nevertheless, during 2009-10 and 2011-12 non-farm employment has increased by 13.5 million per annum (see Table 1). The sectors that drove non-farm employment (25 million increase) during 2004-5 and 2009-10 were construction sector (18.5 million), hotel trade sectors (2.7 million), transport, storage and communication sectors (2.4 million), real estate and finance (2.5 million) and community, social services (1.6 million) respectively. The sectors that drove the massive 27 million increase in non-farm employment during 2010 and 2012 period were: manufacturing sector (9 million), construction sector (6.2 million), community, and social services (7.4 million), hotels and restaurants sectors (2.3 million), and transport, storage and communication (2.9 million). To explore further the process of structural change, it is important to find out the types of employment that had been generated in various non-farm sectors.

3.2 Non-farm Employment by types of employment

3.2.1 As we noted earlier, employment in agriculture decreased by as much as 24 million during 2005 and 2010, and further by 13 million during 2010-12. The decline in agricultural employment during 2005-10 was guided by decline in self-employed workers of which most of them have worked as unpaid family workers. It is important to note that these are the workers whose marginal product is very low. Further, during 2010 and 2012 the decline in agriculture employment is due to decline of casual employment (See Table 2). Since the low productive and casual labourers are leaving agriculture in the process of structural transformation it is expected that their productivity would increase.

3.2.2 The availability of alternative employment opportunities in construction at relatively higher wages is believed to be the main reason for this move out of agriculture. A continuous increase casual employment, 7 million during 2000-05, 17 million during 2005-10 and 5.4 million during 2010-12 in non-manufacturing sector (mainly in construction) indicates that the casual labourers left agriculture are engaged in non-manufacturing sector. Moreover, about 5 million increase of regular salaried workers in manufacturing sector and 14 million increase of regular salaried workers in service sectors clearly indicates the structural transformation that took place during post 2005 periods.

3.2.3 The increasing labour productivity will boost economic growth. Though, it is difficult to measure the labour productivity of the workers those who have left agriculture and have joined non-farm activities, occupational structure of the non- farm workers will provide a basic idea.

3.3 Non-farm Employment by Major Occupations

3.3.1 The occupation-wise distribution of non-farm sector employment enables us to explore sectoral skill compositions of the workforce, and its trend shows how this is changing over the years in India. An increasing number of skilled labour in a sector partly implies increasing labour productivity through rising capital intensity in that sector.

3.3.2 The volume of unskilled or low skilled workers (elementary occupation) and semi-skilled (plant and machine operators, assemblers etc.) workers have increased during 2004-5 and 2011-12 in the construction sector (see Table 3). The number of workers engaged in elementary occupations increased from 23 million to about 26 million during 2004-5 and 2011-12. And the number of plant and machine operators shows a huge increase from 1.4 million to 28 million during the same period. This occupational structure clearly indicates that those who are leaving agriculture also joining construction sector to perform either elementary jobs or work as machine/plant operators. However, declining share (from 89 percent to 52 percent) elementary job workers and increasing share of machine operators (from 5 percent to 42 percent) in construction sector during 2004-5 and 2011-12 indicates the fact that capital intensity is also growing in this sector. The growing capital intensity would likely to limit the unskilled labour absorption capacity of this sector in the long-run.

3.3.3 In manufacturing sector, it is found that both volume and share of unskilled or low skilled workers (elementary occupation) and semi-skilled (plant and machine operators, assemblers etc.) workers are increasing over the years (see Table 3 and Figure1). Though they are engaged as regular salaried workers, due to lack of proper skills they are found in low productive unskilled/semi-skilled occupations. The number of workers engaged in elementary occupations increased from 9.8 million to about 15 million during 2004-5 and 2011-12. The number of plant and machine operators also shows a huge increase from 11 million to 32 million during the same period. The increasing share of workers in the lowest occupations implies that those who are leaving agriculture might have joined manufacturing sector to perform either elementary jobs or as machine/plant operators. The number of workers working in the craft and related occupations have declined tremendously from 23.4 million to only 0.4 million. This could be an outcome of the rising capital intensity in Indian manufacturing sector which caused about 3 million decline of manufacturing employment during 2004-5 and 2009-10. But the increasing number of workers (3 million increase) in the top most occupations (professionals, technicians and administration staffs) implies the fact that entrepreneurs' have long term plans. This would help driving growth of employment and output of the manufacturing sector in long-run.

3.3.4 Similarly in service sector, the subsector transport, storage and communication shows an increasing number of unskilled or low skilled workers (elementary workers), whereas the subsectors like:hotel trade, community and social services (including education and health services) shows increasing demand for semi-skilled workers viz., sales and services workers, clerks and associate professionals etc. This is also reflected by their percentage share (se Figure 1) in total employment in those sectors.

3.3.5 The type of employment that is generated in each of these non-farm sectors not only plays a crucial role in driving the employment trends, but also provides the direction to the government for taking policy measures for future employment generation. It is therefore, important to provide the distribution of non-farm employment by types of employment and level of education (both general and technical education), which provides proper direction for initiating employment policy in India.

3.4 Non-farm Employment by Level of Education and Types of Employment, 2011-12

3.4.1 During 2011-12, out of total 242 million non-farm workers about 48 million (20 percent) were illiterates, 131 million (54 per cent) with up to secondary level of education (general education), 22 million (9 per cent) with higher secondary education (general education), 28 million (12 per cent) with graduate and above level of education (general education) and only about 13 million (5 percent) of workers having technical education (see Table 4).

3.4.2 Out of 48.3 million illiterate non-farm workers 18.7 million (39 percent) worked as self-employed, 7.1 million (13 per cent) as regular salaried workers and 22.4 million (46 percent) as casual labourers. Similarly, among the workers with up to secondary level of education, about 37 million worked as regular salaried workers, 56.3 million as self-employed and 37.6 million as casual labourers. It is important to note that about 60 million workers belonging to lowest education category (and with no education) worked as casual labourer.

Majority of these casual workers (42.5 million) are found in non-manufacturing (mostly in construction) sector. And about 9 million are found in manufacturing sector. These are the workers, who hardly avail any kinds of social security measures, and remain the most vulnerable group. Thus, it is necessary that the government should take necessary policy measures for the betterment of these vulnerable groups.

3.4.3 As expected, workers with higher secondary and above level of general education are mostly engaged as regular salaried workers in various service sectors. In these education categories out of total 50 million workers about 29 million worked as regular salaried workers, of which 18.5 million worked as self-employed and only 2.5 million as casual labourers. And out of 29 million regular salaried workers, 24 million were found in service sectors, 4 million in manufacturing and only 1 million in non-manufacturing sectors. Most of the self-employed persons (15 million out of 18.5 million) are found in service sectors. About 3 million of these self-employed workers are engaged in manufacturing activities and only about 0.5 million in non-manufacturing activities (including construction, electricity, water/gas supply etc.).

3.4.4 Workers with technical educations are mostly (9.6 million out of total 12.8 million) found employed as regular salaried workers in service (6.3 million), manufacturing (2.5 million) and non-manufacturing (0.8 million) sectors. Only 0.5 million worked as casual labourers and about 3 million worked as self-employed. Since the Government of India (GOI) has taken an initiative viz., Self-Employment and Talent Utilisation (SETU[3]) to facilitate self-employed activities, it would definitely promote the self-employment activities of technically educated persons those who are likely to join the labour force. However, it is equally important to initiate measures for promoting self-employment activities of persons those who are likely to enter the labour force with general education. Rather, the growing mechanization in agriculture in one hand, and scarcity of regular salaried jobs in manufacturing and service sectors, on the other, would result in an increased volume of open unemployment in India.

4. Trends and structure of labour force to be absorbed in non-farm sectors

For generating adequate number of non-farm employment, it is important to know the likely increase in labour force and the expected number of new entrants with their skill levels. Before we estimate the number of person that would join the labour force, it is important to find out the past trends of labour force in India.

4.1 Trends and growth of labour force in India

4.1.1 In India the size of labour force was 381.1 million in 1993-94, which increased about 104 million (6 million per annum) to reach at 484.7 million in 2011-12 (see Figure 2). The growth pattern of labour force is not smooth. It increased by 27 million (4.5 million per annum) during 1993-94 and 1999-2000, by 61 million (12.2 million per annum) during 1999-2000 and 2004-05, and surprisingly did not increase during 2004-05 and 2009-10, but a sudden 15 million increase (from 469.5 million to 484.7 million) during 2009-10 and 2011-12

[3]The Government has established a mechanism to be known as SETU (Self-Employment and Talent Utilisation) under NITI Aayog. SETU will be a Techno-Financial, Incubation and Facilitation Programme to support all aspects of start-up businesses, and other self-employment activities, particularly in technology-driven areas.

(7.5 million per annum). The annual growth rate of labour force during 1994 and 2000 was 1.15 percent, which increased to 2.8 percent during 2000 and 2005. Labour force growth rate has come down to about 0.04 percent during 2005 and 2010, but shows a revival with growth rate of 1.6 percent during 2010 and 2012. This uneven growth pattern of labour force is mainly attributed to the changes in demographic profile of the young population (Mehrothra et al., 2014), withdrawal of women from labour force rising enrollment in elementary and secondary schools (Thomas, 2012; Kannan and Raveendran, 2012; and Mehrothra et al., 2014), declining child labour, and partly due to improving living standards (Mehrothra et al., 2014).

4.1.2 Participation in Education seems to be the most likely reason for the slow growth of labour force. And because of this a massive increase of the labour force is noticed during 2009-10 and 2011-12. It indicates that a proportion of the students who were enrolled at secondary and above level of education have started joining the labour force. It could be expected that it would continue in next few years, hence the size of labour force would to grow further. The number of persons likely to join the labour force depends on both the size of current enrollment and their labour force participation rates (LFPR). Therefore, first, we have calculated the number of persons enrolled at various levels of education and their age, sex and education specific labour force participation rates; and then the size of new entrants.

4.1.3 Persons those will turn into 15 years and above during 2019-20 are currently (in 2011-12) belong to the age group 7 years and above. We have calculated both number of students enrolled at various levels of education and the number of persons not attending education (illiterates) belonging to the age group 7 years to 24 years (See Table 5). Within general education; about 252.6 million (126.4 million boys and 126.2 million girls) are attending up to primary education, 40.6 million (20.1 million boys and 20.5 million girls) are attending secondary education, 30.7 million (15.1 million boys and 15.6 million girls) are attending higher secondary education, 6.5 million (2.4 million boys and 204.1 million girls) are attending graduate and above level of education. Within technical education; about 2.3 million (1.5 million boys and 0.8 million girls) are attending secondary (below graduate courses) education and about 1 million (0.6 million boys and 0.4 million girls) are attending graduate and above level of courses. About 7.5 million persons in the age group 7 years and above are illiterates and they are not enrolled/attending any education. The above information is used to estimate the size of labour force for the years 2019-20 and provides two scenarios based on the method outlined in section two (Equation 1).

4.2 Projected Labour Force for the year 2019-20 in India

4.2.1 Scenario 1: If LFPR would remain constant as in 2011-12

4.2.1.1 This is a very restrictive[4] assumption but it provides a rough idea about the labour force growth for the target year. The projected labour force for 2019-20 would be 543 million

[4]To test the credibility of this projection method we have projected the labour force size for the year 2011-12 assuming 2009-10 is the benchmark year. The projected labour force size (485.5 million with 351.3 million male and 134.3 million female) is very close to that of actual labour force (484.8 million with 350.6 million male and 134.2 million female) with slight over estimation. This over estimation, though negligible, arises mainly because of the declined LFPR (for both male and female) between 2009-10 and 2011-12.

with 390 million male and 153 million female. In other words, the size of labour force would increase by 58.2 million during 2011-12 and 2019-20 (See Table 5) with an average of 7.3 million per annum.

4.2.1.2 The distribution of expected new entrants with their level of education reveals that about 9 million (6.8 million boys and 2.3 million girls) would join the labour force with secondary, 6 million (4.5 million boys and 1.8 million girls) with higher secondary, and 2.5 million (1.3 million boys and 1.1 million girls) with graduate and above level of general education. About 1.5 million (1 million boys and 0.5 million girls) would join the labour force with technical educations. About 45 million (30.3 million boys and 14.3 million girls) would join the labour force with either up to primary level of education or with no education (illiterates).

4.2.2 Scenario 2: If LFPR for secondary and above education increases by 5% and for primary education and illiterates declines by 5% points

4.2.2.1 This scenario is based on a more realistic assumption. As the LFPR of illiterates persons and persons with primary levels of education are showing declining trends (from 1993-94 to 2011-12), it could be assumed that LFPR of these groups would decline further. The LFPR of boys having secondary and above level of education is very high (as compared to the overall male LFPR) and showing a slight increasing trend over the years. The LFPR of girls having secondary and above level of education is also greater than the overall female LFPR (overall female LFPR is showing a declining trends) and also showing an increasing trend over the years. It is therefore assumed that LFPR of these groups would increase. We have assumed that LFPR for secondary and above level of education will increase by 5 percent points whereas LFPR of illiterate and persons with up to primary education will decline by 5 percent points. Based on this assumption we have estimated the labour force size for 2019-20. The projected labour force size in 2019-20 is 540.8 million with 388.4 million male and 152.4 million female (see Table 5). The labour force would increase by 56.1 million from 2011-12 to 2019-20 with an average of 7 million per annum.

4.2.2.2 The distribution of expected new entrants with their level of education reveals that about 9 million (6.5 million boys and 2.2 million girls) would join the labour force with secondary, 7 million (4.7 million boys and 1.9 million girls) with higher secondary, and 2.5 million (1.4 million boys and 1.1 million girls) with graduate and above level of general education. About 1.5 million (1 million boys and 0.5 million girls) would join the labour force with technical educations. About 42.5 million (28.8 million boys and 13.6 million girls) would join the labour force with either up to primary level of education or with no education (illiterates).

5. Concluding Remarks and Policy Suggestions

5.1 Indian economy is passing through a phase of very rapid economic growth since 2003-04 which was accompanied by the structural changes in employment. An absolute decline (23.7 million) of agricultural employment was noticed during 2004-5 and 2009-10, of which 22.5 million were unpaid family workers. Additional 17 million decline of casual employment in agriculture during 2010 and 2012 indicates that labour absorption capacity of farm sector has been condensed. Growing mechanization in agriculture and rising agricultural/rural wages were the major factors leading to the decline in agriculture workforce. The massive increase of non-farm employment during the post 2005 periods on the other hand clearly reflects a Lewisian transition, which is expected to sustain in India because of the increasing enrollments in higher education.

5.2 Those entering the labour force with either primary or secondary education are normally expected to search relatively low skilled jobs in manufacturing, non-manufacturing and service sectors. And those entering with higher secondary and above level of education would more likely to search for regular salaried jobs in the non-farm sectors. But the growing mechanization in agriculture limits the choices for job seekers entering with lower level of education. Therefore, it is important that the government should take quick and constructive measures for generating enough non-farm employment to reduce the volume of expected increased open unemployment in India. Given the estimates that about 11 million would enter the labour force with higher secondary and above level of technical education or general education, about 9 million with secondary level of general education, and about 43 million with primary education; employment policy of the government based on this skill distribution would help the economy to boost economic growth further.

5.3 Allocation of Rs. 6,000 crore for the smart cities project and the planning for development of infrastructure in another 500 cities by the government would help sustain the construction sector employment, which is expected to accommodate a substantial volume of low skilled job seekers. The initiatives like addressing regulatory and procedural hurdles, lowering tax burden, and modifying duty structure for raw material and intermediate goods to reduce cost of production etc. would boost manufacturing production. Moreover, a flexible labour regulation would encourage the producers to increase regular employments in manufacturing sector. Furthermore, generating employment opportunities for the vocationally and technically trained persons, and for those who have completed higher secondary and above level of general education, through financial assistance schemes would increase self-employment activities. However, the government should focus and give top most priority to skill development measures given the estimates that majority of India’s job seekers are low-skilled. This would enable to satisfy growing demand for high skilled service workers in India and abroad in the recent years.

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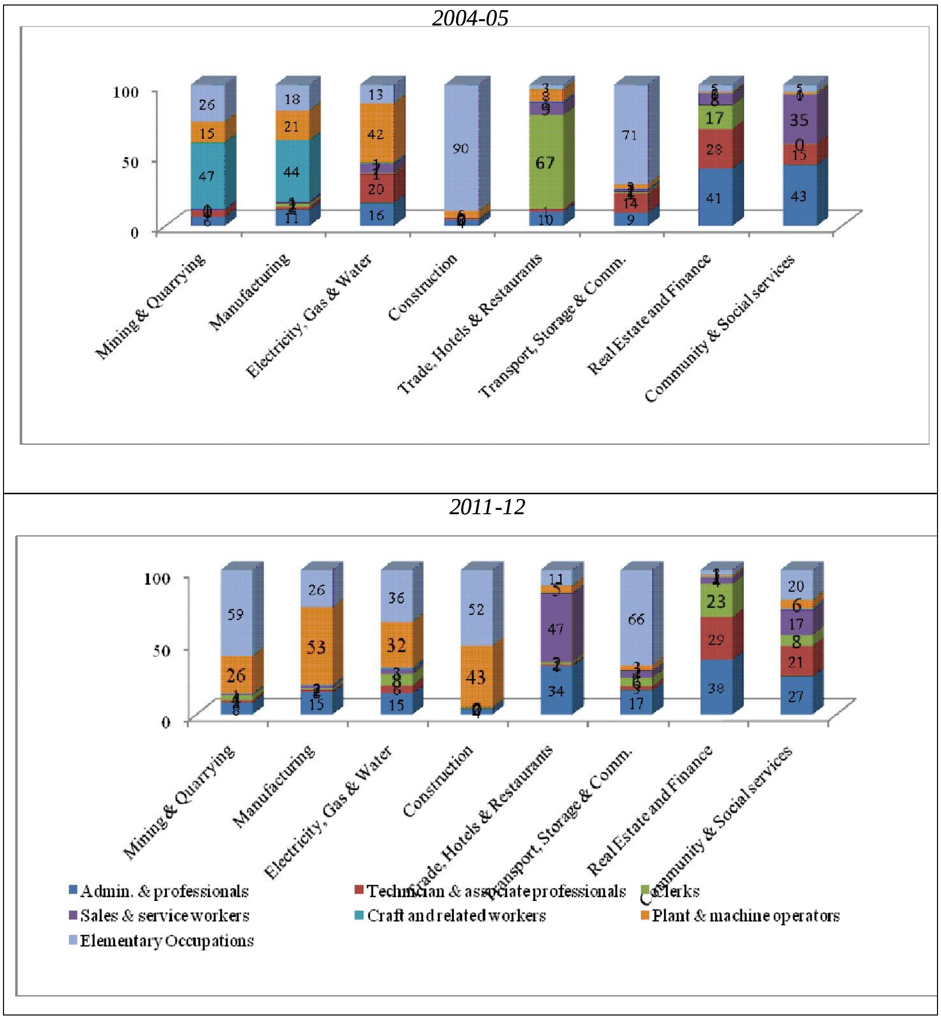
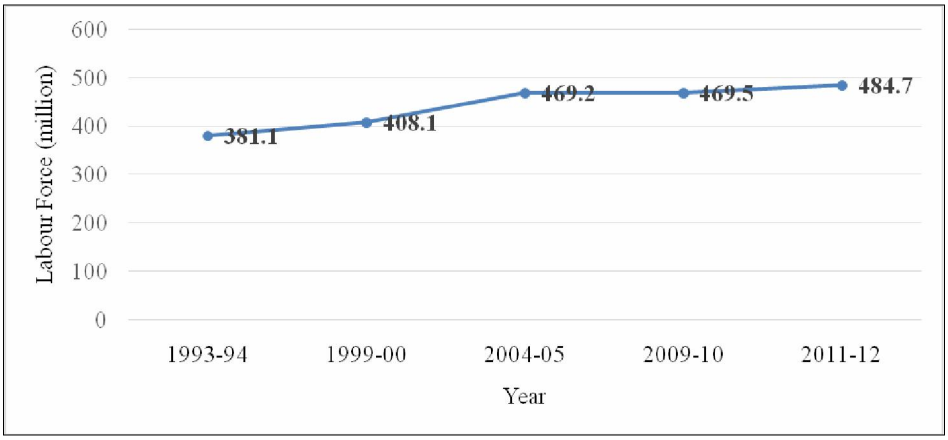
Figure 1: Occupation-wise distribution of Non-farm workers (%) in India, 2011-12



Source: Author's estimates based on NSS unit level data

Figure 2: Trend of labour force in India, 1993-94 to 2011-12



Source: Author's estimates based on NSS unit level data

Table 1: Trends of Farm and Non-farm Employment in India, 1993-94 to 2011-12

Sectors	Absolute Employment (million)					Change in Employment (million)			
	1993-94	*1999-00*	*2004-05*	*2009-10*	*2011-12*	*1994 to 2000*	*2000 to 2005*	*2005 to 2010*	*2010 to 2012*
Agriculture and Allied (Farm)	**242.9**	**246.6**	**268.6**	**244.9**	**232.0**	**3.7**	**22.0**	**-23.7**	**-12.9**
Mining & Quarrying	2.7	2.2	2.6	3.0	2.6	-0.5	0.5	0.3	-0.4
Manufacturing	38.9	42.8	53.9	50.7	59.8	3.8	11.1	-3.1	9.0
Electricity, Gas & Water Supply	1.3	1.1	1.2	1.3	2.5	-0.3	0.1	0.0	1.2
Construction	11.6	17.1	25.6	44.1	50.3	5.5	8.5	18.5	6.2
Trade, Hotels & Restaurants	27.6	39.2	47.0	49.7	52.0	11.6	7.8	2.7	2.3
Transport, Storage & Communication	10.3	14.0	17.6	20.0	22.9	3.7	3.6	2.4	2.9
Real Estate and Finance	3.5	4.6	7.1	9.6	7.8	1.1	2.6	2.5	-1.7
Community, Social services	35.2	32.1	35.6	37.1	44.6	-3.1	3.5	1.6	7.4
Total Non-farm Employment	**131.1**	**153.1**	**190.6**	**215.5**	**242.5**	**22**	**37.5**	**24.9**	**27**
Total Employment	**374.0**	**399.5**	**459.1**	**460.2**	**474.2**	**25.5**	**59.6**	**1.1**	**14.0**

Source: Author's estimates based on NSS unit level data in various rounds

Table 2: Sectoral distribution of workers (PS+SS) by their status of employment in India, 1993-2012

Sectors & Types of Employment		**No. of Workers (million)**					**Change in employment (million)**			
		1993-94	*1999-00*	*2004-05*	*2009-10*	*2011-12*	*1994-2000*	*2000-2005*	*2005-2010*	*2010-2012*
Agriculture & Allied	own account worker	67.8	70.4	78.5	76.3	80.8	2.5	8.2	-2.2	4.5
	employer	5.0	2.6	3.2	2.8	3.4	-2.4	0.7	-0.5	0.6
	unpaid family worker	72.3	69.5	90.6	68.0	66.9	-2.8	21.1	-22.5	-1.1
	regular workers	3.3	3.5	2.9	2.1	1.9	0.2	-0.7	-0.7	-0.2
	casual workers	93.1	100.6	93.3	95.6	78.9	7.5	-7.3	2.3	-16.7
	sub-total	**241.5**	**246.6**	**268.5**	**244.9**	**231.9**	**5.0**	**22.0**	**-23.7**	**-13.0**

Table 2: Sectoral distribution of workers (PS+SS) by their status of employment in India, 1993-2012 (Contd.)

Sectors & Types of Employment		No. of Workers (million)					Change in employment (million)			
		1993-94	*1999-00*	*2004-05*	*2009-10*	*2011-12*	*1994-2000*	*2000-2005*	*2005-2010*	*2010-2012*
Manufacturing	own account worker	11.3	14.2	18.4	17.4	20.7	2.9	4.1	-1.0	3.3
	employer	0.8	0.4	0.8	0.8	0.9	-0.3	0.3	0.0	0.1
	unpaid family worker	6.4	7.5	9.5	6.4	7.8	1.2	2.0	-3.1	1.3
	regular workers	11.9	13.0	15.9	16.4	20.5	1.1	3.0	0.4	4.2
	casual workers	8.6	7.6	9.3	9.8	9.9	-1.1	1.7	0.5	0.2
	sub-total	**38.9**	**42.8**	**53.9**	**50.7**	**59.8**	**3.8**	**11.1**	**-3.1**	**9.0**
Non-manufacturing	own account worker	2.1	2.8	4.1	4.5	4.8	0.7	1.3	0.4	0.3
	employer	0.2	0.1	0.3	0.2	0.4	-0.1	0.2	-0.1	0.2
	unpaid family worker	0.2	0.3	0.4	0.6	0.5	0.1	0.1	0.2	-0.1
	regular workers	2.8	2.6	3.0	4.1	5.3	-0.2	0.4	1.1	1.2
	casual workers	10.4	14.5	21.6	38.9	44.3	4.1	7.1	17.3	5.4
	sub-total	**15.8**	**20.4**	**29.4**	**48.3**	**55.3**	**4.6**	**9.1**	**18.9**	**7.0**
Services	own account worker	29.5	33.7	42.6	45.6	49.2	4.2	8.8	3.1	3.6
	employer	1.3	0.8	1.8	1.6	2.2	-0.5	1.0	-0.1	0.6
	unpaid family worker	8.1	8.7	11.1	10.2	10.1	0.7	2.4	-0.9	-0.1
	regular workers	31.4	36.8	43.6	49.1	56.9	5.4	6.8	5.5	7.8
	casual workers	7.5	9.8	8.2	9.7	8.8	2.3	-1.5	1.5	-0.9
	sub-total	**77.7**	**89.8**	**107.3**	**116.3**	**127.3**	**12.1**	**17.5**	**9.1**	**11.0**

Source: Author's calculation based on NSS unit data in various rounds

Table 3: Sector-wise distribution of Non-farm workers (million) by their Occupations in India, 2004-05 and 2011-12

Type of Occupation	Sector of Employment							
	Mining & Quarrying	*Manufacturing*	*Electricity, Gas & Water Supply*	*Construction*	*Trade, Hotels & Restaurants*	*Transport, Storage & Communication*	*Real Estate and Finance*	*Community & Social services*
2004-05								
Administrator &professionals	0.16	6.1	0.20	1.01	4.7	1.6	2.9	15.4
Technicians & associate professionals	0.11	1.08	0.25	0.12	0.7	2.4	2.0	5.2
Clerks	0.00	1.26	0.01	0.03	31.5	0.22	1.2	0.12
Sales &service workers	0.03	0.70	0.08	0.08	4.1	0.28	0.59	12.4
Craft and related workers	1.2	23.4	0.01	0.04	0.37	0.09	0.01	0.07
Plant &machine operators &assemblers	0.38	11.4	0.52	1.4	3.9	0.54	0.07	0.51
Elementary Occupations	0.66	9.6	0.15	22.8	1.5	12.3	0.34	1.6
Others	0.00	0.19	0.01	0.10	0.07	0.07	0.02	0.27
Total	**2.6**	**53.8**	**1.2**	**25.6**	**46.8**	**17.6**	**7.1**	**35.5**

Table 3: Sector-wise distribution of Non-farm workers (million) by their Occupations in India, 2004-05 and 2011-12 (Contd)

Type of Occupation	Sector of Employment							
	Mining & Quarrying	*Manufacturing*	*Electricity, Gas & Water Supply*	*Construction*	*Trade, Hotels & Restaurants*	*Transport, Storage & Communication*	*Real Estate and Finance*	*Community & Social services*
2011-12								
Administrator &professionals	0.2	9.1	0.37	1.9	17.6	3.9	3.0	11.9
Technicians & associate professionals	0.04	0.9	0.15	0.18	0.6	0.7	2.3	9.4
Clerks	0.09	1.0	0.20	0.20	0.8	1.4	1.8	3.4
Sales &service workers	0.02	1.1	0.08	0.08	24.5	1.0	0.33	7.6
Craft and related workers	0.01	0.4	0.03	0.10	0.2	0.1	0.02	0.41
Plant &machine operators &assemblers	0.66	31.8	0.8	21.7	2.6	0.8	0.11	2.7
Elementary Occupations	0.28	8.2	0.3	25.7	0.54	10.7	0.07	1.3
Others	1.2	7.1	0.6	0.4	5.0	4.4	0.2	7.8
Total	**2.6**	**59.7**	**2.4**	**50.2**	**51.9**	**22.9**	**7.8**	**44.5**

Source: Author's estimates based on NSS unit level data in various rounds

Table 4: Distribution of non-farm workers (in million) by level of education and types of employment in India, 2011-12

Sectors of Employment	Types of Employment by Level of Education							
	Self-employed	*Regular salaried*	*Casual labour*	*Total*	*Self-employed*	*Regular salaried*	*Casual labour*	*Total*
	Illiterate				**Up to Secondary(general)**			
Manufacturing	8.0	2.1	3.0	13.1	17.9	11.9	6.4	36.2
Non- Manufacturing	1.2	0.6	17.1	19.0	3.4	2.7	25.4	31.6
Services	9.5	4.4	2.3	16.2	35.0	22.4	5.8	63.1
Total	**18.7**	**7.1**	**22.4**	**48.3**	**56.3**	**37**	**37.6**	**130.9**
	Higher Secondary(general)				**Graduate and above (general)**			
Manufacturing	1.9	2.2	0.3	4.4	1.2	1.9	0.1	3.2
Non- Manufacturing	0.4	0.5	1.2	2.2	0.4	0.6	0.4	1.3
Services	7.0	8.0	0.4	15.5	7.8	15.7	0.2	23.7
Total	**9.3**	**10.7**	**2.0**	**22.0**	**9.4**	**18.2**	**0.6**	**28.2**
	Below Graduate (Technical)				**Graduate and above (Technical)**			
Manufacturing	0.19	1.67	0.12	1.98	0.11	0.78	0.02	0.90
Non- Manufacturing	0.16	0.52	0.14	0.82	0.08	0.27	0.02	0.37
Services	1.22	2.96	0.14	4.32	1.08	3.36	0.01	4.46
Total	**1.57**	**5.15**	**0.4**	**7.12**	**1.27**	**4.41**	**0.05**	**5.73**

Source: Author's estimates based on NSS unit level data

Note: Higher Secondary education includes both regular and diploma/ certificate courses.

Table 5: Current Enrolments (2011-12) by Sex and Level of Education and Projected Labour Force (2019-20) in India

Level of Education		No. of Persons Attending Education (Age group 7 to 24 years)			Projected New Entrants (million) by education					
					Scenario I			*Scenario II*		
		M	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**
Illiterate and not attending education		5.7	15.2	20.9	3.3	4.2	7.5	3.2	4.0	7.1
General education	Up to Primary	126.4	126.2	252.6	26.9	10.1	37.0	25.6	9.6	35.2
	Secondary	20.1	20.5	40.6	6.8	2.3	9.1	6.5	2.2	8.6
	Higher Secondary	15.1	15.6	30.7	4.5	1.8	6.2	4.7	1.9	6.6
	Graduate & above	2.4	4.1	6.5	1.3	1.1	2.4	1.4	1.1	2.5
Technical education	Below Graduate	1.5	0.8	2.3	0.7	0.3	1.0	0.8	0.3	1.1
	Graduate & above	0.5	0.4	1.0	0.3	0.2	0.5	0.3	0.2	0.5
Total		**171.8**	**182.9**	**354.7**	**43.8**	**19.9**	**63.7**	**42.3**	**19.3**	**61.6**
Projected Labour Force					**389.9**	**153**	**542.9**	**388.4**	**152.4**	**540.8**

Source: Author's estimates based on NSS unit level data

Exploring an Alternative Index of Industrial Production

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Abstract

The present article proposes to construct the Index of Industrial Production by adopting a methodology that is different from the approach which has been in vogue since long. The alternative methodology centres around selection of all registered manufacturing units above certain employment size criterion and building up the index based on the total value of production by the selected factories after deflating them to a constant price. It has been demonstrated based on the data of Annual Survey of Industries for the latest three years that this alternative methodology captures the growth rate in industrial production in a much better manner.

1. Introduction

1.1 In the absence of any monthly or quarterly surveys on industrial sector, Index of Industrial Production (IIP) becomes a very important statistical indicator to measure the short-term growths in industrial production of the country. In fact, growth rates based on the monthly IIP are keenly watched and monitored by the planners and policymakers as well as by the business community at large. Further, quarterly/annual growth rates as revealed by the IIP are used in the compilation of provisional estimates of quarterly and annual GDP by registered manufacturing sector till detailed survey results based on Annual Survey of Industries (ASI) become available.

1.2 The present IIP is being compiled with 2004-05 as the base year[2]. Many a times, concerns have been raised about the accuracy of the growth rates as revealed by the IIP. Quite a few studies conducted in the past point out the mismatch in growth rates of industrial production between the IIP and ASI[3]. The present article suggests the compilation of an alternative IIP adopting a methodology that is likely to capture the growth rates of industrial production for the registered manufacturing sector in a much better way.

2. Shortcomings with the Existing Approach

2.1 A major shortcoming of the existing approach is the divergence of the growth rate (GR) based on IIP with the same according to ASI. Estimates of GR based on ASI are likely to be robust, at least for the registered manufacturing sector as a whole, given the large sample size and a sound sampling procedure adopted in the ASI[4]. **Table 1** and **Charts 1.1**

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[2] A decision has already been taken to switch over to 2011-12 as the new base period for which the preparatory work is in progress. Report of the Working Group for Development of Methodology for Compilation of the All-India Index of Industrial Production with Base Year 2009-10 / 2011-12 is available in www.mospi.nic.in.

[3] See, for example, Manna (2013), A Study of Cross-validation of Growth Rates of Industrial Production Based on IIP and ASI for Some Important Item-groups, The Journal of Industrial Statistics (2013), 2 (1), 83-95.

[4] A sample of about 60,000 factories, out of a total of little more than 200,000 factories in the frame, is selected in each year of ASI after stratifying the units according to their number of employees.

to 1.3 present alternative GRs emanating from IIP and ASI for six industrial categories and registered manufacturing sector as a whole for three years namely, 2009-10 till 2011-12. GRs as per the ASI have been derived after deflating the total estimated value of products and by-products manufactured for each NIC 2-digit/industry and all industries combined[5] by corresponding deflators based on WPI, i.e., after converting the production figures at 2008-09 price. For all the three years divergence between the alternative GRs is alarmingly high, with ASI reporting a much higher GR. For the year 2011-12, two alternative GRs differ by as high as 11.9 percentage points.

2.2 For GDP calculations, initially, IIP-based GR is used for the registered manufacturing sector. Subsequently, with the availability of results based on ASI at a later stage, the initial figures are revised by using the estimates of gross value added based on ASI. **Table 2** shows the percentage change in the GDP estimates between the first 'Revised Estimate' (RE) using the IIP figures and the second RE that uses the results of ASI for the years 2010-11 and 2011-12. It may be seen that with the use of ASI-based estimates, the increase in the GDP estimates at constant (2004-05) price is as high as 5 to 6% for the registered manufacturing sector and it is of the order of about 0.6% for the overall GDP, which is not insignificant given the current levels of growth of the Indian economy.

2.3 In the existing method of compiling IIP, which is consistent with the international recommendations, first an item basket comprising important items in terms of their share in overall production of each industry / NIC 2-digit is finalized based on the data of base year of IIP. Thereafter, for each item, a sample of factories i.e. major units producing the item in the base year is drawn for collecting monthly production data (mostly in terms of quantity) for the item. Then for the purpose of calculation of the index/IIP, Laspeyres method is used to multiply the quantity relatives of total quantities of current period in relation to the base year period with appropriate weights at the item level, and finally, these are added to derive the index. One limitation of the existing approach is its inability to include new units for the purpose of reporting of data – particularly the large ones with major production – that may be coming up in the economy subsequently after the year selected as the base period. Another limitation with the current IIP series is that for some of the 'item-groups', the number of factories in the panel reporting the monthly production data seems to be not representative of the universe either in terms of number of factories in the panel or in terms of their share in the overall output for the given item-group. As per the study of Manna (2013) referred earlier, out of 92 important item-groups studied, for as many as 19 item-groups, the units in the panel had a share of less than 10% only of total estimated output for the item-group as per ASI 2009-10.

3. The Proposed Methodology of Compiling Alternative IIP

3.1 The alternative methodology that we propose basically involves the steps as follows: **one,** selection of cut-off in terms of total number of employees in the factory for each NIC 2-digit so that the contribution of the selected factories with employee size exceeding or equal to the cut-off in total value of products and by-products manufactured in the given NIC 2-digit is quite substantial (at least 75%) as per ASI 2011-12 coinciding

[5]For the remaining industry/NIC codes, the relevant deflators based on WPI are not readily available.

with the proposed new base year; **two,** collection of data on monthly production in value/ monetary terms considering all products and by-products manufactured by the factory (in place of quantity figure of the selected item only as per the existing practice) from all the units in the country[6] qualifying the stated cut-off criterion within each NIC 2-digit; **three,** deflating the monthly total value figures of production of the factories at NIC 2-digit level by corresponding WPI deflators to convert them to constant (base year) price; **four,** deriving the production relative for each NIC 2-digit; and **five,** obtaining the weighted average of the production relatives as the alternative IIP with weights being the percentage share of the NIC 2-digit in the overall gross value added (GVA) by the entire registered manufacturing sector according to the ASI[7].

3.2 **Chart 2** and **Table 3** present percentage shares of factories with different employment size classes (ESC) in total production as per ASI 2011-12. It may be seen that for many NIC codes, ESC of 100+ has a substantial share (more than 77%) in the overall production. However, for NIC codes 16, 18, 22, 31 and 33, ESC of 30+ can probably capture a significant share of production. As per the methodology described in the previous paragraph, finally proposed ESCs for different NIC codes with a view to constructing the alternative IIP are indicated in column 6 of Table 3. The consequent workload to be involved in the collection of production data in terms of number of factories can be seen from column 7 of Table 3. It is needless to mention that although by lowering the ESC, a higher share in overall production can be captured, but the same would involve additional workload in terms of increase in number of factories that may become unmanageable.

4. Testing the Proposed Methodology

4.1 The methodology suggested in paragraph 3.1 to compile the alternative IIP has been tested by taking into account the data for the latest four years of ASI (2008-09 till 2011-12) and by deriving the alternative IIP and corresponding annual growth rates (GRs) in production. This has involved the use of annual estimated production of different ESCs for various years at NIC 2-digit level and use of the weighting diagram with 2008-09 as the reference point. **Table 4** and **Charts 3.1 to 3.3** summarize the findings. It may be seen that as compared to the GRs based on the current IIP, the GRs approximated by the alternative methodology are much closer to the ASI-based estimates.

5. Concluding Remarks

5.1 The alternative IIP as per the proposed methodology is likely to reflect the true behaviour of industrial growths since it takes into account the production data of factories having significant share in the overall production for each NIC 2-digit. Unlike the existing IIP derived by considering the quantity figures, the alternative IIP based on value figures would capture the quality and price differentials of products in a much better manner.

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[6] This list is to be built up by considering the list of factories as per the ASI frame to be supplemented with other eligible units, if any, as per the alternative sources like the sixth Economic Census and lists maintained by the CBEC, Department of Industrial Policy & Promotion and Ministry of Corporate Affairs.

[7] For the purpose of deriving weighting diagram, it would be preferable to use average of consecutive three years' GVA with base year as the mid-point (after converting them to a constant price) instead of using only the base year's data to smoothen the fluctuations in the estimates of GVA at NIC 2-digit level.

Further, the methodology proposed for compiling the alternative IIP permits inclusion of new and large units that may be coming up in the economy in the subsequent periods for reporting the data on production. And finally, the growth rates based on the alternative IIP are likely to be in fair agreement with those based on the ASI.

5.2 The alternative IIP reflecting the growth of industrial production for the registered manufacturing sector will, as usual, be integrated suitably with the indices for mining and electricity sectors to derive the overall alternative IIP. The alternative IIP so obtained can be dovetailed with the index for the MSME (Micro, Small and Medium Enterprises) sector being contemplated with due weights to derive the overall index and the consequent growths of industrial sector of the Indian economy.

5.3 From Table 4, it may be worth noting that considering total output (i.e. including receipts other than value of manufactured products and by-products) and total GVA in real terms as per the ASI, although growth rate in GVA perfectly matches with the growth rate in total output for the year 2009-10, the alternative growth rates differ quite significantly for the succeeding two years with growth rate in GVA being substantially lower[8].

5.4 One limitation of the alternative IIP is its inability to estimate growth rates in production at the item-group/product level or by the 'use-based' classification of products that has been in vogue since long[9]. However, given the extent of volatility in the growth rates of production at the item-group level, this should not be a guiding factor to discard the alternative approach which has, otherwise, got many distinct advantages as deliberated in this article. It is needless to mention that the compilation of alternative IIP is constrained by the availability of WPI deflators at NIC 2-digit level. And the same needs to be ensured in the greater interest of strengthening the database of the Indian Statistical System.

6. Acknowledgement

6.1 The author acknowledges with thanks the valued support by Shri Sudipta Bhattacharya, Deputy Director, Central Statistics Office, Industrial Statistics Wing, Kolkata for providing the requisite tabulation of data based on ASI. The author is also thankful to the referee for his comments on the draft of this article.

[8] With increasing adoption of outsourcing, growth in GVA may fall short of growth in output because with outsourcing GVA may go down even if output remains the same. Increasing use of imported materials, parts and components in manufacturing may lead to fast growth in output, even though GVA does not grow proportionately.

[9] Another practical difficulty could be in terms of collection of data from so many (38,000 and odd) units on a monthly basis. This problem may be tackled with web-enabled data collection system.

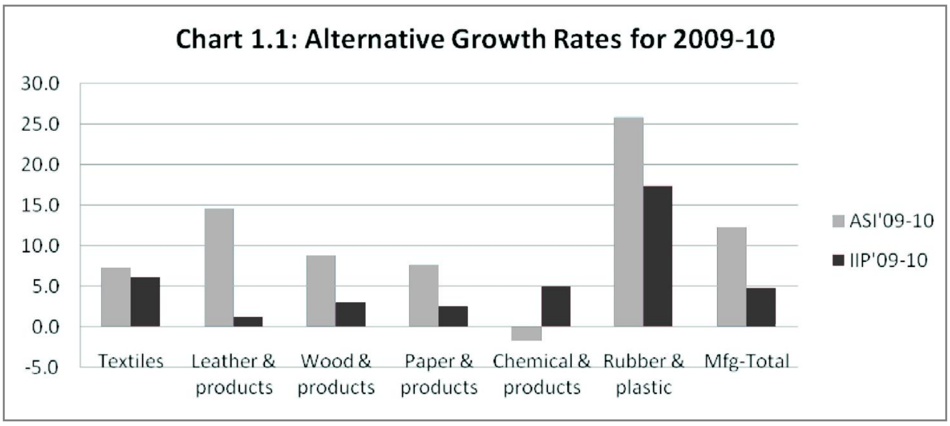
Chart 1.1: Alternative Growth Rates for 2009-10
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
Textiles
Leather & products
Wood & products
Paper & products
Chemical & products
Rubber & plastic
Mfg-Total
ASI'09-10
IIP'09-10

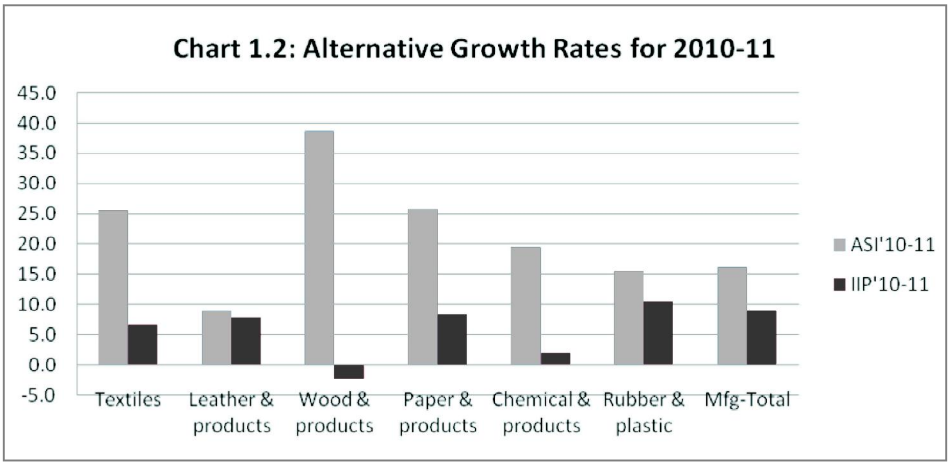
Chart 1.2: Alternative Growth Rates for 2010-11
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
Textiles
Leather & products
Wood & products
Paper & products
Chemical & products
Rubber & plastic
Mfg-Total
ASI'10-11
IIP'10-11

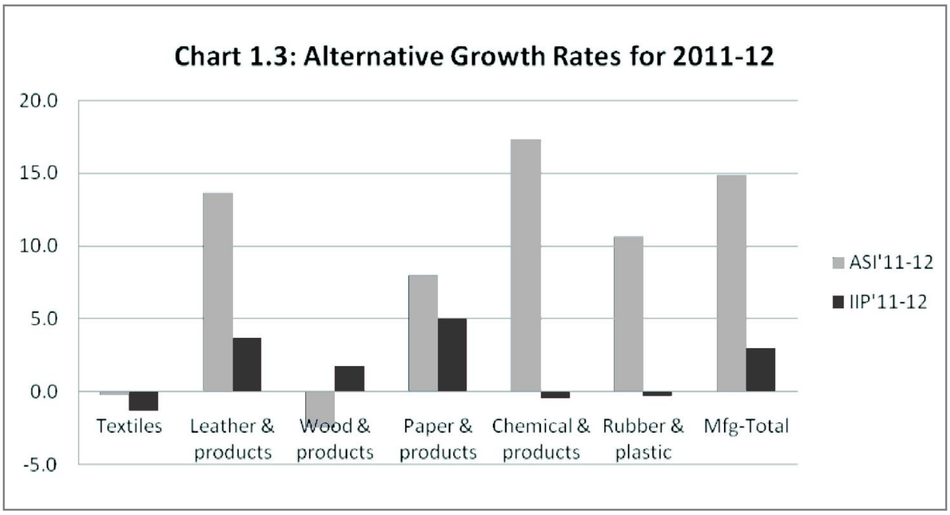
Chart 1.3: Alternative Growth Rates for 2011-12
20.0
15.0
10.0
5.0
0.0
-5.0
Textiles
Leather & products
Wood & products
Paper & products
Chemical & products
Rubber & plastic
Mfg-Total
ASI'11-12
IIP'11-12

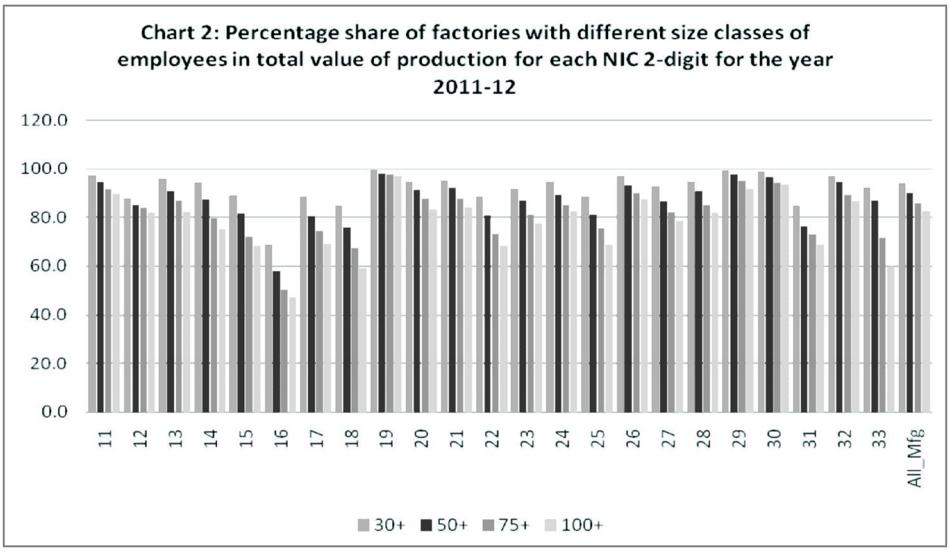
Chart 2: Percentage share of factories with different size classes of employees in total value of production for each NIC 2-digit for the year 2011-12
120.0
100.0
80.0
60.0
40.0
20.0
0.0
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 All_Mfg
30+ 50+ 75+ 100+

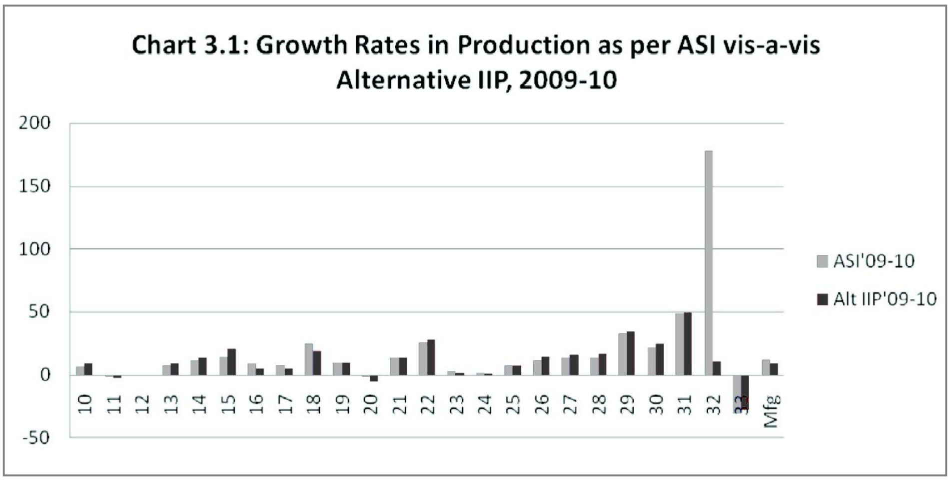
Chart 3.1: Growth Rates in Production as per ASI vis-a-vis Alternative IIP, 2009-10
200
150
100
50
0
-50
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 Mfg
ASI'09-10
Alt IIP'09-10

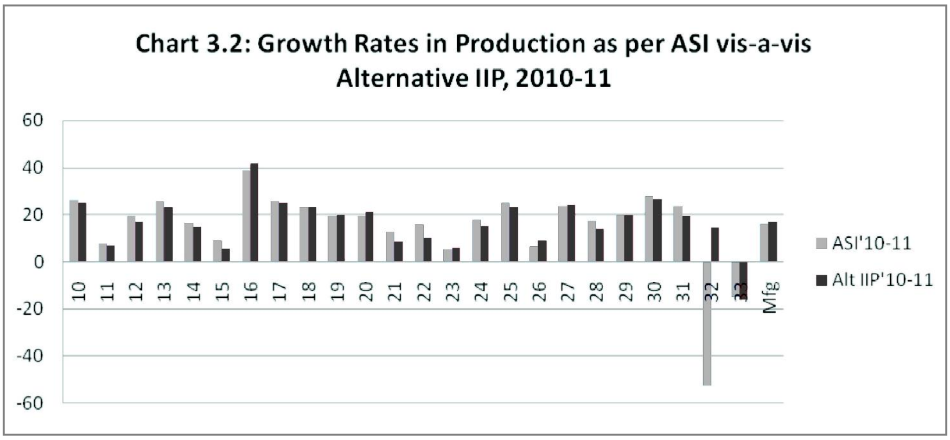
Chart 3.2: Growth Rates in Production as per ASI vis-a-vis Alternative IIP, 2010-11
60
40
20
0
-20
-40
-60
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 Mfg
ASI'10-11
Alt IIP'10-11

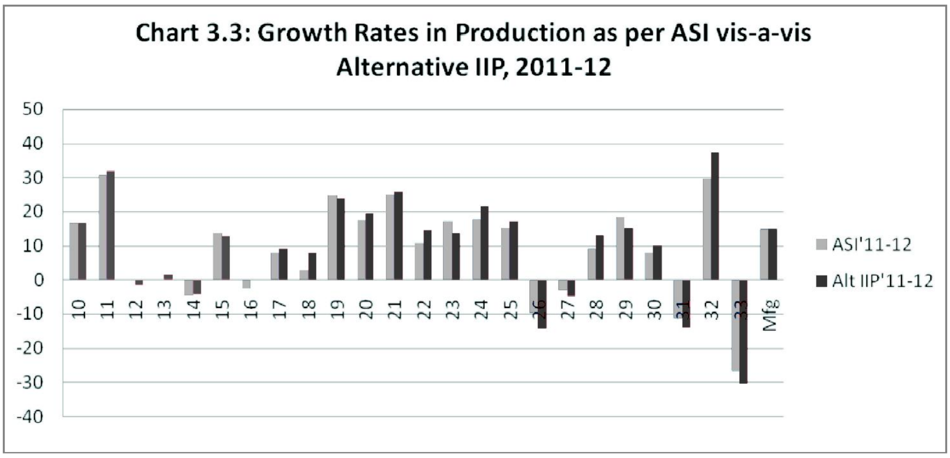

Table 1: Alternative Growth Rates of Industrial Production as per IIP and ASI

NIC 2008	Description (Manufacture of)	Divergences in the annual growth rates (%) of industrial production as per IIP and ASI					
		2009-10		2010-11		2011-12	
		IIP	ASI*	IIP	ASI*	IIP	ASI*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
13	Textiles	6.1	7.3	6.7	25.6	-1.3	-0.2
15	Leather & products	1.3	14.5	8	9.0	3.7	13.6
16	Wood & products	3.1	8.8	-2.2	38.7	1.8	-2.5
17	Paper & products	2.6	7.6	8.5	25.7	5	8.0
20	Chemical & products	5	-1.7	2	19.4	-0.4	17.3
22	Rubber & plastic	17.4	25.7	10.6	15.5	-0.3	10.7
10-33	**All manufactured products**	**4.8**	**12.3**	**8.9**	**16.2**	**3.0**	**14.9**

* At 2008-09 price

Table 2: Change in the GDP Estimates for Use of ASI-based Estimates in Place of IIP

Sector	2010-11				2011-12			
	GDP as per the 1st RE (Rs. Cr.)	GDP as per the 2nd RE (Rs. Cr.)	% Change due to the use of latest		GDP as per the 1st RE (Rs. Cr.)	GDP as per the 2nd RE (Rs. Cr.)	% Change due to the use of latest	
			Data of all sources	ASI data only			Data of all sources	ASI data only
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
At 2004-05 price								
Mfg-reg.	532219	559407	5.11	5.11	573761	607589	5.90	5.90
Mfg-unreg.	241943	242069	0.05	0.00	249262	246509	-1.10	0.00
Mfg	774162	801476	3.53	3.51	823023	854098	3.78	4.11
All (GDP)	**4885954**	**4937006**	**1.04**	**0.56**	**5243582**	**5247530**	**0.08**	**0.65**
At current price								
Mfg-reg.	720376	760650	5.59	5.59	848734	885547	4.34	4.34
Mfg-unreg.	319969	320100	0.04	0.00	353352	350635	-0.77	0.00
Mfg	1040345	1080750	3.88	3.87	1202086	1236182	2.84	3.06
All (GDP)	**7157412**	**7266967**	**1.53**	**0.56**	**8353495**	**8391691**	**0.46**	**0.44**

Table 3: Share of Different Employment Size Classes of Factories in Total Production

ASI: 2011-12

NIC	% Share of Different Employment Size Classes of Factories in Total Production				Selected Employment Size Class*	Estimated no. of factories in the Selected Size Class
	30+	50+	75+	100+		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
10	84.4	77.3	71.3	65.5	50+	6,878
11	97.0	94.3	91.4	89.1	50+	542
12	87.4	84.9	83.7	81.5	75+	646
13	95.4	90.3	86.5	82.0	100+	3,085
14	93.9	87.1	79.5	74.9	50+	3,224
15	88.4	81.2	71.8	68.0	50+	1,293
16	68.5	57.8	50.2	46.8	30+	467
17	88.3	80.3	74.3	68.9	50+	933
18	84.7	75.7	67.2	59.1	30+	1,248
19	99.3	97.6	97.2	96.7	100+	206
20	94.4	91.2	87.5	82.7	100+	1,556
21	94.8	91.7	87.5	83.8	100+	1,210
22	88.3	80.6	73.1	67.9	30+	3,499
23	91.4	86.6	80.8	77.1	100+	1,885
24	94.4	89.0	84.8	82.4	100+	1,995
25	88.3	80.8	75.2	68.5	50+	2,634
26	96.5	93.1	89.6	87.0	100+	607
27	92.6	86.5	82.0	78.4	75+	1,422
28	94.5	90.4	84.9	81.6	100+	1,435
29	98.7	97.4	94.8	91.5	100+	1,496
30	98.2	96.3	94.1	93.1	100+	471
31	84.6	76.0	72.9	68.5	30+	321
32	96.6	94.5	88.9	86.5	100+	695
33	91.7	86.9	71.4	59.6	30+	254
Mfg	**93.8**	**89.5**	**85.6**	**82.3**	--	**38,002**

* Selected by considering both share in total output and additional workload involved in terms of no. of factories

Table 4: Alternative Growth Rates of Industrial Production

NIC 2008	Wt. Diag. (ASI:	SSC	Growth Rates (%) in Industrial Production								
			Current IIP*			ASI			Alternative IIP**		
			2009 -10	2010-11	2011-12	2009-10	2010-11	2011-12	2009-10	2010-11	2011-12
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
10	6.308	50+				6.9	26.1	16.5	8.6	24.8	16.6
11	1.777	50+				-1.7	7.9	30.7	-2.2	6.9	31.8
12	1.586	75+				-0.5	19.5	0.1	0.3	17.1	-1.6
13	4.715	100+	6.1	6.7	-1.3	7.3	25.6	-0.2	9.1	23.1	1.6
14	2.087	50+				11.4	16.6	-4.5	13.7	14.8	-4.1
15	0.675	50+	1.3	8.0	3.7	14.5	9.0	13.6	20.5	5.8	12.7
16	0.172	30+	3.1	-2.2	1.8	8.8	38.7	-2.5	4.9	41.5	-0.2
17	1.455	50+	2.6	8.5	5.0	7.6	25.7	8.0	5.1	24.9	8.9
18	0.791	30+				25.2	23.3	2.6	19.3	23.2	7.9
19	13.012	100+				10.0	19.3	24.5	9.9	19.8	23.7
20	9.496	100+	5.0	2.0	-0.4	-1.7	19.4	17.3	-5.3	21.2	19.4
21	5.969	100+				13.6	12.7	25.0	13.5	8.6	25.7
22	3.561	30+	17.4	10.6	-0.3	25.7	15.5	10.7	27.7	10.2	14.4
23	7.038	100+				2.9	5.2	17.1	1.5	6.1	13.7
24	14.445	100+				1.8	17.8	17.6	0.8	15.1	21.5
25	3.366	50+				7.7	24.8	15.2	7.4	23.0	17.1
26	3.151	100+				11.2	6.5	-9.6	14.1	8.9	-14.2
27	4.419	75+				13.4	23.5	-3.0	16.2	24.1	-4.8
28	7.205	100+				13.9	17.4	9.0	16.8	14.1	13.1
29	4.738	100+				33.2	19.9	18.3	34.6	19.9	15.0
30	2.407	100+				21.7	27.9	8.0	24.6	26.4	9.8
31	0.209	30+				48.6	23.5	-11.4	49.7	19.4	-13.9
32	1.013	100+				178.1	-52.4	29.6	10.8	14.5	37.2
33	0.405	30+				-30.9	-14.8	-26.8	-27.6	-16.1	-30.5
Mfg	**100**		**4.9**	**8.9**	**3.0**	**12.4**	**15.9**	**14.9**	**9.3**	**17.0**	**14.7**
Mfg: Growth rate in total output in real terms						**11.6**	**18.5**	**15.2**			
Mfg: Growth rate in total GVA in real terms						**11.6**	**12.0**	**10.4**			

* Presented only for 5 industry codes corresponding to NIC 2004 Codes 17, 19, 20, 21, 24 and 25 having concordance with NIC 2008 Codes 13, 15, 16, 17, 20 and 22 respectively for which corresponding WPI deflators are available to convert ASI output figures at constant (2008-09) price.

**For NIC 2008 codes other than 13, 15, 16, 17, 20 and 22 and for the entire manufacturing sector, WPI for all manufactured products has been used for constructing the index.

Trade Costs between India and the European Union

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Abstract

The present study aims to utilize the micro-founded measure of trade cost derived by Novy (2013) to estimate the relative bilateral trade costs of India with its European Union partners. The advantage of using such a model is that the trade costs can be derived entirely by using observable trade data. The results show that Indian tariff equivalent with its major EU trading partners has declined by 20 percentage points between 1995-2010, with Malta and Latvia experiencing the greatest decline. The study then decomposes the bilateral trade growth to ascertain whether it is an outcome of increased domestic production or reduction in bilateral and multilateral trade barriers. Novy's model indicates that the decline in relative bilateral trade costs explains the greatest percentage of this trade growth, which is partially offset by decline in multilateral resistance terms that has diverted trade away to other trading partners primarily in South and South-east Asia and North America.

1. Introduction

1.1 All costs incurred in delivering a good from its place of production to its final consumer apart from the marginal cost of producing it, cumulatively add up to trade costs. They are influenced by several factors like – transportation costs, border barriers, common language effects, use of different currency, tariff and non-tariff barriers and other such related transaction costs like collecting information and overcoming trade barriers. (AW 2004)Trade costs significantly affect trade across countries and need to be taken into account to explain the rapid surge in bilateral and multilateral trade across nations in the past decades. However, arriving at a precise estimate of these trade costs is not easy because of the data limitations associated with capturing the aforementioned trade barriers. The problem becomes more acute when we are dealing with emerging economies where data of appropriate quality may not be available. Also, trade costs cannot be neglected in any current popular discourse of International Economics because of their significant negative impact on trade volumes (AW 2004).With greater regional and global integration in the last few decades, trade costs have shown significant declining trend. Regional blocs like ASEAN, SAFTA, SAARC, G20, EU and global bodies like WTO aim to reduce trade barriers to promote efficient trade across countries (De, Prabir 2006). The present study tries to look into the dynamics of one such regional bloc –the European Union(EU) and how its trading relationship with India has shaped up over the last two decades. Given that such a specific study to investigate the determinants of trade flow between India and EU has not been conducted in the past, we hope to obtain significant policy insights from our analysis.

1.2 European Union has emerged as a successful model of regional bloc in the last two decades since its inception in 1993. It is a union of 28 European countries which try to

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leverage the advantages of a single borderless market using standardized system of laws and regulations (Europa). Because of the inseparable nature of their political and economic partnership, the member countries of EU need to be analysed through the same lens of trade policies and design. This is especially relevant in the context of India, for which European Union was the largest trading partner in terms of trade volumes last year (The Diplomat, June 17, 2014). Also, India and EU started negotiations for a Free Trade Agreement in June 2007, which comprehensively covers a wide range of goods and services (The Indian Express, Feb 4, 2014). The negotiations, are still ongoing, and have not reached any definitive conclusion.

1.3 Indian trade policies were characterised by import substitution and quota-raj leading to an autarkic trade regime in the period 1950-1975 (Europa, June 2007). Though partial and intermittent liberalization of the economy started during the mid-seventies, a comprehensive roadmap for implementing economy-wide trade reforms could only be brought about in 1992. In the new millennium, international trade has assumed significant importance for India, being increasingly seen as a powerful instrument in driving economic growth and generating employment. The trade policies are being aimed at reducing a number of tariff and non-tariff barriers like, import quotas, quantitative restrictions and compulsory certification of a range of products which also include time consuming custom procedures. This would also help to improve the ease of doing business in India[2] and help to integrate Indian economy more firmly with the world economy by reducing various multilateral and bilateral trade barriers. Consequently, India has already entered into a number of preferential trade agreements with regional trading partners, key among which are - Comprehensive Economic Cooperation Agreement (CECA) with Singapore (2005), South Asia Free Trade Area (SAFTA) with SAARC nations (2004) and Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) with Bangladesh, India , Myanmar ,Sri Lanka, Thailand, Bhutan and Nepal (2004). Likewise, there has been a significant reduction of tariffs in India in 1990-2005 period, from an average of around 79% to 17%[3]. This decline in tariff has also manifested itself in increased openness of Indian economy, with share of exports of goods and services to GDP rising from 7.3% (1990) to 13% (2000) to 19% (2004). The share of imports of goods and services to GDP has also shown similar trends - 9.9% to 14% to 21%. The signing of the proposed FTA between India and EU is expected to bring in more substantial changes in the structure of tariffs in India for whom EU has emerged as the key trading partner over the years. From the perspective of EU, India is a large rapidly growing economy with an enormous consumer base, and thus it assumes immense potential importance as a trading partner.

1.4 In light of the above, this study tries to capture the implicit and explicit trade costs of India with its European Union trading partners over a period of 16 years (1995-2010) using the micro-founded measure of tariff equivalence. This tariff estimator measures relative bilateral trade costs over and above domestic trade using observable trade data. The study then decomposes this relative bilateral trade volumes across the partners to conclude which factors have been largely responsible for this surge in trade volumes for these years.

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[2] India currently stands at 142nd rank with regards to ease of doing business, 2 notches lower than where it was last year. *(Doing Business Report 2015)*

[3] Qualitative analysis of a potential Free Trade Agreement between the European Union and India - Main Report, June 2007.

2. Literature Review

2.1 The area of trade cost is replete with a good amount of economic literature revolving round its theoretical foundations and empirical studies. Samuelson (1954) is credited with the seminal contribution in this area, who modelled transportation costs in trade as iceberg costs wherein only a fraction of the goods shipped aboard from the exporter country reaches its destination, the rest of it melts away in transit. Tinbergen (1962) used distance as an approximate proxy for trade costs in his famous gravity model formulation. Limao and Venables (2001) use the ratio [(cif/fob)-1] to capture transaction costs of trade across pair of countries. Obstfield and Rogoff (2001) assume iceberg shipping costs in an extremely simple two country endowment economy. Introducing a constant elasticity of substitution utility function for the representative home consumer, they arrive at a precise formulaic estimate of trade costs.[4] Anderson and van Wincoop (2003) incorporated exogenous bilateral trade barriers in their gravity formulation. Specifically, if p_i is the net supply price of the good originating in country *i*, then $p_{ij} = p_i t_{ij}$ is the price of this good faced by consumers in country *j*, where $t_{ij} \geq 1$ is the gross bilateral trade cost factor. They further assumed that bilateral trade costs are a function of two particular trade-cost proxies – a border barrier and geographical distance. The corresponding trade cost function hypothesized by them is: $t_{ij} = b_{ij} d_{ij}^k$ where b_{ij} is a border indicator variable, d_{ij} is the bilateral distance and *k* is the distance elasticity. Anderson and Van Wincoop (2004) model bilateral trade barriers as a log-linear function of observable proxies- distance, adjacency, preferential trade membership, common language and a host of other factors. Hummels (2007) has studied how decline in ocean freight and air shipping costs have fuelled international trade in the last 50 years (1952- 2004). His results indicate that the decline in air shipping costs have been substantial which has acted as a critical input in increasing international trade in the latter half of the 20th century. However, ad-valorem ocean transportation costs have not undergone much decline than their levels in the 1950s. His study uses the standard ad-valorem model, denoting the origin price as p, destination price as p*, and per unit shipping costs as f, where p* = p+f. The ad-valorem percentage change in prices after incorporating transportation costs becomes: p*/p = 1 + f/p. The study then employs a commonly used inaccurate approach to model per unit shipping costs f as a constant percentage τ of the value shipped. The ad-valorem cost, thus, comes out to be p*/p = 1 + τ .

2.2 The problem with the models of trade costs discussed above is that a particular trade cost function has been assumed which may not accurately cover all the relevant factors concerning trade barriers. Novy (2013) resolves these issues by deriving a micro-founded measure[5] that can be obtained by using observable trade data of production and

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[4] $\frac{C_H}{pC_F} = \frac{p^* C_F^*}{C_H^*} = (1-\tau)^{1-\theta}$, where C_H and C_F are home-consumption of home produced good, and home consumption of foreign produced good respectively. The foreign counterparts have similar utility functions – C_H^* and C_F^*. τ is the iceberg shipping cost. See Obstfield and Rogoff (2001) for more details.

[5] Derivation of the model has been done in Novy, Dennis. "Gravity Redux: measuring international trade costs with panel data." *Economic Inquiry* 51.1 (2013): 101-12.

exports. Thus, there is no need to hypothesize a specific trade cost function. Also, the earlier studies use distance as a trade cost proxy, which does not change over time. This rules out the possibility of using time-series or panel data studies over such data. Novy's model, however, can be applied over both time series and panel data sets. Due to these significant advantages over the earlier models, we have chosen Novy's approach to trade cost modelling. An important point to note here is that Novy's model does not assume frictionless domestic trade, thus, tariff equivalent in this model, measures bilateral trade costs relative to the domestic trade costs. All such factors which increase the transaction costs of international trade over and above the domestic trade are captured in his measurement of tariff equivalence. This micro-founded measure of tariff equivalent is also in line with the trade theories of Chaney (2008) and Melitz and Ottaviano (2008) who assume heterogeneous firms in the model. However, we shall not discuss this in our paper given the limited scope of our study.

3. Methodology

3.1 Novy (2013) uses the famous gravity equation of Anderson and Van Wincoop (2003) to derive the following expression for bilateral tariff equivalent. This formulation of tariff equivalent relationship is generalizable and can also be derived from other well-known gravity models like the Ricardian Model by Eaton and Kortum (2002) as well as the heterogeneous firm model by Chaney (2008) and Melitz and Ottaviano (2008)[6].

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}}\right)^{\frac{1}{2(1-\sigma)}} - 1 \qquad (1)$$

where,

t_{ij} & t_{ji} are bilateral trade costs

t_{ii} & t_{jj} are domestic trade costs

$\sigma > 1$ is the elasticity of substitution across goods[7]

x_{ij} denotes nominal exports from country *i* to country *j*

3.2 From Equation 1, we can see that if the bilateral trade flows $x_{ij}x_{ji}$ increase relative to domestic trade flows $x_{ii}x_{jj}$, then the value of tariff equivalent τ_{ij} would go down indicating that it has become easier to trade between the two countries *i* and *j*. τ_{ij} measures the geometric mean of the relative trade barriers in both the directions. Novy (2013) decomposes the Anderson van Wincoop (2004) gravity model[8] as below to provide an analytical

[6]See Novy (2013) for details.

[7]This implies that the goods are imperfect substitutes. When the elasticity of substitution across goods is greater than 1, then an increase in the relative price of a good causes a decline in its share of total expenditure, in line with the law of demand. As we will see later the value has been assumed to be 8 (AW 2004).

[8]Basic Gravity Model Anderson-van Wincoop (2004): $x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma}$

framework of bilateral trade growth accounting. Equation[9] 2 is obtained by taking natural logarithm of the basic gravity model of Anderson-van Wincoop and taking difference on both sides.

$$\Delta \ln(x_{ij}\, x_{ji}) = 2\Delta \ln(\frac{y_i y_j}{y^w}) + 2(1-\sigma)\Delta \ln(1+\tau_{ij}) - 2(1-\sigma)\Delta \ln(\Phi_i \Phi_j) \qquad (2)$$

Here, y_i is the nominal income of country *i*

y_w is the world income defined as $y_w \equiv \sum_j y_j$

Φ_i is a proxy for the country *i*'s multilateral resistance relative to the domestic trade costs , estimated as-

$$\Phi_i = (\frac{\Pi_i P_i}{t_{ii}})^{\frac{1}{2}} \qquad (3)$$

where and are the price indices of country *i.*

$$100\% = \frac{2\Delta \ln(\frac{y_i y_j}{y^w})}{\Delta \ln(x_{ij} x_{ji})} + \frac{2(1-\sigma)\Delta \ln(1+\tau_{ij})}{\Delta \ln(x_{ij} x_{ji})} - \frac{2(1-\sigma)\Delta \ln(\Phi_i \Phi_j)}{\Delta \ln(x_{ij} x_{ji})} \qquad (4)$$

3.3 Equation 2 is divided by the left hand side to arrive at the bilateral decomposition in terms of percentages as given in equation 3.This relates the growth of bilateral trade $\Delta \ln(x_{ij} x_{ji})$ to three distinct factors: the first term outlines the contribution of income growth, the second term is a contribution of the decline in the relative bilateral trade costs and the last term is the contribution of the decline in the multilateral resistance to bilateral trade expansion. The negative contribution of multilateral resistance term decline to trade costs can be interpreted in the manner that if trade barriers with the rest of the world falls then the bilateral trade between country *i* and country *j* decreases. The multilateral resistance terms can be evaluated using observable trade data as using simple substitutions[10] in the theoretical gravity model.

$$2(1-\sigma)\Delta \ln(\Phi_i \Phi_j) = \Delta \ln(\frac{y_i / y^w}{x_{ii} / y_i}) + \Delta \ln(\frac{y_j / y^w}{x_{jj} / y_j}) \qquad (5)$$

4. Data

4.1 The bilateral trade flow data has been extracted from IMF International Financial Statistics. Production data has been obtained from the World Bank database. All the figures used, are nominal values and denominated in U.S. dollars. Greece has been excluded from the study for lack of requisite data in the study period. From equation 1 and 2, we note that both tariff equivalence calculation and trade growth accounting require proxies for national income. Novy (2013) mentions that GDP data is not suitable for trade calculations as it incorporates the contribution of service sector and is based upon value-added methodology. This is not in line with trade volume figures which include gross shipment figures. Thus,

[9] The derivation of equation 2 has been discussed in detail in section 1 of the appendix.

[10] The derivation of equation 2 has been discussed in detail in section 2 of the appendix.

the present study follows the methodology of Wei (1996)[11]in constructing a proxy for national income using the production data of agriculture, manufacturing and mining sector. Nominal values of these production figures have been taken from the World Bank database. is expressed as a difference of nominal GDP minus total exports of the *i*th country to the rest of the world (Shang-Jin Wei (1996)). The value of has been taken to be eight (Anderson and van Wincoop (2004)).The study period which runs from 1995-2010, helps us to ascertain how the post liberalized India has been able to forge trade relations with European Union – the largest unified global market. EU itself came into existence on November 1, 1993, so any relevant study revolving around EU would begin after 1993. Post 2010, both India and EU have been characterized by increasing economic turbulence in the wake of the great recession. So, these may not be the appropriate years for analysis. Keeping these considerations, our study ranges from 1995-2010.

5. Tariff Equivalent Measure of bilateral trade for India with EU Partners

5.1 Figure 1 illustrates the cumulative percentage decline in the relative bilateral trade cost measure for India with all its EU trading partners for 1995-2010. The tariff equivalent measure has significantly fallen for countries like – Poland, Malta, Latvia, France, Estonia and Slovenia. On an average the tariff equivalent has fallen cumulatively by 20 percentage points for European Union Trading partners. Interestingly, tariff equivalent has increased for three European Zone countries – Slovakia, Denmark and Bulgaria. One possible reason which is also supported by data is that the domestic tariffs in these nations have fallen much faster[12] than the corresponding bilateral tariffs. Since, Novy (2013) measures relative bilateral tariff equivalent, it shows a spike for these countries.

5.2 Though countries like Germany and United Kingdom share high trade volume trade partnership with India, their tariff equivalent has not gone down significantly as compared to the overall average. This is one area which could be looked into by the policymakers, wherein we can try reducing trade barriers with countries which are already our big shot partners. We have created a unified index for European Union by summing the production and export levels to the rest of the world of 27 EU countries[13] so that we have consolidated trade and production volumes for EU as a whole. EU can then be treated as a single country which engages in bilateral trade with India.

5.3 Given that EU region has a high degree of economic integration and a common currency, our assumptions gain some ground and the analysis becomes far simpler. Figure 2 illustrates the variation of tariff equivalent for euro zone as a whole over the years with India. Having shown a consistent decline till 2001, the tariff equivalent has stabilised at around 0.5, hence forth.

[11]Wei(1996) uses production data for agriculture, mining and total manufacturing.

[12] Bulgaria's domestic trade volumes ($x_{ii}x_{jj}$) shot up by 412% as compared to the bilateral trade volumes $x_{ij}x_{ji}$. For Denmark and Slovakia, this number was – 720% and 580% respectively.

[13]Greece has been excluded from the analysis because appropriate data was not available.

6. Decomposing growth of Indian Bilateral Trade with EU trading partners

6.1 Table 1 gives the country wise decomposition of bilateral trade growth for India in the period 1995-2010. The countries have been arranged in the decreasing order of their average bilateral trade volume with India in the aforementioned period. Germany was the biggest trade partner of India in this period, and understandably, has a low tariff equivalent. The same holds for countries like UK, Belgium, Italy and France. Apart from Germany, income growth in all these countries is able to explain more than half of the bilateral trade growth with India. For countries which feature lower down in the table, income growth's contribution to trade growth decreases significantly, with countries like Cyprus, Malta and Estonia showing negative trends. The interpretation of coefficients in the Column 5, 6 and 7 is fairly intuitive. Ideally, one would expect that the growth in income would give a positive stimulus to bilateral trade between countries[14] and correspondingly, the terms appearing in column 5 should ideally have a positive sign. Likewise, decline in bilateral trade barriers relative to the domestic trade should also has a positive impact on percentage trade volume transacted between countries, as given in column 6. Column 7 contains contribution of the decline in multilateral resistance on the relative bilateral trade between countries, which should ideally be negative as a negative term implies that easing of trading with the rest of the world (the other EU countries in this case) has diverted bilateral trade away from the trading partners under consideration.

6.2 Equation 2 has been utilized to decompose the growth of Indian bilateral trade. Figure 3 illustrates the contribution of each of the three factors which we discussed above towards the growth in bilateral trade for India with the entire EU region in the period from 1995-2010.

6.3 The decline in relative bilateral trade costs have had the highest positive impact, 109%. Income growth proxied by GDP levels explain 26% of this growth. Decline in multilateral resistance term has had a negative impact on bilateral trade with EU. This indicates that reduction of multilateral barriers has diverted significant portion of trade from Indian and EU to other regions in the world. However, we note that the results are not very consistent across the various partners of EU.

7. Conclusions

7.1 The results indicate that trade liberalisation in the last two decades in India has had a significant impact on its bilateral trade with EU. This may also have to do with the European Union countries gaining higher degree of political and economic integration in the same period. On an average, the Novy tariff equivalent has declined by 20 percentage points in the period of the study (1995-2010). This relative bilateral trade growth has been fuelled mainly by the decrease of bilateral resistance values across the countries which explains 109% of the trade growth. This spurt in trade has been partially offset by the consequent decrease of multilateral resistance terms (-35%) in the same period. India, particularly, has forged ahead on various trade partnerships in South and South East Asia. India's trade with Middle East countries and U.S. has also picked up in this period which has diverted trade away from EU that is reflected by negative contribution of multilateral

[14]See Gravity Model (Tinbergen 1962, AW 2001) for details.

resistance term. Since 1994, WTO has started playing a major role in trade liberalisation worldwide, which also explains the results of the study. In line with the gravity model framework, the increase in incomes is found to have a substantial impact (26%) on trade growth. Amongst the EU countries, Latvia and Malta have experienced the largest decline in their tariff equivalent for trade with India in the study period. Data shows that this tariff equivalent measure is sensibly related to the average bilateral trading volumes of India with the EU countries so that countries which have traded larger volumes of merchandise goods with India in the study period have lower average tariff equivalents.

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Fig. 1 : Percentage decline in Novy Tariff Equivalent (1995 - 2010)

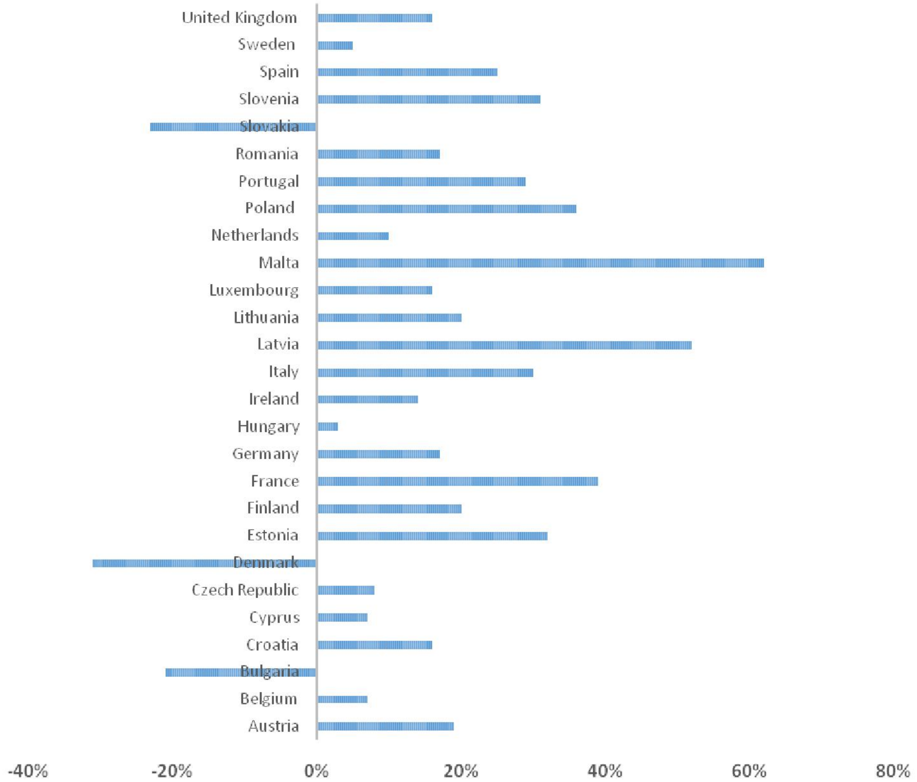

Fig. 2 : Novy Tariff Equivalent of India with European Union

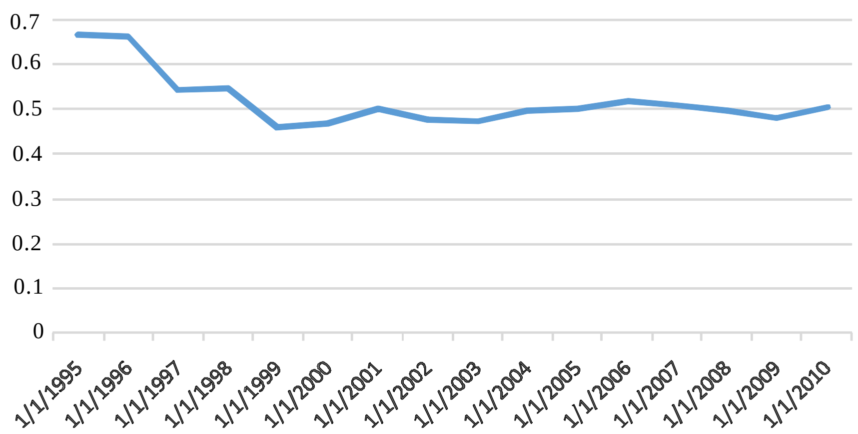

Fig. 3 : Percentagewise decomposition of bilateral trade growth

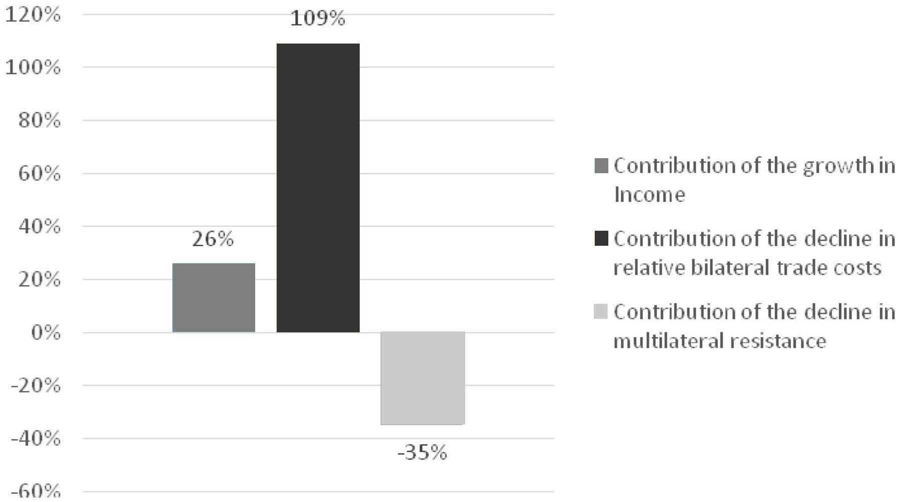

Table : 1

Column 1 Partner Country	Column 2 Average Bilateral Trade Volume (In million USD)	Column 3 Percentage Growth in Bilateral Trade	Column 4 Average Novy's Tariff Equivalent	Column 5 Contribution of the growth in Income	Column 6 Contribution of the decline in relative bilateral trade costs	Column 7 Contribution of the decline in multilateral resistance	Column 8 Total
Germany	22123085.893	248%	0.765	32%	-82%	150%	100%
United Kingdom	16403803.781	195%	0.679	89%	90%	-79%	100%
Belgium	15072182.617	256%	0.825	81%	72%	-53%	100%
Italy	5788532.936	286%	0.850	59%	105%	-63%	100%
France	4937667.515	326%	0.766	84%	9%	7%	100%
Netherlands	4115913.027	376%	1.076	-25%	174%	-50%	100%
Spain	905534.618	362%	1.227	50%	67%	-17%	100%
Sweden	329639.787	319%	1.103	55%	49%	-4%	100%
Denmark	106998.472	165%	1.160	21%	104%	-25%	100%
Austria	101082.612	390%	1.307	44%	-12%	68%	100%
Finland	60764.359	304%	1.000	42%	136%	-78%	100%
Poland	45158.352	357%	1.381	52%	-37%	84%	100%
Czech Republic	35877.076	437%	1.441	-16%	101%	15%	100%
Romania	31279.841	333%	1.557	30%	40%	30%	100%
Ireland	28768.510	366%	1.597	64%	68%	-32%	100%
Hungary	14468.488	501%	1.707	98%	11%	-8%	100%
Portugal	9483.872	276%	1.505	26%	154%	-80%	100%
Slovenia	5507.145	412%	1.694	88%	-31%	42%	100%
Lithuania	2136.857	684%	1.843	-135%	86%	149%	100%
Slovakia	1304.179	169%	1.874	22%	73%	5%	100%
Bulgaria	1167.995	292%	1.613	-50%	-78%	227%	100%
Malta	918.376	852%	1.857	-10%	389%	-279%	100%
Latvia	439.451	1023%	1.920	35%	-22%	86%	100%
Croatia	387.344	343%	2.217	0%	100%	0%	100%
Cyprus	354.052	326%	1.946	-10%	97%	13%	100%
Estonia	302.634	759%	2.117	-4%	66%	38%	100%
Luxembourg	229.819	422%	2.283	32%	29%	39%	100%

Appendix

1. Derivation of Trade Growth Accounting term

Gravity eqn. for trade for trade from i^{th} country to j^{th} country

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\Pi_i P_j}\right)^{1-\sigma} \qquad -(1)$$

Gravity eqn. for trade for trade from i^{th} country to j^{th} country

$$x_{ji} = \frac{y_j y_i}{y^w}\left(\frac{t_{ji}}{\Pi_j P_i}\right)^{1-\sigma} \qquad - \quad (2)$$

Multiplying the above two eqns. we have –

$$x_{ij} x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{t_{ij} t_{ji}}{\Pi_i P_i \Pi_j P_j}\right)^{1-\sigma} \quad - \qquad (3)$$

Taking logarithms both sides, we have –

$$\ln(\mathrm{x}_{ij}\, x_{ji}) = 2\ln\left(\frac{y_i y_j}{y^w}\right) + 2(1-\sigma)\ln(1+\tau_{ij}) - 2(1-\sigma)\ln(\Phi_i \Phi_j) \quad - \qquad (4)$$

Where $\tau_{ij} = \left(\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}}\right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ii} x_{jj}}{x_{ij} x_{ji}}\right)^{\frac{1}{2(\sigma-1)}} - 1$

And $\Phi_i = \left(\frac{\Pi_i P_i}{t_{ii}}\right)^{\frac{1}{2}}$

Taking difference on both sides we have the final equation of trade growth accounting

$$\Delta\ln(\mathrm{x}_{ij}\, x_{ji}) = 2\Delta\ln\left(\frac{y_i y_j}{y^w}\right) + 2(1-\sigma)\Delta\ln(1+\tau_{ij}) - 2(1-\sigma)\Delta\ln(\Phi_i \Phi_j)$$

2. Derivation of the Multilateral Resistance Term

Φ_i is a proxy for the country i's multilateral resistance relative to the domestic trade costs , estimated as-

$\Phi_i = (\frac{\Pi_i P_i}{t_{ii}})^{\frac{1}{2}}$, where Π_i and P_i are the price indices of country *i*

Using the above formulation for Φ_i, we have - $\Phi_i \Phi_j = (\frac{1}{x_{ii} x_{jj}})^{\frac{1}{1-\sigma}} (\frac{y_i y_j}{y_w})^{\frac{2}{1-\sigma}}$ - (4)

Also from gravity model, we have- $x_{ii} x_{jj} = (\frac{y_i y_j}{y^w})^2 (\frac{t_{ii} t_{jj}}{\Pi_i P_i \Pi_j P_j})^{1-\sigma}$ - (5)

Substituting $t_{ii} t_{jj}$ from here, in the previous $\Phi_i \Phi_j$ equation we have –

$$\Phi_i \Phi_j = (\frac{1}{x_{ii} x_{jj}})^{\frac{1}{2(1-\sigma)}} (\frac{y_i y_j}{y_w})^{\frac{1}{1-\sigma}} \qquad \text{- (6)}$$

Taking natural logarithm, followed by differencing on both sides, we arrive at the final expression for multilateral resistance term

$$2(1-\sigma)\Delta \ln(\Phi_i \Phi_j) = \Delta \ln(\frac{y_i / y^w}{x_{ii} / y_i}) + \Delta \ln(\frac{y_j / y^w}{x_{jj} / y_j})$$

3. Listed below is the analysis of the top 5 trading partners of India in EU:

A. Germany

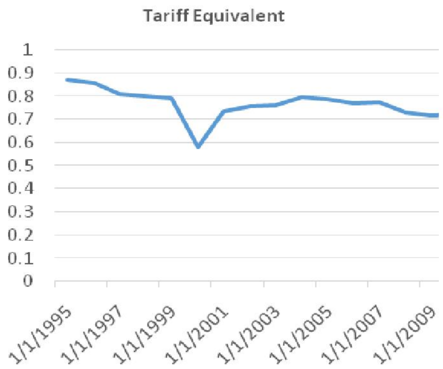

Fig. 4

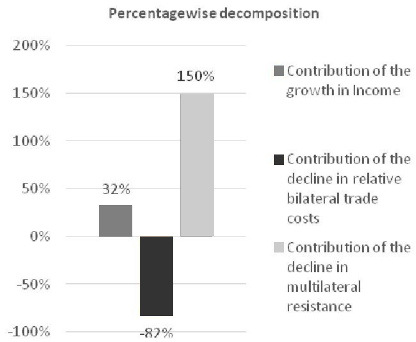

Fig. 5

B. United Kingdom

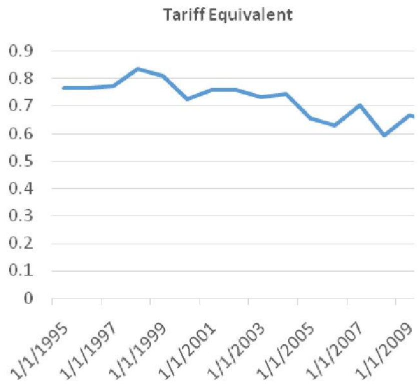

Fig. 6

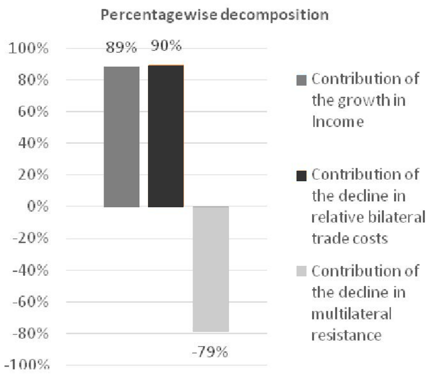

Fig. 7

C. Belgium

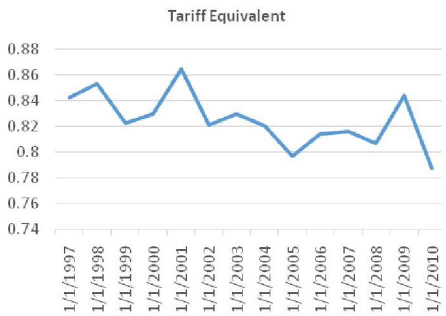

Fig. 8

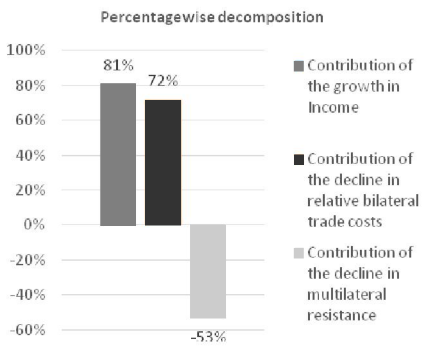

Fig. 9

D. Italy

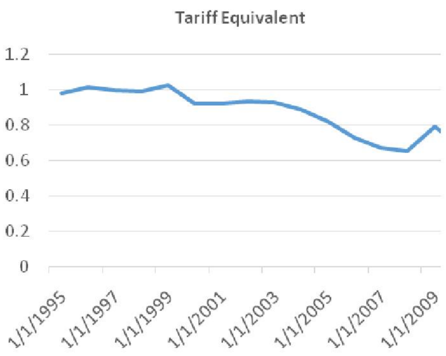

Fig. 10

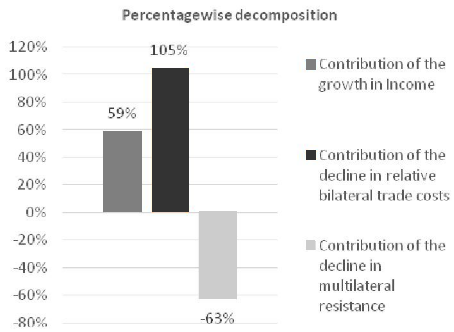

Fig. 11

E. Netherlands

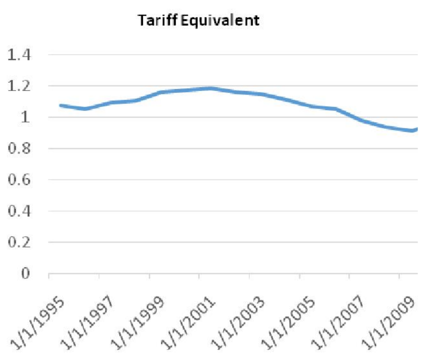

Fig. 12

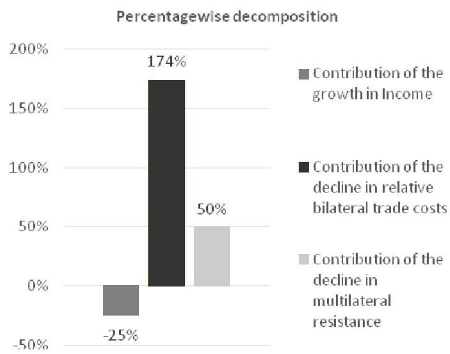

Fig. 13

4. Derivation of Trade Costs of Novy (2008)

Anderson and Wincoop (2003)'s framework

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\pi_i p_j}\right)^{1-\sigma} \quad (1)$$

and $\pi_i{}^{1-\sigma} = \sum_j p_j^{1-\sigma}\theta_j t_{ij}^{1-\sigma} \ \forall_i (2)$

$$p_j{}^{1-\sigma} = \sum_i \pi_i^{1-\sigma}\theta_i t_{ij}^{1-\sigma} \ \forall_j (3)$$

By using gravity equation (1) to find the expression for country *i*'s intranational trade:

$$x_{ii} = \frac{y_i y_i}{y^w}\left(\frac{t_{ii}}{\pi_i p_i}\right)^{1-\sigma} \quad (4)$$

Where t_{ii} represents intranational trade costs, for example domestic transportation costs. Equation (4) can be solved for the product of outward and inward multilateral resistance as:

$$\pi_i p_i = \left(\frac{x_{ii}/y_i}{y_i/y^w}\right)^{\frac{1}{(\sigma-1)}} t_{ii} \quad (5)$$

The explicit solution for the multilateral resistance variables can be exploited to solve the general equilibrium model bilateral trade costs. Gravity equation (1) contains the product of outward multilateral resistance of one country and inward multilateral resistance of another country, $\pi_i p_j$, whereas equation (5) provides a solution for $\pi_i p_i$. It is therefore useful to multiply gravity equation (1) by the corresponding gravity equation for trade flows in the opposite direction, x_{ji}, to obtain a bidirectional gravity equation that contains both countries' outward and inward multilateral resistance variables:

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{t_{ij}t_{ji}}{\pi_i p_i \pi_j p_j}\right)^{1-\sigma} \quad (6)$$

Substituting the solution from equation (5) yields,

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{t_{ij}t_{ji}}{\left(\frac{x_{ii}/y_i}{y_i/y^w}\right)^{\frac{1}{(\sigma-1)}} t_{ii} \left(\frac{x_{jj}/y_j}{y_j/y^w}\right)^{\frac{1}{(\sigma-1)}} t_{jj}}\right)^{1-\sigma}$$

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} \left(\frac{x_{ii}/y_i}{y_i/y^w}\right)^{\frac{1}{(1-\sigma)}} \left(\frac{x_{jj}/y_j}{y_j/y^w}\right)^{\frac{1}{(1-\sigma)}}\right)^{1-\sigma}$$

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{x_{ii}/y_i}{y_i/y^w}\right)^{\frac{1-\sigma}{(1-\sigma)}} \left(\frac{x_{jj}/y_j}{y_j/y^w}\right)^{\frac{1-\sigma}{(1-\sigma)}} \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1-\sigma}$$

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{x_{ii}}{y_i}\frac{y^w}{y_i}\right) \left(\frac{x_{jj}}{y_j}\frac{y^w}{y_j}\right) \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1-\sigma}$$

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{y^w}{y_i^{\,2}}\right) \left(\frac{y^w}{y_j^{\,2}}\right) (x_{ii}x_{jj}) \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1-\sigma}$$

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{y^w}{y_i y_j}\right)^2 \left(x_{ii}x_{jj}\right) \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1-\sigma}$$

$$x_{ij}x_{ji} = \left(x_{ii}x_{jj}\right) \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1-\sigma}$$

$$x_{ij}x_{ji} = \left(x_{ii}x_{jj}\right) \left(\frac{t_{ii}t_{jj}}{t_{ij}t_{ji}}\right)^{\sigma-1} \quad (7)$$

The size variables in the gravity equation (7) are not total income $y_i y_j$ as in traditional gravity equations but intranational trade $x_{ii}x_{jj}$. Intranational trade does not only control for the countries' economic size, but according to equation (5) it is also directly linked to multilateral resistance. (7) can be rearranged as:

$$\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} = \left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}}\right)^{\frac{1}{\sigma-1}} \quad (8)$$

As shipping costs between *i* and *j* can be asymmetric $\left(t_{ij} \neq t_{ji}\right)$ and as domestic trade costs can differ across countries $\left(t_{ii} \neq t_{jj}\right)$, it is useful to take the geometric mean of the barriers in both directions. It is also useful to deduct one to get an expression for the tariff equivalent. The resulting micro-founded trade cost measure is denoted as τ_{ij}:

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}}\right)^{\frac{1}{2(\sigma-1)}} - 1 \qquad (9)$$

τ_{ij} measures bilateral trade costs $t_{ij}t_{ji}$ relative to domestic trade costs $t_{ii}t_{jj}$. It therefore does not impose frictionless domestic trade and captures what makes international trade more costly over above domestic trade.

Financial Structure, Financial Development and Industrial Growth: Evidence from Indian States

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Abstract

Employing data for 1981-2008, the paper examines how state and industry characteristics interact with financial characteristics to influence industry growth. The findings suggest that bigger, capital-intensive industries grow faster in states with greater financial development. More importantly, the findings testify that financial development of states tends to overwhelm their financial structure in influencing industrial growth.

1. Introduction

1.1 The linkage between the real and financial sectors of an economy has always been of serious concern to policymakers. This assumes even greater relevance in developing economies typically characterized by lower levels of investment and concentration of economic activity in one or a few regions. A key concern for policymakers is therefore to ensure balanced expansion across regions in their quest for equitable growth and development.

1.2 Towards this end, using state-industry data for the period 1981-2008 and employing India as a case study, the paper examines how state and industry characteristics interact with financial characteristics (financial sector) to influence industry growth (real sector). We choose three important state financial characteristics: financial structure, the extent of financial development and the degree of financial penetration. Similarly, we employ three relevant industry characteristics: size, external (finance) dependence and capital intensity. We control for state and industry fixed effects and consider the interaction between the relevant state and industry characteristics. The coefficient on this variable enables us to discern how the interplay of industry and state characteristics influences industry growth.

1.3 As observed earlier, our data spans the period 1981 to 2008, which is an especially interesting period: the liberalization of the economy, which begun somewhat hesitantly in the 1980s and was rapidly pushed forward in 1991 post inception of a wider process of economy-wide reforms. The period is thus one of rapid change and growth in the Indian economy, coupled with the emergence of inequalities in the state-level growth process (Bollard et al., 2013).

1.4 Our choice of India rests on three considerations. First, India is presently one of the most important developing countries with a rich history of industrial sector controls.

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I would like to thank, without implicating, an anonymous referee for the insightful comments on an earlier draft.

Second, like the US, India is a federal polity comprising of states with their own governments and a measure of policy autonomy. Third, the country has a rich history of state-level industrial data. The cross-sectional and time series variation in the data provides an ideal laboratory to explore the effects of industrial policies on state-level industrial growth.

1.5 The reminder of the paper unfolds as follows. Section 2 presents an overview of the literature, and a brief description of the evolution of industrial policies in India. The empirical strategy and the database are detailed in Section 4. Section 5 discusses the results, followed by the policy implications and the concluding remarks.

2. Related Literature

2.1 In the Indian case, two sets of studies have explored the interlinkage between industrial policies and economic growth. The first set examines the role of labor lawsin affecting manufacturing performance. Besley and Burgess (2004) find that movement towards pro-worker policies at the state-level is linked to declines in employment and output in manufacturing.Thereafter, employing a much disaggregated codification of state labour laws, Ahsan and Pages (2009) document that pro-worker labor legislations are associated with lower elasticity of demand for labour. Hasan et al. (2009) find that states with relatively restrictive labour regulations have experience slower growth of employment. Hasan and Jandoc (2013) show that the share of labor-intensive employing less than 10 workers is much higher in restrictive labor regulation states as compared to other (pro-employer) states. Dougherty et al. (2014) show that total factor productivity in firms in labour-intensive industries were on average about 11-14% higher in the states with less restrictive labour laws.

2.2 The second set of studies evaluates the effect of liberalization on Indian industry. Thus, Aghion et al (2005) uncovers evidence that state- industries with greater technological capability benefited more from liberalization. Using industry level data, Hasan et al. (2003) report that trade liberalization had a positive effect on labor demand elasticities in manufacturing, especially in states with flexible labor regulations. Utilising industry-level data on major Indian states, Mitra and Ural (2008) show that the impact of trade reforms on productivity to be over 30% higher in states with flexible labor markets.

2.3 Several features of our study are of interest. First, unlike prior studies on this aspect (e.g., Gupta et al., 2008), we focus on how the interaction of state financial structure and industry characteristics influence industry growth. Second, borrowing from cross-country literature, we examine the effect of a state's financial structure as well as its financial development on industrial growth. The latter assumes relevance for India, since our dataset includes information from 1981 to 2008, which falls on both sides of the massive economic liberalization program. Finally, unlike research which focuses primarily on the impact of labor regulations on manufacturing output (Besley and Burgess, 2004), the present study is concerned more with how financial structure and development interact with industrial characteristics to shape industrial growth of sub-national regions.

2.4 The paper therefore, connects three strands of literature. First, it contributes to the development economics literature by addressing the pattern of industrial growth for a leading emerging economy. Second, it supplements the industrial organization literature by directly exploring the interlinkage between industrial characteristics and understanding its impact on industry growth. Finally, it augments the literature on regional economics by exploring how state-level industrial policies influence the geography of industrial location across sub-national regions within an economy.

3. Industrial Policies in India

3.1 The focus on a socialist economy in the 1960s with its overarching emphasis on poverty reduction and social equality meant that the policies pursued by the authorities were highly restrictive. This permeated all spheres of macroeconomic activity. As regards industrialization, the motto was one of self-reliance. As a result, the policy pursued was heavy-industry oriented industrialization within a closed economy setup. A key feature of this process was industrial licensing whereby firms would have to apply for a license for setting up new units or for capacity expansion. This was buttressed by a highly protective trade policy, often providing tailor-made protection to each sector of industry. The significant dead-weight losses that these policies entailed led to an overhaul of the extant architecture, creating a consensus on the need for greater liberalization and openness.

3.2 The economic reforms beginning 1991 laid strong emphasis on enabling markets and globalization coupled with gradual scaling down of government involvement in non-productive economic activities. The process of industrial licensing was dispensed with, except for a few hazardous and environmentally-sensitive industries. The requirement that investment by large industrial houses needed a separate clearance under the Monopolies and Restrictive Trade Practices Act to discourage the concentration of economic power was replaced by a new competition law to regulate anti-competitive behavior. As a result, the liberalization program, which reduced the extent of regulation, would be expected to exert differential impact on the relative roles of the government and the market as regards the location of production by industries.

3.3 The net effect of this process has been a sharp rise in industrial growth. From an average of 4% in the 1970s and around 6.5% in the 1980s, industrial growth jumped to over 8% during the period 1992-98, reflecting the effect of liberalization of various controls. Industry growth has improved thereafter, reflecting among others, a combination of pro-active economic policies and a conducive regulatory environment. Illustratively, industry growth averaged 7.5% during the ten-year period following 1998, peaking at 12.2% in 2006-07.

3.4 Notwithstanding these advancements, there is evidence to suggest that the investment climate varies widely across states, and these differences are reflected in a disproportional share of investment being concentrated in certain states perceived as more investor-friendly. By way of example, the share of industry in state NSDP averaged roughly 18% over the entire period (1981-2008); for only three states, this share was in excess of the all-India average. The level of industrialization appears to have declined over the period, with more and more states falling below the all-India average over the period; only a few states have been able to maintain a consistently high level of industrialization during the entire period (Table 1). These differences could have entailed a variation in state growth rates, with the 'reform-oriented' states growing at a faster clip *vis-à-vis* the 'lagging reformers (Bajpai and Sachs, 1999)'.[2] Because liberalization created a more competitive environment for industry to operate, the payoff from pursuing good policies increased, emphasizing the importance of state-level actions.

4. Empirical Strategy

4.1 We utilize a state-industry panel framework for our analysis. The basic model(Model 1) is given by Eq. (A1):

(Model 1) $$g_{ij} = \alpha_i + \gamma_j + \beta(FS_i * IC_j) + \delta z_{ij} + \varepsilon_{ij} \quad \textbf{(A1)}$$

In Model 1, the dependent variable $g(i, j)$ represents the annual average growth in industry j in state i. The industrial growth rate is measured as the change in real value added per employee, averaged over the sample period. In addition α_i and γ_j are included to account for state and industry fixed effects respectively.

FS(i) is a measure of the state's financial structure. It is computed as the share of banking and finance in net state domestic product (NSDP).

IC (j) represents the characteristics of industry j. We consider three such characteristics: factory size, capital intensity and external dependence.

4.2 The factory size is measured as the number of employees divided by the number of factories. In large industries, workers enjoy both income and employment security through various labor laws. To counter this, the employer also hires specialized expertise on disputes and personnel management. Therefore, it is likely to be the case that disputes will be resolved much more quickly in large industries and consequently, growth will be higher for such industries.

4.3 Capital intensity is defined as the ratio of total capital stock divided by the total number of employees. Hasan et al (2013) observe that the actual capital labor ratios in Indian manufacturing are much higher than those predicted for the US. According to their analysis, labor market rigidities, especially those induced by curbs on hiring and firing, push up indirect labor costs. Economically, although such restrictions might entail higher wages, in effect, such regulations can actually dampen labor demand and consequently, adversely affect industry growth. As compared to this, if higher industry growth envisages more capital intensive techniques which can be funded relatively more easily in states with greater bank penetration, this might ensure robust industry growth.

4.4 The final industry characteristic is external dependence. Following Gupta et al. (2009), this is measured as the ratio of outstanding loans to invested capital. Following from Rajan and Zingales(1998), greater financial development lowers the cost of external

[2]Bajpai and Sachs (1999) classified Indian states into three categories – reform oriented, intermediate reformers and lagging reformers – and claimed that reform oriented states performed better in terms of economic growth in the post-reform period.

finance and as a result, industries with greater dependence on external finance tend to expand faster.

4.5 The interaction term - FS (*i*)*IC(*j*) - tests whether industrial growth is affected by financial structure (the financial structure hypothesis). From Model 1, $\partial g(i,j)/\partial IC(j) = \beta FS(i)$. Therefore,if β>0, it implies that bigger industries grow relatively faster in better-banked states. Finally, an additional term, z(*i,j*) to measure industry *j*'s share in total value added in 1981 is included to test for convergence: industries with a larger share in a state will tend to grow slower over time and *vice versa*.

4.6 The existing literature suggests more than financial structure, it is financial development that affects the real economy (the financial development hypothesis).[3] To address this aspect, we specify model 2, as in Eq.(A2):

(Model 2) $$g_{ij} = \alpha_i + \gamma_j + \beta(FD_i * IC_j) + \delta z_{ij} + \varepsilon_{ij} \qquad \textbf{(A2)}$$

4.7 In this specification, FD (*i*) measures state *i*'s financial development. The financial development measure is measured as the ratio of bank credit to NSDP. The specification is employed to examine whether the coefficient of the interactive term FD (*i*)*IC(*j*), is statistically significant.

4.8 An alternate way to measure financial development is the ratio of credit per lac of population, better known as financial penetration (FP). Following from recent developments in financial inclusion, this variable measures demographic credit outreach and can be utilised to test the impact of credit outreach on industry growth as in Model 3.

(Model 3) $$g_{ij} = \alpha_i + \gamma_j + \beta_1(FP_i * IC_j) + \delta z_{ij} + \varepsilon_{ij} \qquad \textbf{(A3)}$$

4.9 Finally Model 4 includes both FS(*i*)*IC(*j*) and FD(*i*)*IC(*j*). This is to test whether the significance of FS(*i*)*IC(*j*) changes after the effect of FD(*i*)*IC(*j*) has been taken on board. A significant coefficient on the variable would imply that financial structure has a net impact on the growth of industries over and above the impact of financial development.

(Model 4) $$g_{ij} = \alpha_i + \gamma_j + \beta_1(FS_i * IC_j) + \beta_2(FD_i * IC_j) + \delta z_{ij} + \varepsilon_{ij} \qquad \textbf{(A4)}$$

4.10 Finally, Model 5 includes both FS(*i*)*IC(*j*) and FP(*i*)*IC(*j*). This is to test whether the significance of FS(*i*)*IC(*j*) changes after the effect of FP(*i*)*IC(*j*) has been considered. A significant coefficient on the variable would imply that financial structure has a net impact on the growth of industries over and above the impact of financial development.

(Model 5) $$g_{ij} = \alpha_i + \gamma_j + \beta_1(FS_i * IC_j) + \beta_2(FP_i * IC_j) + \delta z_{ij} + \varepsilon_{ij} \qquad \textbf{(A5)}$$

[3]Beck et al. (2001), Beck and Levine (2002) and Levine (2002).

5. Data and Measurement

5.1 Our study covers the period 1981-2008 and exploits annual data on three sets of variables. First, it utilizes state-level information on national accounts. Second, it employs data on manufacturing industries at the two-digit level. Third, it utilizes information on state-level credit data.

5.2 We confine our attention to 14 major Indian states.[4] There are several reasons for restricting ourselves to these states. First, these states have existed for the entire sample period. Among the states that have been left out, several have moved from being centrally administered to ones where they elect their own state-level governments. Second, over 80% of the population resides in these states. Third, over three-quarters of all factories and close to 95% of all industrial output is produced in these states. The data collection methodology for the 14 states has remained largely unaltered throughout the period of analysis. Most analysis on India that utilizes state-level data are typically confined to these states (Ahluwalia, 2002; Sachs *et al.*, 2002; Nachane*et al.*, 2002; Ghosh, 2013).

5.3 Information on state-level national accounts and population numbers is published by the Economic and Political Weekly Research Foundation (EPWRF). The national accounts data on states is available at annual frequency over the sample period and is further decomposed into that arising from agriculture, industry and services. Utilizing this database, we compute the shares of banking and finance in NSDP by appropriately splicing the NSDP series with different base years and adjusting them to a uniform base at 2004-05 prices.

5.4 The Annual Survey of Industries (ASI) data is collated by the Central Statistical Organization of India, a data collection agency of the Federal Government. Among others, the ASI data provides information on industry at the 2-digit level at the state-level. The data covers all factories registered under the Factories Act 1948 (defined as units employing 20 or more workers). The ASI frame can be classified into two sectors –the census sector and the sample sector. Units in the 'census' sector (all factories will more than 100 workers) are covered with a sampling probability of one, while units in the 'sample' sector (employing between 20 and 99 persons) are covered with probabilities one-half or one-third. The census sector covers over 80% of the formal sector of Indian industry and is considered more reliable than the sample sector. We utilize the census database to cull out information on 21 industries at the 2-digit level.[5] Concordance is worked out between NIC 1987 and those that

[4]These states, in order are regional location are, Andhra Pradesh, Karnataka, Kerala and Tamil Nadu in Southern region, Haryana, Punjab, Rajasthan and Uttar Pradesh in the Northern region, Bihar, Orissa and West Bengal in the Eastern region and Gujarat, Maharashtra and Madhya Pradesh in the Western region.

[5] The 18 industries (along with their National Industrial Classification or NIC code) are the following: manufacture of food products (NIC 20-21), manufacture of beverages, tobacco and related products (NIC 22), manufacture of cotton textiles (NIC 23), manufacture of wool, silk and man-made fibre textiles (NIC 24), manufacture of jute and other vegetable fibre textiles, except cotton (NIC 25), manufacture of textile products, including wearing apparel (NIC 26), manufacture of wood and wood products (NIC 27), manufacture of paper and paper products and printing (NIC 28), manufacture of leather and products of leather, fur and substitutes of leather (NIC 29), manufacture of basic chemicals and chemical products, except products of petroleum or coal (NIC 30), manufacture of rubber, plastic, petroleum and coal products and processing of nuclear fules (NIC 31), manufacture of non-metallic mineral products (NIC 32), basic metal and alloys industries (NIC 33), manufacture of metal products and parts, except machinery and equipment (NIC 34), manufacture of machinery and equipment other than transport equipment (NIC 35-36), manufacture of transport equipment and parts (NIC 37), other manufacturing industries (NIC 38) and electricity (NIC 40).

took place in subsequent years to reflect the changes in industrial classification that occurred during this period. For each state-industry pair, data is available on a wide range of variables, including among others, the number of factories, capital, number of employees, value added and depreciation.

5.5 Third, we extract information on credit extended by banks in a particular state. Information on this variable is obtained from the *Basic Statistical Returns*, a yearly publication of the Reserve Bank of India (RBI), which provides extensive data on the business of commercial banks based on data on advances collected under the Basic Statistical Returns System. The main types of data available from this publication are advances and deposits classified according to population groups, bank groups and at the sub-national level.

5.6 To moderate the influence of outliers, all variables are winsorized at 1 percent at both ends of the distribution.Table 2 provides a summary of all the variables and the methods of their measurement.

5.7 Table 3 records the correlation matrix of the relevant variables of interest. Growth in industry value added is negatively correlated with the initial industry share, indicating a convergence effect whereby industries with a large share grow slowly over time. Noteworthy for our analysis, the growth in value added is positively correlated with both financial structure and financial development, suggesting that greater financial expansion is more conducive to industry growth. The bottom half of the panel presents the interrelationship between value added and industry characteristics. To exemplify, growth in value added is positively associated with capital intensity and external dependence. These results indicate that higher capital intensity and greater external dependence have growth-enhancing effects.

6. Results and Discussion

6.1 In Table 4, the industry-specific variable is capital intensity. The results show that the coefficient of the interaction between capital intensity and financial structure is negative and statistically significant. In other words, capital--intensive industries tend to grow faster in states that have higher levels of banking penetration. This, in essence, testifies the complementarity between the financial and real sector: paucity of finance can impede industry growth.

6.2 These results are not only statistically significant, but economically meaningful as well. Take the coefficient on the interaction term in column 1, which equals 0.027. To understand its economic significance, consider two industries - food products in Karnataka and textiles in Punjab - with similar capital intensity equal to 3.88, the median for the sample. The average share of banking in NSDP for the period in Punjab equals 0.19, whereas that in Karnataka equals 0.26, a difference of roughly 36%. The point estimates in column 1 then suggest that, notwithstanding the similar capital intensities, food industry in Karnataka would grow by roughly 1% (=0.027*36) per year faster as compared to the textile industry in Punjab. With average industry growth in the sample being 13.3%, this is quite a sizeable difference.

6.3 The coefficient for the convergence effect is negative and strongly significant, and concurs with our earlier perception: industries with larger initial shares in a state grow slowly over time.

6.4 The result of Models II and III explore the financial development hypotheses. In Model II, the coefficient on the interaction term is positive and strongly significant, suggesting that industries with high capital per worker grow faster in states with higher levels of financial penetration. Thus, not only financial structure but financial development also affects the growth of industries.

6.5 The coefficient on the interaction between financial widening and capital intensity is not significant (Model III).

6.6 It is well acknowledged that the role of market-based financing tends to increase as financial sector develops. As a result, it is possible that the financial structure measure embeds the information contained in the financial development measure.

6.7 Therefore, in Model IV, we include interactions between capital intensity and financial structure on the one hand and between capital intensity and financial development on the other.The findings suggest that the coefficient on the financial development declines only slightly and is significant and the coefficient on financial structure continues to remain significant. What this would suggest is the information contained in the financial development measure is quite distinct as that contained in the measure of financial structure.

6.8 As compared to this, when financial penetration is measured as credit per lac of population, the coefficient on the interaction between capital per employee and the financial widening measure is not statistically significant, although the interaction between capital intensity and financial structure continues to remain significant (Model 5). This indicates that so far as states are concerned, it is financial structure and its development that matters for industry growth.

6.9 Table 5 presents the regression results with size as the industry characteristic. The results indicate strong complementarities between banking and factory size, although in isolation, neither of these measures are significant. In Model IV for example, the interaction between financial structure and factory size is negative and strongly significant with a point estimate equal to -0.79. Similarly, the coefficient between financial development and factory size is strongly significant. What this suggests is that although financial structure is not necessarily conducive to the growth of bigger firms, bigger industries in states with greater financial development tend to experience higher growth.

6.10 Finally, the analysis in Table 6 considers financial dependence as the industry characteristic. The results provide strong support in favor of Rajan-Zingales (1998): industries with greater financial dependence grow faster in states with greater financial development. In Model 1 for example, the coefficient on the interaction term is 0.25. To understand its relevance, consider a state with financial dependence equal to 0.53, the average for the sample. For such a state, a 80% increase in the share of banking from 3.7% to 6.6% - equal to a move from the 25th to the 75th percentile of the distribution - would improve industry growth by roughly 20% (=0.251*80).

6.11 In a similar vein, the coefficient on (Bank credit/NSDP)*Dependence equals 0.05. That is to say, for a state with credit-to-NSDP equal to 0.18, an increase in dependence by 100% from 0.36 to 0.72, which equals a move from the 10th to the 90th percentile of the distribution would improve industry growth by 5% (=0.052*100). All in all, greater dependence on external finance appears to be beneficial for industries, especially in states that are financially more developed.

6.12 The empirical results presented earlier appear to suggest that larger industries with higher capital intensity tend to grow faster in states with better financial development. However, it may very well happen that even industries with low capital intensity grow faster (or, decline slower) in states with lower financial penetration. Even in this case, the coefficient on the interaction term would be positive.

6.13 To examine this issue, we rank industries in terms of their capital intensity and consider the top three and the bottom three industries. As to states, we divide the sample into two groups: those with high financial development and those with low financial development, based on the median value of this variable across states. We thus have four groups. We then regress the industry growth rate on state and industry fixed effects and control for initial industry shares. The residual growth rates of the groups, show that as in so far as capital intensity is concerned, industries with high labor productivity grow faster [0.09 – (-0.62)=0.71(%)] in states with high financial development; low labor productive industries grow slower [-0.06-(-0.16)=0.22(%)] in states with low financial development.

7. Concluding Remarks

7.1 The paper applies the Rajan and Zingales (1998) methodology to examine the relationship between financial structure of Indian states and the differential growth rate of industries with different characteristics. The results suggest that bigger, capital-intensive industries grow faster in states with higher penetration of banking. More importantly, the findings testify that financial development of states tends to overwhelm their financial structure in influencing industrial growth.

7.2 Such evidence provides interesting policy implication for states where governments influence industrial policies. While the economic reforms have reduced the burden of Union government controls on investment activity, there is need for concomitant liberalization at the state-level. This is an area that remains to be explored in future research.

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Table 1: Shares of industry in NSDP across states

States	1981-1991	1992-2001	2002-2008	1981-2008
Andhra Pradesh	0.150	0.164	0.143	0.154
Bihar	0.209	0.064	0.057	0.119
Gujarat	0.276	0.304	0.279	0.287
Haryana	0.194	0.191	0.189	0.192
Karnataka	0.170	0.179	0.176	0.175
Kerala	0.159	0.129	0.088	0.130
Madhya Pradesh	0.177	0.176	0.159	0.172
Maharashtra	0.287	0.255	0.208	0.256
Odisha	0.144	0.152	0.173	0.154
Punjab	0.162	0.159	0.173	0.164
Rajasthan	0.146	0.165	0.158	0.155
Tamil Nadu	0.269	0.247	0.183	0.239
Uttar Pradesh	0.144	0.156	0.141	0.147
West Bengal	0.203	0.165	0.112	0.167
All India	**0.192**	**0.179**	**0.159**	**0.179**

Source: Author's calculations based on state national accounts data

Table 2: Variables in Panel Model

Notation	Measurement	Data source	Mean (SD)
g (*i*, *j*)	Natural log difference for two consecutive periods in gross value added per employee for industry *j* in state *i*	Annual Survey of Industries	0.133 (0.062)
State dummies	Dummy variable with value 0 or 1 for each state		
Industry dummies	Dummy variable with value 0 or 1 for each industry		
State-specific			
FS (*i*)	Share of banking/ NSDP, proxy for financial structure	EPW Research Foundation	0.052 (0.021)
FD (*i*)	Bank credit/ NSDP, proxy for financial development	Reserve Bank of India EPW Research Foundation	0.184 (0.072)
FP (*i*)	Bank credit/100,000 persons, proxy for financial penetration	Reserve Bank of India	7.623 (0.665)
Industry-specific			
Size	Average size of industry *j* where, size=number of employees/total number of factories	Annual Survey of Industries	3.802 (0.546)
Capital/ labor	Average capital intensity of industry *j*, where capital intensity= Capital stock/ number of employees	Annual Survey of Industries	5.896 (5.964)
Dependence	Average external dependence of industry *j*, where dependence=outstanding loans/ invested capital	Annual Survey of Industries	0.529 (0.189)
z (*i*, *j*)	Industry *j*'s share in GVA of state *i* in the initial year	EPW Research Foundation	0.057 (0.087)

Table 3: Correlation matrix

Panel A	**Growth in GVA/employee**	**Share in GVA**	**Share of banking/ NSDP**	**Bank credit/ NSDP**	**Credit/ Population**
Growth in GVA/ employee					
Initial share in GVA	-0.126**				
Share of banking/NSDP	0.117**	-0.004			
Bank credit/ NSDP	0.115**	-0.002	0.889***		
Credit/Population	0.004*	-0.0006	0.743***	0.819***	
Panel B	Growth in GVA/employee	Capital/ Labor	Size	Dependence	
Growth in GVA/ employee					
Capital/labor	0.328***				
Size	0.001	0.169***			
Dependence	0.101**	0.051	0.143**		

* p<0.10; ** p<0.05; *** p< 0.01

Table 4: Panel model estimation when industry characteristic is capital intensity

Variables	**Model I**	**Model II**	**Model III**	**Model IV**	**Model V**
State dummy	Included	included	included	included	included
Industry dummy	Included	included	included	included	included
Industry share	-0.112*** (0.030)	-0.109*** (0..029)	-0.107*** (0..031)	-0.109*** (0..029)	-0.107*** (0.032)
(Share of banking/NSDP)*(Capital/labor)	0.027** (0.012)			0.024** (0.011)	0.023** (0.011)
(Bank credit/NSDP)*(Capital/labor)		0.008*** (0.003)		0.007* (0.004)	
(Bank credit/100,000)*(Capital/labor)			0.0002 (0.0001)		0.0003 (0.005)
R-squared	0.389	0.391	0.346	0.393	0.387
Observations	247	247	247	247	247

Standard errors (clustered by industry) within parentheses.
***, ** and * indicates statistical significance at 1, 5 and 10%, respectively.

Table 5: Panel model estimation when industry characteristic is size

Variables	Model I	Model II	Model III	Model IV	Model V
State dummy	included	included	included	included	included
Industry dummy	included	included	included	included	included
Industry share	-0.108*** (0.029)	-0.108*** (0.030)	-0.112*** (0.032)	-0.104*** (0.029)	-0.114*** (0.032)
(Share of banking/NSDP)*(Factory size)	0.085 (0.119)			-0.785* (0.451)	-0.691 (0.566)
(Bank credit/NSDP)*(Factory size)		0.036 (0.037)		0.269* (0.148)	
(Bank credit/100,000)*(Factory size)			0.002 (0.001)		0.007 (0.005)
R-squared	0.380	0.381	0.386	0.388	0.375
Observations	247	247	247	247	247

Standard errors (clustered by industry) within parentheses.
***, ** and * indicates statistical significance at 1, 5 and 10%, respectively.

Table 6: Panel model estimation when industry characteristic is external dependence

Variables	Model I	Model II	Model III	Model IV	Model V
State dummy	Included	Included	included	included	included
Industry dummy	Included	Included	included	included	included
Industry share	-0.102*** (0.029)	-0.101*** (0.028)	-0.104*** (0.027)	-0.100*** (0..027)	-0.109*** (0.026)
(Share of banking/NSDP)*(Dependence)	0.251** (0.124)			0.203* (0.120)	1.048** (0.548)
(Bank credit/NSDP)*(Dependence)		0.052* (0.029)		0.175* (0.097)	
(Bank credit/100,000)*(Dependence)			0.0002 (0.003)		0.006 (0.004)
R-squared	0.379	0.378	0.379	0.381	0.380
Observations	247	247	247	247	247

Standard errors (clustered by industry) within parentheses.
***, ** and * indicates statistical significance at 1, 5 and 10%, respectively.

Wages, Productivity and Employment in Indian Manufacturing Industries: 1998-2010

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Abstract

The relationship between the growth rates of employment and productivity has been a serious cause of concern particularly in an economy where unemployment is more concentrated among low skilled workers. This paper attempts to examine the regional variation in output, employment and productivity growth with data from registered manufacturing industries across major states in India. The higher rate of growth of manufacturing output leads to higher rate of productivity growth, but not a faster rate of employment growth. The structural change took place in favour of capital that increased profit rate by displacing workers in manufacturing industries in India. Workers were affected badly more as compared to other employees, i.e. office staff and supervisors by this kind of job destroying structural change in manufacturing industry in India. This study observes significant regional disparity in industrial growth in India although the incidence of unevenness declined at a very slow rate. The Western part of the country has been traditionally leading in industrial development and the Eastern part has been lagging further behind.

1. Introduction

1.1 Stagnation of output growth along with zero, and indeed negative, employment growth in many manufacturing industries, particularly in the registered sector, in India during the 1990s is a serious cause of concern in the context of economic reforms. There has been strong evidence of deindustrialisation, particularly in the sense of negative employment growth in the registered sector, in most of the industries in India during the 1980s and 1990s. The level of employment declined in registered manufacturing industries in all states and at a higher rate in the industrially developed states. Between 1995 and 2000, about 1.1 million workers, or 15 percent of workers in the organised manufacturing sector lost their jobs (Nagaraj, 2004) at the national level and such losses have been widened across major states and industry groups.

1.2 The relationship between the growth rates of employment and productivity has been a serious cause of concern particularly in an economy where unemployment is more concentrated among low skilled workers. Undoubtedly, rapid and sustained productivity growth lifted the standards of living in the advanced industrialised nations during the era of the nineteenth century capitalism and even thereafter by any historical standards. But, ironically, in the developing world, the technological innovations and capital-intensive investments, the mainsprings of the productivity growth, may act as instigators of job destruction, particularly for unskilled workers. While there is no causal relationship between

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productivity growth and employment growth in either direction, economic growth continues to go hand in hand with structural change entailing "creative destruction" as celebrated in Schumpeter (1947). Old jobs are lost in declining industries and new jobs are created in the expanding sectors of the economy.

1.3 There has been a great debate on the implications of employment dynamics for productivity growth and it is very difficult to interpret the issues relating to productivity differentials across different regions as observed in India over the past decades. Some regions (e.g. Gujarat) outperformed the others in terms of productivity growth, but at the cost of lower, or even negative employment growth in some sectors. Again, employment growth is not high in some regions, namely West Bengal, experiencing lower productivity growth. This kind of stylised facts may raise the question of a possible trade-off between employment growth and productivity growth, and of a conflict between employment growth and real wage growth.

1.4 Against these stylised facts, this paper attempts to examine the regional variation in output, employment and productivity growth with data from registered manufacturing industries across major states in India. Most of the empirical studies (Bairam 1991, Atesoglu 1993 and Scott 1999) used cross-country regressions for estimating a relationship between output growth and employment growth in manufacturing activities. There have, however, been hardly any studies of this type with time series data for manufacturing industries in a developing country like India.

1.5 This study is motivated by Kaldor's (1966) hypothesis that employment growth and productivity growth are positively related, but not at the proportional rate, largely because of the dynamic increasing returns to scale associated with the invention and innovation in manufacturing industries. Labour productivity growth in the manufacturing sector is positively related to output growth of this sector because of static and dynamic increasing returns to scale. Kaldor observed a highly significant relationship suggesting that the output growth played a major role in determining productivity growth and also employment growth in the manufacturing sector[2]. The higher rate of growth of manufacturing output leads to higher rate of productivity growth, but not a faster rate of employment growth.

1.6 After this introductory remark, section 2 discusses about the data used in this study. Section 3 describes the regional contributions to total output from registered manufacturing industry in India. Section 4 deals with the changing pattern of different structural ratios over time across states. Regional variations in growth rates of different parameters are examined in section 5. Section 6 concludes.

2. Data

2.1 In this study we utilise data provided by the *Annual Survey of Industries* (ASI), the main source of information about the industry published by the Central Statistical Office (CSO), Government of India. However, there are some problems of both coverage

[2] Kaldor estimated the relationship between output growth and employment growth by using data for twelve OECD countries over the period 1953-54 to 1963-64 by applying cross country regression.

and intertemporal comparability of the ASI data. The ASI distinguishes between the census sector which corresponds to the larger units and the sample sector which consists of units below the size that qualifies a factory as a member of the census sector. The coverage of the factory units in ASI under census sector was changed in 1997-98. Previously, factories employing 100 or more workers were included in the census sector and the rest in the sample sector, but since 1997-98 factories employing 200 or more workers have been covered on census basis and the remaining factories on sample basis. In carrying out empirical exercise we have used ASI data from 1998 to 2010 simply because of this change in the coverage under the census sector and the major change in national industrial classification (NIC) in 1998-99.

2.2 Gross output at constant prices is used in this study as a measure of real output. ASI reports gross output data in value terms (Rs. Lakh). Nominal values of gross output are deflated by the wholesale price indices at 1993-94 base period for manufactured goods. In estimating productivity we have used two distinct types of labour inputs: workers and other employees. Numbers of workers and of employees are recorded separately in the ASI. Workers are defined to include all persons engaged directly or indirectly in the production process. Employees, on the other hand, include all workers defined above and other persons engaged in supervisory and managerial activities. We subtract the number of workers from the total number of employees to obtain the number of persons engaged in supervisory and managerial activities and define them as 'other employees'. Unlike other factors of production, capital is used beyond a single accounting period and measuring capital stock is rather problematic. Figures of fixed capital shown in the ASI include the values of plant and machinery along with other types of assets used in production, transportation, living or recreational facilities, hospitals, schools, etc., and are measured in terms of historical prices based on the book value of fixed assets.

3. Regional share of manufacturing output

3.1 Nearly one-third of the gross value added of the registered manufacturing sector has been contributed by the two western region states, Gujarat and Maharashtra, absorbing roughly one-fourth of the total employment in this sector. Maharashtra continued to occupy the top position till the first half of the previous decade contributing more than 19 percent to the national output from registered manufacturing in 2001-02, then it ranked second in 2010-11. Gujarat gained its position to the top by raising its share significantly from 15 percent in 2001-02 to over 17 percent in 2010-11. The eastern region states, on the other hand, have been continually losing their prominence. West Bengal's share in value added by India's factory sector remained at around 4.4 per cent in 2010-11. Rajasthan and Uttar Pradesh in the north-west and Madhya Pradesh in the central region experienced a marginal increase in their shares in the country's factory sector, as did the three southern states of Andhra Pradesh, Tamil Nadu and Karnataka (Table 1).

3.2 Regional variation in industrial development has been clear from the estimated figures as shown in Table 1. West Bengal, for example, experienced a dramatic fall of output share over the decades and at a significantly higher rate in the period of license permit raj. It is well documented that the recessionary effect on industry in West Bengal was not only the most severe but long lasting as well (Bagchi, 1998), and this was partly attributable to industrial policies of the central government of the country. In spite of the industrial slow down, the rate of labour absorption, as shown by the country's employment share, in registered manufacturing industries located in West Bengal was significantly higher than that in Gujarat having a much larger share of factories till the mid-1990s, but it followed a steep deterioration throughout[3]. The relative share of gross output was also higher in West Bengal even during the recessionary phase of the 1970s and then started to lagging behind.

3.3 The growth rate of output from registered manufacturing declined significantly after the mid-1980s in industrially advanced states, namely Maharashtra and Gujarat, but the rate increased in West Bengal during the same period (Das, 2007). Unregistered manufacturing, on the other hand, displayed higher output growth in industrial states, including West Bengal, during this period compared to the previous regime. Income from the services sector grew at a higher proportional rate everywhere during the post-reform period than in the pre-reform phase in India, but the growth acceleration of this sector was higher in the Southern region states and also in Maharashtra and West Bengal. Agriculture shows no growth improvement in most of the states in the country, and indeed in the post-reform epoch, the growth rate fell in states dominated by agriculture, such as Punjab, Uttar Pradesh and Orissa. West Bengal and Andhra Pradesh, however, showed improvement in the growth rate of agricultural output after the mid-1980s.

4. Changing pattern of structural coefficients of industries by states

4.1 Structural change in registered manufacturing occurred in favour of capital during the period 1998-2010, highly unevenly across the major states as shown by the coefficient of variation (CV) in the last row of Table 2. In terms of capital-labour ratio, Gujarat was at the top, followed by Uttar Pradesh, Himachal Pradesh, Orissa, Madhya Pradesh and Karnataka. Capital intensity in registered manufacturing increased dramatically in Orissa during this period. The states including Jharkhand, Andhra Pradesh, Chhattisgarh, Uttaranchal and West Bengal also experienced a marked increase in capital labour ratio during this period. In Maharashtra, the leading industrial state of the country, however, capital labour ratio was low throughout the period. On the other hand, capital intensity in registered manufacturing declined in Uttar Pradesh, Karnataka, Madhya Pradesh along with some other states during the same period. Capital labour ratio in registered manufacturing varied from 2.8 in Delhi to 33.7 in Orissa in 2010-11.

4.2 Manufacturing workers have been highly dominating in the ASI sector everywhere in India (Table 2). About three fourth of the total employees in registered manufacturing in India were workers in 1998 and the proportion increased to 78 percent in 2010 at the national level. In Assam, Andhra Pradesh, Bihar, Kerala, Tamil Nadu and West Bengal the share of manufacturing workers was 80 percent and above during 1998-2010. The proportional share of workers to total employees varied between 65 percent in Delhi and 86 percent in Kerala and Bihar in 2010. Regional variation in workers' composition has been very low during this period.

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[3] A comparison of manufacturing growth between West Bengal and Gujarat has significance because they are prominent industrial states in the eastern and western regions respectively with distinct types of socio-political character. For detail analysis of comparative study between West Bengal and Gujarat see Das (2007).

4.3 We have calculated real wage per employee, taking all types of employees, in the registered manufacturing sector. Table 2 displays the variations in wage rate by major states in India in different years between 1998 and 2010. Wage rate in real terms in registered manufacturing varied widely across the regions as measured by the CV. Although the real wage rate improved in almost all states over this period, the regional variation has still been prominent. In 1998, wage per employee was higher in Chhattisgarh, Jharkhand, Maharashtra, Himachal Pradesh, West Bengal, Karnataka and Haryana as compared to the rest of the country. In 2010, the pattern of inequality roughly the same with higher wage rate in Jharkhand, Maharashtra, Chhattisgarh, Karnataka, Delhi, Haryana and Orissa.

4.4 Figures 1 and 2 display the trends in output and employment in registered manufacturing across 21 states in India during 1998-2010. There has been no sign of systematic convergence in either indicator. Gujarat performed better in terms of output and gross value added followed by Maharashtra, Tamil Nadu, Karnataka and Andhra Pradesh. While West Bengal and Uttar Pradesh performed moderately, the performance of the other states was not promising. The regional distribution of gross value added per factory was roughly the same as for gross output, but gross value added increased at a slower rate compared to the rate of growth of gross output during 1998-2010. Incidence of industrial employment had traditionally been high in Jharkhand and West Bengal. Recently, however, Tamil Nadu, Andhra Pradesh, Maharashtra and Gujarat registered higher absorption of manufacturing workers as compared to other states. Workers are dominating in the manufacturing sector in India. But, in Bihar, Chhattisgarh, Jharkhand the proportion of manufactured workers and other employees are roughly equal.

4.5 Labour productivity, measured by output labour ratio, in registered manufacturing increased significantly in every states during 1998-2010 (Table 3). It is clear that productivity for other employees has been markedly higher than the productivity of manufactured workers (in some states 5 times or more) for obvious reasons. Productivity of manufactured worker was the highest in Gujarat and the lowest in Tamil Nadu in 2010-11. Labour productivity increased at the highest rate in West Bengal during 1998-2010.

5. Growth rates of output, employment and capital

5.1 Table 4 displays growth rates of number of factories, output, labour and fixed capital in the registered manufacturing sector across different states in India over the period 1998-2010. Number of factory units increased at highly uneven rates across different regions of the country. Factory units grew at less than 4 percent rate at the national level. While Himachal Pradesh and Uttaranchal experienced significantly higher rate of expansion in manufacturing units, the industrially advanced states of Gujarat and Maharashtra along with other states like West Bengal exhibited a marginal rate of growth during this period. Output growth in registered manufacturing was spectacular during the past decade. Growth rate was more than 10 percent in most of the states with the highest rate in Uttaranchal. But, the growth rate was below the national average in some industrial states including Maharashtra, West Bengal and Tamil Nadu.

5.2 Fixed capital in real terms grew at the highest rate in Uttaranchal and at the lowest rate in Kerala displaying a wide regional variation of it. Growth rates of employment were 5 percent and 3.8 percent for workers and other employees respectively at the all India level. Employment of worker increased at below 5 percent in Gujarat and below 3 percent in Maharashtra. The growth rate of employment of other employees, however, was significantly less than the rate for workers everywhere in the country. Employment growth was even negative in West Bengal and Jharkhand. West Bengal achieved 11 percent growth of real output with negative employment growth of either type of employees.

5.3 We also have looked at the growing pattern of profitability, productivity of workers and wage rate in registered manufacturing industries across the major states in India. Table 5 displays the regional distribution of growth rates of these parameters. Profit grew at more than 1 percent rate in Uttaranchal, Himachal Pradesh, Orissa and Jammu and Kashmir. But the profit rate was very low and even falling in some regions, namely, Kerala, Assam and Delhi. Productivity of workers grew at a significantly higher proportional rate than the employment growth or the growth in wage by following some fundamentals of capitalist development. Although productivity of workers had grown at the double digit rate in most of the states, wage rate grew at the significantly lower rates in all states, and indeed, the wage in real terms actually declined in West Bengal during 1998-2010. The regional variation in growth rates of value added followed roughly the same pattern as for productivity of workers.

6. Conclusions

6.1 In this study, we have tried to figure out the regional variation in output, employment and productivity growth in registered manufacturing industries across the major states in India during the period after one decade of economic reforms. The structural change took place in favour of capital that increased profit rate by displacing workers in manufacturing industries in India during 1998-2010. In most of the industries in India, a smaller labour force relative to the size of capital has been employed and over 70 per cent of them were ordinary workers. Thus workers were affected badly more as compared to other employees, i.e. office staff and supervisors by this kind of job destroying structural change in manufacturing industry in India. Workers were displaced tactfully in the process of structural change, but technological diffusion did not take place even by factor substitution (Das 2011). The contribution of labour to output growth was significantly higher than that of capital. This was achieved partly by increasing the workload of the ordinary workers without technological up-gradation of machinery. Furthermore, there is no causal relationship between productivity growth and employment growth in either direction.

6.2 This study observes significant regional disparity in industrial growth in India although the incidence of unevenness declined at a very slow rate. The Western part of the country has been traditionally leading in industrial development and the Eastern part has been lagging further behind. Surprisingly enough, some industrially less significant states like Uttaranchal performed dramatically in either indicator of industrial growth during the period 1998-2010. Structural change occurred in Indian industries in favour of capital, but at an uneven rate across the states. Capital labour ratio increased not only because of higher employment of capital but because of the displacement of workers as well. Output growth increased at a higher rate with slower employment growth or negative employment growth may be an indicative of higher work burden per worker even in indecent work conditions during the post-reform period in India. The mismatch between output and employment growth also implies higher productivity growth contributing to more profit of the capitalist class.

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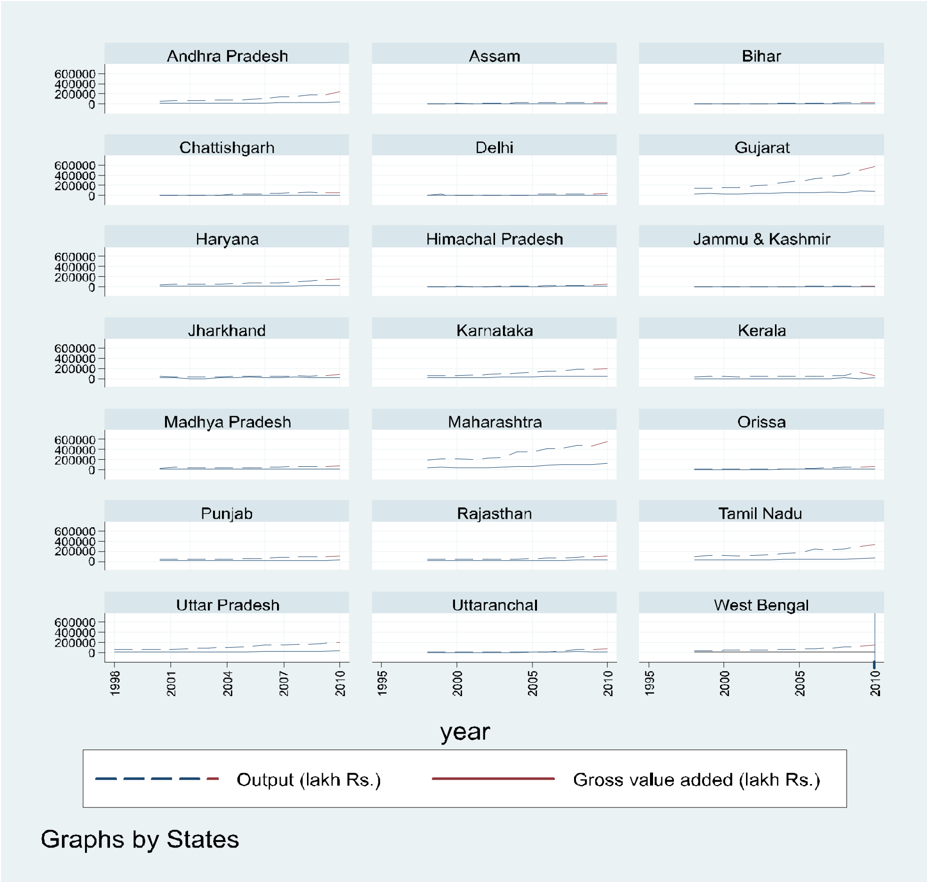
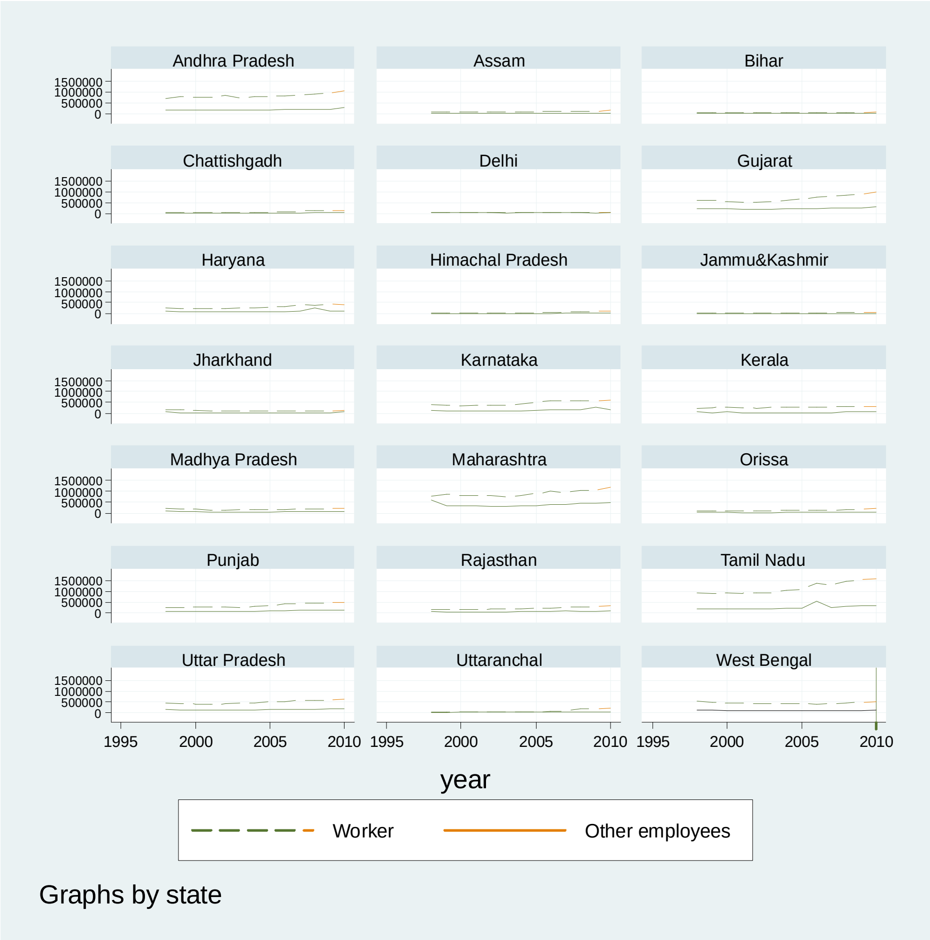
Figure 1 : Output and GVA in registered manufacturing



Source: As for Table 1

Figure 2 : Number of workers and other employees in registered manufacturing



Source: As for Table 1

Table 1 : Share of states in gross output (at constant 1993-94 prices) by factory sector in India

States	2001-02	2005-06	2010-11
Andhra Pradesh	6.8	6.2	7.4
Assam	1	1.3	0.9
Bihar *	2.8	3.1	2.8
Gujarat	15.1	16.1	17.2
Haryana	4.7	4.5	4.6
Himachal Pradesh	0.6	0.9	1.5
Jammu & Kashmir	0.2	0.4	0.4
Karnataka	5.5	6.9	6.1
Kerala	2.6	2.3	1.8

Table 1 : Share of states in gross output (at constant 1993-94 prices) by factory sector in India (Contd)

States	2001-02	2005-06	2010-11
Madhya Pradesh**	5.1	4.2	4.2
Maharashtra	19.3	19.6	16.8
Orissa	1.4	1.5	2.0
Punjab	3.8	3.1	3.2
Rajasthan	3.2	2.8	3.2
Tamil Nadu	10.2	10.0	10.1
Uttar Pradesh***	7.6	7.0	8.6
West Bengal	4.4	4.3	4.4
C.V.	**0.95**	**0.97**	**0.92**

Source: *Annual Survey of Industries Time Series data*, and *Annual Series (Volume 1)*, Central Statistical Organisation, Government of India.

Note: Figures shown in the Table are in percentage to all India total.

* includes Jharkhand, ** includes Chhattisgarh, *** includes Uttaranchal

Table 2 : Changes in selected structural ratios: 1998-2010

States	Capital labour ratio				Share of worker to total employee (%)				Wage per employee (Rs. lakh)			
	1998	2002	2006	2010	1998	2002	2006	2010	1998	2002	2006	2010
Andhra Pradesh	9.7	5.7	7.3	14.6	82	84	84	79	0.37	0.42	0.46	0.6
Assam	7.4	5.4	9.9	9	84	84	86	85	0.33	0.38	0.40	0.51
Bihar	5.3	7.0	9.3	7.9	82	82	84	86	0.44	0.46	0.37	0.45
Chhattisgarh	6.2	25.6	9.8	12.8	75	69	75	75	1.25	1.14	1.11	1.09
Delhi	3.1	5.6	6.8	2.8	69	66	69	65	0.59	0.70	0.75	0.93
Gujarat	18.2	21.3	24.5	18	74	73	75	77	0.56	0.70	0.73	0.84
Haryana	5.7	10.4	9.8	7.4	73	72	77	78	0.62	0.77	0.78	0.92
Himachal Pradesh	16.4	19.5	25.5	18.1	76	73	75	77	0.63	0.63	0.78	0.87
Jammu and Kashmir	2.2	3.2	6.0	8.8	77	78	80	80	0.53	0.47	0.45	0.51
Jharkhand	9.6	16.5	21.9	19.1	75	76	77	68	0.95	1.26	1.30	1.27
Karnataka	12.7	11.5	12.4	10.6	74	75	78	78	0.62	0.71	0.75	0.94
Kerala	5.7	4.2	5.1	5.3	81	84	86	86	0.45	0.49	0.49	0.54
Madhya Pradesh	14.7	11.9	16.1	13.2	70	76	76	75	0.48	0.68	0.71	0.81
Maharashtra	6.4	12.9	17.9	8.5	58	70	71	71	0.77	0.92	1.04	1.15
Orissa	15.4	16.3	26.0	33.7	67	77	76	81	0.6	0.85	0.83	0.91
Punjab	6.8	5.5	6.8	7.5	79	78	80	79	0.46	0.49	0.50	0.53
Rajasthan	10.6	10.6	10.5	12	74	77	78	78	0.55	0.58	0.59	0.7
Tamil Nadu	8	5.8	8.4	8	81	82	82	82	0.47	0.51	0.55	0.68
Uttar Pradesh	16.5	11.6	11.9	8.6	73	75	77	77	0.6	0.61	0.64	0.77
Uttaranchal	8.4	13.5	13.6	12.5	79	67	75	81	0.49	1.06	0.80	0.71
West Bengal	2.9	7.6	9.5	9.1	80	79	82	81	0.63	0.70	0.69	0.74
All India	**9.1**	**10.2**	**12.6**	**11.8**	**75**	**77**	**78**	**78**	**0.59**	**0.66**	**0.69**	**0.78**
C.V.	**0.53**	**0.55**	**0.52**	**0.56**	**0.08**	**0.07**	**0.06**	**0.07**	**0.34**	**0.35**	**0.34**	**0.29**

Source: As for Table 1

Table 3 : Changes in labour productivity: 1998-2010

States	Productivity of workers				Productivity of other employees			
	1998	**2002**	**2006**	**2010**	**1998**	**2002**	**2006**	**2010**
Andhra Pradesh	6.2	8.5	12.3	15.3	28.1	43.6	66.0	75.9
Assam	7.5	8.6	19.9	17.9	38.9	45.7	117.5	97.9
Bihar	7.4	13.1	25.2	23.6	32.7	59.7	136.0	131.5
Chhattisgarh	12.7	19.6	30.4	35.8	38.0	42.7	93.0	108.8
Delhi	15.8	19.8	20.1	23.7	34.5	39.1	44.0	54.5
Gujarat	16.5	28.3	39.3	44.3	48.2	77.2	120.6	146.8
Haryana	11.1	21.9	24.0	23.4	30.3	57.6	81.1	89.7
Himachal Pradesh	14.3	22.9	35.9	30.9	44.6	62.3	107.6	105.4
Jammu and Kashmir	9.1	8.1	18.5	18.3	30.1	29.2	71.8	92.4
Jharkhand	10.3	15.8	31.3	39.2	31.2	51.3	102.5	112.8
Karnataka	9.4	15.1	22.5	24.5	27.0	45.5	78.2	47.3
Kerala	7.8	9.3	12.8	30.2	34.2	50.5	77.8	189.4
Madhya Pradesh	12.1	24.2	25.5	25.5	28.7	75.3	81.5	75.6
Maharashtra	17.2	22.2	36.3	36.0	24.1	52.4	87.3	84.8
Orissa	9.3	15.0	21.7	21.5	19.2	51.1	69.7	101.3
Punjab	11.0	14.0	14.5	15.9	40.2	49.5	57.4	63.3
Rajasthan	12.3	17.5	20.4	21.6	34.7	58.6	72.6	78.9
Tamil Nadu	7.4	10.5	14.6	15.0	32.0	47.4	67.3	66.2
Uttar Pradesh	11.1	17.5	20.3	23.4	30.5	51.4	68.7	80.6
Uttaranchal	7.7	19.1	24.8	25.8	29.5	38.5	76.1	97.5
West Bengal	5.3	10.1	16.5	20.7	22.0	39.0	72.9	91.1
All India	**10.7**	**16.2**	**22.9**	**25.0**	**30.7**	**53.7**	**82.6**	**86.9**
C.V.	**0.32**	**0.36**	**0.34**	**0.32**	**0.22**	**0.23**	**0.27**	**0.34**

Source: As for Table 1

Table 4 : Growth rates of factory units, output, capital and labour: 1998-2010

States	Number of factories	Real output	Real fixed capital	Worker	Other Employee
Andhra Pradesh	3.7***	11.2***	10.1***	2.5***	3.8***
Assam	4.8***	12.0***	7.6***	3.4***	2.5***
Bihar	3.4***	13.0***	5.7***	3.9***	0.7
Chhattisgarh	5.0***	14.3***	10.6***	6.1***	4.8***
Delhi	-0.8	4.2***	1.7**	0.1	-0.3
Gujarat	1.6*	12.6***	7.1***	4.8***	3.2***
Haryana	1.8***	10.7***	7.6***	6.4***	4.6**
Himachal Pradesh	12.7***	19.8***	17.4***	13.3***	12.6***
Jammu and Kashmir	7.3***	21.6***	20.3***	9.1***	6.8***
Jharkhand	3.6***	8.7***	5.2***	-2.1***	0.1***
Karnataka	2.7***	13.0***	6.9***	4.9***	4.8***
Kerala	2.7***	9.6***	2.5***	2.8***	0.5
Madhya Pradesh	1.3**	5.9***	3.6**	1.1	0.3
Maharashtra	1.6*	9.7***	7.0***	2.9***	1.1*
Orissa	3.0***	14.3***	16.7***	7.1***	2.9*
Punjab	4.8***	8.7***	7.7***	5.9***	5.2***
Rajasthan	3.5***	10.0***	5.6***	5.8***	4.2***
Tamil Nadu	3.6***	10.6***	8.0***	5.5***	5.5***
Uttar Pradesh	1.9***	9.7***	1.5*	3.8***	1.8**
Uttaranchal	12.1***	27.2***	25.2***	18.9***	16.1***
West Bengal	1.3**	11.0***	7.3***	-0.3	-1.4**
All India	**3.9*****	**12.3*****	**8.8*****	**5.0*****	**3.8*****

Note: Growth rates are calculated by estimating log linear trend in percentage form. The values of fixed capital and output are in real terms (at 1993-94 prices). *significant at 10% level, **significant at 5 % level, ***significant at 1% level, the rest are statistically insignificant

Source: As for Table 1

Table 5 : Growth rates of profit rate, productivity of workers, real wage and real gross value added: 1998-2010

States	Profit rate	Productivity of workers	Real wage	Real GVA
Andhra Pradesh	0.7***	12.9***	6.7***	11.7***
Assam	-0.4***	13.1***	5.9***	7.7***
Bihar	0.4***	14.1***	1.8***	7.1***
Chhattisgarh	0.8***	12.9***	5.4***	13.1***
Delhi	-0.2***	8.6***	3.1***	1.5***
Gujarat	0.4**	12.6***	7.0***	10.1***
Haryana	0.2*	9.0***	7.9***	9.7***
Himachal Pradesh	1.6***	11.0***	16.6***	22.7***
Jammu and Kashmir	1.4***	17.3***	8.9***	25.4***
Jharkhand	0.4	14.6***	1.1	6.6***
Karnataka	0.5***	12.4***	7.5*	11.0***
Kerala	-0.3**	11.5***	3.1**	2.6***
Madhya Pradesh	0.5***	9.4***	3.8***	6.3***
Maharashtra	0.7***	11.8***	5.3***	10.0***
Orissa	1.4***	12.7***	9.0***	15.3***
Punjab	0.0***	7.4***	6.6***	7.3***
Rajasthan	0.5***	9.0***	6.7***	9.2***
Tamil Nadu	0.2***	9.5***	8.1***	9.4***
Uttar Pradesh	0.3***	10.7***	5.3***	7.2***
Uttaranchal	2.0***	13.5***	19.2***	30.7***
West Bengal	0.7***	16.0***	-0.2	6.8***
All India	**0.6*****	**11.9*****	**6.6*****	**11.0*****

Note: Growth rates are calculated by estimating log linear trend in percentage form. *significant at 10% level, **significant at 5 % level, ***significant at 1% level, the rest are statistically insignificant.

Source: As for Table 1

SECTION II : FACTS & FIGURES

Table 1: Annual gross value added per worker (in Rs. Lakhs) for each activity category

NIC 2008	Activity Description	Gross Value Added per worker (Rs. Lakhs)			
		Organised Manufacturing (based on ASI 2010-11)	Unorganised Manufacturing (based on NSSO 67th Round)		
		ASI	OAE	Estt.	All
0163	Cotton Ginning, Cleaning and Bailing	4.33	0.20	0.75	0.46
10	Manufacture of Food Products	4.63	0.36	0.61	0.47
11	Manufacture of Beverages	9.29	0.21	0.77	0.34
12	Manufacture of Tobacco Products	2.37	0.12	0.50	0.13
13	Manufacture of Textiles	3.88	0.22	0.67	0.38
14	Manufacture of Wearing Apparel	2.07	0.30	0.59	0.38
15	Manufacture of Leather and Related Products	2.09	0.38	0.58	0.49
16	Manufacture of Wood and of Products of Wood	2.44	0.24	0.75	0.35
17	Manufacture of Paper and Paper Products	5.77	0.20	0.79	0.59
18	Printing and Reproduction of Recorded Media	8.85	0.46	1.01	0.88
19	Manufacture of Coke and Refined Petroleum Products	103.09	0.20	0.70	0.64
20	Manufacture of Chemicals and Chemical Products	15.44	0.13	0.72	0.43
21	Manufacture of Pharmaceuticals, Medicinal Chemical and Botanical Products	15.15	0.43	0.98	0.93
22	Manufacture of Rubber And Plastics Products	8.38	0.34	0.80	0.64
23	Manufacture of Other Non-Metallic Mineral Products	5.74	0.21	0.54	0.43
24	Manufacture of Basic Metals	13.24	0.46	1.02	0.79
25	Manufacture of Fabricated Metal Products	6.79	0.42	0.93	0.78
26	Manufacture of Computer, Electronic and Optical Products	13.68	0.60	0.99	0.96
27	Manufacture of Electrical Equipment	9.85	0.77	0.83	0.82
28	Manufacture of Machinery and Equipment N.E.C.	10.86	0.55	1.17	1.10
29	Manufacture of Motor Vehicles, Trailers and Semi-Trailers	8.72	0.89	1.23	1.20
30	Manufacture of Other Transport Equipment	11.56	0.50	1.07	0.99
31	Manufacture of Furniture	5.88	0.48	0.77	0.63
32	Other Manufacturing	5.13	0.39	0.65	0.51
33	Repair and Installation of Machinery and Equipment	8.69	0.49	0.81	0.66
All Activities		**8.33**	**0.27**	**0.70**	**0.44**

Note: ASI: Annual Survey of Industries
OAE: Own Account Enterprise
Estt.: Establishment

Table 2 : Annual gross value added per worker (in Rs. Lakhs) by State/UT for all enterprise

Sr. No.	State/UT Name	Gross Value Added per worker (Rs. Lakhs)			
		Organised Manufacturing (based on ASI 2010-11)	Unorganised Manufacturing (based on NSSO 67th Round)		
		ASI	OAE	Estt.	All
1	Andhra Pradesh	6.58	0.29	0.53	0.39
2	Arunachal Pradesh	NA	1.09	1.64	1.48
3	Assam	5.42	0.46	0.58	0.52
4	Bihar	5.32	0.37	0.56	0.41
5	Chhattisgarh	11.47	0.18	0.70	0.32
6	Delhi	8.01	0.80	0.96	0.94
7	Goa	18.17	0.68	2.31	1.88
8	Gujarat	11.05	0.34	0.81	0.58
9	Haryana	7.01	0.55	0.85	0.73
10	Himachal Pradesh	17.22	0.34	0.85	0.50
11	Jammu & Kashmir	6.97	0.50	0.75	0.57
12	Jharkhand	17.60	0.22	0.42	0.26
13	Karnataka	8.03	0.31	0.81	0.50
14	Kerala	3.06	0.33	0.95	0.66
15	Madhya Pradesh	8.74	0.19	0.46	0.25
16	Maharashtra	14.00	0.36	0.88	0.63
17	Manipur	1.12	0.27	0.52	0.31
18	Meghalaya	13.58	0.33	0.60	0.44
19	Mizoram	NA	0.42	0.99	0.65
20	Nagaland	2.94	0.37	0.63	0.45
21	Odisha	9.35	0.16	0.50	0.22
22	Punjab	4.80	0.42	0.69	0.57
23	Rajasthan	6.46	0.39	0.89	0.57
24	Sikkim	54.47	0.46	1.57	1.23
25	Tamil Nadu	5.37	0.33	0.75	0.55
26	Tripura	1.30	0.38	0.55	0.42
27	Uttaranchal	12.45	0.38	0.64	0.51
28	Uttar Pradesh	8.19	0.19	0.50	0.29
29	West Bengal	4.89	0.17	0.49	0.28
30	Andaman & N.Islands	6.94	0.31	1.27	0.85
31	Chandigarh	9.50	0.36	1.07	0.64
32	Dadra & Nagar Haveli	9.96	0.43	1.19	0.96
33	Daman & Diu	8.32	0.29	0.85	0.56
34	Lakshadweep	NA	0.21	0.89	0.28
35	Puducherry	7.95	0.26	0.68	0.51
All-India		**8.33**	**0.27**	**0.70**	**0.44**

Note: ASI: Annual Survey of Industries
OAE: Own Account Enterprise
Estt.: Establishment
NA: Not Applicable (not covered in ASI)

Table-3: Estimated number of enterprise, workers and gross value added with respect to organised and unorganised manufacturing sector in India

Variables	Organised	Unorganised			Total Manufacturing
	ASI	OAE	Estt.	All	
1	2	3	4	5	6
Number of enterprise	172175	14429989	2780280	17210269	17382444
Number of workers	9901969	20844151	14044283	34888434	44790403
Gross value added (Rs. Crore)	825133	56613	98108	154720	979853

Note: ASI: Annual Survey of Industries
OAE: Own Account Enterprise
Estt.: Establishment

Table 4: Percentage share of enterprise, workers and gross value added with respect to organised and unorganised manufacturing sector in India

Variables	Organised	Unorganised			Total Manufacturing
	ASI	OAE	Estt.	All	
1	2	3	4	5	6
Number of enterprise (%)	0.99	83.01	15.99	99.01	100.00
Number of workers (%)	22.11	46.54	31.36	77.89	100.00
Gross value added (%)	84.21	5.78	10.01	15.79	100.00

Note: ASI: Annual Survey of Industries
OAE: Own Account Enterprise
Estt.: Establishment

A Note on State Index of Industrial Production (IIP) with base year 2011-12

Introduction:

1. The Index of Industrial Production (IIP) describes the change of the volume of goods and/or services produced over time. Its main purpose is to provide a measure of the short-term changes in value added over a given reference period. However, since it is difficult to collect high-frequency data to accurately measure value added, gross output measures such as value of production data are more commonly used. Besides, since typically for particular industry, volumes of value added move more or less at similar lines to volumes of output in the short run, the IIP can be regarded as a measure of short-term movements in value-added. The IIP being a volume index means the index is free from price fluctuations. Thus, the IIP is an important short-term economic indicator in official statistics. However, due to constraint in resources, the Laspeyres' index is used, which is fixed basket index and uses base period value share as weight. Moreover, it is an important indicator in its own right as well as being used in comparison to or conjunction with other short-term indicators to assess the performance of an economy in general and that of the industrial sector in particular. IIP data are most commonly published for the hierarchical levels of the industrial classification. However, some countries also publish IIP data for other groupings, such as by 'stage of processing' or by 'use' groupings. In India, a mixture of 'use based' and 'stage of processing based' indices are complied and presented. On the one hand, they are categorised as primary products and intermediate products (i.e., by stage of processing) and on the other as capital goods, consumer durable goods and consumer non-durable goods (i.e., by use-based). This is done in case of both all-India IIP as well as for State IIP.

Historical Background:

2. The Index of Industrial Production (IIP) has traditionally been used to provide insight into short-term changes in economic activity. The compilation of such indices in India dates back to at least in the 1930's. The first official series of IIP with base year 1937 was compiled and released by the Office of the Economic Advisor, Ministry of Commerce and Industry, covering 15 important industries, accounting for more than 90% of the total industrial production. This was much before than even the recommendations on the subject at the international level by United Nations. With the establishment of the Central Statistical Organization (CSO) in 1951, the responsibility for compilation and publication of IIP was vested with CSO. Since then the all India IIP is being released by the CSO as monthly series. The CSO released the IIP series with base year 1946 commencing from 1950.

3. The structure and composition of industry are very dynamic, particularly thanks to the technological changes that takes place in the economy. The demand for goods changes over time as changes in tastes, habits and consumption patterns of the people undergo change. To meet these changes in demand, production in industrial sector of an economy also undergoes changes. To capture these changes over time in the industrial sector, it is necessary to revise the IIP periodically by changing its base to a realistically

representative period. This period should be a normal period which is not affected by either recession or by high growth of the economy. The United Nations Statistical Office (UNSO) has recommended in May 1950 for quinquennial base revision of IIP. The CSO has also made such periodic revisions of the IIP that have improved the scope and coverage and compilation methodology, as far as practicable, by shifting the comparison base to a recent period, with a view to objectively reflecting adequately the industrial growth and structure. The index was commenced in India with 1937 as the base year and this was revised successively to 1946, 1951, 1956, 1960, 1970, 1980-81, 1993-94, 2004-05 and finally to 2011-12. As far as State-wise IIP is concerned, State like Tamil Nadu started compiling IIP from 1993-94. However, a concerted effort was made by many States under the technical guidance of CSO (IS Wing) to compile IIP with base year 2004-05.

Methodology for construction of State IIP:

4. A Working Group was constituted under Dr. Saumitra Chaudhuri, former Member, Planning Commission, for evolving the methodology for compilation of all-India Index of Industrial Production (IIP) with the new base year 2011-12. The report of the Working Group (WG) was submitted to Government of India in April 2014.

5. The specifications with regard to the drawing of the item basket and weighting diagram as recommended by the WG have been elucidated below as guidelines for framing the IIP for States/ UTs with base year 2011-12.

Base year and frequency

6. Since the base year for all-India IIP in the new series has been revised to 2011-12, it is advisable for the States/ UTs to adopt the same base in order to maintain comparability with the all-India figures as well as inter-state comparability.

7. The frequency of releasing the IIP should preferably be monthly. If bringing out a monthly IIP is not feasible in the initial stages, a quarterly IIP should be published with extra efforts being made to sensitize the factories and increase response rates and their frequency in order to shift to a monthly IIP as soon as possible.

How to measure industrial production

8. The physical quantum of production and values of output are the preferred units for measurement of industrial production for the purpose of compilation of IIP. (Value of output is used to report production figures of non-additive products such as apparels, commercial vehicles, etc., where a difference in specification of the product entails non-usage of a particular unit of measurement for the purpose of reporting). The quantum of production, as reported, may be used for compiling the indices since IIP is primarily a production index. However, where the figures are supplied in terms of the value of output,

such figures may suitably be deflated by using appropriate Wholesale Price Index (WPI) as the deflator for compiling the indices. Thus, the hybrid method of using a mix of physical quantities and value of output (deflated by WPI) should be followed**.**

Selection of Item basket

9. The scope of IIP constitutes the mining, manufacturing and electricity sectors. Out of the three sectors, mining and electricity are in the form of a composite index.

10. In case of the index for the *Mining sector*, the item basket as well as the weights are decided and provided by the Indian Bureau of Mines (IBM) to the States/UTs. IBM supplies a composite index in regard to the items prevalent in the mining sector on the basis of data provided by the mines in the respective states. For the *Electricity sector*, the electricity generation figures (single item) may be obtained by the Central Electricity Authority (CEA).

11. In case of the *Manufacturing sector*, the basis for selection of item basket is the value of output figures for products from the Annual Survey of Industries (ASI) 2011-12.

12. It has been noticed that in the production data of ASI, many products correspond with more than one industry groups (NIC 3-digit level) with varying unit values. This seems to be happened due to the practice of classifying NIC of the factory by the major product manufactured in the factory. It is established that the NIC group in which the product's maximum value occurs is the most correct industrial grouping of the product. Thus for selection of the item basket, a product which gets aligned to more than one NIC groups, has been taken in that particular NIC (3-digit) group in which it has maximum value of output. Thus the methodology proposed for the construction of state-level IIP is as below:

i. Using the ASI 2011-12 production data pertaining to NIC 10 to 32 the first job is to remove 'other products and by-products' from all the industry groups after re-distributing their values over the rest of the products occurring in the respective industry groups (NIC 3 digits).

ii. Subsequently, each product (7-digit NPCMS) is placed in alignment with a particular industry group (NIC 3-digit level) in which the product's maximum GVO occurred, leaving with a unique product description, its NPCMS code, its maximum value occurring over the complete dataset and the industry group pertaining to the maximum value.

iii. From the list stated above, the product descriptions at the 7-digit level of the NPCMS corresponding to not-elsewhere-classified (n.e.c.) products are removed and the contributions of all such products in a particular industry group are re-distributed among the non-'n.e.c.' products. This is done to avoid ambiguity of description as well as to facilitate easy identification and collection of data pertaining to these items from the factories.

iv. The list of products thus obtained is arranged in descending order of value of output within each 3-digit level of NIC and then starting from the highest contributor, all the products are to be selected till total value of output of the selected products becomes at least 80% of the total value of output at each 3-digit level.

Weighting Diagram

13. The methodology for deriving the weighting diagram for State IIP is detailed as under:

i. Sectoral weight: Weight for Mining, Manufacturing and Electricity sectors are derived using their respective GVA figures for each of the sectors from the GSDP statistics for 2011-12 released by the Central Statistics Office (CSO) for 2011-12. However, the weight for manufacturing sector will be based on the total GVA of NICs 10 to 32 at 2-digit level.

ii. Weights at 2-digit level: The weight for the manufacturing sector is distributed at 2- digit levels of NIC in proportion to the total GVA in each 2-digit level of NIC for the State from ASI 2011-12 data. The negative GVA, if any, requires necessary adjustment. The proposed adjustment procedure is explained below in paragraph v.

iii. Weights at 3-digit level: Weights in each of the NIC 2 digit level is then distributed to NIC 3 digit levels in proportion to their respective GVA figures for the State from ASI 2011-12.

iv. Weights at product/item group level: NIC-3 digit level weights are then distributed to selected products/ item groups in proportion to their GVOs for the State from ASI 2011-12.

v. Problem of Negative GVA: The weights at any level of NIC ultimately depend on respective GVA and negative weight is not permissible. Thus, if any negative GVA at any digit level is observed, that may be adjusted/replaced with the following formula:

$$ {}^{s}\text{GVA\_adj}_{z} = {}^{s}\text{GVA}_{\text{all-activities}} \times \left[\frac{{}^{s}\text{GVO}_{z}}{{}^{s}\text{GVO}_{\text{all-activities}}} \right] \ldots\ldots.(1), $$

where ${}^{s}\text{GVA\_adj}_{z}$ stands for adjusted Gross Value added of s^{th} state from z^{th} activity,

${}^{s}\text{GVO}_{z}$ stands for Gross Value of Output of s^{th} state from z^{th} activity,

${}^{s}GVA_{all\text{-}activities}$ stands for Gross Value added of s^th state from all activities and

${}^{s}GVO_{all\text{-}activities}$ stands for Gross Value of Output of s^th state from all activities.

Selection of factories

14. Once the item basket for a State/ UT has been derived, the list of factories under an item may be selected by considering complete list of factories having a substantial combined/aggregate share of production of the item in the state/ UT from ASI 11-12 data. A reserve list of factories at item level was also provided.

Compilation

15. Laspeyres' index number formula is to be used to compile indices for industrial production in the new series. The Laspeyres' formula is a fixed basket index number and base period value shares are used as weight. Since IIP is a quantity index numbers, the share of respective GVA is used while calculating sectoral and activity weight. On the other hand, the value of output is used to calculate weight of any item within a specific activity. If T0i and T1i are the quantity of production of i^{th} item for base period '0' (i.e., 2011-12) and current month '1' respectively, The production relatives R_i (=T1i ÷ T0i) for item-level are then combined with item-level weights (W_i) to give the index at 3-digit level of NIC-08 using the formula, $I_{3d} = \sum W_i R_i / \sum W_i$, where I_{3d} is the index at 3-digit activity level, R_i is the production relative for the i-th item under specific 3-digit activity and W_i is the corresponding weight. Now, using, 3-digit level indexes and the 3-digit level weights, 2-digit level indices are computed (I_{2d}) using the same Laspeyres' formula and so on. Thus, the index will be computed initially at item level. Then, aggregating the item level indices at NIC 3-digit activity level, the IIP at 3-digit activity level (i.e., NIC 3-digit level) is to be computed. Again these 3-digit indices are aggregated at 2-digit level and finally these 2-digit level indices are aggregated and indices for manufacturing sector will be obtained.

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- The Journal of Industrial Statistics is meant for original articles on industrial statistics based on data, mainly on Indian context. Government officials, business houses, individual researcher, entrepreneurs, research organization can contribute articles in the journal.

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RNI registration No.
WBENG/2012/46797

PCSO – 27.7-12 (II) 2015

The Journal of Industrial Statistics

The Journal of Industrial Statistics is published by CSO (IS Wing) twice a year in March and September. The journal will publish original data-based articles on different facets of Industry, mainly with reference to the Indian context. Government officials, business executives, individual researchers, entrepreneurs and others interested in industrial statistics and their uses can contribute articles in the journal.

Editorial Address
All communications concerning editorial matters should be addressed to:
The Editorial Secretary
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M/o Statistics & PI
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(Industrial Statistics Wing)
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Kolkata- 700 001

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Soft copies of The Journal of Industrial Statistics are available in the following links:

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http://www.csoisw.gov.in/CMS/En/1034-the-journal-of-industrial-statistics.aspx

Price: ₹ 100

Printed and published by Shri T. K. Sanyal, Deputy Director General, on behalf of Central Statistics Office (IS Wing), 1 Council House Street, Kolkata-700 001 under M/o Statistics and P.I., Govt. of India and Printed at M/s. Bright Prints, 93, Sarat Chatterjee Road, Howrah – 711 102 through the O/o Assistant Director of Printing (OP Branch), Govt. of India, 1 Council House Street, Kolkata-700 001 and published at Central Statistics Office (IS Wing), 1 Council House Street, Kolkata-700 001. Editor-in-Chief: Prof. S P Mukherjee.