The University of Manchester

Institute for Development Policy and Management (IDPM)

Development Economics and Public Policy Working Paper Series WP No. 36/ 2014

Published by: Development Economics and Public Policy Cluster, Institute of Development Policy and Management, School of Environment, Education and Development, University of Manchester, Manchester M13 9PL, UK; email: idpm@manchester.ac.uk.

Measurement of Regulations: An Application to the Agricultural Produce Markets of Indian States

Purnima Purohit*

Abstract: Effective regulation of agricultural produce markets has been increasingly recognised as an important institution for agricultural sector development. This paper provides the construction of a composite time-varying *de jure* quantitative index measuring a specific legislative institution of colonial lineage − the Agricultural Produce Markets Commission (APMC) Act & Rules across 14 Indian states for the period 1970-2008. It represents the first most comprehensive effort till date to systematically characterise post-harvest regulations of agricultural produce markets of India. The paper discusses the possible sensitivity of the APMC indices using higher statistical techniques and examines the evolution of agricultural regulations across Indian states through the study of cross-sectional and secular trends in the indices. The results suggest that though regulations of agricultural produce markets have shown improvement over time in all states but few; however pace of the progress has been extremely slow. There are wide differences in the APMC measures across the states. Rankings of states in terms of the APMC index show varying time trends − stable and high ranks for states like Maharashtra and Punjab, stable and low ranks for states like Uttar Pradesh, West Bengal and Assam, rapidly improving ranks for states like Karnataka and Madhya Pradesh, while maintaining better ranks for Haryana, Andhra Pradesh, Tamil Nadu and Rajasthan and swift deterioration in ranks for states like Gujarat, Bihar, and Orissa.

Key words - agricultural markets, institutions, regulations, economic growth, development, governance, index, measurement

JEL Classification: D4, K2, O1

* This working paper has been prepared as a part of the doctoral research at the University of Manchester, UK (2009-2013). The author is grateful to Kunal Sen, Professor, and Katsushi Imai, Associate Professor, University of Manchester for their support and guidance. Presently, the author is an international research consultant for IFAD; Email: purnimapurohit@gmail.com. The views expressed are personal and not necessarily of the IDPM, University of Manchester or IFAD.

Measurement of Regulations: An Application to the Agricultural Produce Markets of Indian States

> "There are known aspects of our society which most of us wish to improve, and new and different imperfections will continue to appear. If we seek to correct these various deficiencies without knowing how legal systems work and what effects they actually have, we shall achieve improvements only by sheer chance…The law and economics of public policy now poorly serve, but can surely be brought to serve powerfully, our social conscience" (Stigler, 1972, p.2)

Introduction

Over the twentieth century, economists have come up with a number of ways of thinking about economic institutions. They often refer to institutional constructs that cannot be observed directly (Treier & Jackman, 2008). On the one hand they attempt to provide precise description of the mechanism through which institutions play a role in determining economic development outcomes whilst on the other hand offering quantification of institutional variables, whose measurement has been the subject of a substantial amount of research in recent years (Calì, et al., 2011). Examples include quantification of investor protection & employment policies (Pagano & Volpin, 2005), business regulations (Lopez de Silanes et al., 1998; Djankov et al., 2002; Botero et al., 2004), political freedom (Huber & Inglehart, 1995); democracy (Treier & Jackman, 2008), governance (Kaufmann & Kray, 2008); corruption (Murphy et al., 1993; Transparency International) etc, to capture the heterogeneity of these institutions in different countries or within country. In each case, technically the available data is taken as a manifest of the latent indicator (e.g. institutions that are not tangible) and the inferential problem is stated as follows: given observable objective data y, what should be a well-informed deduction about latent measure x? (Treier & Jackman, 2008)

A distinct contribution of this kind − and the focus of this paper − is the measurement of a specific economic institution of post-harvest agricultural produce markets: the Agricultural Produce Markets Commission Act (hereafter, APMC Act & Rules)−, which has so far received relatively little attention in the measurement literature.

The importance of agricultural marketing laws in the economic performance of agricultural sector is well documented by the very diverse experiences in agricultural performance in East Asia, compared with those in Africa, Eastern Europe and former Soviet Union (e.g. Rozelle & Swinnen, 2004; Swinnen et al., 2010). For decades, economic literature has conceptually emphasized that one of the most important factors bedeviling the agricultural growth is the nature of intervention by the government in farm sector through the establishment of rules and sanctions (see Schultz, 1978b; Bates, 1981; Newman et al., 1988; Fafchamps, 2004; Fafchamps et al., 2008; Minten et al., 2012).

The goal of government regulations overseeing the market is to offer incentives to producer farmers, correcting market failures and augment social welfare. Thus, regulated agricultural marketing system heavily determines agricultural sector development. An economic argument can be made that if additional produce in the market does not bring additional revenue to the cultivator farmer, then this lack of increase in revenue may work as a disincentive to increased production. Necessarily, regulations strengthen legal and administrative framework of agricultural produce marketing system to efficiently provide outlets and incentives for increased production. If the agricultural produce marketing system is inadequately developed, a policy effort to increase production is likely to be negated. In sum, efficiently functioning markets can add to welfare of producers as well as consumers (Cullinan, 1999).

In light of the present state of world food economy, this work assumes greater importance. It is significant in a global context when inflation and price rises on food items have become a major concern for policy makers worldwide, and particularly for India and other developing countries. In India, the recent food inflation is largely due to an inadequate supply

response to increasing demand, aggravated by various market imperfections and market-related logistic constraints. This is highlighted in official analysis which notes that in India one of the principal factors behind the higher levels of inflation in the recent period is constraints in food production, and distribution. It concludes that the solution to price inflation lies in increasing productivity, production and concomitantly decreasing market imperfections (see Eleventh Five Year Plan Report 2007-2012, Government of India, 2008).

Against this backdrop, this paper makes a major contribution. It represents the first and the most comprehensive effort to date to construct multidimensional index that systematically measures the post-harvest agricultural marketing state law, APMC Act & Rules for select 14 out of the total 28 states of India for the period 1970-2008. In particular the states considered for the analysis are: Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.[1] The construction of this legal measure has not been made for the states of Kerala, Manipur, Andaman & Nicobar Islands, Dadra & Nagar Haveli, Daman & Diu and Lakshadweep. This relates to limitations found in time-series data availability and missing records on variables needed for robust index construction for 14 major states in this paper. This work is also in line with a number of earlier studies which also make use of 14 states (Besley & Burgess 2004; Calì, et al., 2011). However, even with only 14 states covered, it is argued that this index provides a comprehensive perspective to analyse role of state-led institutions for agricultural development. The 14 states covered account for over 88 percent of total value of output from total agricultural and allied activities for each year in the country and the states also comprise the bulk of the Indian population (around 94%) (IndiaStat.com).

India is an appropriate context for building sub-national indices as it is a federal country composed of several states with a fairly high degree of political autonomy and legislative powers. The legislative powers and

[1] Please see Annex 1.A14 for the map of India, showing States and Union Territories

jurisdiction between the Central and State Governments are demarcated under the Constitution of India (Besley & Burgess 2004; Calì, et al., 2011). Agriculture is a state subject which means that the state government is sovereign as regards the enactment of laws and regulations in relation to agriculture. Laws and regulations at the level of each state thus play a key role in influencing performance in the agriculture sector. Marketing of agricultural produce (products) in India is governed by the state level statutory bodies –the Agricultural Produce Marketing Committees (APMC) established under the Agricultural Produce Markets Commission Act (APMC Acts & Rules). In other words, state agricultural development is contingent upon efficient marketing systems, where the functional legal blueprint is outlined by the respective state's APMC Act, where state-led APMC Act & Rules govern, organise and guide all transactions and conduct (market entry, movement, storage, processing, sale & purchase of post-harvest farm produce) of the regulated markets in the states of India (Acharya & Agarwal, 2009).

Further justification as to why the state is a key geographical unit of analysis also comes from the fact the Indian agriculture growth pattern has been highly varied at the state level (Eleventh Five Year Plan Report 2007-2012, Government of India, 2008) There is a wide variation in the performance of different states and the computed APMC index and its sub-indices per se may serve as useful measures to compare the competitive situation of agricultural produce markets in 14 states of India, allowing the identification of problematic states and dimensions of legal provisions that deserve attention by policy makers for improvement.

This work can also offer useful pathways to investigate further and draw reliable inferences about the impact of APMC Act and Rules, particularly on use of modern agricultural inputs, uneven growth patterns in agricultural productivity and rural poverty outcomes in the states of India.

In terms of scope of this paper, agricultural marketable surplus in India is disposed off mainly in two ways: (a) sales in the unregulated village market directly to merchants, agent or village consumers and b) sales into the designated regulated market, which is a formal channel of marketing. The

paper concerns the marketing operations in category (b) as these are the agricultural markets principally regulated by APMC legislation, instituted by the state government. This focus also takes into consideration the view that currently state governments are working towards to bring all agricultural markets across the country under the formal channel of marketing through market legislations (Acharya, 2006).

The paper is divided into nine sections. The next section reviews the measurement literature as the basis for the APMC measure. Section 1.3 states meaning of regulations in terms of APMC Act, dimensional approach to APMC index, and introduce measurement issues such as weighting, aggregation scheme and robustness check. Section 1.4 describes approach to reading the APMC Act, including identification and classification of legal variables, historical and present marketing system of the APMC Act and provides a rationale behind state-wise codification of the law. Section 1.5 includes description of the variables and quantification of the variables in the index. Section 1.6 explains the choice of statistical technique and approach used to construct six single-dimensional measures of the APMC Act. It goes through the statistical procedure in depth, with identification of normalization and standardization of the selected variables in the index construction. Section 1.7 discusses approach to construction of multi-dimensional measure of the APMC Act. Section 1.8 discusses the results, describes the trends of the indices across Indian states at various points of time, for each state over time; Section 1.9 concludes.

Disputed Issues and Choices: Measurement Literature

Empirical work studying the legal aspects of economic questions has become prevalent in economics over the last couple of decades, and today might be regarded as a major sub-discipline of economics. Tremendous amount of time and effort have been devoted to measuring or more specifically, assigning quantitative scores to countries or states on specific indicators of a law, legal environment or legal solutions to problems in socio-economic areas of the economy. Numerous and diverse measures in the literature use different approaches to capture state policies and regulation: rules for shareholder protection; employment laws and job security/satisfaction, pension/retirement plan, overtime etc; labour laws

and rigidity of labour markets; land reform acts as a measure of re-distribution policy and the like (e.g. Shleifer & Vishny, 1997; Besley & Burgess 2004; La Porta et al., 2006; Lele & Siems, 2007; Armour et al., 2009 and so on). However, in some of the cases what scores or measures capture or what is the 'nature' of underlying latent construct – institutional regulation – is unclear? Questions have been raised in the literature that not much attention is paid to the quality of the variables used for such measurement analysis.

Armour et al., (2009) extensively describe many of the deficiencies in the method or approach of index constructions of laws. For instance, in selecting indicators, researchers tend towards minimalist approach of not using comprehensive (wide) set of variables to separate out distinct dimensions of a law. The work sometimes suffers from ad hoc selection of the variables, without well-conceived view of indicators. They also point at the problem as a result of fuzzy definition of variables. Some of the cross-country works (e.g. La Porta et al., 1997) have been criticized on the choice of variables suffering from particular country bias (Armour et al., 2009). All the more beyond issues around indicators, problems of causal inference tends to 'overshadow the equally important problems of conceptualization and measurement' (Munck & Verkuilen, 2002: 5).

Literature has made a distinction between *de jure* (in law) rules and *de facto* (in practice) functioning of legal rules and regulations. A measure is considered objective when it is constructed by scoring for existence and strength of formal (*de jure*) legal rules and regulations (Savoia & Sen, 2012). On the other hand, a measure is considered subjective when scoring relies on perceptions of the *de facto* function of rules, coming from (i) experts' opinion, e.g. risk-rating agencies, foreign investors, academics or NGOs; and (ii) surveys of national respondents (firms and individuals) (ibid). Savoia & Sen (2012) argue that *de jure* measures have some of the best properties in terms of methodology. The advantage of rules-based indicators is that they are free from personnel-specific political or ideological biases that, experts' assessments may have. Glaeser et al., (2004) add that measurement of 'formal' institutions by definition limits methodological subjectivity as formal institutions evolve slowly and better suited to be captured by objective measures. Williams & Siddiqui (2008) explore these

issues in terms of state governance measures, demonstrating conceptual problems and researcher's coarseness around distinguishing between objective and subjective measures. They also raise validity issues that choice of variables and the measure constructed can be an outcome of state 'capacity', rather an assessment of its 'quality'. Kaufmann & Kraay (2008) opine that measuring latent constructs such as governance quality requires some degree of subjective judgment (for instance, when selecting the elements of an objective measure).

Other literature has argued that *de facto* measures are still crucial. In the context of a developing country (although conceivably also relevant in all countries), Anant et al., (2006) argue that regulations depend on the culture of governance and constructing latent variables (regulation or law) directly from legal statutes could be misleading as there are 'intermediate factors' (e.g. bribes, corruption, political interference) that transform 'enactment' to 'enforcement' that could invalidate the intention of the statutory law. Building on Williams & Siddique's (2008) argument that the role of the intermediate factors' in measurement of law may lead to measurement error since not considering *de jure* laws in 'absolute' terms would necessarily capture or measure the *de facto* elements of malpractices, cultural and value judgments that change over time (through education, globalization) rather than law itself or change in law. Savoia & Sen (2012) notes that not considering *de jure* (statutory rules) but *de facto* indicators (ground implementation) of a latent institution do not indicate which specific policy intervention is actually responsible for observed change in outcome.

Within Indian experience, literature on legal measures is relatively scarce, with an exception of extensive study of labour market regulations such as the Industrial Disputes Act (IDA) (see Sharma & Sasikumar, 1996; Besley & Burgess 2004; Deshpande et al., 2004; Tapalova, 2004; Bhattacharjea, 2006; Hasan et al., 2007; Zilibotti et al., 2008; Ahsan & Pages, 2009). Bhattacharjea (2006) provides a critical review of methodology adopted and interpretation of the IDA amendments. For instance, the labour laws are measured by computing a cumulative score of number of times a state amends (undertakes reforms) the labour law. The approach ignores

possibility of the law being potentially progressive in a state from the inception as compared to other states that need to amend the law as problems emerge. In such case, the state, with progressive law, would need to amend the law fewer times or less drastically than the other states would do. Thus, such a methodology does not capture the correct attitude/intent of the law in the state and tend to favour those states that had an inferior law to start with (Bhattacharjea, 2006).

Building on many of these shortcomings, Armour et al., (2009) demonstrates that it is more appropriate that variables of law are selected on the basis of their economic functions or objectives. And Lele & Siems (2007) explain that choice of variables should be consistent and comprehensive enough to identify the appropriate attributes that best typify law (latent variable). Treier & Jackman (2008) agree that a good measure of latent variable "should identify appropriate attributes that constitute the measured institution, each represented by multiple observed indicators, have a well-conceived view of the appropriate level of measurement for the indicators and the resulting scale; and should properly aggregate the indicators into a score without loss of information" (p.202). Many applications which measure latent institutional entity are deficient on at least one of these counts. Since all choices – in terms of selection of indicators, technique etc- will significantly affect the resultant multidimensional index, it is important to clarify them.

In sum, the literature review guards against spurious selection of variables and flawed codification of the variables. In this work *de jure* choice of indicators over the *de facto* choice of variables are preferred to construct a measure of the APMC Act & Rules. The choice of *de jure* indicators controls biases both 'for' and 'against' a particular state. It also limits selection of spurious indicators of the APMC Act, driven by individual ideology or beliefs and it allows distinguishing objective indicators easily from the outcome indicators. Discussion on the codification approach and choice of methodology is taken-up in the sections later in the paper.

The Meaning and Measurement Issues of the APMC Act and Rules

In this section, the definition of regulation in the context of the agricultural market system is defined and other APMC Act related measurement considerations are noted, given that Indian agricultural marketing system is well-known for being institutionally complex from centuries (Harriss-White, 1995). This section leads to outlining a general approach to the construction of the index of APMC Act & Rules for the select 14 states of India, for the period 1970-2008.

1.1.1 Regulation in Agricultural Markets: Meaning

This sub-section is heavily based on Dahl's (1979:767) review of regulatory economics of the food system to understand and explain what is meant by the term regulation. I start with clarifying the general agreement in the literature that there is no one single definition of regulation.[2] There is a spectrum of definitions of regulation ranging from broad to narrow in conceptual scope, appeared at different times and there is no accepted international definition of regulation.[3] Hood et al., (2000:3) offers one of the narrowest definitions stating that "regulation refers to the use of public authority to set and apply rules and standards". Other simple definition refers to any government measure or intervention that seeks to change the behaviour of individuals or groups (Parker, 2000; Parker & Kirkpatrick, 2004).

At the broadest extreme, regulation refers to the "full pattern of government intervention in the market" and includes "taxes and subsidies of all sorts as well as to explicit legislative and administrative control over rates, entry and other facets of economic activity" (Posner, 1974:336) According to Dahl (1979), a broad definition of the term regulation encompasses the entire set of *economic functions* of government as presented in the public choice literature. This would include: "(1) providing

[2] See Shaffer (1979) and Gardner (1979)

[3] More recently, much of the analysis in the literature on regulations surrounds characterizing of good and bad regulations, which is also driven by shift in development thinking. It relates to striking a balance between state and market based approaches to economic and development policy objectives. It concludes in general that 'an appropriateness of regulatory regime depends upon economic and social impact on the regulated community' (Ogus, 2002).

the legal foundation and social environment conducive to the effective operation of the price system, (2) maintaining competition, (3) redistributing income and wealth, (4) adjusting the allocation of resources so as to alter the composition of the national output, and (5) stabilizing the economy, that is, controlling unemployment and inflation caused by the business cycle and promoting growth" (Ibid; McConnell et al., 2011:102).

The conceptual definition of regulation understood in this research follows Dahl (1979) which highlights three types of government involvement or activity in the economic market system of agricultural produce:
(a) The full pattern of government intervention in markets through legislative and administrative rules, whereby government defines the scope of economic transactions in markets; attempting to encourage, constrain or facilitate operational aspects of the market economy (i.e. establishment of regulated agricultural markets)
(b) Those political activities that cause government entities to be co-participants with business as users of economic resources (e.g. buying and selling of the foodgrains for food programmes); and
(c) The range of administrative government controls defining the operation of a private market economy or direction of certain economic decisions (e.g. control over food prices; assisting disadvantaged group, including licensing, taxes and subsidies) (Kahn, 1970; Dahl, 1979).

Within this definitional framework, it implies that APMC Act & Rules takes the centre-stage in the establishment, organization and operation of the post-harvest agricultural produce markets in Indian states to a considerable degree. It influences (directly and indirectly) cost of exchange and production, alters preferences of actors and serves interest group by provisions provided and enforced codes of conduct.

I study the evolution of this law from the scope of normative economics (as opposed to positive economics) to consider the role of state functioning for economic and social fairness. Within about 50 years, state agricultural markets evolved from a colonial administrative structure to an Indian nationalist one. Present agricultural market institutions have been steadily re-worked (through reforms) by the state as part of the modernisation and

capitalist growth of India. Therefore, in the conceptual institutional framework of this research, institutions are meant to offer those arrangements that promote broad-based growth by maximizing the growth potential of the society as a whole (Acemoglu, 2003). As a starting point, the historical institutional context is used as an evidence to problematise the research area (Harriss-White: 1995). Traditionally, there is no agreement where and how much the state should intervene in an economy. At the same time, institutions must have a dynamic feature since a good institutional arrangement may later become obstructive to growth in a different time and context (Acemoglu, 2003). However, over the time, political and economic theories of regulations differ on both role and functions of the state tremendously (see Stigler & Samuelson 1963; Stiglitz 1989 for contrasting theories of state regulations).

Based on subscribed understanding of the regulation (Dahl, 1979) in this research, an approach to selection of variables for index construction is taken-up in the next sub-section.

1.1.2 Approach to Selection of Variables

Dhal's (1979) description of types of government activity in the economic food market system of agricultural produce offers a guide for identifying the scope of multidimensional construct of the APMC Act. The APMC index is accordingly conceptualized to be a multi-dimensional construct. It is obtained by combining the six different regulatory indices that measure one distinct regulatory dimension of the APMC Act and Rules. They are: (1) Scope of Regulated Markets; (2) Constitution of Market and Market Structure; (3) Regulating Sales and Trading in Market; (4) Infrastructure for Market Functions; (5) Pro-Poor Regulations; and (6) Channels of Market Expansion.

Each of the six[4] indices (sub-indices) is constructed based on variables classified from state specific APMC Act & Rules and other supporting agricultural marketing related information. The various APMC sub-indices

[4] A 7th dimension 'Market Linking' was also considered. It covered length of roads (kms) in the state to proxy for villages connected with the regulated markets but later it was decided to not to add the indicator in the composite index. Details are available in Annex 1.A13.

are then combined to form an overall state-wise composite index of APMC Act – (hereafter APMC index). I treat the APMC index as a latent, continuous variable, where selected indicators are seen as a functional characterisation of the APMC Act and Rules.

Measuring such regulated markets over space and time is complex and poses challenges of statistical representativeness. An official state database recording the marketing practices in the regulated markets across states over time is not available, so there is no direct way to quantify if progressive marketing institutions over space have come about, the extent and form of which shapes the agricultural marketing system in the Indian states. To overcome this problem, I choose a strategy to pin certain type of marketing features evident in the APMC laws as associated with specific historical events.

The *steps* below explain the approach followed to identify and collect objective dimensions and indicators characterising the APMC Act across 14 states over time .The exact approach on selection of variables and their coding are explained with examples in section 1.4.

Step 1: The first historical colonial Act (1897) had limitations. The literature critiquing the historical Act leads to a set of indicators on 'deficiencies' in the colonial marketing system.

Step 2: Historical Act was dissolved. The central government of India introduced a new nationalized model law (1939), overcoming the shortcoming of the colonial historical law. Subsequently, states of independent India enacted the APMC law in their respective states patterned on this new nationalized model bill (1939). Until date, the form and extent of the same market law in the states is regulating the state marketing system, which have been reviewed, debated and amended from time to time at the state level. The critical variables missing in historical laws were cross-matched state-wise with the existing state's APMC Act for 14 states, for each year from 1970-2008. One may expect that the law across the states would display much similarity, largely due to the fact that law in all the states was patterned on the same model law of 1939.

Contrary to expectation, many of these state Acts differ in vital contents across the states, indicating towards persisting tendency of underlying path dependency of institutions. This provides for identification and variation in the variables across states over time in the index construction.

Step 3: Expert Committee on agricultural marketing reforms (2001)and existing new research on India's agricultural markets have been highlighting growing problems associated with present regulatory framework of agricultural produce market, especially since the introduction of structural reforms in India in 1991 and India becoming founder member of WTO in 1994.[5] In response to criticism of the existing regulated marketing system, the Union Ministry of agriculture introduced a new Model Act: APMC Act 2003 incorporating new reform measures to make the present system of agricultural marketing more efficient, competitive and modern. The state governments have been urged to undertake various legislative reforms in their respective state APMC Act & Rules, recommended in the new model APMC Act. In accordance to the recommendations, some of the states have notified the amended Act and Rules. In some states, content and coverage of new reforms vary. Some states have yet to initiate the reforms. Review of such non-uniform response of the states to new legislative reform measures (based on the model Act of 2003) allows identifying the additional dimension and indicators of measuring APMC Act & Rules[6] across the selected 14 states. The approach enables the selection of *de jure* variables to measure the APMC Act & Rules.

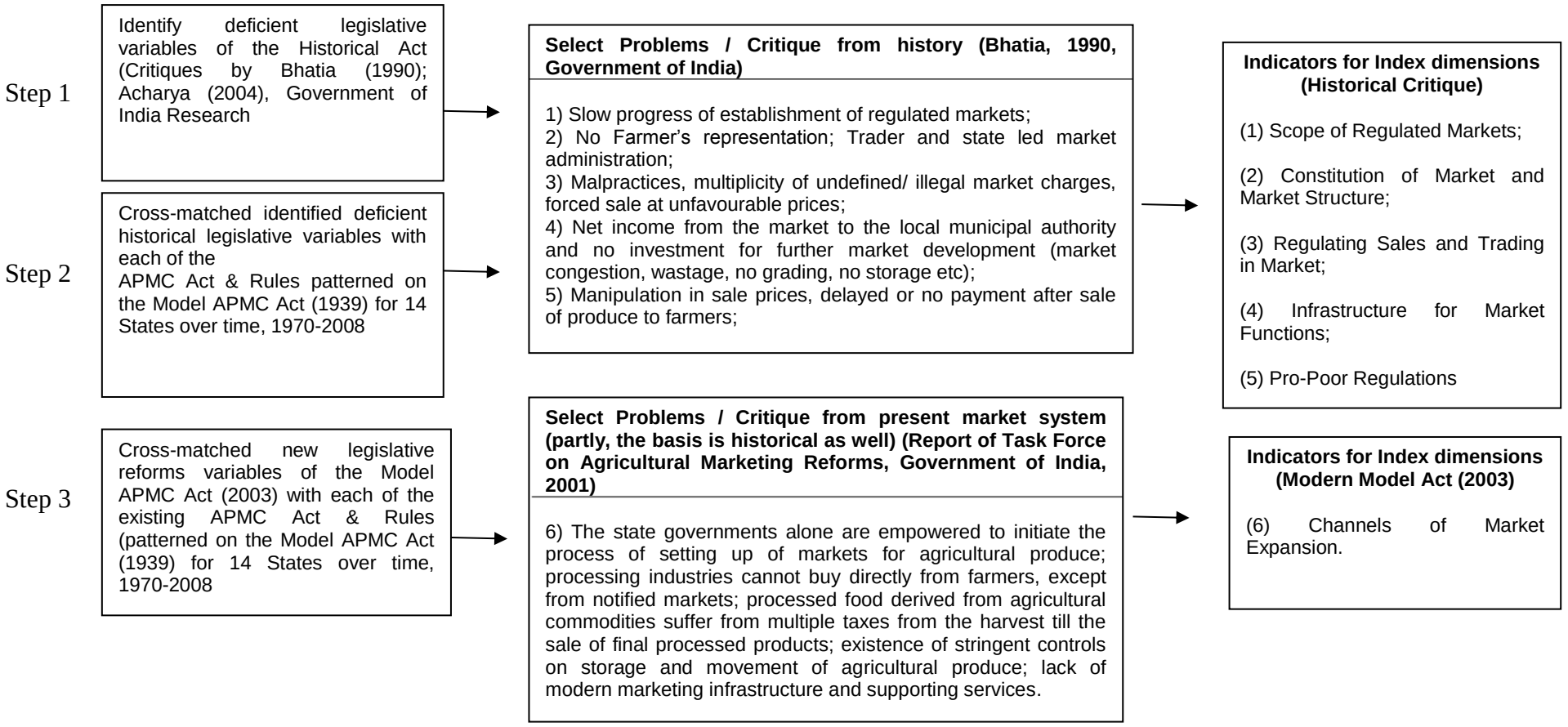
Lastly, evidence of variations in legal features of the law was supplemented with other marketing related information (mostly on regulated marketing infrastructure), which was collected from the official records of the Directorate of the Agricultural Marketing, Ministry of Agriculture,

[5] See Acharya & Agarwal, 2009:287-295 for details of various Expert Group committees on improving agricultural marketing.

[6] This research does not critically review the union government's model APMC Act, 2003. Here, the model Act is viewed as one for promoting development and strengthening of agricultural marketing in the country. The model APMC Act & Rules mould economic outcomes with reference to how far they support or structure market-based economic activities of the agricultural markets by reducing uncertainly and establishing a predictable stable structure to human interaction. (e.g. North, 1990; La Porta et al., 1997; Hall & Jones, 1999; Rodrik et al., 2004; Cali` et al. 2011). The model Act is considered as the baseline 'ideal' Act & Rules.

Government of India. The schema in Box 1.1 summarizes approach to selection of dimensions and variables, featuring the APMC Act. More details are discussed as the paper progresses.

Box 1.1: Schema – Approach to Selection of Dimensions and Variables



Source: Author's work.

1.1.3 Composite Indexing: Aggregation and Weighting Scheme

1.1.3.1 Variable Reduction Procedure

In the literature, arbitrary approach to data selection to characterize features of APMC Act may be prone to critique around possible redundancies arising from managing between overlapping information and risk of losing information (Perez-Mayo, 2005).[7] As per the literature, using a multivariate statistical tool (such as Principal Component Analysis [PCA]) can be a partial solution to such issues as PCA allows researchers to reduce the observed variables into smaller number of principal components (artificial variable) that will reveal underlying correlation between indicators of regulations and retain only the sub-set that best summarizes the available information (Njong & Ningaye, 2008). I construct the six sub-indices measuring the APMC Act & Rules using the statistical procedure of principal components to extract the common information of the variables corresponding to each of the six identified sub-indices (Filmer & Pritchett 2001).

1.1.3.2 Sub-index Weighting Scheme

As regards decision to assign weights to variables within a sub-index, I do not opt for an equal weight scheme in construction of the six dimensions of the APMC index. It is possible that functional importance of observed legal clauses (variables) of the APMC Act & Rules is not even. Also, according to Roodman (2006), when using equal weights, it may happen that by combining variables with a high degree of correlation – an element of double counting may enter into the index. In other words, if two collinear indicators are included in the index with a weight w1 and w2, the unique dimension that the two indicators measure would have weight (w1+w2) in the summed-up index.

In the literature review of statistical methods for setting weights to the variables in the measurement of multidimensional index, no settled method or justified rule regarding how one choose an appropriate weighting structure was found. Some studies take the approach of no weights or a priori specified equal weights, in the construction of the composite indices,

[7] In this case, redundancy means that some variables are correlated with one another because they are measuring the same construct or share a common regulatory objective.

to avoid attaching different importance to the various dimensions of the index (see Chakravarty, 2003; Nolan & Whelan, 1996). The particular problem with a priori specified equal weighting scores noted in the studies is that it discards much of the variation in the indicators (Treier & Jackman, 2008).

In a second approach, variables are combined using weights determined through a consultative process involving subject experts and practitioners. Although this approach is an improvement over the first option in terms of moving away from purely arbitrary weights, it is based on subjective opinions regarding the relevance or importance of each component. Also, the difficulty here relates to whose preference will be used in the application of the weights, whether it would be the preferences of policymakers, farming community, traders or the consumers (Smith, 2002). In a third approach, studies rely on multivariate statistical methods to generate weights and aggregate variables to generate indices. The exercise in this paper follows this statistical approach and relies on PCA statistics to extract and assign optimal weights to each variable of sub-index and then technically summed to compute their score on a component. In the section 1.6.3, significance and choice of the PCA technique is discussed in detail.

More specifically, I apply a standard PCA on the continuous variables and a recently developed tetrachoric PCA technique on the binary (0/1) variables of my dataset to construct six sub-indices that measure each one dimension of agricultural produce market regulations – (1) Scope of Regulated Markets; (2) Constitution of Market and Market Structure; (3) Regulating Sales and Trading in Market; (4) Infrastructure for Market Functions; (5) Pro-Poor Regulations; and (6) Channels of Market Expansion. I show later in section 1.6.3 relevance of the choice of standard and tetrachoric PCA technique with respect to type of variable.

1.1.3.3 Aggregation: Composite Index

When I combine the sub-indices to construct the composite APMC Index, I choose an approach to capture multi-dimensionality of the APMC Act and Rules. The methodological formula of computing the composite APMC index entails the use of a non-linear aggregation of the six sub-indices rather

linear aggregation (Giovannini, 2008). The choice of non-linear aggregation is made based on its features. The non-linear aggregation obtains an overall composite index of APMC Act & Rules that allows partial compensation for the sub-indices with low values, and yet it still incentivizes the state to improve its position in the low score measure (Munda & Nardo, 2005). One may argue that each of the six dimensions of the APMC measure are distinctly important and therefore, an absolute non-compensatory aggregation method would be better as it makes APMC measure more liable to be punished for being non-progressive on one or more dimensions of the Act. However, I do not opt for an absolute non-compensatory approach to compute the composite APMC measure. The reason is that each dimension of the APMC Act & Rules regulating the market functions and functionaries does not perform in isolation. Each of them serves the market functionaries and consumers individually and together in tandem in the state and society. These market dimensions interact and influence one another to achieve the overall objective of the APMC Act & Rules (Munda & Nardo, 2009). They structure the performance of a market in more than one way or more precisely in combination within the premises of regulated market. For instance, a farmer could also be a trader and consumer, playing a dual role at the same time. Thus, in essence, I choose the approach that allows at least a partial compensation between dimensions. From the viewpoint of policy approach, it seems to be penalizing moderately for the index with low score and more incentivizing the state to improve the level of APMC Act & Rules.

1.1.4 Robustness Check

As a robustness check in index computation approach, simple arithmetic average is also used to compute six indices of the APMC Act & Rules. In this option, weighting score on each index is determined implicitly. According to literature, this alternative way of index computation is also reliable as more implicit weights are given to good quality data (Roodman, 2006). However, it has a significant weakness and can give more emphasis to variables which are easier to measure and readily available rather than more important regulatory indicators which may be more problematic to identify with good data (Njong & Ningaye, 2008). The option, nevertheless, is used with an objective to check the robustness of measurement results of the six sub-

indices. It also provides a check against eventual major measurement error in the composite index (Calì, et al., 2011).

Reading the Law: Background for Data Classification

The interest of the study is to measure the evolution of the APMC Act & Rules of select 14 states for the period 1970-2008. As outlined above with a lack of direct measures of marketing practices of the regulated markets set up under the APMC Act, I primarily read and code the state-wise APMC Act & Rules, which capture the differences in administrative design, ways of efficiency in trading, special protection to disadvantaged farmers, and market orientation of agricultural sector as whole to increase agricultural income and attain development.

A historical background of regulated markets in the states offer analytical guide in reading the law and serves two purposes. First, historical narration allows one to perceive the underlying rationale behind the British administration for bringing agricultural markets under the legislative order. It instills the idea of why this institution, established in the interwar period in India with enabling, disciplining and constraining function, continues to vary over time and space in different states of India. Second, it helps to understand, identify and classify the variables that link to creation of institutions of the present day regulated markets. The choice of indicators is also partly driven by existence of variation in the APMC Act & Rules in time-series data, which is relevant to the latent regulation that the index is intended to measure across the selected states.

History in Brief: The APMC Act

The history of establishment of regulated markets in India dates back to 1886, when elements of regulation were introduced in the Karanja Cotton Market under the Hyderabad Residency's Order. The motive behind this regulatory measure by the then British rule was to ensure supply of pure cotton at reasonable prices to the textile mills in Manchester, UK, and so the first regulated market was established in India. Subsequently in the year 1897, a special legislation known as "The Berar Cotton and Grain Market Law" was enacted in Berar, then known as "Hyderabad Assigned District" in 1897. Under the provisions of this Act, the British Resident acquired the

authority to declare any place in an assigned district a market for sale and purchase of agricultural produce, and to form a committee to supervise these regulated markets. It was the first exclusive statute on regulation of marketing of agricultural produce. Subsequent Acts, whenever passed were generally modelled on the general principles embodied in this law (Acharya & Agarwal, 2009).

The salient features of the colonial agricultural marketing law were as follows:[8] All the markets that existed on the date of enforcement of the law fall under the state's law fold; (i) The British Resident could declare any additional markets or bazaars for the sale of agricultural produce. (ii) A Commissioner was to appoint from among the list of eligible persons, a committee ordinarily of five members: two representing the Municipal Authority with the remaining three from amongst the cotton traders for enforcing the law. (iii) Unauthorised markets and bazaars were banned within five miles of a notified market. (iv) Trade allowance or prevalent local market customs in the Resident were abolished; (v) Market functionaries were required to take licenses. (vi) The Resident was empowered to make rules for some specific matters such as levy and collection of fees, licensing of brokers, weighmen and also for checking of weights and measures (services), (vii) The Act was applicable to both cotton and grain markets. (viii) Penalties for breach of certain provisions of the law were laid down.

The serious drawback of this law was that it provided no representation for the growers/farmers on the market committee even though the grower would need legislative protection (Bhatia, 1990). Though the Act provided for the regulation of market for all agricultural produce, only markets for cotton were established. There was no independent machinery for the settlement of disputes between the seller and the buyer. Further, limitations emerged in the course of time, for instance, it was found that regulated markets were turning into a source of municipal revenue as the Act provided that after expenses has been paid out of revenue derived of the market fees, surplus (if any) should be given to respective municipalities in which the market was located. It was later recommended that revenue

[8] The Berar Cotton and Grain Markets Law, 1897, vide Appendix VI to "Report of the India Cotton Committee, published in 1919, p. 236-38, cited by Gosh, 1999

raised from the markets should be spent in developing facilities and services in the markets that would benefit producers etc. But the progress under the Act was very discouraging because the process of obtaining necessary resolution from the District local Boards, municipalities and other bodies was quite lengthy (Gosh, 1999).

The first colonial agricultural market (law) Act was repealed, and the new improved model Act 'Agricultural Produce Markets (Commission) Act' (APMC Act) was introduced in the year 1938. The states were urged to pattern their respective laws based on the new model law prepared by the Indian Central Government, and to establish regulated markets to help orderly marketing of all agricultural produce. The subsequent agricultural market law, whenever passed by the states either immediately or after an interval, was virtually based on the general principles embodied in the original law (Bhatia, 1990). After independence, despite efforts by the central government, the actual growth of regulated markets and their geographical distribution remained highly uneven. The progress made with the regulated markets in subsequent decades was slow and highly inadequate to cover large farmers' population.

Another significant fact about these markets was their heavy concentration in the cotton growing states. This largely explains why in 1964, 80 percent of the total 1000 regulated markets, then in existence, were located in the five western states, although, they accounted for only 30 percent of India's population. The markets did not embrace other agricultural produce, and were largely confined to cotton marketing. Until late 60s, certain states of India such as Uttar Pradesh, West Bengal, and Assam hardly had any regulated market (Rajagopal, 1993). In gist, jurisdiction of market regulations were for the cash crops to serve the interest of the colonial power.[9] With the reorganization of the Indian states in 1956, more than one Act became operative simultaneously in different regions of the reorganized states. This called for unification of market laws, and most of the

[9] Further historical account of the evolution of law in the pre-independent period is given in Annex 1.A1.

reorganized states thereafter enacted legislation for this purpose.[10] (As narrated in Bhatia, 1990; Rajagopal, 1993; Acharya & Agarwal, 2009).

The present-day Agricultural Produce Markets Act, thus, came into force in different states as outlined in Table 1.1 to help orderly marketing of all agricultural produce. I use these state-wise Acts to read and classify regulatory variables for the computation of the sub-indices and the composite index. I classify the current state APMC Act & Rules into six main sub-categories according to their purpose or function. The six categories take the form of sub-index, as noted in section 1.3. I construct cross-state database covering 14 states with 46 variables measuring the APMC index for the time period of 38 years (1970-2008).

Table 1.1: Agricultural Produce Market (Regulation) Acts in force in (select) different states of India

S.no	State	Title of the APMC Act	Rules
1.	Andhra Pradesh	The Andhra Pradesh Agricultural Produce and Livestock Markets Act, 1966 (AP Act 16 of 1966)	1969
2.	Assam	The Assam Agricultural Produce Markets Act, 1972 (Assam Act 23 of 1974)	1975
3.	Bihar	The Bihar Agricultural Produce Markets Act, 1960 (Bihar Act 16 of 1960)	1975
4.	Gujarat	The Gujarat Agricultural Produce Markets Act, 1963 (Gujarat Act 20 of 1964)	1965
5.	Haryana	The Haryana Agricultural Produce Markets Act, 1961 (Haryana Act 23 of 1961)	1962
6.	Karnataka	The Karnataka Agricultural Produce Marketing (Regulation) Act, 1966 (Karnataka Act 27 of 1966)	1968
7.	Madhya Pradesh	The Madhya Pradesh Krishi Upaj Mandi Adhiniyam, 1972 (Madhya Pradesh Act 24 of 1973)	1973
8.	Maharashtra	The Maharashtra Agricultural Produce Marketing (Regulation) Act, 1963 (Maharashtra Act 20 of 1964)	1967
9.	Orissa	The Orissa Agricultural Produce Markets Act, 1956 (Orissa Act 3 of 1957)	1958
10.	Punjab	The Punjab Agricultural Produce Markets Act, 1961 (Punjab Act 23 of 1961)	1962
11.	Rajasthan	The Rajasthan Agricultural Produce Markets Act, 1961 (Rajasthan Act 38 of 1961)	1963
12.	Tamil Nadu	The Tamil Nadu Agricultural Produce Markets Act, 1959 (Tamil Nadu Act 23 of 1959)	1962
13.	Uttar Pradesh	The Uttar Pradesh Krishi Utpadan Mandi Adhiniyam, 1964 (Uttar Pradesh Act 25 of 1964)	1965
14.	West Bengal	The West Bengal Agricultural Produce Marketing (Regulation) Act, 1972 (West Bengal Act 35 of 1972)	1982

Source: Various State Laws

[10] A few of the other states having no such legislation at the time of reorganization also enacted such legislation for their respective states.

APMC Act: Present System of the Agricultural Markets

In India, the APMC Act sets legislative clauses and rules for establishment of regulated market for the sale and purchase of agricultural produce. Presently all the wholesale markets in almost all the states and union territories of the country have been regulated under their respective state APMC Acts. Under these Acts, geographical regions within a state are divided and declared as market area under one or the other regulated market. The markets are managed by the market committees constituted by the state governments under these Acts. Within each markets area, marketing of specified agricultural commodities is regulated in accordance with the provisions of the market regulation Act. Once a particular area is declared as market area under the APMC Act and falls under the jurisdiction of a particular market committee, only licensed persons or association are allowed to carry on wholesale marketing. Thus, APMC Act, at least in their initial stage can be seen to broadly mirror those established institutions driven by colonial production concerns. Recently, states have started to institute new legal provisions (under reforms) to legally permit setting up of an alternative marketing system to operate in parallel to the state regulated markets run by the private sector. The purpose of this 'private' marketing system is to establish modern efficient trade practices, e.g. to function as a catalyst for changes in the market system driving competition and efficiency (Acharya, 2006).

Ideally, the aim of enactment of the APMC Act & Rules has been to create uniform conditions for efficient performance of trading in the agricultural markets through facilitating functions of fair and free market competition. The specific objectives of the APMC Act are to (i) ensuring remunerative prices to farmers, inducing them to adopt new technology for increasing the production of food and other agricultural commodities and in turn improving their livelihoods and food security; (ii) maintain supply of essential foodgrains to consumers and raw material to the industry at reasonable prices; (iii) reducing the inter-year fluctuations in supply of foodgrains, mainly cereals, through buffer stocking operations and operating a public distribution system; and (iv) promote an orderly marketing of agricultural

produce by improving the infrastructural facilities (Acharya, 2006:4; Acharya & Agarwal, 2009).

The Statutory Text of the APMC Act

Each state APMC 'Act' corresponds with state APMC 'Rules'. The Rules are blueprint (a practical specification) to implement the clauses of the Act which simply outlines how regulated markets are establish and function (see Table 1.1 for the year of APMC Rules in various states). This means that the Act is enforced only if the Rules exist. Each state Act is modelled and customized based on the central government's model Act & Rules. The model Act[11] is comprised of 14 chapters and 111 sections, covering clause for declaration and establishment of markets to regulate notified agricultural produce, constitution of market committee and marketing board, conduct of business and power and duties of the market committee, regulation of trading, model specification for contract farming, private market yard, penalty, budget etc and the schedule. The schedule[12] provides the list of agricultural produce in which sales and trade takes place in the market of area. The state government makes set of rules corresponding to the APMC Act for carrying out the purposes of the Act. In most agricultural regulated markets, subject to the provisions of the APMC Act and the Rules, a market committee may frame bye-laws on any matter for effectively implementing the provisions of the APMC Act and Rules. This work focuses on State's principal APMC Act and its main Rules. It codes state-wise legislation based on readings of each APMC Act and Rules of 14 states of India for the period between 1970 and 2008. Although all states adapted the APMC Act based

[11] A copy of the model Act and Rules, as the baseline Act, can be found at http://agmarknet.nic.in/amrscheme/modelact.htm and Rules: http://agmarknet.nic.in/amrscheme/FinalDraftRules2007.pdf

[12] Historically, the colonial Act provided for the regulation of market for all agricultural produce but markets for cotton were only established (in which British rulers were interested). Today Acts in most states covers comprehensive list of agricultural commodities, and legal definition of the term 'Agricultural produce' is widening over time. However, regulation of trade is exercised only on commodities from amongst these included in the schedule as are specified in the Government notification in respect of each market, even when more agricultural commodities may be arriving in the market (as per the intended law). I could not take into account this feature of commodity coverage in the composition of the index because: legal definition of Commodity coverage under the existing Act has been revised in most states over time. The commodity coverage in schedule has also improved. And in some states (for example, Gujarat), markets for trade in livestock and poultry are separate from markets for cereals. The legal Act for livestock are also separate than APMC Act. So, the information on commodity coverage in the state regulated market was not possible without a primary visit to markets in the states.

on central government's model Act, they diverged from one another overtime.

As noted, the new Model APMC Act (2003) is used as the baseline Act to code State-level APMC Act and Rules for all the selected states. At present, the important legislative measures intended for improvement in agricultural marketing in the states of India include (Acharya, 2004):

(a) Supervision of marketing practices by market committees consisting of farmer's representatives;
(b) Licensing of functionaries operating in the markets;
(c) Open auction or close tender system of buying and selling;
(d) Issue of sale slips showing quantity and price to the farmers;
(e) Well-publicised time and days of auction;
(f) Correct weightment of the produce by licensed weighman;
(g) Prescription of rational market prices;
(h) Provision of payment to farmers within stipulated period;
(i) Mechanism of dispute settlement;
(j) Dissemination of market related information;
(k) Provision of amenities to the farmers in market yards;
(l) Availability of cash loan against stored produce in some markets; and
(m) Reduction of physical losses during buying and selling.

Keeping the New Model APMC Act 2003 as the reference model law, identified legal clause in each of the states' APMC Act is scored of either one (if a legal provision or feature exists in the state's APMC Act) or zero (if a legal provision or feature does not exists in the state's APMC Act). Such classification of legislative measures helps to codify the level of the APMC Act & Rules across states. It distinguishes between states having different level of APMC Act and Rules over the time.

It is useful to give a couple of examples to demonstrate this coding procedure. A sample of good quality regulatory market clause is from Rajasthan on 'terms and procedure of buying and selling' (Section 15-D (2 a-c) of the Act, 1961). The clause reads the following:

Section 15-D(2-a) of the Act, 1961 reads: "The price of agricultural produce brought in the principal market yard or sub-market yard or private sub-market yard shall be paid on the same day to the seller in principal market yard or sub-market yard or as the case may be, private market yard…"

Section 15-D (2-b) of the Act, 1961 reads: "In case purchaser does not make payment as specified under clause (2-a), he shall be liable to make payment within five days from the date of purchase with an additional amount at the rate of one percent per day of the total price of the agricultural produce payable to the seller"

Section 15-D(2-c) of the Act, 1961 reads: In case the purchaser does not make payment as specified in clause (b) within the said period of five days, his licence shall, without prejudice to his liability under any other law, be deemed to have been cancelled on the sixth day and he shall not be granted any licence or permitted to operate in a market area as any other functionary under this Act for a period of one year from the date of such cancellation.

Out of the Acts of the 14 states that I read, here the state of Rajasthan gets a code of plus one in the data set since the 1963. The rules to enforce the Act were framed in 1963 satisfies three identified variables: (1) provision of payment to grower/seller on the same day; (2) provision of interest payment over the delayed payment and (3) penalty for default payment. In comparison, except for the state of Madhya Pradesh and Karnataka that included similar clauses in 1986 and 2007 respectively, other state's Act excluded clauses on interest over the delayed payment and penalty for default payment, and in this case these states included only provision on point (1) of payment to grower/seller on the same day. So these states get zero on two of the three legal aspects.

Another sample of good quality regulatory market clause is from Karnataka on 'democratic farmer led market structure' (Section 11-12 of the Act, 1966 and Section 41 of the Act, 1966). The clause in the Karnataka Act reads the following on constitution of market committee and election of the market committee Chairman:

Section 11-12 of the Act, 1966: provides legal provision on 'Constitution of second and subsequent market committees' in the state market area through election and Section 12 of the Act provides procedural provision for conducting the election. Section 41 of the Act, 1966 states about the

Election of Chairman and Vice-Chairman such as:- (1) Subject to the provisions of sub-sections (2) and (3), every market committee shall choose two members representing the agriculturists' constituencies of the market committee to be the Chairman and Vice- Chairman thereof respectively"

The above provision captures two aspects about Karnataka Act: (a) market committee of the regulated market is constituted in a democratic way through election and (b) the law mandates that elected chairperson of the committee is one of the agriculturalists member. So, Karnataka gets plus one since 1968 on two identified variables: (1) appointment of market chairman by election and (b) agriculturalist as the market chairman. Barring this solitary example of Karnataka, no State Act contained specific provision in this respect until the year 1987. While both the clauses are missing till date in the states of Uttar Pradesh and West Bengal, the states of Assam, Bihar, Orissa, Gujarat and Madhya Pradesh only provided for a provision on constitution of the market committee through election through reforms in later years. So these states get zero for missing clause in the Act.[13]

Having obtained the score on status of principal APMC Act and Rules, I combine other state-data on infrastructural facilities for agricultural marketing to the coded APMC Act. The choice of continuous variables on marketing infrastructure is complimentary as the Act prescribes the State Marketing Committee and Marketing Board to provide and improve the infrastructural facilities of the market area of agricultural produce. This provides more granular time series and cross-sectional variation on the legislation, much more than if coded APMC variables were considered in isolation. This forms the basic database of variables to generate the measure of the APMC Act & Rules.

Variables

I discuss below the complete list of choice of variables on regulations that are taken to measure six dimensions of the APMC Act & Rules of 14 states

[13] States with no provision of election system, the committee members and the Chairman are nominated by the State Government. The literature underscores that one of the principal functions of the market committee under each state Act is to protect the interest of the producer-seller. To facilitate better execution of this function each market committee should have an agriculturalist as the Chairman (Bhatia, 1990)

of India. In this section, discussion on the variables are mainly based upon two sources: (i) Government commissioned research documents and (ii) semi-structured interviews-cum-discussions with government officials at Directorate of Agricultural Marketing and Inspection, Ministry of Agriculture, Government of India, New Delhi and National Institute of Agricultural Marketing, Government of India, Jaipur, held during January 2011-July 2011. For explanatory discussions, this work refers a comprehensive study on Agricultural Marketing (Acharya, 2004), Volume 17 of 27 Volumes, State of Indian Farmer, A Millennium Study, Ministry of Agriculture, Government of India and Report on Task Force on Agricultural Marketing Reforms, 2001.

Six Dimensions of the APMC Act & Rules

1) **Scope of Regulated Markets:** This dimension conceptually characterises the spread of the regulated markets as well as the sufficiency (against shortage) of the markets in the state. It is measured by the following two variables.

   (i) ***Average area covered by each regulated market in Sq km*** measures the density of market (Acharya & Agarwal, 2009). The National Commission on Agriculture (1976) and National Commission on Farmers (2004) have recommended that the facility of regulated market should be available to the farmers within a radius of 5 Km. If this is considered a benchmark, the command area of a market should not exceed 80 Sq. Km. However, in the existing situation, except Delhi and Pondicherry, no State is even close to the norm. The area served per market yard is as high as 823 Sq. Km. (radius of 16 km) in Rajasthan and much higher in hilly states. Even the national average area is quite high where one regulated market on an average serves 435 Sq. Km area (radius of 12 km) in the country (Acharya & Agarwal, 2009). Farmers, thus, often have to travel far with their produce to avail the facility of regulated market. The state having largest market area implies that the travel distance to markets in that state is longest than ideally recommended. Hence, the state receives lowest score on this variable amongst all states after standardisation of raw score. Accordingly, the score for each state is computed year-wise.

(ii) ***Population served by each market per thousand people*** measures the adequacy of number of markets in a state to serve the public efficiently. Larger population implies considerable congestion in market yards that may lead to undue delays in the disposal of the farm produce resulting in long-waiting period and low returns. Annex 1.A1 gives an overview of the number of regulated markets during pre and post independence Indian states. It is well known from the existing studies that there is considerable gap in the infrastructural facilities available and needed in the market yards and sub-yards. "Nearly two-third of market yards and sub-yards were laid out initially on vast land area with such facilities as auction platforms, shops, godowns, rest houses and parking lots. However, studies have shown that facilities available in these yards are considerable short of requirement and most of them have become congested" (Acharya, 2006:6). Further, nearly 95% of rural market places have very little or almost no facilities for trade to take place efficiently (Ibid). The state having largest population in a market is taken to mean insufficient markets and facilities to the service-users in the market area. Hence, the state receives lowest score on the variable amongst all states after standardization of raw score. Accordingly, the score for each state is computed year-wise.

2) Constitution of Market and Market Structure:[14] This dimension conceptually characterises the level of democracy in the regulatory set-up which equitably represents diverse interests involved in sale and purchase of agricultural produce. Under the current Act, market committees are corporate bodies, and they seem to be closely

[14] A clause on dispute settlement provision in the APMC Act was also considered as a useful indicator of market structure. However, I did not find variation across the states. Each of the states provides for such provision in their respective APMC Act. It was found that a more appropriate variable in the context could be a number of cases filed or solved in a given time by the Dispute settlement sub-committee in a state. Unfortunately, such information was unavailable from the State departments. Further, whilst talking to experts in the field, I gathered that small farmers are not literate and informed enough about the clause and it is difficult for farmers to write and file an application against a trader or an agent in the market. Thus, this information could not be included due to lack of suitable data information. Another interesting variable is the number of market functionaries (Number of license holders: market commissions and traders) operating in the state. I chased for this variable very hard (through National Institute of Agricultural Marketing, Ministry of Agriculture) but I could get data only for Rajasthan and that only for the current year.

modelled on India's first legislation: the Berar Cotton and Grain Market Act of 1897 in the states. It is measured by the following seven variables.

(i) ***Composition of market committee by election procedure*** measures if a provision for the election of the non-official members of the market committees in the state exists or not. A score of 1 is given in each year the provision in the Act existed, 0 otherwise, for example, if in a state the members of the market committee are appointed by the state government, the state scores the value zero.

(ii) ***Agriculturalist as the Chairman of the market committee*** measures if a specific clause for agriculturalist chairmanship of the market committee exists or not. One of the principal functions of the market committee under each Act is to protect the interest of the producer seller. To facilitate better execution of this function each market committee should have an agriculturalist as the chairman. In some states like Gujarat, Assam, Madhya Pradesh, it is presumed that since majority of the members belong to producer seller (grower) group in the market committee, there is a natural likeliness that assures selection of a grower to be the Chairman of the committee. However, according to the literature, this need not be true in all situations, especially when the traders are resource-wise very powerful and growers are usually indebted to such traders. Therefore, it is necessary to have a specific provision in the Act itself for electing only a grower as the Chairman (Bhatia, 1990). A score of 1 is given in each year the provision of agriculturalist chairmanship in the Act exist, 0 otherwise.

(iii) ***Elected Chairman of the market committee*** measures if the chairman of the market committee joins the office through an election procedure or by direct appointment or nomination by the state government. A score of 1 is given in each year the provision of electing the chairman in the Act exists, 0 otherwise.

(iv) ***Clause to dismiss market committee chairman*** measures if the chairman or a member of the market committee can be dismissed or removed from the office for misconduct or for neglect

or incapacity to perform his duties. A score of 1 is given in each year the provision of dismissal of appointment in the Act exists, 0 otherwise.

(v) ***Clause to dismiss the market committee*** measures if a market committee can be superseded by the state government if it is found not competent to perform, abuses its powers, or makes persistent defaults in the discharge of the duties under the Act. A score of 1 is given in each year the provision of dismissal of market committee in the Act exists, 0 otherwise.

(vi) ***Legal status of the Agricultural Marketing Board*** measures if the institution of Agricultural Marketing Board has a legal status or an advisory status. The objective of the marketing board in the state has been to expedite execution of the market development work. State boards having advisory status have very limited functions such as reviewing the working of regulated market, market committees and provision of advice to the state government on the development of the regulated markets. Advisory marketing boards do not hold power to 'execute' development work other than advising the committees. On the other hand, the statutorily established marketing boards cover wide area of activity. The statutory boards are in charge of executing the development works. Some of the functions include, inter-alia, superintendence and control over the market committees with a view to ensure efficiency, approve proposals for new market sites, building infrastructural facilities, market research, training of market functionaries etc. A score of 1 is given in each year if legal status of the agricultural marketing board in the Act exists, 0 otherwise.

(vii) ***Existence of State Marketing Board website*** measures if the directorate of agricultural marketing or the agricultural marketing board has a website or not. This variable is likely to proxy for dissemination of market schemes and price information online.[15] It

[15] Existing research notes that sometimes small farmers are unable to take advantage of an online information directly either because of their illiteracy or the non-availability of internet kiosks when they require them. However, given the close social network of the farming community, information is expected to travel or be shared. In some states like Karnataka, Marketing Boards has started SMS services for disseminating information on prices (Acharya & Agarwal, 2009).

is possible that a directorate or a state board which has more organized and targeting functioning arrangements would have a website in place for a longer time. A score of 1 is given in each year if a website for the directorate or board of agricultural marketing exists, 0 otherwise.

3) Regulating Sales and Trading in the Market:[16] This dimension conceptually characterises the level of regulatory provisions of the regulated marketing system to foster the market orientation for Indian farmers. The sales and trading sub-index is measured by the following six variables.

(i) ***Single point levy in the market area*** measures if a provision of single point levy of the market fee on the sale of notified agricultural commodities in the market area exists or not. As a model legal provision, market fee should not be collected by another market committee within the state if fee leviable on agricultural produce has already been paid to a market committee of the State and proof of payment of fees in this context has been furnished. A score of 1 is given in each year if a provision of single point market fee levy in a prescribed manner exists, 0 otherwise.

(ii) ***Open auction*** measures if the Act mandates the system of sale of notified produce to take place in the market yard by tender bid or open auction system. A score of 1 is given in each year if a provision of open auction of food in a prescribed manner exists, 0 otherwise.

(iii) ***Payment to grower-seller on same day of sales*** measures if the Act mandates to make payment of the price of the agricultural produce bought in the market yard on the same day to the seller at the market yard. A score of 1 is given in each year if a provision of payment to grower-seller in a prescribed manner exists, 0 otherwise.

(iv) ***Sale-Slip*** measures if the Act mandates the commission agent to issue a sale slip to the seller, duplicate copy to the buyer, triplicate to

[16] I also considered the rate of Market Fee charged (percentage ad valorem) across states but dropped it due to lack of variation across years in the fee. Also, the report of taskforce on agricultural marketing reforms, notes that other state taxes on agricultural trade like sales tax on agricultural commodities are more problematic. For instance, in the state of Punjab, present incidence of tax on procurement of paddy and groundnut under a contract farming programme is stated to be 11.5% (purchase tax: 4%; cess:1%, Market fee 2%, Rural Development Fund:2%, Agent's charges:1%, infrastructural costs: 1.5%). The tax varies with commodity across the states (Taskforce Report on market reforms, 2001). The time-series data on commodity-wise sales tax is not easily available. Thus, I could not include it in the analysis.

the officer of the market committee to ensure payment to the farmer as soon as any sale is effected. A score of 1 is given in each year if a provision of issue of sale-slip in a prescribed manner exists, 0 otherwise.

(v) ***Provision of input shop*** in the regulated market measures if market committee facilitates additional services to support agricultural productivity such as sale of agricultural inputs that include stocks of fertilizer, pesticides, insecticides, improved seeds, agricultural equipments etc. A score of 1 is given in each year if a legal provision of inputs-sale exists, 0 otherwise.

(4) Infrastructure for Market Functions: This dimension conceptually characterises the level of physical marketing infrastructural facilities and services provided by the State government in the states. Some of the infrastructural provisions provided by central government are also included in the index. Corporations, such as Food Corporations of India (FCI), Central Warehousing Corporation (CWC) though union government's organisation, serve all the states of India and operates on behalf of both the Central and State governments to facilitate the management of food procurement and distribution throughout the country.[17] Under various arrangements determined by different state governments, corporations could participate in the state trading (partial or complete) i.e. procurement and distribution of foodgrains. Corporations' marketing facilities directly affects functions of the regulated markets in the states. As such, the availability of marketing infrastructure affects the structure, conduct and performance of the agricultural markets.

[17] The Government of India enacted the Agricultural Produce (Development and Warehousing) corporations Act, 1956. The Act provided for (a) the establishment of the Central Warehousing Corporation and the establishment of State Warehousing Corporation in all states in the country, other than the establishment of a National Co-operative Development and Warehousing Board. The areas of operations of the Central Warehouse include centres of all India and inter-state importance. State Warehousing corporations (SWC) are set up in different states of India and are centres of district importance. The Warehousing Centres are under the dual control of the state government and the central warehousing corporations.

The spatial distribution of CWC and State WC and FCI storage capacity (godowns) constructed in the country is uneven across the states with relatively poor storage facilities in the eastern states of the country. The available storage capacity is also poor in the hilly and desert areas. According to an index of infrastructural facilities in the states as constructed by CMIE (Centre for Monitoring Indian Economy), marketing infrastructure is better developed in the states of Punjab, Tamil Nadu, Haryana and Gujarat but continues to be weak in Eastern Uttar Pradesh, Bihar, West Bengal, Rajasthan, Orissa, Assam and parts of Madhya Pradesh.

Also, marketing literature questions whether it is the traders or public agencies more than the farmers who get to utilize the available marketing infrastructure like warehouses, grading facilities etc. However, Acharya (2004) counters it and argues that under-utilisation of these facilities by the farmers should be a lesser matter of worry provided facilities are adequately available and utilized. Even if it is the traders who store farm products in warehouses, or transport them through railways or roads, it can be viewed as to farmers benefitting from the infrastructure indirectly. Information on pre-determined procurement prices and trading with public procurement agencies limits or prevent the speculative trader from acting against the interest of farmer by assuring him a remunerative price for his produce. This dimension is measured by the following six variables.

(i) ***Number of Central Warehouse available per 1000 sq km*** measures the adequate availability of number of scientific storage facilities for foodgrains of per thousand sq kms in the state. The state having higher number of storage facility at a shorter distance implies that the market operation serves the interests of both the farmers and consumers better as compared to other states. In terms of market functions, warehouse facility allows procurement of sizeable portion of marketable surplus of foodgrains at incentive prices from the farmers. It also facilitates prompt and uninterrupted supply of foodgrains to the vulnerable sections of society. The state where the storage facilities are available at smallest travel distance receives highest score on the variable amongst all states after standardization

of raw score. Accordingly, the score for each state is computed year-wise.

(ii) ***Central Warehouse capacity available in tonnes for per 1000 MT*** production measures marketing function of availability of scientific storage capacity per 1000 MT production of agricultural produce in the state. The state having highest storage capacity in relation to quantity of total agricultural production implies that availability of the scientific storage facility is relatively better in that state. Hence, the state receives highest score on the variable amongst all states after standardization of raw score. Accordingly, the score for each state is computed year-wise.

(iii) ***Number of State Warehouse availability per 1000 sq kms measures*** marketing function of availability of number of state-run scientific stores within the area of per thousand sq kms to the users in the state. The state where the storage facilities are available at smallest travel distance receives highest score on the variable amongst all states after standardization of raw score. Accordingly, the score for each state is computed year-wise.

(iv) ***State Warehouse capacity available in tones for per 1000 MT production*** measures marketing function of availability of state-run scientific storage capacity for per 1000 MT production of agricultural produce in the state. The state having highest storage capacity in relation to quantity of total agricultural production implies that availability of the scientific storage facility is relatively better in that state. Hence, the state receives highest score on the variable amongst all states after standardization of raw score. Accordingly, the score for each state is computed year-wise.

(v) ***FCI storage capacity per 1000 MT production:*** Apart from CWC and SWCs, the Food Corporation of India also provides storage space. Most of this space is of covered type which includes conventional but scientifically designed godowns and silo complexes. The state having highest storage capacity in relation to quantity of total agricultural production implies that availability of the scientific storage facility is relatively better in that state. Hence, the state receives highest score on the variable amongst all states after standardization of raw score. Accordingly, the score for each state is computed year-wise.

(vi) ***Number of Grading Units available per 1000 sq kms***[18] measures number of grading units functioning in the states within the area of per thousand sq kms in the state. Grading offers many advantages to different groups of persons. Research studies find that grading of the agricultural produce before its sale enables farmers to get a higher price for their produce. It also serves as an incentive to producers to grow a farm produce of better quality. Grading widens the market for the product, for buying can take place between parties located at distant place on the telephone without inspection of quality of the product (Acharya & Agarwal, 2009). The state having highest number of grading units in closer distance implies that accessibility to the units is relatively better. Hence, the state receives highest score on the variable amongst all states after standardization of raw score. Accordingly, the score for each state is computed year-wise.

(vii) ***Number of Grading Units available for per 1000 MT production*** measures availability of grading facility for per 1000 MT production of agricultural produce in the state. The state having highest number of grading units in relation to agricultural production implies that availability of the grading facilities is relatively better. Hence, the state receives highest score on the variable amongst all states after standardization of raw score. Accordingly, the score for each state is computed year-wise.

(5) Pro-Poor Regulations: This dimension conceptually characterises pro-poor regulatory environment to ensure social justice to small and marginalised farmers. The law recognizes that owing to unscrupulous practices by certain sectors of traders, special regulations in the regulated markets are required. It is measured by the following three variables.

(i) ***Provision of interest on delayed payment*** measures if a provision exists so that a buyer is liable to make additional payment over the actual due amount as an interest payment, if the buyer at first trade

[18] Grading standard is a marketing function that establishes quality specification of model processes and methods of producing, handling and selling of agricultural produce based on certain characteristics such as weight, size, colour, appearance, texture, moisture content, staple length, amount of foreign matter, ripeness, chemical content etc. The function facilitates in making the quality specification uniform among buyers and sellers over space and over time to enhance business viability in agriculture (Acharya & Agarwal, 2009:93)

transactions fails to make immediate cash payment to the seller. A score of 1 is given in each year if a provision of interest payment over the principal amount in a prescribed manner exists, 0 otherwise.

(ii) ***The provision of minimum period for payment*** *(penalty)* measures if a provision of some form of penalty on a buyer who is a defaulter in making payment (both principal and interest) to the seller within the specified period, exists or not. A score of 1 is given in each year if a provision of penalty on a buyer (such as cancellation /suspension of his license) for failure to make due payment for the produce in accordance with market rules exists, 0 otherwise.

(iii) ***Provision of maintaining market stability***[19] measures if a provision allowing the state government to adopt special measures by passing an order to correct an immediate market problem or to give effect to the provisions of the Act, subject to providing reasons in the order, exists or not. For instance, Section 64 B-C of the Act 2007 in the Act of Karnataka mandates that no bid during the market auction shall be permitted to start below the price of notified agricultural produce in the market yard, of which minimum support price (MSP) has been declared by the state government. Section 17(2 xi), 1972 of Madhya Pradesh Act, with a view to maintaining stability, seeks to ensure that traders do not buy agricultural produce beyond their capacity and avoid risks to the sellers in disposing off their produce (to avoid distress sale or price crash). A score of 1 is given in each

[19] A variable clause on 'Provision of Regulating informal advances to agriculturalist' was also considered in the pro-poor regulatory index but was later dropped. I did not come across any case in the literature which shows that this clause is true in practice. I find the clause unique for the fact that state law acknowledges the problem of informal financing arrangements for the farmers during the period between the production and sale of their produce through marketing middleman (a licenced broker) and associated implications of such practice. According to the literature, many farmers in India sell their standing crops or borrow money in advance from local traders, commission agents against their crops and bind themselves to sell the crop through the commission agent/trader. This checks their freedom to sell the produce through open market (auctioned price). The APMC Act & Rules of Rajasthan is the sole example that mandates to correct this practice. Section 97 of APMC Rules provides such provision that reads "A licenced broker may give advance in cash or in kind to agriculturalists but such advances shall be made subject to following conditions: (1) if any agreement is entered into between the lender and the borrower, the lender shall supply a copy of the agreement to the borrower; (2) When the advances are given from time to time, on account book of advances given and repayments made shall be kept in the manner laid down in the bye-laws. The lender shall give a copy of such account book to the borrower and enter and attest with his signature every individual transaction of lending and recovery in the copy of the account book so given"

year if a provision of market stability in a prescribed manner exists, 0 otherwise.

(6) Channels of Market Expansion: This dimension conceptually characterises expansion of scope of agricultural market by recognizing the role of alternative marketing channels such as contract farming, direct marketing, private markets, e-markets etc in the State. It proxies for level of agri-business by legally empowering the private sector to establish alternative agricultural markets and encourages private-public partnership at the management level to increase efficiency. This sub-index captures mostly revamped clauses of the latest new Model Act entitled 'The State Agricultural Produce Marketing (Development and Regulation) Act, 2003 which was circulated to the States by the Union Ministry of Agriculture to make amendment in their respective state APMC Acts. This dimension is measured by the following eight variables.

(i) ***Single licence to trade in a state*** measures if a provision of single license facility to operate trading in any market place within the entire state exists or not. For example, Maharashtra is the only State that has a provision of granting single license to operate in entire state. A score of 1 is given in each year if a provision of single licence to do trade in entire state exists, 0 otherwise.

(ii) ***Licence for trade in more than one market*** measures if a provision allowing a trader to operate in more than one notified market area falling under different market committee with a single licence exists or not. A score of 1 is given in each year if a provision of single licence to trade in multiple markets exists, 0 otherwise.

(iii) ***Legal provision and rules to set-up consumers-farmers market*** codes if a provision of direct marketing by the farmers in the state exists or not. Conceptually, direct sale of farm produce encourages system of marketing without the role of middleman by the small and marginal producers. The Model Act 2003 provides for establishment of farmers' market. According to the provisions, farmers are not charged market fee with a view to providing opportunity to farmers to undertake sale of their farm produce directly to the consumers. Such markets can be established either by

APMCs or by any person licensed by APMC for this purpose. Several states have instances of farmers' market, such as, these include, Punjab (Apni Mandi), Haryana (Apni Mandi), Rajasthan (Kisan Mandi), Andhra Pradesh (Rythu Bazar), Tamil Nadu (Uzhavar Shandy), Maharashtra (Shetkari Bazar) and Orissa (Krushak Bazar).[20] A score of 1 is given in each year if a provision of consumers-farmers' market exists in a state, 0 otherwise.

(iv) ***Legal provision and rules to set-up private agricultural produce market*** measures if a provision of private markets or yards in the state exists or not. The Model Act suggests provision for private markets or yards to be managed by private provisions other than state APMCs. By the year 2009, out of 35 states and UTs, 17 states had the provision for private market yards, but rules have not yet been formulated by all of them. The rules are critical to implement this aspect of the new Act.[21] A score of 1 is given in each year if a provision and rules to set-up private markets exist in a state, 0 otherwise.

(v) ***Legal provision and corresponding rules to operationalise purchase centres or direct procurement from farmers*** measures if state recognises the role of private sector in terms of permitting agri-trading companies to undertake procurement/purchase of agricultural commodities directly from the farmers field and to establish effective linkage between the farm production and retail chains. The legislative clause aims to gain momentum to improve the efficiency of the marketing system, improving the market access to the farmers and better price realisation for agriculture produce. The Model Act provides for granting licenses to processors, exporters, graders, packers, etc for purchase of agricultural produce directly from farmers. A score of 1 is given in each year if both legal clause

[20] Studies find that these markets benefit both farmers and consumers. These markets need to be promoted. It also notes that total quantity of market surplus passing through this channel will continue to be small until traders and processors are allowed to procure from these markets (Acharya, 2006).

[21] Nevertheless, some states that have amended their respective APMC Acts in accordance with the new provision have not received encouraging response from private investors. For example, Andhra Pradesh has formulated rules, which stipulate a licence fee of Rs 50000 and minimum cost of Rs 10 crores for setting up of private markets. It appears that such conditions are excessively stringent to attract private players. Nonetheless, in the paper, only information on the legal legislative measures allowing private players to establish agriculture markets is considered for index coding.

and rules of direct procurement from farmers exists in a state, 0 otherwise.

(vi) ***Legal provision and corresponding rules to legalise contract farming*** measures if state formally recognises this form of alternative marketing in a state. Literature shows that contract farming has potential framework for the delivery of price incentives, technology and other agricultural inputs to farming community (Singh & Asokan, 2005) The Modal Act provides for permitting contract farming by registration of contracts with APMCs, allowing purchases of contracted produce directly from farmers outside market yards, and exemption of market fee on such purchases. By 2009, 17 states and UT have incorporated this provision, except the exemption of market fee. Only Punjab has recently exempted the market fee on purchases under the contract agreements. Andhra Pradesh's amended Act requires the buyer to render a bank guarantee for the entire value of the contracted produce. A score of 1 is given in each year if a provision of contract farming exists in a state, 0 otherwise.

(vii) ***Provision of Spot Exchange***[22] in agricultural produce measures if the state permits electronic spot exchange market option to trade in agriculture commodities. The provision enables the farmers to sell their produce electronically through competitive bidding to buyers spread across the country in anonymous manner through ICT (Information and communication technology) applications. It is a compulsory delivery based platform, which enable the farmers and traders to realize the best possible price. The idea is that such an option may help to reduce the cost of intermediation and to enhance farmers' price realization, whilst reducing the higher prices of agricultural produce for the consumer by enhancing

[22] The spot exchange is mainly regulated by three different regulators i.e. State Agriculture Marketing Board (SAMB), Forward Market Commission (FMC) and Warehouse Development Regulatory authority (WRDA). Since marketing of notified agricultural produce is regulated by Directorate of Marketing of respective State Government, National Spot Exchange Limited (NSEL) obtains licenses from State Governments under respective State APMC Acts, where it intends to launch Farmers Contracts for agricultural commodities. SAMB regulates the transaction involving farmers' sales of agricultural commodities on electronic platforms. WRDA covers the aspect of negotiability of warehouse receipt thus trading of warehouse receipt of commodities in all the notified commodities. FMC regulates all the trade where netting of intraday transaction in the commodities contract is allowed by the Exchange. (http://www.nationalspotexchange.com/regulatory_set_up.htm/ http://www.fmc.gov.in/index3.aspx?sslid=27&subsublinkid=13&langid=2 , accessed on 13 July 2011).

marketing efficiency and bringing transparency in agriculture marketing. A score of 1 is given in each year if a provision of electronic spot marketing exists in a state, 0 otherwise.

(viii) ***Provision of Public-Private Partnership Market function*** measures if a specific provision in the Act exists in a state. The existing state APMC Act provides for creation of market committee funds to meet expenses and cost of market development. The market development fund is created at the level of SAMB (State Agricultural Marketing Board) with contributions from APMCs (see Annex 1.A3). The development heads vary from market to market depending on the volume of transactions and number of market players visiting and using the market yards. There is no specific provision in the Act which prohibits spending of market committee fund or development on purposes other than market development. As a consequence, a considerable part of these funds built on market fee is transferred to the general account of the state governments. To check such practices, the Model Act provides for application of market committee fund or development fund for creation and promotion, on its own or through public-private partnership, infrastructure of post-harvest handling, cold storage, pre-cooling facilities, pack houses, etc for modernizing the marketing system. Out of the total states which have recently amended their Act, only Maharashtra, Karnataka and Andhra Pradesh have included this provision. A score of 1 is given in each year if a provision of public-private partnership for market development exists in a state, 0 otherwise.

Construction of Sub-indices

The objective of the sub-indices is to provide summary measure for each dimension of the APMC Act & Rules for each of the selected state. In every sub-index, I combine variables that are taken to belong to one dimension, using the Principal Component Analysis (PCA) as the procedure, which helps to reduce redundant or overlapped information and assign weights to variables. For this, I follow three-step procedure. The first step is the standardization and normalisation of the data by converting it to a unitless scale for ease of state comparison. The second step is to check the statistical association between the variables to verify redundancy in the

variables, if any[23]. The third step consists in aggregating the variables with PCA weighting scheme.

1.1.5 Normalisation of the Data for Comparison between Variables across Time and States

To be able to make clear comparison between large and small states on chosen variables, all raw data are normalised either by size of the state in terms of its area, population or both in some cases. I also control the comparison between state variables by using the total annual food production of the state. The application of normalization approach on the list of variables is given in Annex 1.A4.

Next, I standarised the variables scaled on different measurement units in the dataset. All variables that are not dichotomous variables (0 and 1) are adjusted to a unitless measurement scale by the application of standard Min-Max normalisation method. It scales the data within a range between 0 and 1. The approach offers certain desirable characteristics, required in index construction of APMC Act & Rules. First, in particular, the method widens the range of indicators lying within a small interval, increasing the variation effect on the composite indicator more than any other transformation methodology. This data property is very useful given that change or variation in the APMC Act & Rules could be very gradual and marginal over the time. The method allows us to capture even an iota of variation in the law quality over time across states. Second, the method adjusts data in such way that subsequent comparison only reveals difference in regulatory levels in the states that a legal variable intends to measure, which is another relevant point for the index. More specifically, aggregate average value of standarised variables/indicators is the same, which conveniently allows one to spot if a specific indicator/variable score in the state is above or below average across all states. Third, standarised variables have the same standard deviation such as z-score and this allows a raw score 0 to scale to a normalized value of 0 (Roodman, 2006; Giovannini, 2008; Calì, et al., 2011). The formula to calculate an identical

[23] In this case, redundancy means that some variables are correlated with one another because they are measuring the same construct.

range between 0 and 1 is by subtracting the minimum value in series and dividing it by the range of the indicator values. I employ the following min-max formula to ease comparison between variables across states:

Each indicator x_{qs}^{t} for a state *s* and time *t* is transformed in:

$$I_{qs}^{t} = \frac{x_{qs}^{t} - min_{s}(x_{q}^{t})}{max_{s}(x_{q}^{t}) - min_{s}(x_{q}^{t})}$$

Where, $\min_{s}(x_{q}^{t})$ and $\max_{s}(x_{q}^{t})$ are the minimum and the maximum value of x_{qs}^{t} across all states *s* at time *t*. In this way, normalised indicators I_{qs}^{t} arrives at values lying between 0 (laggard, $x_{qs}^{t} = \min_{s}(x_{q}^{t})$) and 1 (leader, $x_{qs}^{t} = \max_{s}(x_{q}^{t})$).

x_{qs}^{t}: Raw value of individual indicator q (marketing variable) for state s at time t, with q = 1…Q and s=1…M (Giovannini, 2008). The approach ensures comparability of the variables with their variation intact. The summary statistics of all the normalized variables is given in Annex 1.A5. It presents a descriptive summary of the normalized variables, looking at means, standard deviation (basically coefficient of variation) and skewness. I present only the overall variation in the variables. Given that the data is in panel format, the statistics show that for most variables in the data summary, within variation is smaller than between variation.

1.1.6 Measuring the Association between variables and use of Principal Component

Having obtained a uniform data structure on common scale for all the 38 years in the 14 Indian states, a total of 546 observations, I check the association between variables. Pair-wise correlations between variables constituting six sub-indices is verified, as shown in the Annex 1.A6 to Annex 1.A11**,** to ensure that each variable measures a distinct feature of the dimensions with no case of duplication. This function is useful for two aspects: (a) it can help to identify indicators that overlap significantly; and (b) correlation analysis is the primary step before the application of Principal Component technique. Principal Component Analysis (PCA) works

best when indicators or variables are correlated. PCA addresses not just redundancy issue in significantly correlated variables and but also determines weighting scheme objectively for variables, depending on underlying correlation between the observed variables (Mckenzie 2005; Vyas & Kumaranayake, 2006).

1.1.7 Principal Component Analysis (PCA)

1.1.7.1 PCA Basics, Objectives and its Appropriateness

In this section, I discuss the relevance of the PCA application, considerations and what does it achieve here? As mentioned, the key objectives of applying PCA in this work are (1) data reduction and (2) statistical weight extraction. PCA is useful because intuitively what PCA does is that it statistically extracts reduced number of orthogonal (uncorrelated) linear combinations (dimensions) of the variables from a set of input variables (correlated) that capture the common information most thoroughly. It addresses the problem of data redundancy by taking into account univariate contribution of an individual variable to the PC, irrespective of the other variables (Njong & Ningaye 2008).

PCA is defined as a multivariate statistical procedure that explains the variance-covariance structure of a set of variables through a few linear weighted combinations of the variables (Jolliffe, 1990). So in procedural terms, from an initial total set of (x) correlated variables, PCA creates a smaller number of uncorrelated principal components (k), where each component is a linear combination of optimally-weighted initial set of observed (x) variables. It means that there is as much information in the k components as there is in the original n variables (Krishnakumar & Nagar, 2008).[24] In order to understand the definition, the process of how principal components are mathematically computed and weights are processed is outlined below.

For the specification and mathematical process underlying PCA in the paper, I present a version of the PCA based on Njong & Ningaye (2008) who

[24] 'Optimally weighted' means that the observed variables are weighted in such a way that the resulting components account for a maximal amount of variance in the data set (Jolliffe, 1990; 2002)

simplified the process from Kolenikov & Angeles's (2009) derivations of the main principles of PCA. If x is a random variable of dimension q with finite q x q variance-covariance matrix V[x]=∑, PCA solves the problem of finding directions of the greatest variance of the linear combinations of weighted observed x's. In other words, the principal components (k_j) of the variables $x_1,....,x_q$ are linear combinations $a_1'x,....,a_q'x$. Below is the general form of the formula to compute scores on the components extracted in a PCA:

$$k_j = a_j'x \quad j=1,....,z \qquad (1)$$

Such that: $k_1 = a_{11}(x_1)+a_{12}(x_2)+...a_{1q}(x_q)$ (2)

(2) represents the first component in a PCA analysis, where

k_1 = the state's score on principal component 1 (the first component extracted)

a_{1q} = the regression coefficient (or weight) for observed variable x, as used in creating principal components 1

x_q = the state's score on observed variable x

The main objective in equation 1 is that PCA seeks to configure the observed data in a multidimensional space, measuring different dimensions/components in the data (Manly, 1994). The estimated components are ordered so that the first PC will have the maximum variance and extract the largest amount of information from the original data, subject to the constraint imposed that the sum of the squared estimated weights ($a^2_{11} + a^2_{12} +...+ a^2_{1q}$) is equal to one. The first PC also gives a line such that the projections of the data onto the line will have the smallest sum of squared deviations of the residuals among all possible lines (Moser & Felton 2007b). The second component will be orthogonal (uncorrelated) to the first component, and extract additional but less variation in that sub-space than the first component; and so on.

The solution to equation (1) is given by the eigenvectors of the correlation matrix ∑, or if the original data was standarised, the covariance matrix of ∑.

This involves finding variance (λ) for each principal component by the eigenvalue of the corresponding eigenvector and weight (*a)* such that:

$\Sigma a = \lambda$ (3)

By solving the equation of eigenvectors (2) for the covariance matrix, the set of principal components weights a (also called factor loadings)[25], the linear combinations a'x (referred to as factor scores) and eigenvalues $\lambda_1 \geq \lambda_2 \geq \ldots\ldots \geq \lambda_q$ are computed. Technically the procedure works by solving the equation $V[a'x] = \lambda_k$ so that the eigenvalues are the variances of the linear combinations.[26] As the sum of the eigenvalues equals the number of the variables in the initial data set, the proportion of the total variation in the original data set accounted by each PC is given by λ_q / x. In other words, Total variance = $\lambda_1 + \lambda_2 + \ldots\ldots + \lambda_q$ and resultantly the proportion of total variance explained by the k-th PC= $\frac{\lambda_k}{\lambda_1 + \lambda_2 + \ldots\ldots + \lambda_q}$

Kaiser-Guttman criterion (1954) is the most common stopping rule in PCA. One can extract[27] number of principal components as long as the associated eigenvalue is greater than one. According to the Kaiser-Guttman method, eigenvalues greater than the average eigenvalue (i.e., λ >1) in PCA are retained because these axes summarise more information than any single original variable. Therefore, only components with λ >1 are interpreted in the literature (Jackson, 1993:2205). This work was found to meet the Kaiser-Guttman criterion of component selection. As standard practice in PCA analysis, the first PC explains most of the variance in the original data set and is often considered to represent the latent variable. In view of such intuition underlying the first principal, all six indices (sub-indices of the APMC Act & Rules) are constructed and interpreted based on first component of the PCA analysis, while ensuring that eigenvalues of the

[25] The component loadings in PCA are the correlation coefficients between the variables (rows) and factors (columns).
[26] The eigenvalue for a given component measures the variance in all the variables which is accounted for by that component.
[27] Some statisticians recommend using all eigenvectors with eigenvalues greater than one; others suggest the 'scree test'. However, these are more complex to interpret than using the first eigenvectors (Jolliffe, 2002)

component is greater than one.[28] The computed index is thus a weighted average of the variable scores with weights equal to the loadings of the first PC (Houweling et al., 2003, Vyas & Kumaranayake, 2006).

1.1.8 Methodology Choice: Classical PCA and Tetrachoric PCA

The application of the factorial techniques such as PCA technique depends on type of data available. In this work, I have two kinds of data-set. The variables used in the index − (i) Scope of Regulated market, (ii) Infrastructure for market function which are continuous numeric. On the other hand, variables used in the remaining indices: (iii) Constitution of Market and market structure, (iv) Regulating Sales & Trade, (v) Pro-Poor Regulations, and (vi) Channels of market expansion −are binary data, (i.e. a variable that takes one of two values, such as existence of a legal provision or not).
For the construction of index (i) & (ii) which use continuous numeric variables and the relationships between variables are assumed to be linear, I apply the classical standard PCA.

According to the recent literature, classical PCA technique is not appropriate for data that is binary in nature (Dolan, 1994; DiStefano, 2002; Branisa et al., 2010). It has statistical implications. The problem with use of binary variables in the standard PCA, as explained in the literature, is that the discrete character of the data variables (0/1) does not have unit of measurement and therefore means, variances and co-variances have no real meaning. As PCA relies on estimating the co-variance (correlation) matrix, the standard PCA model is inappropriate (Njong & Ningaye, 2008).

Another undesirable implication from using binary data directly in the standard PCA is the fact that variables with low standard deviation would carry low weight from the PCA. The PCA analysis is based on z-scores which has unit variance. The variables are standardized by subtracting the sample mean and dividing them by the standard deviation. Binary features tend to

[28] Some literature has considered the use of additional principal components for characterisation or interpretation of results (e.g. Mckenzie, 2005, Tarantola, 2002). The reason I decide to retain results from the first PCA is that the computed weights for each variable in first PC was also positive implying that variables are measuring what it intends to measure (level of regulations). The second component of the PCA generated negative weight on certain variables and most weights were concentrated on sub-group of set of variables.

make data points concentrated in a single category of the data classification, making the distribution of the data skewed. With skewed distributions of the binary variables, regular PCA assign large weight to variables that are most skewed, because skewness is associated with smaller standard deviation. To illustrate this, consider a legal provision which exists in 90% of the state Acts or alternatively no state's Act provides it, here data would be concentrated at one of the two variables (1 or 0). Then this variable would exhibit little or no variation between the Acts across the states and would have a very small standard deviation.[29] Accordingly for standardization, when the variable is divided by the small standard deviation, the calculated value of the variable gets magnified. It receives a large weight in the PCA, but this is misleading weight.
Following the literature, particularly, Kolenikov & Angeles (2009), I apply an alternative approach of tetrachoric PCA to treat binary variables in the construction of index noted above from (iii) to (vi). The tetrachoric PCA technique is especially appropriate for binary variables. It improves upon the standard PCA in terms of recovering the improved measure of correlations between the underlying continuous variables using their discrete binary manifestations. For this purpose, it assumes that a latent bivariate normal distribution (X1, X2) for each pair of variables (v1, v2), with a threshold model for the manifest variables (vi = 1 if and only if Xi > 0). The means and variances of the latent variables are not identified but the correlation of X1 and X2 (underlying continuous latent variable) can be estimated from the joint distribution of v1 and v2 and is called the tetrachoric correlation coefficient. Tetrachoric PCA uses estimates of the tetrachoric correlation coefficients of the variables to perform a principal component analysis of binary variables (Kolenikov & Angeles, 2009; STATA tetrachoric help file).

Generally, a number of studies have continued to use the standard PCA irrespective of the nature of the data (Filmer & Pritchett 2001; Schellenberg et al., 2003; Vyas and Kumaranayake, 2006). Jolliffe (2002:339) argues

[29] McKenzie (2005) refers to this as problem of 'clumping' and 'truncation' for PCA-based index may arise due to little variation in the data series. Clumping or clustering is described as states being grouped together in a small number of distinct clusters. Truncation implies a more even distribution of level of the APMC Act, but spread over a narrow range, making it difficult to differentiate between the level of regulation in the states (e.g. not being able to score between high or low level of legal environment in the states).

that there is no reason for the variables in the PCA analysis to be of particular type (continuous, ordinal or binary (0/1)) if PCA is used as a descriptive technique. The continuous character of variables matters in variance, covariance and correlations analysis and possibly the discrete variables are less easily interpretable than linear function of continuous variables. However, the working behind PCA is to summarise most of the variation that is present in the original set of variables using a smaller number of derived variables. This can be achieved regardless of the nature of the original variables. In scientific terms, modelling binary data (0/1 indicators) having continuous feature underneath provides close to Pearson's correlations coefficients. I, therefore, apply standard PCA also (in addition to tetrachoric PCA) to combine binary and continuous variables – to construct the six sub-indices of the APMC index.

As discussed earlier, an option of simple arithmetic averages to aggregate variables into six sub-indices was also opted for robustness check. The three different ways (Standard PCA, Tetrachoric PCA and arithmetic average aggregation) allow checking the robustness of results. It provides a check against consistency about the relative influence of different dimensions in the APMC measure.

A number of studies apply PCA to construct socio-economic status index (SES) e.g. (Filmer & Pritchett 2001; Tarantola et al., 2002 (over time); McKensie 2005; Vyas and Kumaranayake, 2006, Branisa et al., 2010). Index construction in most of the works was based on household dataset at one time point, while in this paper I follow Tarantola et al., (2002) who apply PCA to construct a European Commission Internal market index on macro data for 15 countries and 10 years time range. In line with this work, I keep weights for the variables measuring the APMC Act for 14 states unchanged for the period 1970-2008. The approach of unchanged weight over the time is useful to analyse evolution of the different dimensions (sub-indices) of the APMC Act & Rules over time in the State and to undertake comparison of level of market regulations for both within state across time and between states over time.

The study by Moser & Felton (2007a) uses categorical data with multiple time periods (1978/1992/2004) to construct asset index using polychoric PCA. The work applies PCA analysis independently for each year, allowing weight on variables to alter every year. It aggregates the data on a variable for each year of the total time period. Intuitively in an asset index, such approach to PCA application makes sense. Assets like a TV model can become outdated and lose value over time, so, changing weights for consumer goods may make sense. In the case of interpreting evolution of market regulations (APMC Act) over time, such approach, where weight of the variables alters every year, is not appealing. Unfixed weights or moving weights on indicators permits comparative analysis of level of regulation between the states only in a specific year. It restricts the ability to undertake a comparative analysis of level of distinct regulation between states across the years (over time). For instance, a variable, representing the law, is weighted differently in different years will not be comparable because estimated weights assigned to variables in the previous year are different from weight assigned to variables in the following year.

In general, unfixed weight in application of PCA analysis might reveal divergence in relationships between variables over time that were not initially suspected. However, such approach would make it impossible to track true change in the key variables of regulations over time. For the objective of this paper, such feature is not desirable. The objective of this work is to capture and study historically evolving State-run APMC Act & Rules in the respective states from many years. By determining same weights over time, as illustrated in Tarantola et al.,(2002), one can capture aspects of critical junctures, or path dependency in the actual level of market regulations over the time across the states. The weight that each variable gets as an outcome of this process is shown in table 1.2.

1.1.9 Estimation of the PCA Model and Constructing sub-indices with PCA

I have used three statistical approaches (as discussed in section 1.6.4 above) to aggregate variables in index form. I focus mainly on discussing features from the chosen approaches, namely − standard PCA and tetrachoric PCA − in this paper, presenting the results from other approach

in periphery. Table 1.2 presents the list of variables used to estimate each of the six single dimensional sub-indices, with the choice of standard PCA and tetrachoric PCA. In each of the estimations of the correlation matrix, the first PC has associated eigenvalues larger than one; and contributes individually to the explanation of overall variance from the range of 30% up to 50% in the sub-indices. The leading eigenvector and total variance explained from the first PC eigenvalue decomposition of the correlation matrix in each six sub-indices is also presented in Table 1.2. The interpretation of the component loadings/weights simply implies the relative contribution of each variable in the index.

These estimated weights are used to compute a state-specific composite indicator (single dimension index) based on each state's APMC variable value as described in equation 2 in section 1.5.3.

Table 1.2: Factor scores or weights, Eigenvalues and Cumulative variance from First Principle component entering the computation of the Sub-indices: Tetrachoric and Standard Classic PCA

.no	Sub Indices	Weight Std. pca	Eigen value	% total variance	Weight Tetra pca	Eigen value	% total variance
1.	**Scope of the Regulated Market**		**1.82181**	**0.9109**			
	Area Covered by Each Market SqKms	0.7071					
	Population served by Each Market '000 population	0.7071					
2.	**Constitution of Market and Market Structure**		**2.31412**	**0.3306**		**2.99705**	**0.4281**
	Constitute market committee by election	0.3671			0.3063		
	Agriculturalist as market committee Chairman	0.3289			0.3092		
	Elected market committee Chairman	0.5619			0.5016		
	Clause to dismiss market committee chairman	0.4843			0.4977		
	Clause to dismiss the market committee	0.2302			0.2753		
	Legal Marketing Board Exist	0.2532			0.2630		
	State Marketing Board website	0.2994			0.4079		
3.	**Channels of Market Expansion**		**5.17657**	**0.3982**		**8.6725**	**0.7227**
	Single license for trade in State	0.1807			0.3275		
	License for trade in more than one market area	0.3178			0.2878		
	Provision for setting private market yard	0.3223			0.2944		
	Rules to procure license for setting private market yard	0.2936			0.3114		
	Provision for private consumer-farmers market	0.2605			0.2703		
	Rules for establishing Private consumer-farmers market	0.2335			0.2366		
	Provision for direct procurement from farmers	0.3465			0.3083		
	Rules for direct procurement from farmers	0.3457			0.3155		
	Provision of contract farming	0.3070			0.2980		
	Rules for contract farming	0.2836			0.2818		
	Provision Public-Private Partnership market function	0.1874			0.2231		
	State National Spot Exchange	0.2414			0.2910		
4.	**Regulating Sales and Trading in Market**		**1.89311**	**0.3155**		**3.01778**	**0.6036**
	Single Point levy in the market area				0.2103		
	Provision on open- auction	0.4991			0.5401		
	Payment to grower on same day of trading/sales provision	0.5169			0.4833		
	Provision of input shop in the Regulated market	0.3289			0.5089		
	Sale-slip provision	0.5483			0.4142		
5.	**Pro-Poor Regulation**		**2.02511**	**0.5063**		**2.29397**	**0.7647**
	Interest on delayed payment	0.6668			0.6217		
	Minimum period for payment exist	0.6807			0.6492		
	Provision market stability	0.2983			0.4383		
6.	**Infrastructure for Market Functions**		**3.12016**	**0.4457**			
	No. of Central warehouse available per 1000 sq.km.	0.4632					
	Central Warehouse capacity available in tonnes for per 1000 MT production	0.1029					
	FCI storage capacity '000tonnes	0.4260					
	No. of State warehouse available per 1000 sq.km.	0.4599					
	State Warehouse capacity available in tonnes for per 1000 MT production	0.4093					
	No. of Grading Units available for per 1000MT production	0.4451					
	No. of Grading Units available per 1000 sq.km.	0.1279					

Source: Author's calculations

1.1.10 Rescaling value of the Sub-indices

As next step, the value of each PCA based sub-index is rescaled so that each index ranges from 0 to 1 to ease interpretation. The technical output from a PCA is a table of component/factor scores or weights for each variable in form of z-score. Generally a variable with a positive factor score is associated with availability of higher level of regulations and conversely a variable with a negative factor score is associated with availability of low level of regulations in the agricultural markets.

I obtain the value of each sub-index by rescaling the first principal component by using min-max approach so that it ranges from 0 to 1, as discussed in section 1.6.1 on normalisation. A state's sub-index that provides all selected regulatory and administrative provisions in the agricultural market is assigned the value 1 and a state's sub-index that does not provide any regulatory and administrative provisions of agricultural market gets the value 0 Hence, the sub-index values of all states lie between the range of 0 and 1.

Each sub-index is intended as a measure of a distinct dimension of the APMC Act & Rules regulating the agricultural markets. To check whether the sub-indices are empirically non-redundant, (i.e. that they each provide additional information), I conduct an empirical analysis of the statistical association between sub-indices and the composite APMC measure. In table 1.3, column 1, I present the correlation statistics. All six sub-indices are positively correlated with the composite APMC measure, which indicates that each of the six sub-measures is related to a latent aspect of the APMC Act & Rules of the agricultural markets. The correlations coefficients of each sub-index are low which means that each sub-index measures a distinct aspect of APMC framework.

In Table 1.3, the statistical associations amongst the six sub-index measures constructed by using PCA also reveal an interesting pattern of relationship, which appears to be consistent with underlying motivation of the APMC Act & Rules. The expectations from the APMC Act & Rules vary from group to group in the agricultural markets and generally the objectives

of the different groups are in conflict.[30] The efficiency and success of the marketing system designed from the Act depends on how best the conflicting objectives are reconciled. Thus, the government through the means of APMC Act intervenes in the agricultural produce market to safeguard interest of all groups.

Table 1.3: Correlation Table of APMC Index and sub-indices

	Composite APMC Index	Constitution of Market and Market Structure	Channels of Market Expansion	Regulating Sales and Trading in Market	Pro-Poor Regulations	Infrastructure for Market Functions	Scope of Regulated Markets
Composite APMC Index	1.00						
Constitution of Market and Market Structure	0.61*	1.00					
Channels of Market Expansion	0.45*	0.31*	1.00				
Regulating Sales and Trading in Market	0.73*	0.51*	0.33*	1.00			
Pro-Poor Regulations	0.47*	0.38*	0.09	0.19*	1.00		
Infrastructure for Market Functions	0.48*	-0.07	0.16*	0.30*	-0.20*	1.00	
Scope of Regulated Markets	0.45*	-0.04	0.06	0.14*	-0.02	0.31*	1.00

*Source: Author's calculations. Please note *p<0.05*

The diverse strategic functions of marketing system may explain negative correlations amongst some of the sub-indices. For instance, sub-index on pro-poor regulation and sub-index marketing infrastructure for market functions are significantly negatively correlated. Such result can be understood by observing complexity of objectives of the market system. Generally, prices in the agricultural produce market are determined through free market process by negotiations at rural purchasing, wholesale and

[30] For example, producer-farmers want marketing system to purchase their produce without loss of time and provide maximum share in the consumer's rupee. They want the maximum possible price for their surplus produce from the system. They want the system to supply them the inputs at the lowest possible price. Consumers of agricultural products are interested in marketing system that can provide food and other items in the quantity and of quality required to them at the lowest price. The objective of marketing for consumer is contrary to the objective of marketing for farmer consumers.
Traders or agents are interested in a marketing system which provides them steady and increasing income from the purchase and sale of agricultural commodities. This objective may be achieved by purchasing the agricultural products from the farmers at low price and selling them to the consumers at high price.

retail stages and represent a balance between consumers' ability to pay and the farmers' need for incentive to produce.

Through the minimum support price (MSP) policy, government tries to regulate market stability and avoid distress sales by the farmers especially during the harvest season, when prices of some commodities tend to fall drastically. It fixes procurement price serving as MSP for 'open ended procurement' of the foodgrains. Sometime, these prices for farmers are fixed very high even when the market conditions are adverse (i.e. the system fails to take into account demand side factors), making the market environment unprofitable for trading. The artificial price leaves no incentives for private trade to operate in the agricultural market. Consequently, the private sector is driven out of the agricultural trade and there is increase in market uncertainty (Acharya & Agarwal, 2009). On the other hand, there is shortage of infrastructure facilities in the markets across the states. Government is trying to persuade private sector to invest more in marketing infrastructure expansion. The private sector investment is needed to improve infrastructure facilities such as storage and warehousing facilities. The private companies however would make investment in marketing infrastructure only if they foresee prospects of profit in the market (Chakraborty, 2009).

Thus, the six sub-indices measuring the APMC Act & Rules can function in conflicting direction if regulations are not moderated in a reasonable fashion permitting margins for all groups to operate in the market.

Composite APMC Index Construction

With the six sub-indices described in the above section as input, I compute a multidimensional index termed as Agricultural Produce Markets Commission Index (APMC Index) which reflects the level of regulations in agricultural produce markets in the states of India.

The proposed index is easy to read and understand. As in the case of the variables and of the sub-indices, the composite APMC measure is scaled on 0 to 1. The index value 1 corresponds to availability of optimum level of regulatory provisions and the index value 0 or closer to 0 corresponds to

availability of sub-optimum level of regulatory provisions in the agricultural markets.

The APMC index is an unweighted average of a non-linear function of the sub-indices. I use equal weights for the sub-indices, as I see no theoretical reason for valuing one of the dimensions more or less than the others.[31] The non-linear function arises because I assume that APMC Act has a governing impact on sustaining higher levels of agricultural productivity. In the absence of proper marketing machinery to ensure a fair return to the producer, creditable success achieved by the post-independence production programme suffer more than proportionately and thereby potentially jeopardize country's food security and well-being of majority of population in the states. Thus, sub-optimal legal and administrative framework is penalized in every dimension of the APMC Act. The non-linearity also means that the APMC measure does not allow for total compensation among sub-indices, but permits partial compensation. Partial compensation implies that low performance in one dimension (sub-index) can only be partially compensated with better performance on another dimension. To put differently, complete compensability implies that a strong legal and administrative framework on one dimension can justify any type of weak legal and administrative framework on the other dimensions, which is exactly what the composite APMC index tries to avoid.

For the specific six sub-indices, the value of the APMC index is then calculated as follows:

APMC Index = 1/6 (sub-index Regulating Sales and Trading in the Market)^2 + 1/6 (sub-index Constitution of Market and Market Structure)^2 + 1/6 (sub-index Infrastructure for Market Functions)^2 + 1/6 (sub-index Channels of Market Expansion)^2 + 1/6 (sub-index Pro-Poor Regulations)^2 + 1/6 (sub-index Scope of Regulated Markets)^2 (4)

[31] Empirically, even in the case of equal weights the ranking produced by a composite index is influenced by the different variances of its components. The component that has the highest variance has the largest influence on the composite index (Branisa et al., 2010). In the case of APMC index, the variances of the six components are reasonable close to each other, Scope of the Regulated Market having the largest (91%) and Regulating Sales and Trading in Market having the lowest variance (32%).

Where in (4) the formula of non-linear aggregation is used to allow for partial compensation in the composite index, i.e. compensating for a lower value on one or more sub-index (Branisa et al., 2010). In any sub-index value 0 is interpreted as the absence of optimum level of legal and administrative framework and the value 1 is interpreted as the existence of optimum level of legal and administrative framework. Smaller values of sub-indices should lead to penalization in the APMC Index which should increase as the distance to 1 in sub-index value gets higher. In the non-linear aggregation, each sub-index is the square of the distance to 1. It implies that sub-index with low values get much lower score on the composite than the sub-index with values close to 1.[32]

Table 1.4 presents the statistical association between the three composite score of the APMC index, calculated using the three aggregation procedures. The Pearson's correlation coefficient between the composite APMC index computed by (i) standard classic PCA, (ii) Tetrachoric PCA and (iii) Arithmetic averages, shows a high and statistically significant correlation.

Table 1.4: Correlation Table of APMC Index (computed by three methods)

Composite Index	Tetrachoric PCA APMC Index	Classic PCA APMC Index	Arithmetic Average APMC Index
Tetrachoric PCA APMC Index	1.00		
Classic PCA APMC Index	0.99*	1.00	
Arithmetic Average APMC Index	0.98*	0.97*	1.00

*Source: Author's calculations. Please note *p<0.05*

The APMC Index 1970-2008: Results

1.1.11 APMC Index

The multi-dimensional APMC index is computed in three ways and a panel dataset for 14 states of India is constructed for the period 1970-2008. In the first approach, I compute six sub-indices into APMC index (termed as PCAAPMC Index) by applying standard classical PCA to aggregate both binary and continuous variables. In the second approach, I computed six sub-indices into APMC index (termed as TetraAPMC Index) by applying

[32] The square function also has the advantage of easy interpretation. It satisfies the transfer principle which means here that an improvement in legal framework in one dimension and deterioration in legal framework in another dimension of the same magnitude will decrease value of the APMC measure (Branisa et al., 2010; Munda & Nardo, 2005).

standard classical PCA to only continuous variables and tetrachoric PCA is used for the binary variables. In the third approach, I compute six sub-indices into APMC index (termed as AvgAPMC Index) by doing simple arithmetic averages. I used non-linear aggregation to generate the composite index in each of the three approaches.

Table 1.5 presents the overall summary statistics of the six sub-indices: (1) Scope of Regulated Markets; (2) Constitution of Market and Market Structure; (3) Regulating Sales and Trading in Market; (4) Infrastructure for Market Functions; (5) Pro-Poor Regulations; and (6) Channels of Market Expansion and (7) the composite APMC index, calculated using different statistical approaches.

The overall mean score of the APMC begins with very low score of 0.006 that improves significantly over the time. Irrespective of the way in which I calculate the APMC index, the increase in value of the APMC index over the period 1970-2008 periods (given by the difference between 'max' and 'min' values) is significant and greater than 0.5. Nevertheless, measure evolves very gradually over 38 years of time period and still it is substantially lower than the optimum level.

The composite APMC measure, computed using three types of statistical approaches, show variability between them, though the difference between them is minor. The coefficient of variation shows that composite APMC Index, constructed by using the tetrachoric PCA approach, has the highest mean variability as compared to the relative dispersion in composite APMC Index constructed by using that standard classic PCA method. It is possible that employing tetrachoric PCA technique on binary variables preserved the variation in the data more precisely, while improving comparability of the variables. Thus, the rest of the results and trends in the APMC measure are discussed based on APMC measure computed by using tetrachoric PCA in this thesis.

Table 1.5: Summary Statistics of the Sub-indices and APMC Index by type of technique, 1970-2008

Index Variable	Type of Technique	Obs	Mean	Std.Dev	Coefficient of variance	Min	Max
Constitution of Market and Market Structure	Tetrachoric PCA	546	.4693987	.2680749	0.571103	0	1
Constitution of Market and Market Structure	Classic PCA	546	.4716543	.2680108	0.568236	0	1
Constitution of Market and Market Structure	Arithmetic Average	546	.4905809	.2514237	0.512502	0	1
Channels of Market Expansion	Tetrachoric PCA	546	.0803826	.1584917	1.971717	0	1
Channels of Market Expansion	Classic PCA	546	.0538777	.1253923	2.327351	0	.9999999
Channels of Market Expansion	Arithmetic Average	546	.0836386	.1611468	1.926704	0	1
Regulating Sales and Trading in Market	Tetrachoric PCA	546	.5516117	.2505543	0.454222	0	1
Regulating Sales and Trading in Market	Classic PCA	546	.6019063	.257508	0.427821	0	1
Regulating Sales and Trading in Market	Arithmetic Average	546	.5212454	.2441745	0.468444	0	1
Pro-Poor Regulations	Tetrachoric PCA	546	.1546828	.2896834	1.872758	0	1
Pro-Poor Regulations	Classic PCA	546	.1442912	.2980881	2.065879	0	1
Pro-Poor Regulations	Arithmetic Average	546	.1623932	.2980881	1.835595	0	1
Scope of Regulated Markets	Classic PCA	546	.773865	.2654756	0.343052	0	1
Scope of Regulated Markets	Arithmetic Average	546	.7735989	.265559	0.343277	0	1
Infrastructure for Market Functions	Classic PCA	546	.2906956	.2293733	0.78905	0	1
Infrastructure for Market Functions	Arithmetic Average	546	.290382	.186117	0.640938	.0157143	.8071429
Composite APMC Index	Tetrachoric PCA	546	.2674108	.1222625	0.457209	.006668	.6097309
Composite APMC Index	Classic PCA	546	.2761637	.1213891	0.439555	.006668	.6098919
Composite APMC Index	Arithmetic Average	546	.2607179	.1133859	0.434899	.0056602	.6460373

Source: Author's calculations.

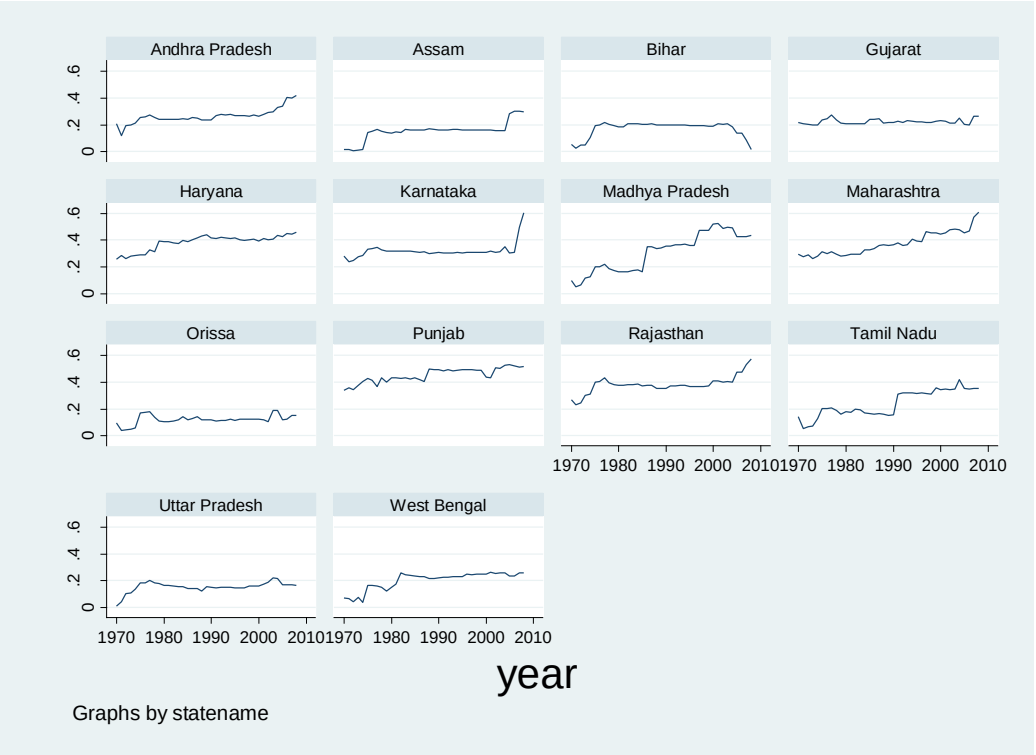
Tetrachoric PCA is applicable to sub-indices with binary variables only. Sub-index: Scope of Regulated Markets; and Sub-index: Infrastructure for Market Functions include only continuous variables

Figure 1.1 captures the movements of state-wise APMC measure in the period 1970-2008. Table 1.6 provides state-wise means and standard deviations of the composite and sub-indices, averaged for 1970-2008 period. The statistics demonstrates that there is significant variation across the Indian states in terms of APMC index and sub-indices.

Amongst the 14 states considered in analysis, Maharashtra, Haryana, Punjab, Karnataka, Andhra Pradesh, Madhya Pradesh and Rajasthan obtain the highest levels of APMC measure, implying that pertinent regulatory provisions exist for agricultural produce markets to function well in these states. Orissa is the state that occupies the last position, followed by Assam, Bihar and Uttar Pradesh, which means that poor regulatory marketing system is a major problem there.[33] The mean value of the remaining states Gujarat, Tamil Nadu and West Bengal score at intermediate level.

[33] Bihar represents a case of interest as it repealed the APMC Act & Rules in 2006 with an objective to reap the benefits of market liberalization. On the basis of Bihar's indices, the case of Bihar does not seem encouraging. Shaffer (1979) explains the context of repeal of regulation. The State can go wrong in its economic analysis of regulation if state Arithmetic Average implicitly measure regulations against the theoretical ideal of the unregulated, perfectly competitive market, and conclude that any regulation inconsistent with the perfect competition model will necessarily reduce welfare. In fact it is not possible to determine whether or not welfare will be improved by repealing such regulations without first analyzing the welfare implications of the existing laws. The conditions of perfect competition are not met in real world (Shaffer, 1979: 722).

Figure 1.1: APMC Composite Index by State



Source: Author's calculations.

In terms of levels and change in the APMC measure (see Figure 1.1), the states of Maharashtra, Punjab, Haryana, Karnataka and Rajasthan start on a good footing. They start from a level close to 0.20 and improve the levels to reach higher than 0.40 values of the APMC measure. Madhya Pradesh, particularly, as well as Tamil Nadu and Andhra Pradesh provide example of states that set off from a very low level score of the APMC measure and over time demonstrate a leap positive change in their APMC measure. For instance, Madhya Pradesh improves the measure from as low as 0.050 to as high as 0.52 in the time period. Gujarat starts at medium level (0.199) and remains at medium level (0.274). The states of West Bengal, Uttar Pradesh, Assam, Bihar, and Orissa also demonstrate some positive change from very low levels in the APMC measure, but APMC score in these states remains low over the period.

The poor trend in APMC measure for the eastern states, especially Orissa, Assam and West Bengal is consistent with findings of a recent case study of agricultural marketing system in some of these states, conducted by the National Institute of Agricultural Marketing (NIAM), Government of India.

The study by NIAM finds that regulations of the agricultural markets are loosely enforced in the eastern states. Especially for the case of Orissa, the study presents a unique case of ownership and management of markets. The functioning of the Agricultural marketing system in the state of Orissa is not fully under the control of the state administration. The markets are owned by different agencies such as Municipalities, Panchayats, private persons, in addition to the APMC regulated markets in the state. Therefore, the ownership and functioning of the markets is not uniform. According to the study, as the marketing system in Orissa is not fully under the control of the state, amended APMC Act according to the model law shows no impact on the ground. The study recommends that the entire state marketing system must fall under the administration of APMC Act to establish an efficient marketing body, and boost production and productivity of Agricultural produce.[34] (Sharma, 2011).

[34] Because APMC Act in Orissa is weak with no enforcement of code of business, accordingly the state can always claims to be a state with reformed APMC Act in accordance with parameters of the Model Act circulated by the Government of India. In Orissa, practically, there is no restriction on movement, and direct marketing of agriculture produce. There is also no enforcement for compulsory trading only in an APMC Market Yard. However, the case of Orissa indicates that it would be delusionary to view the state having free play of market forces in agricultural marketing, in the absence of functional institutional body. There are problems in absence of institutional body. Farmers may tend to become laggards, as the market signals have greater lag before it reaches them. Similarly, Agri-industry or businesses Industry will take a lot of time to develop, as the supply will be staggered and widely separated thus increasing the payback period of Agri-processors. It implies that the core of a strategy for development ought to be strengthening of legal and administrative framework with a well spread-out infrastructure of agricultural produce markets. From the findings and existing literature, it is uncertain if the case of Bihar could be matched with the case of Orissa.

Table 1.6: State-wise Summary Statistics (Mean and Std.Dev) of the Sub-indices and APMC Index, 1970-2008

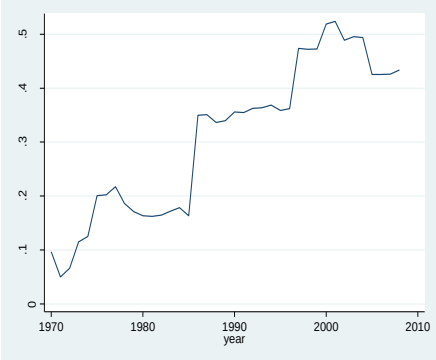
1	2	3	4	5	6	7	8
State	**Composite APMC Index**	**Constitution of Market and Market Structure**	**Channels of Market Expansion**	**Regulating Sales and Trading in Market**	**Pro-Poor Regulations**	**Infrastructure for Market Functions**	**Scope of Regulated Markets**
Andhra Pradesh	0.264	0.359	0.109	0.684	0.151	0.267	0.886
	(0.055)	(0.108)	(0.243)	(0.035)	(0.127)	(0.050)	(0.111)
Assam	0.153	0.597	0.026	0.583	0	0.218	0.073
	(0.069)	(0.244)	(0.092)	(0.226)	(0)	(0.082)	(0.219)
Bihar	0.169	0.236	0.096	0.357	0	0.084	0.856
	(0.058)	(0.114)	(0.073)	(0.169)	(0)	(0.081)	(0.179)
Gujarat	0.223	0.668	0.039	0.257	0	0.219	0.857
	(0.018)	(0.093)	(0.135)	(0.020)	(0)	(0.100)	(0.090)
Haryana	0.382	0.405	0.209	0.866	0	0.576	0.973
	(0.087)	(0.145)	(0.137)	(0.114)	(0)	(0.069)	(0.019)
Karnataka	0.319	0.780	0.034	0.673	0.051	0.135	0.871
	(0.059)	(0.065)	(0.132)	(0.020)	(0.223)	(0.037)	(0.071)
Madhya Pradesh	0.307	0.495	0.031	0.489	0.675	0.145	0.753
	(0.143)	(0.241)	(0.070)	(0.271)	(0.399)	(0.059)	(0.158)
Maharashtra	0.374	0.763	0.071	0.703	0.261	0.388	0.886
	(0.086)	(0.165)	(0.225)	(0.044)	(0.273)	(0.077)	(0.070)
Orissa	0.120	0.192	0.022	0.493	0	0.082	0.625
	(0.034)	(0.034)	(0.081)	(0.044)	(0)	(0.040)	(0.181)
Punjab	0.452	0.418	0.128	0.815	0	0.901	1.000
	(0.053)	(0.052)	(0.139)	(0.141)	(0)	(0.098)	(0.002)
Rajasthan	0.381	0.723	0.056	0.710	0.769	0.130	0.744
	(0.063)	(0.142)	(0.183)	(0.045)	(0.078)	(0.085)	(0.165)
Tamil Nadu	0.241	0.481	0.184	0.275	0.256	0.368	0.767
	(0.098)	(0.388)	(0.250)	(0.283)	(0)	(0.082)	(0.157)
Uttar Pradesh	0.153	0.172	0.015	0.421	0	0.193	0.745
	(0.038)	(0.150)	(0.033)	(0.205)	(0)	(0.087)	(0.222)
West Bengal	0.201	0.283	0.104	0.398	0	0.365	0.800
	(0.066)	(0.194)	(0.070)	(0.269)	(0)	(0.104)	(0.262)
Total	0.267	0.469	0.080	0.552	0.154	0.291	0.774
	(0.122)	(0.268)	(0.158)	(0.251)	(0.289)	(0.229)	(0.265)

Source: Author's calculations. (Std.Dev) in parenthesis

Further, the contrasting cases of Madhya Pradesh and Bihar indicate the role of political responsiveness in determining trends in the APMC measure. Figure 1.1 shows that APMC measure of both states starts from a very low level. But from there the status of the APMC Act diverges completely into opposite direction. It is worth to note the difference in strategy behind the common vision for agricultural sector in the two states as detailed in box 1.2, which explains why the APMC measure evolves differently in these states.

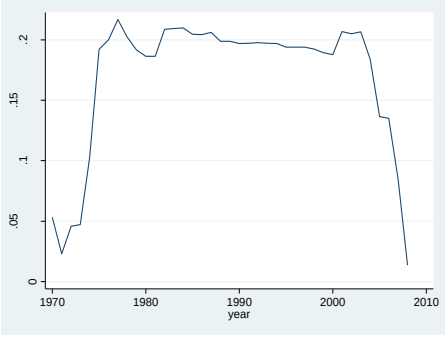
Box 1.2: A Case of Political Activity behind APMC Act: Madhya Pradesh and Bihar

Madhya Pradesh



Madhya Pradesh's Chief Minister made a statement during Agri-business meet on May 26, 2007, "Agriculture in Madhya Pradesh cannot grow unless we make agriculture profitable to the farmers. I am committed to make Agriculture a profitable venture to achieve this goal." In order to reverse this cycle *(of slow growth, low capital formation and agriculture sector becoming un-remunerative)* and to rejuvenate agriculture economy, there has an urgent need to initiate some pro active reforms and to draw a strategy for implementation thereof with due support of trade and industry. The State opted to amend the APMC Act to include new reforms to encourage private sector involvement in agricultural sector.

Bihar



Bihar's Chief Minister opted to completely repeal the APMC Act and abolish the marketing boards in September 2006, as a strategy to boost production and productivity of Agricultural produce in the state. According to the State government, with the passage of time APMC Act has proven to be a hindrance to development of natural markets, prohibiting farmers from selling their produce to the best buyer available in the State. The repeal of the Act was thought would help to boost private sector investment and promote the marketing through measures as contract farming and direct marketing.

Source: Author's calculation. Fieldwork information

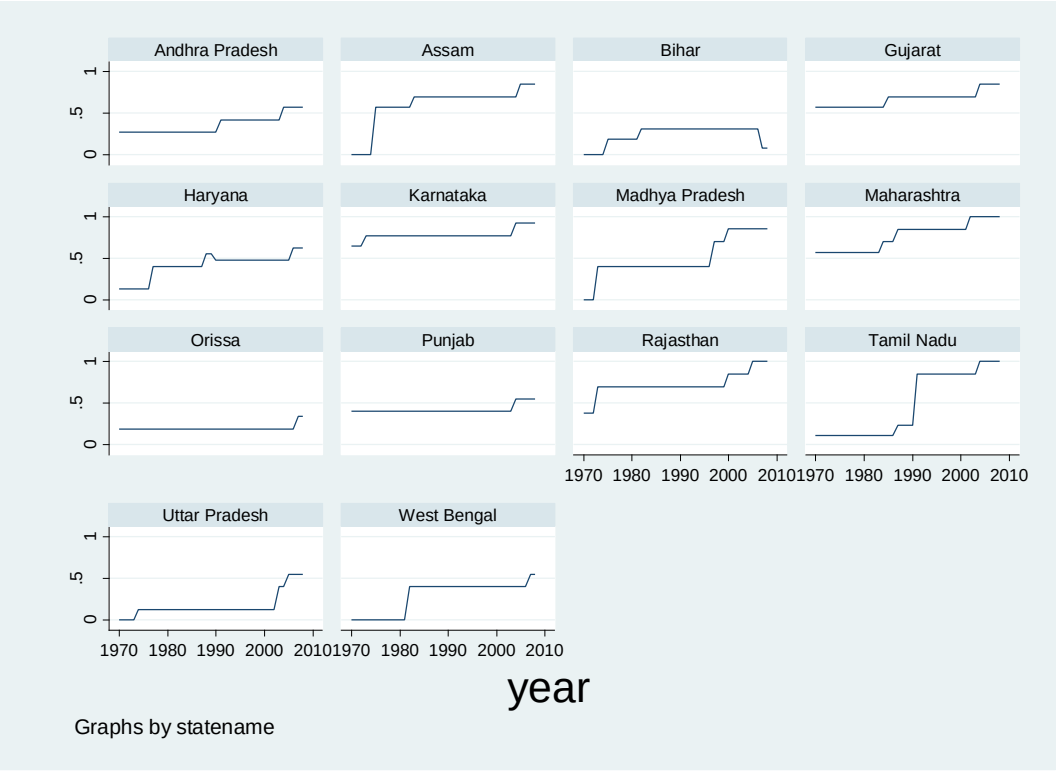
1.1.12 APMC Sub-indices

Trends according to the sub-indices are as follows. For index on *Constitution of Market and Market Structure* (Figure 1.2, Table 1.6, column 3), best performers are Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Rajasthan, Tamil Nadu and Assam. The mean value of each of these states ranges above, or close to the overall mean 0.49 of Constitution of Market and Market Structure. Worst performers were Orissa and Uttar Pradesh with

sub-index measure falling below 0.20. The remaining states: Andhra Pradesh, Bihar, Haryana, Punjab and West Bengal perform moderately with measure scoring between 0.23 and 0.42.

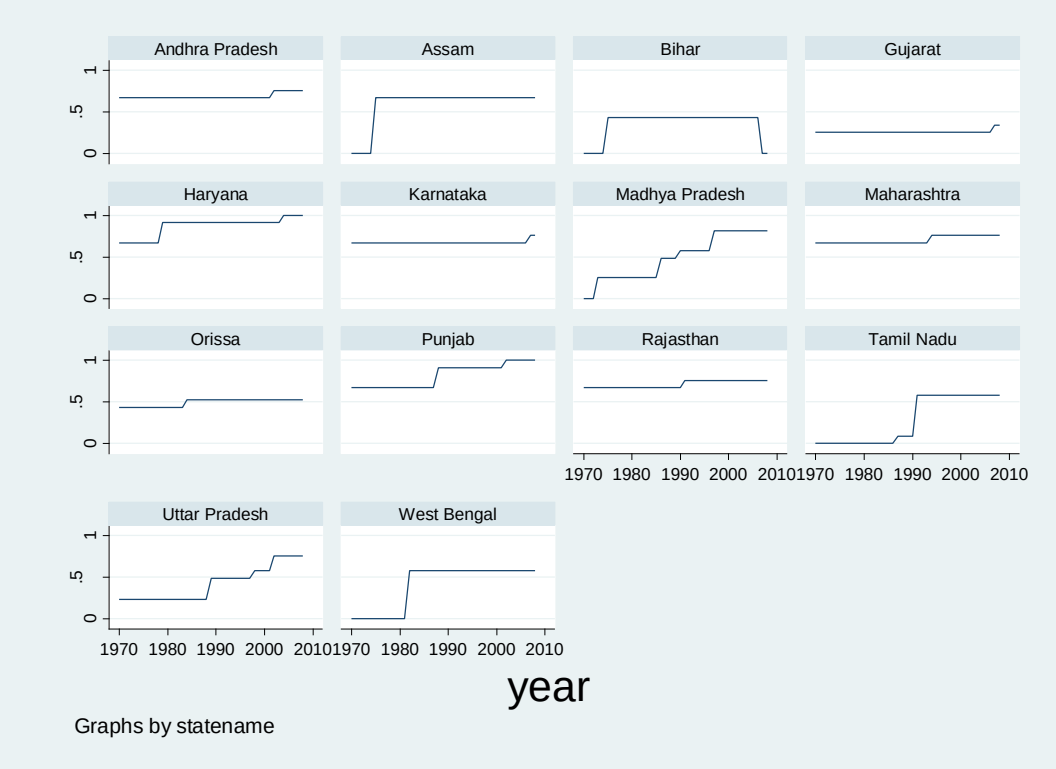
In the dimension of *Regulating sales and trading index* (Figure 1.3, Table 1.6, column 5), best performers are Maharashtra, Andhra Pradesh, Haryana, Punjab, Assam, Karnataka and Rajasthan. The mean value of each of these states' ranges above or closes to the overall mean 0.55 of Regulating Sales and Trading in Market. Worst performers are Gujarat (0.25) and Tamil Nadu (0.27). Bihar, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal score moderately ranging between 0.35 and 0.49. Further observation of these two sub-indices (i) constitution of market and market structure index (overall correlation coefficient 0.61) and (ii) Regulating sales and trading index (overall correlation coefficient 0.73) (Figure 1.2 & 1.3) suggest that they seem to influence most significantly initial level of the composite APMC index for the states like Maharashtra, Andhra Pradesh, Karnataka and Rajasthan. These states entrusted the regulatory and administrative management of the markets to the elected committees as corporate bodies duly representing all the interests viz, traders, co-operatives, local bodies and particularly the producers. Because these States established the regulated markets based on the prescribed model law from the very start, the initiative positioned these states a few points higher on index scale over the target period 1970-2008 as compared to other states. The other interesting fact is that APMC Act in these select states, that start on a good base, were enacted a few years later than in other states like Tamil Nadu and Orissa (see table 1.1), which illustrates that it is possible for less developed states to improve their marketing systems through effective reforms.

Figure 1.2: Market Structure dimension of the APMC Index by State



Source: Author's calculations.

Figure 1.3: Sales & Trading dimension of the APMC Index by State



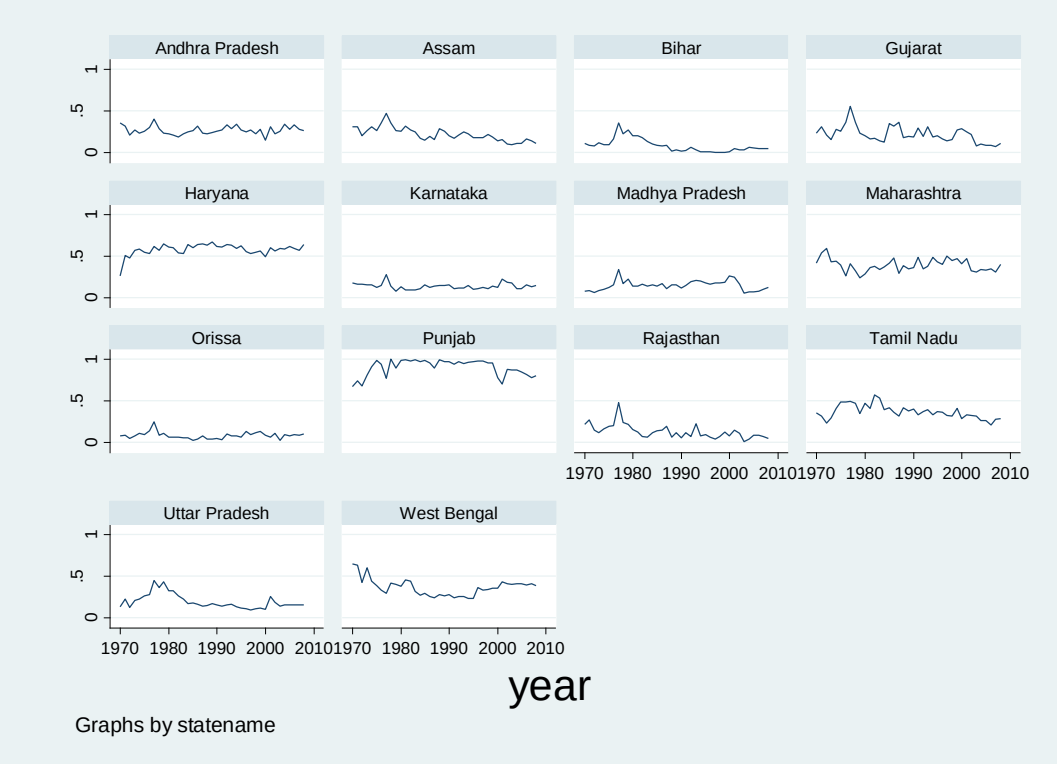
Source: Author's calculations.

In the sub-index *Infrastructure for Market Functions* (Figure 1.4, Table 1.6, column 7), there is considerable variation in regulated marketing

infrastructure in the states. Punjab, Haryana, Maharashtra, Tamil Nadu and West Bengal are the best scorers. The mean value of each of these states' is significantly above the overall mean 0.29 of Infrastructure for Market Functions. Punjab's mean score 0.901 tops all states. Worst performers are Bihar (0.084), Orissa (0.082), Rajasthan (0.130), Karnataka (0.135), Madhya Pradesh (0.145) and Uttar Pradesh (0.193). The remaining states: Andhra Pradesh, Assam and Gujarat score between 0.21 and 0.267.

The trend movements over time in figure 1.4 show that Maharashtra and Andhra Pradesh make an improvement in infrastructural facility over time. Trends for the Gujarat show an improvement with fluctuations in availability of the infrastructure facility. Later, it shows slightly downward trend movement in the index.

Figure 1.4: Market Infrastructure dimension of the APMC Index by State



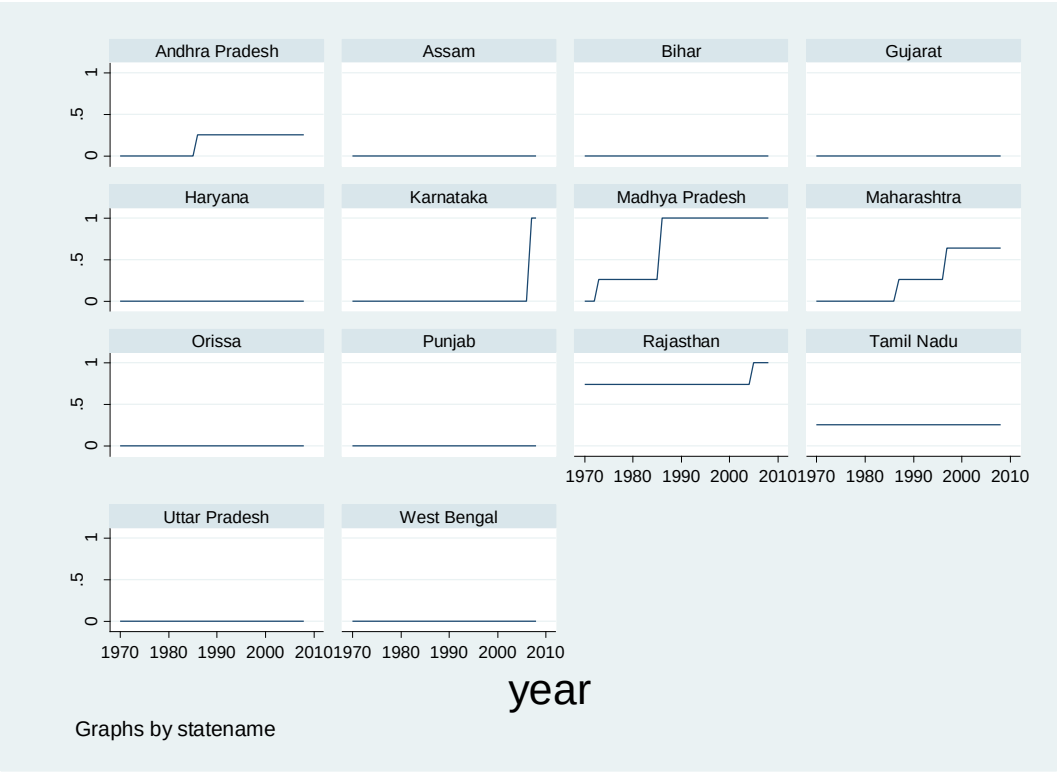
Source: Author's calculations.

States such as Orissa, Assam, Bihar, Uttar Pradesh, Rajasthan, and West Bengal show almost a static to downward trend in terms of infrastructure facilities over time. The trends in these states move at dismally low level from the start and show little improvement. According to the literature, this imply that the farmers in these states with poorly developed infrastructural

facilities do not get adequate price signals for adoption of new technology which may be a reason for lower economic status of farmers in these states (Acharya, 2004: 127).

In the dimension of *Pro-Poor Regulations* (Figure 1.5, Table 1.6, column 6), best performers are Madhya Pradesh (0.675) and Rajasthan (0.769). The mean value of each of these states is well above the overall mean of 0.155 of Pro-Poor Regulations. Andhra Pradesh, Maharashtra, and Tamil Nadu also score above the overall mean score. The enforced market Acts in these states provide special provisions to step up the efforts to benefit producer-farmers, beyond other marketing provisions to incentivize farmers, improving the performance of the agricultural sector. The score on this sub-index also indicates that though in the majority of the Acts, functions assigned to the market committee more or less cover the objectives embodied in the model Act, significant scope exists for making the provisions more exhaustive to ensure welfare of the marginalized farmer producer (Bhatia, 1990). Notably, states of Assam, Bihar, Gujarat, Haryana, Punjab, Orissa, Uttar Pradesh and West Bengal do not provide the specific set of regulations and score zero value on dimension of 'Pro-Poor Regulations of the APMC Act. The remaining state: Karnataka scores 0.051, which is very low, yet indicates some level of pro-poor provisions in the market as compared to the states that have no explicit pro-poor provisions.

Figure 1.5: Pro-Poor Regulatory dimension of the APMC Index by State

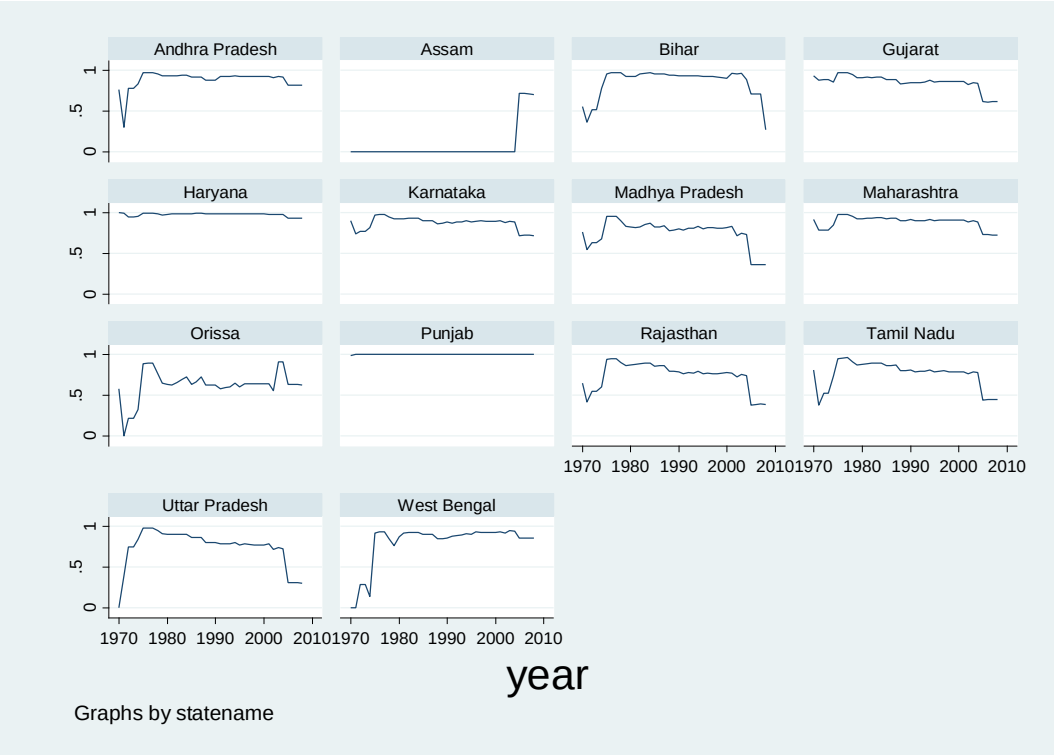


Source: Author's calculations.

In the dimension of *Scope of Regulated Markets* (Figure 1.6, Table 1.6, column 8), best performers are Andhra Pradesh, Bihar, Gujarat, Haryana, Punjab, Karnataka, Maharashtra, Tamil Nadu and West Bengal. The mean value of each of these states' ranges above or closes to the overall mean of 0.77. Punjab's mean score of 1 achieve optimum, followed by 0.97 score of Haryana. The research studies reveal that farmers on an average get 8 to 10 percent higher price and higher share in consumer's rupee by selling the produce in regulated markets compared to rural, village and unregulated markets (Acharya, 2004). The trend in sub-index scope of regulated markets shows that most of the states have started well and got better over time. Worst performer is Assam (0.073). Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh score moderately ranging between 0.62 and 0.75. Today, overall 7,161 markets are regulated out of 7,293 wholesale assembling markets. Facilities in these regulated markets vary extensively. Only 60 to 70 percent markets are laid out on vast land area with all basic amenities (Ibid). Even in these regulated markets, lack of space for auction, cleaning, and grading and non-availability of adequate storage facilities are a common feature. States like Rajasthan, Tamil Nadu, Maharashtra and

Madhya Pradesh show downward trend in terms of proper spread-out markets in the state. The shortage of markets in these states may mean poor market management, higher traffic or congestion, poor service and low returns (see figure 1.6). The studies show that the benefits received by the farmers by sale of agricultural produce vary from area to area because of the variation on their spread over the states and availability of infrastructural facilities in the yards of these regulated markets (Acharya, 2004: 146).

Figure 1.6: Scope of Regulated markets dimension of the APMC Index by State



Source: Author's calculations.

In the dimension of *Channels of Market Expansion* (Figure 1.7, Table 1.6, column 4), best performers are Andhra Pradesh, Tamil Nadu, Haryana, Punjab and West Bengal. The mean values of each of these states' ranges well above the overall mean 0.080 of *Channels of Market Expansion*. Tamil Nadu (0.18) and Haryana (0.20) are the leading states. These states provide legislative reforms in the Act and the corresponding Rules that legally permit private agri-businesses, direct procurement and online trading in agricultural commodities, which further drive the composite index

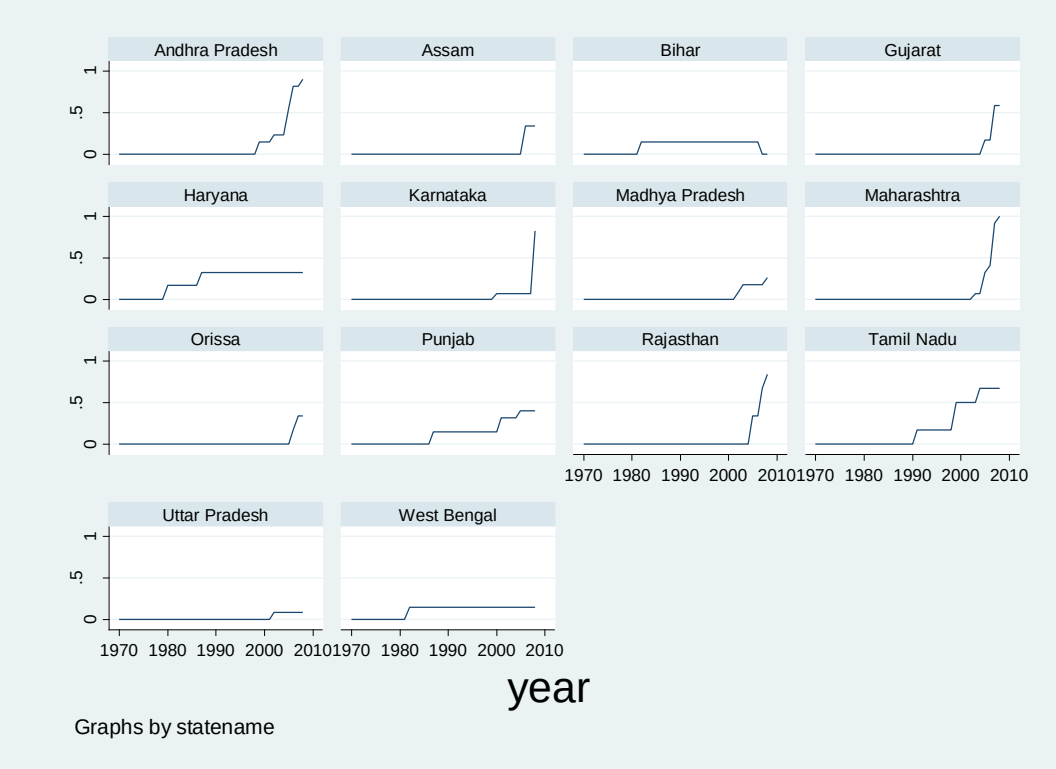
a few points higher for these states.[35] Worst performers are Assam, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan and Uttar Pradesh. The remaining state: Bihar scores 0.096, which is very low, yet above the mean score. It indicates alternative provisions to expand marketing system through modern channels in the state.

As noted earlier, Bihar presents an exceptional case. The Chief Minister of Bihar Nitish Kumar repealed the APMC Act in Bihar in 2006, a first state ever to do so, to open up of agricultural trade and promote growth in agricultural sector by inviting private business. Graphical trends in Bihar do not appeal in terms of legislative performance. There is considerable downward trend and eventually a dip in movements of each of the sub-indices. The deep dip post 2006 in the figure 1.7 is driven by repeal of the Act altogether in Bihar. A recent study of Bihar's post-reforms case finds that abolishment of the APMC Act in the state has resulted in vacuum in terms of some institutional body required to administer and promote the development of agricultural markets in the state. In absence of an institutional agency to manage the functioning of the markets, there is continuous decline in the facilities provided by these markets in spite of the availability of basic infrastructure in these markets. According to NIAM's study (2011), Bihar had 95 regulated agricultural markets and out of them almost 53 markets have basic marketing infrastructure in place. It finds that though the existing infrastructure in the market yards can be strengthened for rest of the markets by utilizing the subsidy under the scheme for development/strengthening of agricultural marketing infrastructure, grading

[35] State governments have shown mixed reactions towards reforms. Some states have reform the APMC Act but have not notified the amended Rules. From the 14 states, only the state of Andhra Pradesh, Rajasthan, Maharashtra, Orissa, Karnataka (single point levy of market fee), Madhya Pradesh (only for special license for more than one market) and Haryana (only for contract farming) have notified amended Rules. Such variation drives the changes in the Act, suggesting improvement. However, there is a downside here, which needs to be noted. In the states, the amended Rules vary in their content and coverage. In current form, many of the states seem to introduce new stringent conditions that are enforced on private businesses. They are not applicable on newly established state led APMCs. Such regulatory attitude make the entire private investment project extremely difficult to initiate (almost unviable). It may explain lukewarm response from private sector players in terms of making new investments in the agricultural markets, despite legislative reforms in the APMC Act & Rules. However, this dimension could not take into account these issues in the index construction, as reforms are presently being negotiated between the private sector and the state government.

and standardization, it cannot be done (Government of India Memo, 2010). In absence of an institutional structure for the promotion of agricultural marketing in Bihar, the funds under the scheme cannot be utilized. The study shows that in spite of the requirement of much needed capital in the state, there has not been any private sector investment under the scheme due to absence of regulatory institution like the APMC Act (Intodia, 2011).

Figure 1.7: Alternative Market Channels dimension of the APMC Index by State



Source: Author's calculations.

Annex 1.A12 presents ranking of various states in terms of the overall APMC index over time. As can be seen, most states show a small positive upward movement in the APMC index. In terms of rankings over time, not much fluctuation is witnessed. But it is possible that some states have lost ground in terms of rankings and yet they register an increase in the magnitude of the APMC index. Comparing the trend and movement of ranks in the states over time, Maharashtra and Punjab appears to witness stable and high ranking historically. The top gainers in terms of ranking are Karnataka and Madhya Pradesh. The top losers in terms of ranking are Gujarat, Bihar, and Orissa. Gujarat and Bihar ranked at 6th and 12th position respectively in 1970 but their ranks deteriorated to 11th and 14th position in 2008. The

states of Uttar Pradesh, West Bengal and Assam show relative improvement in terms of magnitude of the APMC index but continue to rank poorly. Haryana, Andhra Pradesh, Tamil Nadu and Rajasthan maintained the ranks at higher side over time most of the time period.

Conclusion

In this paper, I present composite index that offer a way to measure state-led regulatory institution aiming to improve post-harvest agricultural market systems of 14 states of India in the period 1970-2008. The proposed measures proxy the underlying regulatory agricultural marketing framework that are mirrored by *de jure* legal and administrative norms together with level of regulated infrastructure of agricultural produce markets that might have implications for agricultural growth and poverty reduction in these states.

This exercise represents the first effort to systematically characterize APMC Act & Rules across the states over time, without resorting to subjective surveys. Based on extensive literature review, no comprehensive empirical study has been undertaken on the 'form' and 'trend' of legal framework of the agricultural markets for set of states over the time. The absence of a comprehensive empirical study similar to that undertaken here has been perhaps because the regulatory effects, though significant, are often difficult to quantify (Cullinan, 1999). In this sense, the research study is useful in that it utilizes a method of quantification of regulatory institutions that is relevant to the study of agricultural development. The computed measure can be used to empirically investigate and draw reliable inferences about the impact of APMC Act and rules on use of modern agricultural inputs, uneven growth patterns in agricultural productivity as well as rural poverty outcomes in the states of India.

Based on 41 variables quantifying the APMC Act & Rules, I constructed six sub-indices each measuring one dimension of the economic institution related to agricultural markets at the state level. They are: (1) Scope of Regulated Markets; (2) Constitution of Market and Market Structure; (3) Regulating Sales and Trading in Market; (4) Infrastructure for Market Functions; (5) Pro-Poor Regulations; and (6) Channels of Market Expansion.

The Agricultural Produce Markets Commission Index (APMC Index) combines the sub-indices into a multi-dimensional index of post-harvest *de jure* legal and administrative framework of agricultural produce markets for 14 Indian states from 1970 to 2008 time period. With these measures, select 14 states are compared and ranked over time.

In constructing indices, drawing on previous critiques, indices have been produced transparently with clear clarifications concerning the decisions and trade-offs associated with choice and treatment of the variables included, the weighting scheme and the aggregation method. This has resulted in six sub-indices into APMC index by applying standard classical PCA to only continuous variables and tetrachoric PCA is used for the binary variables, to extract common information of the included variables.

The methodology for constructing the multidimensional APMC index is an un-weighted average of a non-linear function of the sub-indices. The non-linear function arises because I assume that APMC Act has a governing impact on sustaining higher levels of agricultural productivity. The Act has multiple effects. In the absence of proper marketing machinery to ensure a fair return to the producer, creditable success achieved by the post-independence production programme will suffer more than proportionately and thereby potentially harm socio-economic well-being of majority of population in the states. I use formula of non-linear aggregation and this has an advantage of penalizing weak dimensions of agricultural marketing and only allowing for partial compensation among the six dimensions.

Examining of the evolution of APMC index and its sub-indices across Indian states suggests a few perspectives to understand agricultural growth prospects and development. They are:

First, APMC index over time shows an upward movement, which implies strengthening of legal and administrative framework of agricultural produce markets. Yet, much scope of improvement remains in the states. APMC begins with very low score of 0.006 in 1970 and reaches up to 0.609 in 2008. There are wide differences in the APMC measures across the states.

Second, rankings of states in terms of the APMC index show varying time trends (Annex 1.A12)– Maharashtra and Punjab witness stable and high ranking historically. The top gainers in terms of ranking are Karnataka and Madhya Pradesh. The top losers in terms of ranking are Gujarat, Bihar, and Orissa. Gujarat and Bihar ranked at 6th and 12th position respectively in 1970 but their ranks deteriorated to 11th and 14th position in 2008. The states of Uttar Pradesh, West Bengal and Assam show relative improvement in terms of magnitude of the APMC index but continue to rank poorly. Haryana, Andhra Pradesh, Tamil Nadu and Rajasthan maintained the ranks at higher side over time most of the time period. Based on the state rankings in the year 2008 alone, Maharashtra emerges as the top performer implying that pertinent regulatory provisions exist for agricultural produce markets to function well in the state. Uttar Pradesh and Bihar are the bottom performers, which mean that poor regulatory marketing system is a major problem in these states.

As regards the average data for the 1970-2008 (table 1.6), Haryana, Punjab, Karnataka, Maharashtra, Madhya Pradesh and Rajasthan obtain the highest levels of APMC measure, scoring over 0.30. Orissa is the state that occupies the last position, followed by Assam, Bihar and Uttar Pradesh. The mean value of the remaining states Gujarat, Tamil Nadu, Andhra Pradesh and West Bengal score at intermediate level.

Third, the case of Bihar out of all selected states emerges as an exception because instead of the state showing response to strengthen the APMC Act & Rules by providing legitimate space to private sector investment, it chooses to repeal the state's APMC Act in 2006 as an alternative strategy to boost private sector involvement in development of agricultural produce sector. Such state response left the Bihar's system of agricultural marketing without the dedicated legislative and administrative machinery for development of markets, fair trading practices and increasing market efficiency to protect the interest of the producer-sellers and other functionaries in the state. In absence of the institutional agency to manage functioning of the markets, there is continuous decline in the facilities provided by the agricultural markets. In this respect, Bihar lost scoring and ranking in the APMC measure.

Fourth, much difference occurs in the APMC results when information pertaining to infrastructure and pro-poor regulations are incorporated into the index. Punjab and Haryana are the best performers both in terms of availability of number of markets and regulated infrastructure facilities within the market yard of agricultural produce. Karnataka, Maharashtra, Madhya Pradesh and Rajasthan particularly achieve better in providing pro-poor legal provisions to safeguard the interest of producer-farmer.

Fifth, the magnitude and state-wise ranking of the APMC index post 2006 that show a positive movement in a sudden jump are mostly driven by introducing latest reform provisions in the APMC Act (i.e. based on Model APMC Act 2003) to allow establishment of an alternative markets by the private sector (see Figure 1.1). In overall terms, the improvement of APMC index over the time in Maharashtra, Madhya Pradesh, Haryana, Punjab, and to some extent Tamil Nadu, has been faster than in other states. Andhra Pradesh, Gujarat, Karnataka and Rajasthan have relatively steady (consistent) growth than the rest. For Orissa, Uttar Pradesh and West Bengal - until 1990, the scores on APMC index are found to be low. The states like Karnataka, Andhra Pradesh, Rajasthan and Assam witness sudden spiky growth in the index post 2000 (after revamping of the State Act on line of the latest model APMC Act 2003).

Sixth, in regional terms, southern and northern states perform better and eastern states of India under-perform.

Although, the paper utilizes a robust method of quantification of APMC Act & Rules that is relevant to the study of agricultural development, a note of caution is needed especially as far as some possible limitation of the sub-indices of the APMC index are concerned. First, a composite index depends on quality of the data and choice of variables used as input in each sub-component of the APMC measure (Branisa et al., 2010). Substantial efforts are made in the paper to characterize each component of the APMC measure through the most appropriate variables, this choice, however, is still inherently subjective, and to an extent it has been driven by the possibility to access the data. In this sense, the estimated measure of the APMC Act & rules is an imperfect representation and proxy of the Act because of the possible random or systematic measurement error.

Literature has invariably suggested not to assume a completely deterministic and perfect measurement process of a latent variable; the APMC Act & Rules is one of such variables (Bollen & Paxton, 1998; Treier & Jackman, 2008:203). Regulations in general are hard to measure and thus, this first effort of measuring the APMC Act & Rules is an important step forward to opening a debate. The construction of quantitative APMC indices overcomes the major constraint of lack of adequate measurement of agricultural market regulations over time, the measure, however, with more data coverage especially by use of qualitative information, could be further improved.

Second, although index measure has the advantage of synthesizing formal institutional and policy elements into one single aggregate regulatory institutional index, by aggregating variables and sub-indices, some information will inevitably get concealed. Figures, correlations and rankings according to the APMC index and its sub-indices should not substitute a careful investigation of the variables from the database and market practices at the ground (Branisa et al., 2010:17). Nonetheless, this paper is an important contribution to ongoing policy debates on agricultural reforms in India. It may help to diffuse the fallacy or general pessimism about multifaceted regulations of the agricultural markets. Lack of policy understanding about regulations being an important condition for economic development can severely undermine effort to enhance economic growth in agriculture and poverty reduction in nation states.

In our forthcoming research, systematic empirical analysis has been undertaken to examine whether this variation in the computed APMC measure across the 14 states over time can explain the differences in the use of modern farm inputs and growth patterns in agricultural productivity as well as rural poverty outcomes in these select 14 states of India.

References

1. Acemoglu, Daron (2003), 'Why Not a Political Coase Theorem? Social Conflict, Commitment, and Politics', *Journal of Comparative Economics,* 31 (4), 620-52.
2. Acharya, SS (2004), *State of the Indian Farmer-a Millennium Study, Vol. 17 Agricultural Marketing* ed. Government of India Ministry of Agriculture (Agricultural Marketing, 17; New Delhi: Academic Foundation).
3. Acharya, S. S (2006), 'Agricultural Marketing Reforms: Status and Road Map', *A Background Paper for the Working Group on Agricultural Marketing Reforms, Contract Farming and Agro Processing, constituted by the Sub-Committee of National Development Council* (Jaipur: National Institute of Agricultural Marketing).
4. Acharya, S.S. and Agarwal, N. L. (2009), *Agricultural Marketing in India* (New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.).
5. Ahsan, Ahmad and Pagés, Carmen (2009), 'Are All Labor Regulations Equal? Evidence from Indian Manufacturing', *Journal of Comparative Economics,* 37 (1), 62-75.
6. Anant, T.C.A, et al. (2006), 'Labor Markets in India: Issues and Perspectives', in J. Felipe and R. Hasan (eds.), *Labor Markets in Asia: Issues and Perspectives* (Palgrave Macmillan, ADB,), pp.205-300.
7. Armour, John, et al. (2009), 'Shareholder Protection and Stock Market Development: An Empirical Test of the Legal Origins Hypothesis', *Journal of Empirical Legal Studies,* 6 (2), 343-80.
8. Bates, Robert (1981), 'States and Markets in Tropical Africa: The Political Basis of Agricultural Policy', *Berkeley: University of California Press, series on social choice and political economy*.
9. Besley, Timothy and Burgess, Robin (2004), 'Can Labor Regulation Hinder Economic Performance? Evidence from India', *The Quarterly Journal of Economics,* 119 (1), 91-134.
10. Bhatia, G.R. (1990), 'Legal and Administrative Framework for Regulation and Management of Agricultural Produce Markets in India', *Agricultural Marketing: A National Level Quarterly Journal on agricultural Marketing, XXXIII, No 1, April-June, 1990*, XXXIII, No 1, April-June, 1990.
11. Bhattacharjea, Aditya (2006), 'Labour Market Regulation and Industrial Performance in India: A Critical Review of the Empirical Evidence', *Indian Journal of Labour Economics,* 49 (2), 211-32.
12. Bollen, Kenneth A. and Paxton, Pamela (1998), 'Detection and Determinants of Bias in Subjective Measures', *American Sociological Review,* 63 (3), 465-78.
13. Botero, Juan C, et al. (2004), 'The Regulation of Labor', *The Quarterly Journal of Economics,* 119 (4), 1339-82.
14. Branisa, Boris, Ziegler, Maria, and Klasen, Stephan (2010), 'The Institutional Basis of Gender Inequality', (Verein für Socialpolitik, Research Committee Development Economics).
15. Calì, Massimiliano, Mitra, Siddhartha, and Purohit, Purnima (2011), 'Measuring State−Business Relations within Developing Countries: An

Application to Indian States', *Journal of International Development,* 23 (3), 394-419.
16. Chakraborty, Debashis (2009), 'Contract Farming in India Unique Solution to Multilayer Agricultural Problems?', *Review of Market Integration,* 1 (1), 83-102.
17. Committee, Expert (2001), 'Report of Task Force on Agricultural Marketing Reforms.', in Government of India The Ministry of Agriculture, Available on: http://agmarknet.nic.in/taskrep.htm (ed.), (New Delhi: The Ministry of Agriculture, Government of India).
18. Cullinan, Cormac (1999), *Law and Markets: Improving the Legal Environment for Agricultural Marketing* (FAO).
19. Dahl, Dale C (1979), 'Regulation Analysis as a Research Focus in Agricultural Economics', *American Journal of Agricultural Economics,* 61 (4), 766-74.
20. Deshpande, LK, et al. (2004), 'Liberalisation and Labour: Labour Flexibility in Indian Manufacturing (New Delhi, Institute for Human Development)'.
21. DiStefano, Christine (2002), 'The Impact of Categorization with Confirmatory Factor Analysis', *Structural Equation Modeling,* 9 (3), 327-46.
22. Djankov, Simeon, et al. (2002), 'The Regulation of Entry', *The Quarterly Journal of Economics,* 117 (1), 1-37.
23. Dolan, Conor V (1994), 'Factor Analysis of Variables with 2, 3, 5 and 7 Response Categories: A Comparison of Categorical Variable Estimators Using Simulated Data', *British Journal of Mathematical and Statistical Psychology,* 47 (2), 309-26.
24. Fafchamps, Marcel (2004), *Market Institutions in Sub-Saharan Africa: Theory and Evidence* (3: MIT Press).
25. Fafchamps, Marcel, Hill, Ruth Vargas, and Minten, Bart (2008), 'Quality Control in Nonstaple Food Markets: Evidence from India', *Agricultural Economics,* 38 (3), 251-66.
26. Filmer, Deon and Pritchett, Lant H (2001), 'Estimating Wealth Effects without Expenditure Data—or Tears: An Application to Educational Enrollments in States of India*', *Demography,* 38 (1), 115-32.
27. Gardner, Bruce L (1979), 'Economic Analysis of the Regulation of Agriculture', *American Journal of Agricultural Economics,* 61 (4), 732-40.
28. Ghosh, M.M. (1999), 'Growth and Development of Regulated Markets in India ', in Jagdish Prasad (ed.), *Encyclopedia of Agricultural Marketing: Market Regulation and Development* (New Delhi, : Mittal Publications.).
29. Giovannini, Enrico (2008), *Handbook on Constructing Composite Indicators: Methodology and User Guide* (Organisation for Economic Cooperation and Development (OECD)).
30. Glaeser, Edward L, et al. (2004), 'Do Institutions Cause Growth?', *Journal of economic Growth,* 9 (3), 271-303.
31. Hall, Robert E and Jones, Charles I (1999), 'Why Do Some Countries Produce So Much More Output Per Worker Than Others?', *The Quarterly Journal of Economics,* 114 (1), 83-116.

32. Harriss-White, Barbara (1995), 'The Changing Public Role in Services to Food and Agriculture: The Legal Regulation of Food Markets in India', *Food Policy,* 20 (6), 585-96.
33. Hasan, Rana, Mitra, Devashish, and Ramaswamy, KV (2007), 'Trade Reforms, Labor Regulations, and Labor-Demand Elasticities: Empirical Evidence from India', *The Review of Economics and Statistics,* 89 (3), 466-81.
34. Hood, Christopher, James, Oliver, and Scott, Colin (2000), 'Regulation of Government: Has It Increased, Is It Increasing, Should It Be Diminished?', *Public Administration,* 78 (2), 283-304.
35. Houweling, Tanja AJ, Kunst, Anton E, and Mackenbach, Johan P (2003), 'Measuring Health Inequality among Children in Developing Countries: Does the Choice of the Indicator of Economic Status Matter?', *International Journal for Equity in Health,* 2 (1), 8.
36. Huber, John and Inglehart, Ronald (1995), 'Expert Interpretations of Party Space and Party Locations in 42 Societies', *Party Politics,* 1 (1), 73-111.
37. Intodia, Vijay (2011), 'Investment in Agricultural Marketing and Market Infrastructure - a Case Study of Bihar (Http://Www.Ccsniam.Gov.In/Report/Final%20report%20of%20bihar%20research%20study.Pdf)', in National Institute of Agricultural Marketing (NIAM) (ed.), *Research Report* (Jaipur: National Institute of Agricultural Marketing (NIAM)).
38. Jackson, Donald A (1993), 'Stopping Rules in Principal Components Analysis: A Comparison of Heuristical and Statistical Approaches', *Ecology*, 2204-14.
39. Jolliffe, Ian T (1990), 'Principal Component Analysis: A Beginner's Guide—I. Introduction and Application', *Weather,* 45 (10), 375-82.
40. --- (2002), *Principal Component Analysis* (Springer verlag).
41. Kahn, Alfred E (1970), *The Economics of Regulation: Principles and Institutions, Vol. 1* (New York: John Wiley and Sons).
42. Kaufmann, Daniel and Kraay, Aart (2008), 'Governance Indicators: Where Are We, Where Should We Be Going?', *The World Bank Research Observer,* 23 (1), 1-30.
43. Kolenikov, Stanislav and Angeles, Gustavo (2009), 'Socioeconomic Status Measurement with Discrete Proxy Variables: Is Principal Component Analysis a Reliable Answer?', *Review of Income and Wealth,* 55 (1), 128-65.
44. Krishnakumar, Jaya and Nagar, AL (2008), 'On Exact Statistical Properties of Multidimensional Indices Based on Principal Components, Factor Analysis, Mimic and Structural Equation Models', *Social Indicators Research,* 86 (3), 481-96.
45. La Porta, Rafael, Lopez-de-Silanes, Florencio, and Shleifer, Andrei (2006), 'What Works in Securities Laws?', *The journal of finance,* 61 (1), 1-32.
46. La Porta, Rafael, et al. (1997), 'Legal Determinants of External Finance', *The journal of finance,* 52 (3), 1131-50.
47. Lele, Priya and Siems, Mathias (2007), 'Shareholder Protection: A Leximetric Approach', *Journal of Corporate Law Studies,* 7, 17.

48. López de Silanes, Florencio, et al. (1998), 'Law and Finance', *Journal of political economy,* 106, 1113-55.
49. Manly, BFJ (1994), *Multivariate Statistical Methods: A Primer. 2nd Edition* (London: Chapman and Hall).
50. McConnell, CR, Brue, SL, and Flynn, SM (2011), *Economics: Principles, Problems and Policies* (Boston: Irwin McGraw-Hill Publishing.).
51. McKenzie, David J (2005), 'Measuring Inequality with Asset Indicators', *Journal of Population Economics,* 18 (2), 229-60.
52. Minten, Bart, Vandeplas, Anneleen, and Swinnen, Johan (2012), 'Regulations, Brokers, and Interlinkages: The Institutional Organization of Wholesale Markets in India', *Journal of Development Studies,* 48 (7), 864-86.
53. Moser, Caroline and Felton, Andrew (2007), *Intergenerational Asset Accumulation and Poverty Reduction in Guayaquil Ecuador (1978-2004)*. p. 15-50.
54. --- (2007), 'The Construction of an Asset Index Measuring Asset Accumulation in Ecuador', *Chronic poverty research centre working paper,* (87).
55. Munck, G and Verkuilen, Jay (2000), 'Measuring Democracy: An Assessment of Alternative Data Sets', *Ponencia presentada a la conferencia" Annual Meeting of the American Political Science Association", se*.
56. Munda, Giuseppe and Nardo, Michela (2005), 'Constructing Consistent Composite Indicators: The Issue of Weights', *EUR 21834 EN*.
57. --- (2009), 'Noncompensatory/Nonlinear Composite Indicators for Ranking Countries: A Defensible Setting', *Applied Economics,* 41 (12), 1513-23.
58. Murphy, Kevin M, Shleifer, Andrei, and Vishny, Robert W (1993), 'Why Is Rent-Seeking So Costly to Growth?', *The American Economic Review,* 83 (2), 409-14.
59. Newman, Mark D, Sow, Alassane, and Ndoye, Ousseynou (1988), *Regulatory Uncertainty and Government Objectives for the Organization and Performance of Cereal Markets: The Case of Senegal* (Department of Agricultural Economics, Michigan State University).
60. Njong, Aloysius Mom and Ningaye, Paul (2008), 'Characterizing Weights in the Measurement of Multidimensional Poverty: An Application of Data-Driven Approaches to Cameroonian Data', *Retrieved from Oxford Poverty and Human Development Initiative (OPHI) website: http://www. ophi. org. uk/wp-content/uploads/OPHI-wp21. pdf*.
61. North, Douglass C (1990), *Institutions, Institutional Change and Economic Performance* (Cambridge university press).
62. Ogus, Anthony (2002), 'Regulatory Institutions and Structures', *Annals of Public and Cooperative Economics,* 73 (4), 627-48.
63. Pagano, Marco and Volpin, Paolo F (2005), 'The Political Economy of Corporate Governance', *American Economic Review*, 1005-30.
64. Parker, David (2002), 'Economic Regulation: A Review of Issues', *Annals of Public and Cooperative Economics,* 73 (4), 493-519.

65. Parker, David and Kirkpatrick, Colin (2004), 'Economic Regulation in Developing Countries: A Framework for Critical Analysis', *Leading issues in competition, regulation and development*, 92-113.
66. Pérez–Mayo, Jesús (2005), 'Identifying Deprivation Profiles in Spain: A New Approach', *Applied Economics,* 37 (8), 943-55.
67. Posner, Richard A (1974), 'Theories of Economic Regulation', *Bell Journal of Economics,* 5 (2), 335-58.
68. Rajagopal (1993), *Indian Rural Marketing* (Jaipur: Rawat Publications).
69. Rodrik, Dani, Subramanian, Arvind, and Trebbi, Francesco (2004), 'Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development', *Journal of economic Growth,* 9 (2), 131-65.
70. Roodman, David (2006), 'Building and Running an Effective Policy Index: Lessons from the Commitment to Development Index', *Center for Global Development. http://www. cgdev. org/content/publications/detail/6661*.
71. Rozelle, Scott and Swinnen, Johan FM (2004), 'Success and Failure of Reform: Insights from the Transition of Agriculture', *Journal of economic literature,* 42 (2), 404-56.
72. Russell, Stuart H (1974), 'Agricultural Law-Federal Administrative Procedures', *South Dakota Law Review,* 19, 603-21.
73. Savoia, Antonio and Sen, Kunal (2012), 'Measurement and Evolution of State Capacity: Exploring a Lesser Known Aspect of Governance', *Effective States and Inclusive Development Research Centre Working Paper,* 10.
74. Schellenberg, Joanna Armstrong, et al. (2003), 'Inequities among the Very Poor: Health Care for Children in Rural Southern Tanzania', *The Lancet,* 361 (9357), 561-66.
75. Schultz, Theodore W (1978), 'On Economics and Politics of Agriculture', *Bulletin of the American Academy of Arts and Sciences*, 10-31.
76. Shaffer, James D (1979), 'Observations on the Political Economics of Regulations', *American Journal of Agricultural Economics,* 61 (4), 721-31.
77. Sharma, Purushottam (2011), 'A Study on Agricultural Marketing System in Odisha (Http://Www.Ccsniam.Gov.In/Report/Odisha%20report.Pdf)', in Jaipur National Institute of Agricultural Marketing (NIAM) (ed.), *Research Report* (Jaipur).
78. Sharma, Alakh and Sasikumar, SK (1996), 'Structural Adjustment and Labour', *VV Giri National Labour Institute, NOIDA (mimeo)*.
79. Shleifer, Andrei and Vishny, Robert W (1997), 'A Survey of Corporate Governance', *The journal of finance,* 52 (2), 737-83.
80. Singh, Gurdev and Asokan, S.R (2005), 'Contract Farming in India', in Ramesh Chand (ed.), *India's Agricultural Challenges: Reflections on Policy, Technology and Other Issues* (New Delhi: CENTAD, New Concept Information Systems Pvt. Ltd.), p. 79-103.
81. Smith, Peter (2002), 'Developing Composite Indicators for Assessing Health System Efficiency', in OECD (ed.), *Measuring Up: Improving the Performance of Health Systems in Oecd Countries* (Paris. OECD).
82. Stigler, George J (1972), 'Law and Economics of Public Policy: A Plea to the Scholars, The', *J. Legal Stud.,* 1, 1.

83. Stigler, George Joseph and Samuelson, Paul Anathony (1963), *A Dialogue on the Proper Economic Role of the State* (Selected Papers No. 7: Graduate School of Business, University of Chicago, 3rd Edition).
84. Stiglitz, Joseph Eugene (1989), *The Economic Role of the State* (Blackwell Pub).
85. Swinnen, Johan FM, Vandeplas, Anneleen, and Maertens, Miet (2010), 'Liberalization, Endogenous Institutions, and Growth: A Comparative Analysis of Agricultural Reforms in Africa, Asia, and Europe', *The World Bank Economic Review,* 24 (3), 412-45.
86. Tarantola, Stefano (2002), *Statistical Techniques and Participatory Approaches for the Composition of the European Internal Market Index 1992-2001* (European Commission, Joint Research Centre, Institute for the Protection and the Security of the Citizen, Technological and Economic Risk Management Unit).
87. Tarantola, S, Saisana, M, and Saltelli, A (2002), 'Internal Market Index 2002: Technical Details of the Methodology', *European Commission Joint Research Centre, Italy.[http://www.edis.sk/ekes/im-index-2002_en.pdf]*.
88. Topalova, Petia (2004), 'Trade Liberalization and Firm Productivity: The Case of India', *IMF Working Papers,* 2004 (28), 1-37.
89. Treier, Shawn and Jackman, Simon (2008), 'Democracy as a Latent Variable', *American Journal of Political Science,* 52 (1), 201-17.
90. Vyas, Seema and Kumaranayake, Lilani (2006), 'Constructing Socio-Economic Status Indices: How to Use Principal Components Analysis', *Health Policy and Planning,* 21 (6), 459-68.
91. Williams, Andrew and Siddique, Abu (2008), 'The Use (and Abuse) of Governance Indicators in Economics: A Review', *Economics of Governance,* 9 (2), 131-75.
92. Zilibotti, Fabrizio, et al. (2008), 'The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India', *American Economic Review,* 98 (4), 1397-412.

Annex

Annex 1.A1: Subsequent Historical Account of evolution of the APMC Act in the States of India

The Indian Cotton Committee (General Cotton Committee) was appointed by the Government of India in 1917 to look into the problems of marketing of cotton. This Committee had observed that in most of the cases the cotton growers were selling cotton to a village trader-cum-money lender, under whose financial obligation they were, at a price much below the ruling market rate and other agriculturalists were seriously handicapped in securing adequate price for their produce because of long chain of middleman in the marketing process. The Committee therefore, recommended that markets for cotton on Berar system should be established in other provinces having compact cotton tracts. This could be done by introduction of suitable provisions in the Municipal Acts or under a special regulation as in the case of Berar.

The Government of Bombay presidency was the first to implement this recommendation by enacting the Bombay Cotton Markets Act in 1927. This Act was an improvement over the Berar Cotton and Grain Markets Law of 1897 as it provided for representation to the growers on the market committee and also contained a provision for spending the surplus funds of the marketing committee, which should be transferred to the respective local bodies in whose jurisdiction the market was established in 1929 and the first regulated market was established under this Act at Dhulia during the year 1930-31.

The Royal Commission on Agriculture, in its report submitted in 1928, recommended the regulation of market practices and the establishment of regulated markets in India on the Berar pattern as modified by the Bombay Cotton Markets Act 1927, with special emphasis on the application of the scheme of regulation to all agricultural commodities instead of cotton alone. The Commission advised to include provisions for establishment of machinery in the form of Board of Arbitration for the settlement of disputes; prevention of brokers from acting for both buyers and sellers in the markets; adequate storage facilities in the market yards; standarisation of weights and measures under a single all pervading Provincial legislation. The Commission also recommended that the Provincial Governments should

take initiative in the establishment of regulated markets and grant loans to market committees for meeting initial expenditure on land and buildings. Its recommendations were subsequently endorsed by the Central Banking Enquiry Committee, 1931. This recommendation had an effect on the states as borne out from the fact that a number of states have enacted regulated markets Acts thereafter.

In the year 1930, the Hyderabad Agricultural Markets Act, largely modelled on the Bombay Agricultural Markets Act, 1927 was passed. The Central provinces (now Madhya Pradesh) came next with the 'Central Provinces Cotton market Act', 1932. In 1935, another law called Central Provinces Agricultural Produce Markets Act' was on lines of 'Central Provinces Cotton market Act' 1932. According to this Act, markets could be regulated for the sale and purchase of all kinds of agricultural produce other than cotton as the latter was already covered by the Cotton Markets Act of 1932. Market regulation was introduced in Madras (now Tamil Nadu) under the Madras Commercial Crops Markets Act, 1933 and the first regulated market was established in the State in 1936 at Tirupur in Coimbatore District.

In 1935, Government of India established the office of the Agricultural Marketing Adviser (Directorate of Marketing and Inspection) under the Ministry of Food and Agriculture to look into the problems of the marketing of agricultural produce. The Directorate recommended to the State Governments that markets be regulated to safeguard the interest of the producers and to remove prevalent malpractices in the markets. In 1938, the Directorate of Marketing and Inspection prepared a model Bill, on the lines of which several states drafted their own Bills. Since then, State Governments have enacted legislation for the regulations of markets in their states.

They are: the Hyderabad Agriculture Market Act, 1930; The Madras Commercial Crops Market Act, 1935. In 1939, the Government of Bombay enacted the Bombay Agricultural Produce Markets Act and made it applicable to all the agricultural commodities including cotton. As a result, the Cotton Market Act on 1927 was repealed and all the market committees set up under this Act were declared deemed to be the market committees under the new Act. In Mysore State (now Karnataka), the 'Mysore

Agricultural Produce Markets' Act was passed in 1939. However, the first regulated market at Tiptur could be established only about a decade later i.e. in November, 1948. The outbreak of the Second World War in September 1939 dislocated the normal economic activities in the country. Controls on food grains and other essential commodities were imposed and their free movement was restricted. The levy system for direct procurement of food grain from producers was resorted to and price control and statutory/informal rationing was introduced. As a result, very limited progress could be achieved in the field of regulation during the war period. Market regulation was introduced in the erstwhile Patiala State in January, 1948 under the Patiala Agricultural Produce Markets Act, 1947. The Government of Madhya Bharat passed the Madhya Bharat Agricultural Produce Markets Act in 1952. This was modeled mostly on lines of Bombay Act. All regulated wholesale markets which were governed by the previous laws of the respective merged states were declared as regulated under the new Act. In the mean time, Andhra Pradesh adopted Madras Act, Gujarat and Maharashtra States inherited the Bombay Act and Delhi and Tripura passed legislation on the lines of Bombay Model Act. The Agricultural Produce Market Acts, in force, in different states are given in the Table 1.1.

Regulation of markets for agricultural product was stressed by several Committees and Commissions from time to time. The important ones are the Banking Enquiry Committee, 1931; The Congress Agrarian Reforms Committee, 1947; The Rural Marketing Committee of the National Congress, 1948; The Planning Commission, 1958; The All India Rural Credit Committee, 1954, the Agricultural Production Team on Ford Foundation and the Task Force on Agricultural Marketing Reforms, 2001.

Source: Acharya & Agarwal, 2009:268-270; Rajagopal, 1993:31-34

Annex 1.A2: Number of Markets Regulated pre and post Independent Indian states, 1931- 2010

S.no	State	1931-40	1941-50	1951-60	1961-70	1971-70	1985	2008	2010
1.	Andhra Pradesh	10	35	86	123	525	568	891	901
2.	Assam	-	-	-	-	14	32	224	226
3.	Bihar*	-	-	-	144	438	798	526	0
4.	Gujarat	-	-	-	236	297	324	414	414
5.	Haryana	-	-	-	150	177	255	284	284
6.	Karnataka	5	23	72	168	318	372	498	501
7.	Madhya Pradesh	-	3	86	246	317	514	501	513
8.	Maharashtra	52	121	280	315	512	759	880	880
9.	Orissa	-	-	15	54	67	129	314	314
10.	Punjab	-	92	132	243	481	665	437	488
11.	Rajasthan	-	-	-	152	297	380	428	430
12.	Tamil Nadu	11	11	37	95	218	272	292	292
13.	Uttar Pradesh	-	-	-	132	617	630	587	605
14.	West Bengal	-	-	-	1	1	2	684	687

Note: The number for Gujarat is included in Maharashtra up to 1960; The number for Haryana is included in Punjab up to 1960; *until 2006

Source: Directorate of Agriculture Marketing and Inspection, Ministry of Agriculture, Government of India

Annex 1.A3: Status of the State Agricultural Marketing Departments, Agricultural Marketing Boards, Rate of Market Fee Charges and contribution to Marketing Boards by Market Committee in the States, 2006

S.no	State	Rate of Market fee (percentage ad valorem)	Contribution to Market Boards (%age of annual Income of Market Committees)	Whether separate Dte. Of Agricultural Marketing has been Established	Status of Agricultural Marketing Boards established
1.	Andhra Pradesh	1	Upto 30%	Yes	Advisory
2.	Assam	1	Upto 30%	No	Statutory
3.	Bihar	1 (until 2006)	10-25%	No	Statutory
4.	Gujarat	0.40 to 0.50	-	No	Statutory
5.	Haryana	2	20-30%	No	Statutory
6.	Karnataka	1	Upto 5%	Yes	Statutory
7.	Madhya Pradesh	0.50	5 %	Yes	Statutory
8.	Maharashtra	0.50 to 1	-	Yes	Statutory
9.	Orissa	0.25 to 1 on Agricultural Produce and 1 to 2 on Livestock	Not specified	No	Advisory
10.	Punjab	2	10-30%	Yes	Statutory
11.	Rajasthan	1.60	Upto 10%	Yes	Statutory
12.	Tamil Nadu	0.25 to 0.45	5%	Yes	Advisory until 1989, Statutory since 1991
13.	Uttar Pradesh	1	Upto 10%	Yes	Statutory
14.	West Bengal	1	Upto 20%	Yes	Statutory

Source: Marketing Statistics, National Institute of Agricultural Marketing, Ministry of agriculture, Government of India

Annex 1.A4: Normalisation of the Variables

S.no	Agricultural Regulatory Index	Normalisation approach for state size/comparison	Rational	Scaling 0-1	Data Source
1.	Area Covered by each regulated Market in sq kms	State Area in sq kms/Total regulated markets in the state	Larger the market area, less accessible (far from the production area/village)	(x-max)/(min-max)	Bulletin on Food Statistics, Dir. Of Economics & Statistics, Min. of Agriculture, Department of Agri & Cooperation
2.	Population served by each Market	Total state population/ total regulated markets	Larger the number of people, means lesser markets, higher traffic/congestion, poor service	(x-max)/(min-max)	Bulletin on Food Statistics, Dir. Of Economics & Statistics, Min. of Agriculture, Department of Agri & Cooperation
3.	No. of Grading Units available per 1000 sq.km.	(No. of Grading Units at Producers level/ Larea, Sq Kms) x 1000	More the number, the better it is	(x-min)/max-min	AGMARK Grading Statistics, Dir. Of Marketing & Inspection, Min. of Agriculture, Govt. of India
4.	No. of Grading Units available for per 1000MT production	(No. of Grading Units/ Total Agricultural Production) x 1000	More the number, the better it is	(x-min)/max-min	AGMARK Grading Statistics, Dir. Of Marketing & Inspection, Min. of Agriculture, Govt. of India
5.	No. of Central warehouse available per 1000 sq.km.	(No. of central warehouse/ Larea, Sq Kms) x 1000	More the number, the better it is	(x-min)/max-min	Agricultural Statistical Compendium, Vol I Foodgrains Part II P.C. Bansil
6.	Central Warehouse capacity available in tonnes for per 1000 MT production	(Central Warehouse capacity/ Total Agricultural Production) x 1000	More the number, the better it is	(x-min)/max-min	Agricultural Statistical Compendium, Vol I Foodgrains Part II P.C. Bansil
7.	No. of State warehouse available per 1000 sq.km.	No. of state warehouse/ Larea, Square Kms) x 1000	More the number, the better it is	(x-min)/max-min	Agricultural Statistical Compendium, Vol I Foodgrains Part II P.C. Bansil
8.	State Warehouse capacity available in tonnes for per 1000 MT production	(State Warehouse capacity/ Total Agricultural Production) x 1000	More the number, the better it is	(x-min)/max-min	Agricultural Statistical Compendium, Vol I Foodgrains Part II P.C. Bansil
9.	Storage available in thousand tonnes with FCI per 1000MT production	(FCI storage capacity/ Total Agricultural Production) x 1000	More the number, the better it is	(x-min)/max-min	Indian Agricultural in Brief, Min of Agriculture
10.	Storage available in thousand tonnes with FCI per 1000MT production with C.A.P	(FCI storage capacity with CAP/ Total Agricultural Production) x 1000	More the number, the better it is	(x-min)/max-min	Indian Agricultural in Brief, Min of Agriculture

Source: Author's calculations.

Annex 1.A5: Summary Statistics of all the variables used in the construction of APMC Index

Variable	Obs	Mean	Std. Dev.	Coefficient of Variation	Min	Max	Coefficient of Skewness	Type
Scope of the Regulated Market								
Population served by Each Market '000 population	546	.7889744	.2734242	0.346556	0	1	-1.21817	Continuous
Area Covered by Each Market SqKms	546	.7582234	.2830534	0.373311	0	1	-1.0787	Continuous
Infrastructure for Market Functions								
No. of Grading Units available per 1000 sq.km.	546	.2250916	.2677718	1.189613	0	1	1.177401	Continuous
No. of Grading Units available for per 1000MT production	546	.2627289	.2839584	1.080804	0	1	1.138148	Continuous
No. of Central warehouse available per 1000 sq.km.	546	.3057326	.300786	0.983821	0	1	1.054563	Continuous
Central Warehouse capacity available in tonnes for per 1000 MT production	546	.318315	.314602	0.988335	0	1	1.128235	Continuous
No. of State warehouse available per 1000 sq.km.	546	.1931319	.2941844	1.52323	0	1	1.051707	Continuous
State Warehouse capacity available in tonnes for per 1000 MT production	546	.3657875	.2901993	0.793355	0	1	0.78347	Continuous
FCI storage capacity '000tonnes	546	.3618864	.2995169	0.827654	0	1	0.820185	Continuous
Regulating Sales and Trading in Market								
Provision open- auction	546	.8772894	.3284056	0.374341	0	1	-1.12097	Binary
Payment to grower on same day of trading/sales	546	.6868132	.4642149	0.675897	0	1	-2.02398	Binary
Single Point levy in the market area	546	.2930403	.4555741	1.554647	0	1	1.929699	Binary
Sale-slip	546	.6336996	.4822347	0.760983	0	1	-2.27877	Binary
Provision of input shop in the Regulated market	546	.1153846	.3197785	2.771414	0	1	1.08248	Binary
Pro-Poor Regulation								
Minimum period for payment exist	546	.1391941	.3464664	2.489088	0	1	1.205261	Binary
Interest on delayed payment	546	.1172161	.3219726	2.746829	0	1	1.092168	Binary
Provision market stability	546	.2307692	.4217114	1.827416	0	1	1.641662	Binary
Constitution of Market and Market Structure								
Constitute market committee by election	546	.6428571	.4795968	0.74604	0	1	-2.23402	Binary
Agriculturalist as market committee Chairman	546	.2948718	.4564033	1.547802	0	1	1.938232	Binary
Elected market committee Chairman	546	.5457875	.4983557	0.913095	0	1	-2.73427	Binary
Clause to dismiss market committee chairman	546	.7161172	.4512941	0.630196	0	1	-1.88713	Binary
Clause to dismiss member of the market committee	546	.7435897	.4370513	0.587759	0	1	-1.76005	Binary
Legal Marketing Board Exist	546	.7234432	.4477055	0.618854	0	1	-1.85316	Binary
State Marketing Board website	543	.1197053	.324916	2.714299	0	1	1.105258	Binary
Channels of Market Expansion								
Single license for trade in State	546	.003663	.0604672	16.50756	0	1	0.181735	Binary
License for trade in more than one market area	546	.0677656	.2515737	3.71241	0	1	0.8081	Binary
Provision for setting private market yard	546	.0915751	.2886897	3.152491	0	1	0.951628	Binary
Rules to procure license for setting private market yard	546	.018315	.1342109	7.327922	0	1	0.409393	Binary
Provision for private consumer-farmers market	546	.2380952	.4263083	1.790495	0	1	1.675514	Binary
Rules for establishing Private consumer-farmers market	546	.2216117	.415712	1.875858	0	1	1.599268	Binary
Provision for direct procurement from farmers	546	.0641026	.2451602	3.824497	0	1	0.784417	Binary
Rules for direct procurement from farmers	546	.032967	.178714	5.420997	0	1	0.553404	Binary
Provision contract farming	546	.1282051	.3346246	2.610072	0	1	1.149393	Binary
Rules for contract farming	546	.1025641	.3036669	2.960752	0	1	1.013256	Binary
Provision Public-Private Partnership market function	546	.0347985	.1834373	5.271414	0	1	0.569107	Binary
State National Spot Exchange	546	.0128205	.1126027	8.783019	0	1	0.341568	Binary

Source: Author's calculations.

Annex 1.A6: Correlation Table of Scope of Regulated Markets

	Population served by Each Market '000 population	Area Covered by Each Market SqKms
Population served by Each Market '000 population	1.00	
Area Covered by Each Market SqKms	0.82*	1.00

*Source: Author's calculations. Please note *p<0.05*

Annex 1.A7: Correlation Table of Infrastructure for Market Functions (PCA)

	No. of Central warehouse available per 1000 sq.km.	Central Warehouse capacity available in tonnes for per 1000 MT production	No. of State warehouse available per 1000 sq.km.	State Warehouse capacity available in tonnes for per 1000 MT production	FCI storage capacity '000tonnes	No. of Grading Units available per 1000 sq.km.	No. of Grading Units available for per 1000MT production
No. of Central warehouse available per 1000 sq.km.	1.00						
Central Warehouse capacity available in tonnes for per 1000 MT production	0.12*	1.00					
No. of State warehouse available per 1000 sq.km.	0.67*	-0.18*	1.00				
State Warehouse capacity available in tonnes for per 1000 MT production	0.35*	0.07	0.63*	1.00			
FCI storage capacity '000tonnes	0.53*	0.36*	0.44*	0.54*	1.00		
No. of Grading Units available per 1000 sq.km.	0.64*	0.05	0.57*	0.37*	0.41*	1.00	
No. of Grading Units available for per 1000MT production	0.05	0.35*	-0.13*	0.06	0.12*	0.44*	1.00

*Source: Author's calculations. Please note *p<0.05*

Annex 1.A8: Tetrachoric Correlation Table of Regulating Sales and Trading in Market for binary variables

	Single Point levy in the market area	Provision open-auction	Payment to grower on same day of trading/sales	Provision of input shop in the Regulated market	Sale-slip
Single Point levy in the market area	1.00				
Provision open- auction	0.33*	1.00			
Payment to grower on same day of trading/sales	0.18*	0.60*	1.00		
Provision of input shop in the Regulated market	0.22*	0.76*	0.86*	1.00	
Sale-slip	0.09	0.81*	0.40*	0.35*	1.00

*Source: Author's calculations. Please note *p<0.05*

Annex 1.A9: Tetrachoric Correlation Table of Pro-Poor Regulations for binary variables

	Interest on delayed payment	Minimum period for payment exist	Provision market stability
Interest on delayed payment	1.00		
Minimum period for payment exist	0.98 *	1.00	
Provision market stability	0.37*	0.51*	1.00

*Source: Author's calculations. Please note *p<0.05*

Annex 1.A10: Tetrachoric Correlation Table of Constitution of Market and Market Structure for binary variables

	Constitute market committee by election	Agriculturalist as market committee Chairman#	Elected market committee Chairman	Clause to dismiss market committee chairman	Clause to dismiss member of the market committee	Legal Marketing Board Exist	State Marketing Board website
Constitute market committee by election	1.00						
Agriculturalist as market committee Chairman	-0.04	1.00					
Elected market committee Chairman	0.83*	0.41*	1.00				
Clause to dismiss market committee chairman	0.09	0.74*	0.61*	1.00			
Clause to dismiss member of the market committee	0.22*	-0.22*	0.31*	0.44*	1.00		
Legal Marketing Board Exist	0.05*	-0.02*	0.25*	0.32*	0.18	1.00	
State Marketing Board website	0.19*	0.30*	0.39*	0.53*	0.30*	0.43*	1.00

*Source: Author's calculations. Please note *p<0.05 #Negative correlation is plausible as State APMC Act draws a line between bestowing powers and misuse of those powers by the Marketing Committees. Generally, the State Government oversees the proper functioning of the Marketing Committees in the agricultural markets of the State.*

Annex 1.A11: Tetrachoric Correlation Table of Channels of Market Expansion for binary variables

	Single license for trade in State	License for trade in more than one market area	Provision for setting private market yard	Rules to procure license for setting private market yard	Provision for private consumer-farmers market	Rules for establishing Private consumer-farmers market	Provision for direct procurement from farmers	Rules for direct procurement from farmers	Provision contract farming	Rules for contract farming	Provision Public-Private Partnership market function	State National Spot Exchange
Single license for trade in State	1.00											
License for trade in more than one market area	0.77*	1.00										
Provision for setting private market yard	0.78*	0.83*	1.00									
Rules to procure license for setting private market yard	0.88*	0.70*	0.86*	1.00								
Provision for private consumer-farmers market	0.81*	0.52*	0.53*	0.57*	1.00							
Rules for establishing Private consumer-farmers market	0.76*	0.44*	0.41*	0.51*	0.92*	1.00						
Provision for direct procurement from farmers	0.82*	0.88*	0.86*	0.77*	0.66*	0.44*	1.00					
Rules for direct procurement from farmers	0.91*	0.82*	0.84*	0.77*	0.85*	0.79*	0.84*	1.00				
Provision contract farming	0.79*	0.61*	0.67*	0.86*	0.69*	0.56*	0.76*	0.67*	1.00			
Rules for contract farming	0.80*	0.50*	0.59*	0.86*	0.71*	0.70*	0.57*	0.66*	0.93*	1.00		
Provision Public-Private Partnership market function	0.74*	0.60*	0.58*	0.69*	0.29*	0.22*	0.64*	0.55*	0.43*	0.38*	1.00	
State National Spot Exchange	0.72*	0.85*	0.73*	0.77*	0.52*	0.34*	0.90*	0.68*	0.86*	0.67*	0.55*	1.00

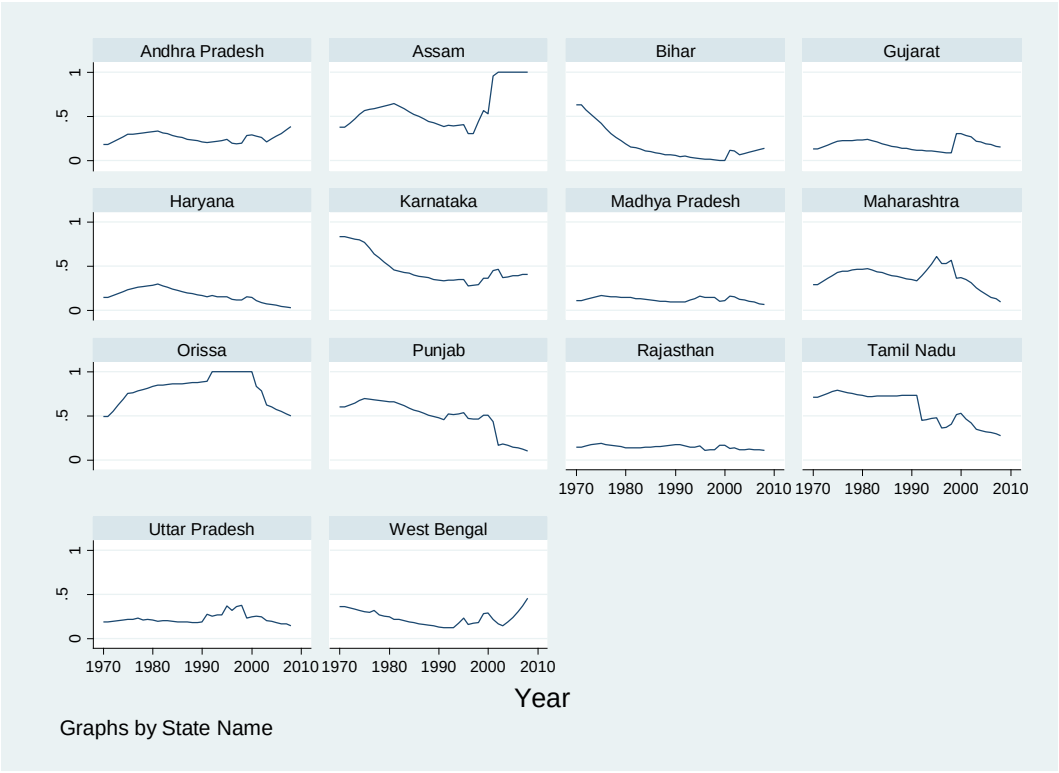
Source: Author's calculations. Please note *p<0.05

Annex 1.A12: APMC Rankings, 1970-2008

Year	AP	As	Bi	Guj	Har	Kar	MP	Mah	Ori	Pun	Raj	TN	UP	WB
1970	7	13	12	6	5	4	10	2	9	1	3	8	14	11
1971	7	14	13	6	3	5	9	2	10	1	4	11	12	8
1972	7	14	12	6	4	5	9	2	11	1	3	10	8	13
1973	6	14	13	7	3	5	9	4	12	1	2	11	8	10
1974	6	14	11	7	3	5	10	4	12	1	2	9	8	13
1975	6	14	8	7	5	3	9	4	12	1	2	10	11	13
1976	6	13	8	7	5	3	9	4	11	1	2	10	12	14
1977	7	11	8	6	3	4	9	5	13	2	1	12	10	14
1978	6	11	8	7	3	4	10	5	14	1	2	12	9	13
1979	6	11	8	7	3	4	10	5	14	1	2	12	9	13
1980	6	11	8	7	3	4	13	5	14	1	2	10	9	12
1981	6	11	8	7	3	5	13	4	14	1	2	12	10	9
1982	7	11	8	9	3	5	13	4	14	1	2	10	12	6
1983	6	11	8	9	3	5	12	4	14	1	2	10	13	7
1984	6	11	8	9	3	5	10	4	14	1	2	12	13	7
1985	7	10	9	6	3	5	12	4	14	1	2	11	13	8
1986	7	11	9	8	2	6	5	4	14	1	3	12	13	10
1987	8	11	9	7	2	6	5	4	13	1	3	12	14	10
1988	7	11	9	8	2	6	5	4	14	1	3	12	13	10
1989	7	11	9	8	2	6	5	4	14	1	3	13	12	10
1990	7	11	10	8	2	6	5	4	14	1	3	12	13	9
1991	8	12	11	9	2	6	5	3	14	1	4	7	13	10
1992	8	12	11	9	2	6	5	4	14	1	3	7	13	10
1993	8	12	11	9	2	7	5	4	14	1	3	6	13	10
1994	8	12	11	9	2	6	5	3	14	1	4	7	13	10
1995	8	12	11	9	2	6	5	3	14	1	4	7	13	10
1996	8	12	11	10	2	6	5	3	14	1	4	7	13	9
1997	8	12	11	10	4	6	3	2	14	1	5	7	13	9
1998	8	12	11	10	4	6	3	2	14	1	5	7	13	9
1999	8	12	11	9	4	7	3	2	14	1	5	6	13	10
2000	8	12	11	9	5	7	1	3	14	2	4	6	13	10
2001	8	12	11	10	5	7	1	2	14	3	4	6	13	9
2002	8	13	11	10	5	7	3	2	14	1	4	6	12	9
2003	8	14	11	10	5	7	3	2	13	1	4	6	12	9
2004	8	14	13	9	5	7	3	2	12	1	4	6	11	10
2005	6	9	13	11	4	8	5	3	14	1	2	7	12	10
2006	6	8	13	11	4	7	5	3	14	1	2	9	12	10
2007	7	9	14	11	5	4	6	1	12	2	3	8	13	10
2008	7	9	14	11	5	2	6	1	12	4	3	8	13	10
Rank change	0	+4	-2	-5	0	+2	+4	+1	-3	-3	0	0	+1	+1

** AP: Andhra Pradesh; Assa: Assam; Bih: Bihar; Guj: Gujarat; Har: Haryana; Kar: Karnataka; MP: Madhya Pradesh; Maha: Maharashtra; Ori: Orissa; Pun: Punjab; Raj: Rajasthan; TN: Tamil Nadu; UP: Uttar Pradesh; WB: West Bengal*

Annex 1.A13: Seventh APMC sub-dimension: Roads Linking Markets[36]



Source: Author's calculations.

[36] A 7th dimension 'Market Linking' was also considered in index construction. It covered length of roads (kms) in the state to proxy for villages connected with the regulated markets but later it was decided to not to add the indicator in the composite index. It was dropped because although State Agricultural Boards and marketing committees in the states are legally responsible to build small patches of roads officially termed as 'linking roads' to connect villages to the agricultural market area, the actual variables on 'linking roads' is not available. In each state Public Works Department (PWD) department is responsible to construct roads and other public infrastructure. Using the data on length of roads in Kms does not capture the correct intent of the APMC Act. The existing marketing literature informs that existing infrastructure in the states are far from adequate. Nearly half of the villages are still not connected by roads (time-series data is not available). The studies at IFPRI finds that investment in rural roads, both in terms of reduction of poverty and acceleration in economic growth are the highest compared to that in other rural development activities like irrigation, watershed development and education (cited in Acharya, 2006). I show the trends in index of 'market linking' measured by (i) Road density (construction/length of roads in the area of per thousand sq kms): It provides the intuition of connectivity of villages to available regulated markets and also points towards progress to achieve the concept of single national market ; (ii) Road length in kms per thousand people/population: It provides intuition for the adequacy of road in the state to serve the population efficiently. It may proxy for level of traffic or congestion on the road that may lead to undue delays in the disposal of the farm produce resulting in long-waiting period and low returns. I do not use it in the APMC index.

Annex 1.A14: Map of India, showing States and Union Territories

Source: http://www.mapsofindia.com/maps/india/indiastateandunion.htm#