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MTID Discussion Paper No. 82

Agricultural Policies in India: Producer Support Estimates 1985-2002

Kathleen Mullen, David Orden and Ashok Gulati

2033 K Street, NW, Washington, DC 20006-1002 USA • Tel.: +1-202-862-5600 • Fax: +1-202-467-4439 • ifpri@cgiar.org
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We have also benefited from discussion at presentations of parts of this paper at the international conference on "Globalization, Market Integration, Agricultural Support Policy and Smallholders," Nanjing, November 8-9, 2004; the annual meeting of the American Agricultural Economics Association, Denver, August 1-3, 2004; a seminar at ERS, USDA, Washington D.C., January 29, 2004; the CAAS-IFPRI Conference on "The Dragon and the Elephant: Rural Development and Agricultural Reform Experiences in China and India," Beijing, November 10–11, 2003, and a workshop at FAO, Rome, October 23, 2003.

SUMMARY

Since the early 1990s, India has undergone substantial economic policy reform and economic growth. Though reforms in agricultural policy have lagged those in other sectors, they have nonetheless created a somewhat more open economic orientation. In this study, we evaluate the protection and support versus disprotection of agriculture in India. Our methodology involves examining market price support (MPS) for eleven crops, the expenditures on input subsidies benefiting farmers (for fertilizer, electricity and irrigation), and product-specific and total producer support estimates (PSEs) over the period 1985-2002. We draw on the extensive price-comparison and subsidy-measurement data sets and analysis developed earlier by Gulati and his co-authors, often using disaggregated analysis for representative surplus and deficit states. This allows us to explore how key cost adjustments impact the results.

Overall, our results indicate that support for agriculture in India has been counter-cyclical. Support for agriculture has been rising when world prices are low (as in the mid 1980s and 1998-2002) and falling when world prices are high (as in the early and mid 1990s). Our results demonstrate the increased importance of budgetary payments for input subsidies in agriculture in recent years. Yet, in the aggregate for both price support and budgetary expenditures over the period 1985-2002 the counter-cyclical dimension of agricultural policy dominates a clear trend of movement from disprotection towards protection.

Using different variants of MPS and PSE measurment we have extended earlier analysis to demonstrate the impact of key assumptions on the calculations. These assumptions we argue are important to consider. For example, in the standard approach, the MPS for the covered commodities is "scaled up" based on the share of the covered commodities in the total value of production. If the commodity coverage is less than complete, as is often the case, the scaling up procedure leads to a total MPS of greater absolute value than the MPS for the covered commodities. This can result in PSEs of different sign than the non-scaled up version but is inappropriate unless market price support for the commodities not covered is similar to that of the covered commodities.

Furthermore, we find that the standard procedure of computing the MPS through a comparison of the domestic price to an adjusted reference price based on observed imports or exports can be problematic. This happens when trade volumes are relatively small. In such a scenario a reference price based on observed imports or exports can lead to misleading conclusions. To address the reference price issue, we follow Byerlee and Morris (1993). Essentially the approach adopted is to compute the level of protection or disprotection based on a counterfactual reference price chosen on economic criteria i.e. the adjusted reference price that would exist in the country if the policy interventions were removed. The relevant price can either be the autarky equilibrium price or the import or export adjusted reference price depending on the relationship among these prices. We apply this modified procedure for six crops (wheat, rice, corn, sorghum, sugar and groundnuts). The choice of the crops is dictated by the fact that India has been near self-sufficiency and there have been changes in the direction of trade over the period of analysis.

The magnitudes of estimated support for agriculture obtained in this paper are important for several reasons. The estimates confirm that high levels of subsidies were required for India to export wheat or rice in recent years, a conclusion reached by several other studies. However, we report less disprotection of Indian agriculture in the 1990s than in earlier studies. Partly this difference is explained by the modified procedure for choice of a reference price. A large component of this difference can be accounted for by whether or not the scaling up procedure is invoked.

There are also fertile areas for future research. Estimates of adjustment costs used in domestic-to-border price comparisons, such as transportation and processing costs or marketing margins, are crucial variables in the analysis and merit being re-examined and further updated. Resolving what are the most reasonable assumptions about reference prices, or extending the analysis to additional crops and livestock to reduce uncertainty in future assessments will also contribute to fuller understanding of the net stance of policy toward agriculture and how it has evolved over time.

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ACRONYMS

General

AMS	Aggregate Measure of Support
CVD	Countervailing Duty
CSE	Consumer Support Estimate
EPC	Effective Protection Coefficient
ESC	Effective Subsidy Coefficient
EU	European Union
GSSE	General Services Support Estimate
IFS	International Financial Statistics
MT	Metric Tons
MMT	Million Metric Tons
MPS	Market Price Support
NPC	Nominal Protection Coefficient
NRP	Nominal Rate of Protection
OECD	Organization for Economic Cooperation and Development
PPP	Purchasing Power Parity
PSE	Producer Support Estimate
QR	Quantitative Restriction
SAD	Special Additional Duties
STE	State Owned Enterprise
TRQ	Tariff Rate Quota
UHT	Ultra Heat Treated
URAA	Uruguay Round Agreement on Agriculture
WTO	World Trade Organization

India

AIBP	Accelerated Irrigation Benefit Program
APEDA	Agricultural and Processed Foods Products Development Authority
AEZ	Agricultural Export Zone
BPL	Below Poverty Line
CACP	Commission for Agricultural Costs and Prices
CCI	Cotton Corporation of India
CLA	Central Loan Assistance
EXIM	Export Import
FCI	Food Corporation of India
GOI	Government of India
HPS	Hand Picked Select
KCC	Kissan Credit Card
MIS	Market Intervention Scheme

MEP	Minimum Export Price
MMPO	Milk and Milk Products Order
MSP	Minimum Support Price
NABARD	National Bank for Agriculture and Rural Development
PDS	Public Distribution System
RIDF	Rural Infrastructure Development Fund
RPS	Retention Price System
SAP	State Advised Price
SEB	State Electricity Board
SDF	Sugar Development Fund
SMP	Statutory Minimum Price
STC	State Trading Corporation
TRV	Tariff Rate Value

AGRICULTURAL POLICIES IN INDIA: PRODUCER SUPPORT ESTIMATES 1985-2002

Kathleen Mullen, David Orden and Ashok Gulati[1]

1. INTRODUCTION

Governments intervene in agricultural markets with trade and domestic support policies in developed as well as in developing countries though the nature and the degree of distortions differ substantially. The support to agriculture in developed countries came under sharp focus under the Uruguay Round Agreement on Agriculture (URAA) of the World Trade Organization (WTO) and due to the work by the Organization for Economic Cooperation and Development (OECD). The work by OECD reported high market price support (MPS) and producer support estimates (PSEs) for the developed and some emerging transition economies. There are however few such estimates available about support provided by the developing countries especially post Uruguay round.

In a seminal work, Schiff and Valdes (1992) studied agricultural policy distortions in 18 developing countries over the period 1960-1985. Their findings, based on a partial equilibrium framework, revealed that developing countries had inflicted substantial implicit taxation on their agricultural sectors through their restrictive trade, pricing and exchange rate policies. The implication was that the policies of developing countries had restricted the growth rates of agriculture. The effect of removing these distortions was estimated to be substantial. In particular, the growth rates in agriculture in the developing countries was expected to double if the distortions were removed (Schiff and Valdes, 1992).

Since the mid 1980s, much of the developing world has undertaken major policy reforms affecting agricultural pricing and exchange rates. Moreover, URAA has enforced

[1] The authors are, respectively, former Senior Research Assistant, Senior Research Fellow (d.orden@cgiar.org), and Director (a.gulati@cgiar.org) in the Markets, Trade and Institutions Division, International Food Policy Research Institute (MTID/IFPRI), Washington, D.C.

several disciplines on the agricultural trade policies in the developing countries. With rising membership of the developing countries in the WTO, including such large economies as India and China, it is becoming increasingly important to know the structure of farm support or taxation in these countries. The importance of such assessments is exemplified by the highly confrontational views on the agricultural policies of developing and developed countries that has complicated progress in the ongoing Doha Development Round of WTO negotiations launched in 2001.

This study on India is a part of a larger project to compute PSEs in agriculture for selected Asian developing countries, using a common approach. We draw on the OECD's approach to the measurement but make important modifications to apply in case of a developing country.[2] In the context of India, an issue that has dominated the discussions is whether agriculture as a whole has gone from being taxed to being subsidized. Input subsidies in the 1990s have risen to a hefty 8.5 percent of agricultural GDP. Indian grain surpluses have also burgeoned in recent years (2001-2002). When world prices of farm commodities fell during 1998-2002, in part due to farm subsidy and protection policies worldwide, India found it difficult to export some crops without subsidies.

In our analysis, MPS and PSEs have been computed from 1985 to 2002 for 11 commodities: cereals (wheat (through 2003), rice, corn, and sorghum), sugar, oilseeds (groundnut, rapeseed, soybean, and sunflower), pulses (chickpeas), and cotton. These crops accounted for an average of 45 percent of the total value of agricultural production in India during 1985-2002. We find that the level of protection or disprotection has a counter-cyclical characteristic for specific crops and in the aggregate. The total PSE is positive when world prices are low (as in the late 1980s and 1990s) and negative when world prices are high (as in the mid 1990s). We also find significant variations in the magnitude of protection or disprotection across commodities and for each commodity over time.

[2] Related papers are Mullen et al. (2004), Thomas and Orden (2004), Hoa and Grote (2004), and Cheng and Orden (2004).

The rest of this paper is organized as follows. In section 2 we provide a brief overview of the general economic situation in India since the mid-1980s and describe the place of the agricultural sector. We also review India's international trade and domestic policy regimes for agriculture with reference to URAA commitments. In Section 3 we describe our approach to PSE measurement and in Section 4 we review past studies of agricultural protection in India. In Sections 5 and 6 we discuss product-specific MPS and PSE results and present some discussion of the dairy and poultry sectors. Sections 7 and 8 present our estimates of the total PSE for India and a summary and conclusions, respectively.

2. ECONOMIC AND POLICY BACKGROUND

2.1 OVERVIEW

In recent decades economic growth and living standards have improved in India. Many social indicators demonstrate improvements, such as lower levels of poverty and increased levels of education. India's per capita GDP has doubled over the last two decades. The middle class with annual incomes of more than $13,750 adjusted for purchasing power parity (PPP) includes over 15 percent of the population and is the fastest growing income group (Landes and Gulati, 2003).[3] The percentage of the population living in urban areas has increased from 23 percent in 1980 to 28 percent in 2001, and is projected to reach 41 percent by 2030 (Pingali and Khwaja, 2004). The proportion of people living on less than $1 per day decreased from 46 percent in the early 1990s to 35 percent in 2002. Yet, progress in other areas, such as increasing employment in rural areas, has been slow (World Bank, 2003a). Thirty percent of the rural population, and 25 percent of the urban population lives below the poverty line (World Bank, 2003b). Aggregate indicators at the all-India level mask regional inequalities, with poverty particularly acute in the heavily populated northern and eastern states (World Bank, 2003a).

India's GDP grew more strongly in the 1980s than during the 1970s (see Figure 1). GDP has subsequently registered impressive growth in the 1990s after an economic crisis in 1991 stimulated significant economic reforms.[4] During the height of the economic crisis in 1991, India's holdings of foreign reserves fell to about $1 billion, equal to the value of just two weeks of imports (Joshi and Little, 1995). Following the crisis, India launched reforms that included reductions in the central government fiscal deficit, substantial liberalization and deregulation of the industrial sector, trade policy

[3] Throughout this report, figures in dollars ($) refer to U.S. currency.

[4] Some contend that the 1980s growth, depending on how one defines the "1980s" and "1990s," was on average higher, although more variable, than during the 1990s, but also unsustainable (Panagariya, 2004; Ahluwalia, 2002). Rodrik and Subramanian (2004) attribute the pick-up in the economy in the 1980s, a full decade before the 1991 reforms, to an attitudinal shift in the national government in favor of private business.

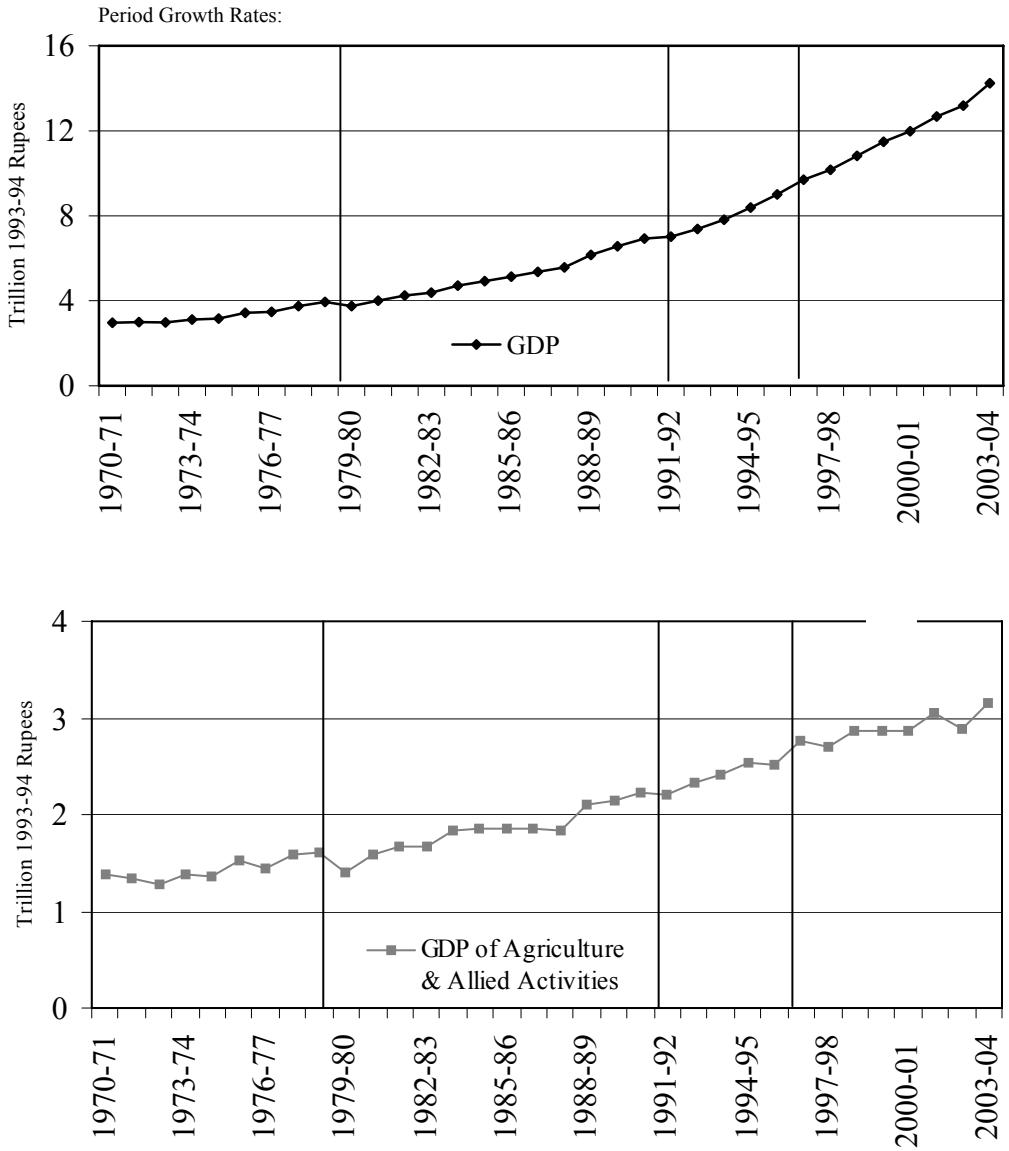
reforms, devaluation and floating of the rupee, reforms of the tax system, and measures to strengthen and to improve monitoring of the financial system (Ahluwalia, 2002). Subsequently, in the period 1992-93 to 1996-97, GDP grew at a rate of 7.1 percent. In 1997-98 to 2003-04, GDP grew at 5.5 percent, a slight slowdown from the period immediately following reforms brought on, among other factors, by a slowdown in public sector investments, falling world prices of most agricultural products, and the poor monsoon rains, especially in 2002-03.

Despite the past two decades of growth, India has lagged some of its neighbors in economic performance. India's per capita GDP was roughly equal to that of China and Indonesia in 1970 ($213 in real 1995 value). By 2000, its per capita GDP ($477 real 1995 value) was less than half that achieved by China ($878) and Indonesia ($1,034) (World Bank, 2003a). Indian exports during the decade of the 1990s grew at an annual rate of 10.1 percent, compared to 7.4 percent during the 1980s (Joshi et al., 2003). Yet, despite India's increasing integration into the global economy, it ranks 61st out of 62 countries, ahead of only Iran, in the 2004 A.T. Kearney/Foreign Policy Globalization Index (Foreign Policy, 2004).[5]

Although agriculture benefited indirectly from the exchange rate devaluation and liberalization of the industrial sector, direct reforms in the agriculture sector following the 1991 crisis were notably absent (Pursell and Gulati, 1995). Agriculture grew more slowly than the other sectors both in the decades before and after the 1991 reforms, leading to a significant change in the structure of the economy (Figure 1). Between 1980 and 2003, agriculture declined from 38 percent to 22 percent of total GDP (Government of India (GOI), 2004). Following reforms, growth has been strongest in the services sector, yet agriculture still employs nearly sixty percent of the total work force (World Bank, 2003b).

[5] The Globalization Index is based on 14 variables grouped into four categories: economic integration, technology, political engagement and personal contact.

Figure 1—Real Growth of GDP and GDP of Agriculture and Allied Activities at Factor Cost, 1970/71-2003/04



Note: Growth rates are logarithmic trends. The average growth rates GDP and GDP of Agriculture and Allied Activities from 1992-93 to 2003-04 are 6.1% and 2.5%, respectively.
Source: GOI, 2004

2.2 A CHANGING AGRICULTURAL SECTOR

Traditional crops and livestock products remain dominant in Indian agriculture, but the output mix is changing rapidly. Table 1 gives levels of production of India's top ten agricultural products in 2003 (ranked by value of production at international commodity prices). For eight of the ten products, India is also the first or second largest producer in the world. It ranks lower only for indigenous cattle meat (ninth in the world) and cotton lint (third in the world).

Table 1—Production of Major Agricultural Commodities in India, 2003

Rank in Domestic Production	Rank in World	Product	Production (MT)
1	2	Rice, Paddy	132,013,000
2	1	Buffalo Milk	47,850,000
3	2	Wheat	65,129,300
4	2	Cow Milk, Whole, Fresh	36,500,000
5	2	Vegetables Fresh nes	37,000,000
6	2	Sugar Cane	289,630,016
7	2	Groundnuts in Shell	7,500,000
8	1	Chick-Peas	4,130,000
9	9	Indigenous Cattle Meat	1,489,929
10	3	Cotton Lint	2,100,000

Note: Ranked in terms of value of production at international commodity prices.
Source: FAO (2004).

While the growth rates for the entire agricultural sector has been relatively constant in the 1980s and 1990s, the composition of the production mix has changed in favor of high-value commodities (Joshi and Gulati, 2003). During the 1990s, high-value agriculture, defined as fruits and vegetables, dairy, poultry, eggs, meat and fishery, grew by more than double the rate registered by the cereal sector. The growth rates measured as the value of output (as distinct from that of agricultural GDP) for fruits and vegetable, in particular, increased at a rate of over six percent per year during the 1990s (Figure 2). Thus, Indian agriculture is undergoing a significant structural transformation from a

cereal led growth to high-value led growth, which is being driven by increased domestic and export demand for non-cereals and improved supply capacity for the high-value products.

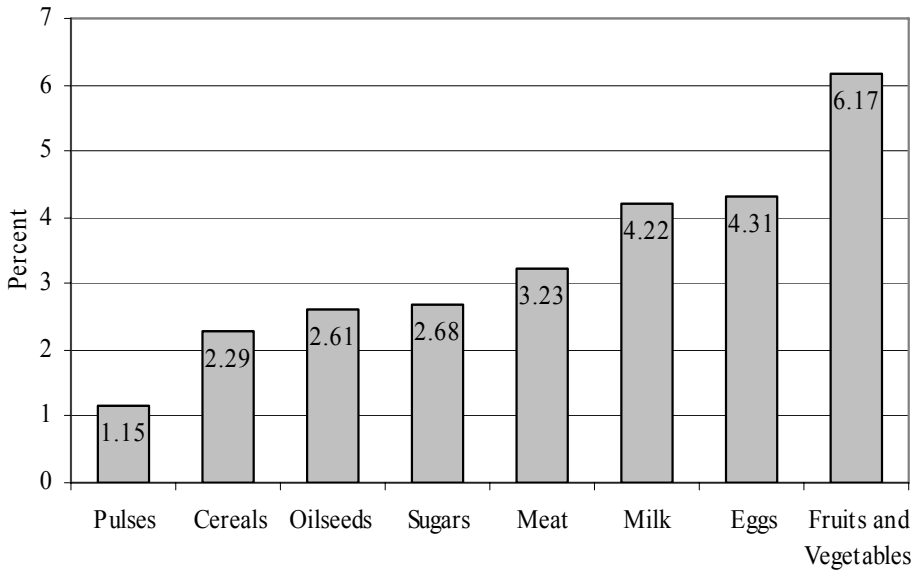
Within India, rising incomes, urbanization, changing relative prices of cereals and non-cereal foods, are leading to diet diversification away from cereals and towards high-value agriculture. Preferences are shifting toward high-value products at all income levels. Growth in demand for staple foods, such as wheat, rice, and coarse grains, which have been the focus of agricultural development policy, institutions and public spending, has slowed (Landes and Gulati, 2003). By contrast, demand for other foods, including fruits, vegetables, fats, and livestock products are now showing relatively high, even accelerating, growth (Figure 3).

The exports of agricultural commodities during the 1990s grew at an annual rate of 8.1 percent, compared to an annual rate of 3.3 percent during the 1980s. Although the share of agriculture in total exports declined from 24 percent during the 1980s to 18 percent in the 1990s, the diversification in agricultural production has promoted exports of many non-traditional items. Historically, there were virtually no exports of fruits and vegetables or livestock and fish products. The export shipments of these commodities more than doubled during the 1990s (Figure 4). However, compared to countries such as China, India has not experienced as much of a shift in the composition of exports from land-intensive bulk commodities to labor-intensive products that might be competitive in a smallholder dominated agricultural system. In India's top export products, the traditional commodities are still dominant with the exception of fish that has reached a value as high as the 10th-ranked agricultural exports of castor bean oil (see Figure 4 and Table 2). Overall, exports of basic agricultural commodities in 2002 were only a small proportion of domestic production (for example, negligible amounts of rice or buffalo meat, but 5.6 percent of wheat, among the top ten commodities in production and exports).

Agricultural imports make up a relatively small portion of total merchandise trade. In the period 1996/97 to 1999/2000, agriculture accounted for 4 to 7 percent of

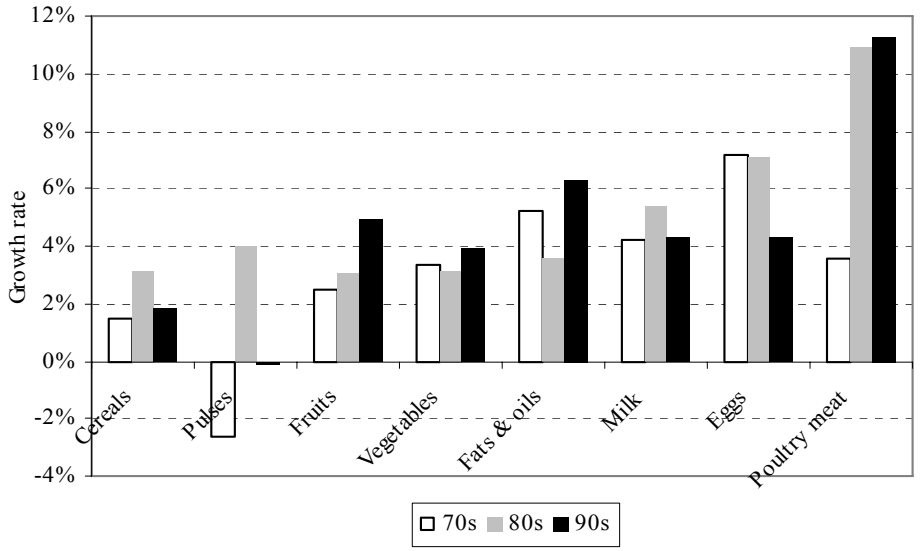
merchandise imports (WTO, 2002). Palm oil and soybean oil are India's top agricultural imports, and India is also the world's largest importer of these products (Table 3). In recent years edible oil imports have accounted for over 50 percent of the total value of India's agricultural imports. Cashew nuts, the 3rd ranked import, account for about ten percent of the total agricultural import value.

Figure 2—Growth in Value of High-Value Agricultural Output, 1990-2000



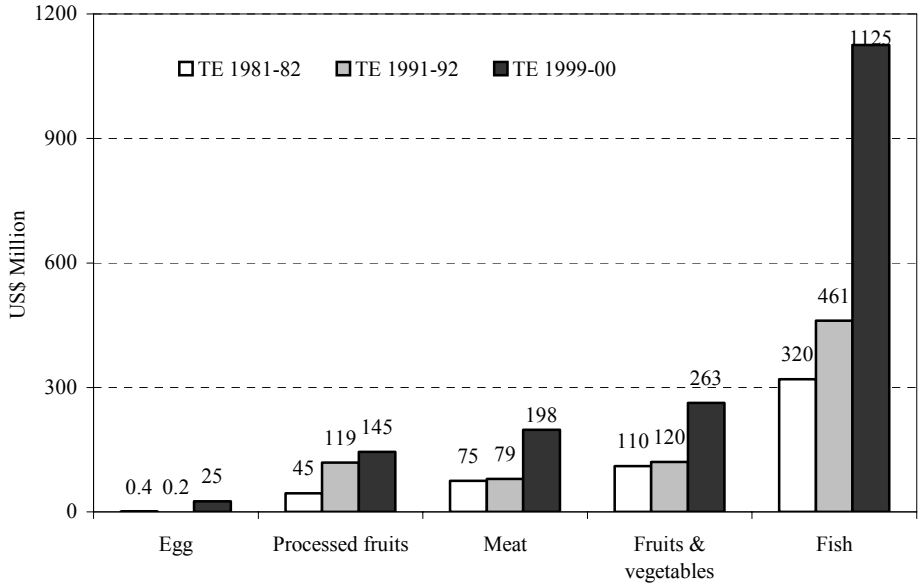
Source: Gulati and Bathla (2002).

Figure 3—Growth in Food Consumption, 1970s, 1980s and 1990s



Source: Landes and Gulati (2003)

Figure 4—Exports of Non-Traditional Crops, 1980s and 1990s



Note: TE is triennium ending.
Source: Joshi and Gulati (2003).

Table 2—Exports of Major Agricultural Commodities by India, 2002

Rank among India's Exports	Rank in World	Product	Quantity (MT)	Value (1,000 US$)	Unit Value (US$)
1	2	Milled Paddy Rice	4,968,813	1,202,408	242
2	1	Cáshew Nuts Shelled	122,064	396,790	3,251
3	10	Wheat	3,671,254	361,917	99
4	3	Tea	181,617	326,629	1,798
5	5	Sugar Refined	1,469,875	322,235	219
6	7	Cake of Soya Beans	1,440,805	274,796	191
7	1	Buffalo Meat	292,163	263,703	903
8	11	Tobacco Leaves	101,164	151,844	1,501
9	12	Coffee, Green	164,689	142,590	866
10	1	Oil of Castor Beans	143,643	100,979	703

Note: Ranked in terms of value of trade at international commodity prices.
Source: FAO (2004).

Table 3—Imports of Major Agricultural Commodities by India, 2002

Rank among India's Imports	Rank in World	Product	Quantity (MT)	Value (1,000 US$)	Unit Value (US$)
1	1	Oil of Palm	3,052,625	1,211,810	397
2	1	Oil of Soya Beans	1,196,535	540,146	451
3	1	Cashew Nuts	402,982	254,233	631
4	7	Cotton Lint	230,801	252,985	1,096
5	1	Pulses nes	761,310	242,326	318
6	1	Peas, Dry	869,803	197,979	228
7	1	Silk, Raw and Waste	9,054	133,087	14,699
8	5	Fatty Acids Oils	272,481	90,826	333
9	5	Wool, Greasy	28,675	86,658	3,022
10	4	Wool, Scoured	44,983	78,238	1,739

Note: Ranked in terms of value of trade at international commodity prices.
Source: FAO (2004).

2.3 AGRICULTURAL TRADE AND DOMESTIC POLICIES[6]

Indian agricultural policy has long been characterized by border and domestic interventions aimed at protecting farmers from international price volatility. To achieve this goal the Government of India (GOI) has at various times implemented myriad policies including tariffs, quantitative import restrictions (QRs), import licensing, domestic marketing controls, and export restrictions. These controls have been implemented with a view toward the balance of domestic demand and supply, export potential, and the national balance-of-payment situation (WTO, 2002). There were sweeping reforms in exchange rate policies and a marked decline in industrial protection in 1991, but it was not until later in the decade that direct reforms began in agriculture. Agricultural reforms started at the border, with the opening up of rice exports in 1994. In comparison, the reforms in the arena of domestic policy have been slow. These reforms have been to a large extent a consequence of unilateral policy initiatives rather than the results of reduction commitments required under the WTO (Hoda and Gulati, 2005).

2.4 TRADE POLICIES

The economic reforms introduced in 1991 initiated a partial liberalization of India's trade regime, mainly because the progress in phasing out QRs on consumer products, including agricultural products, was slow. Except for the liberalization of import licensing on sugar and cotton in 1994, the same year that exports of rice were opened up, most agricultural products remained subject to import controls. India's import policy reform did not begin in earnest until the abolition of QRs was required under the WTO in 2001. Export controls in agriculture were also slow to be removed.

2.4.1 Import Policy

The most important import policy features to occur are removal of QRs and the binding of tariffs at high rates. In 1997, with considerable improvement in its post-crisis

[6] This section draws heavily on Hoda and Gulati (2005).

balance-of-payments situation, India agreed to phase out its QRs over a nine-year period. Under a dispute settlement ruling by the WTO Appellate Body, India then had to accelerate lifting these measures to April 2001.[7] To alley fears of a surge in imports when the QRs were abolished, the GOI trade policy (GOI, 2001d) provided for a ministerial-level standing group that was to function as a "war-room" tracking and analyzing information about imports of 300 sensitive items, of which over two-thirds were agricultural products. The GOI also explored options that would permit the imposition of temporary QRs to stem any import surges. Removal of QRs increased attention to enforcement of existing legislation concerning bio-security and sanitary and phytosanitary permits and other packaging and labeling requirements for imports of agricultural commodities.[8] Strict enforcement of the non-tariff protection measures was perceived as one mechanism that would allay the risk of a sharp rise of imports (Hoda and Gulati, 2005).

Following the 1991 economic reforms, India also progressively trimmed the list of products that were canalized (directed to state-owned enterprises) for import. However, as late as 2002, imports of a few critical commodities continue to be controlled by State Trading Enterprises (STEs). The EXIM policy for 2002-2007 imposed further reform by retaining import monopolies only in respect of copra and coconut oil (State Trading Corporation, STC) and some cereals (Food Corporation of India, FCI).[9]

Tariff Bindings and Applied Tariffs

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[7] See Hoda and Gulati (2005) for further discussion of these developments.

[8] Among existing legislation, import of primary products of plant and animal origin are subject to "Bio Security and Sanitary and Phytosanitary Permits" issued by the Ministry of Agriculture under the conditions set out in *Plants, Fruits and Seeds (Regulation of Import into India) Order, 1989*. Imports of meat and poultry products are subject to the conditions regarding manufacture, slaughter, packing, labeling and quality in the Meat Food Products Order, 1973. Imports of food products, whose domestic manufacture and sale are governed by Prevention of Food Adulteration Act, 1954, are subject to all of its conditions. Import of these products must also comply with the quality and packaging requirements of the Standards of Weights and Measures (packaged commodities) Rules, 1977.

[9] Use of import monopolies is consistent with Article XVII of GATT 1994 as long as the agencies that have been granted these monopolies have a free hand in importing the canalized products. Since import tariffs for the canalized products remained high in general, imports had not been taking place until the end of 2002.

India adopted a modified tariff schedule on March 15, 2000. The tariff bindings, subsequent to revision in 1996 and renegotiations within the WTO in 1999, retain the overall structure notified after the Uruguay Round: 100 percent for commodities, 150 percent for processed products and 300 percent for edible oils. Departures from this pattern are mainly with respect of tariff lines that were negotiated as special cases.[10]

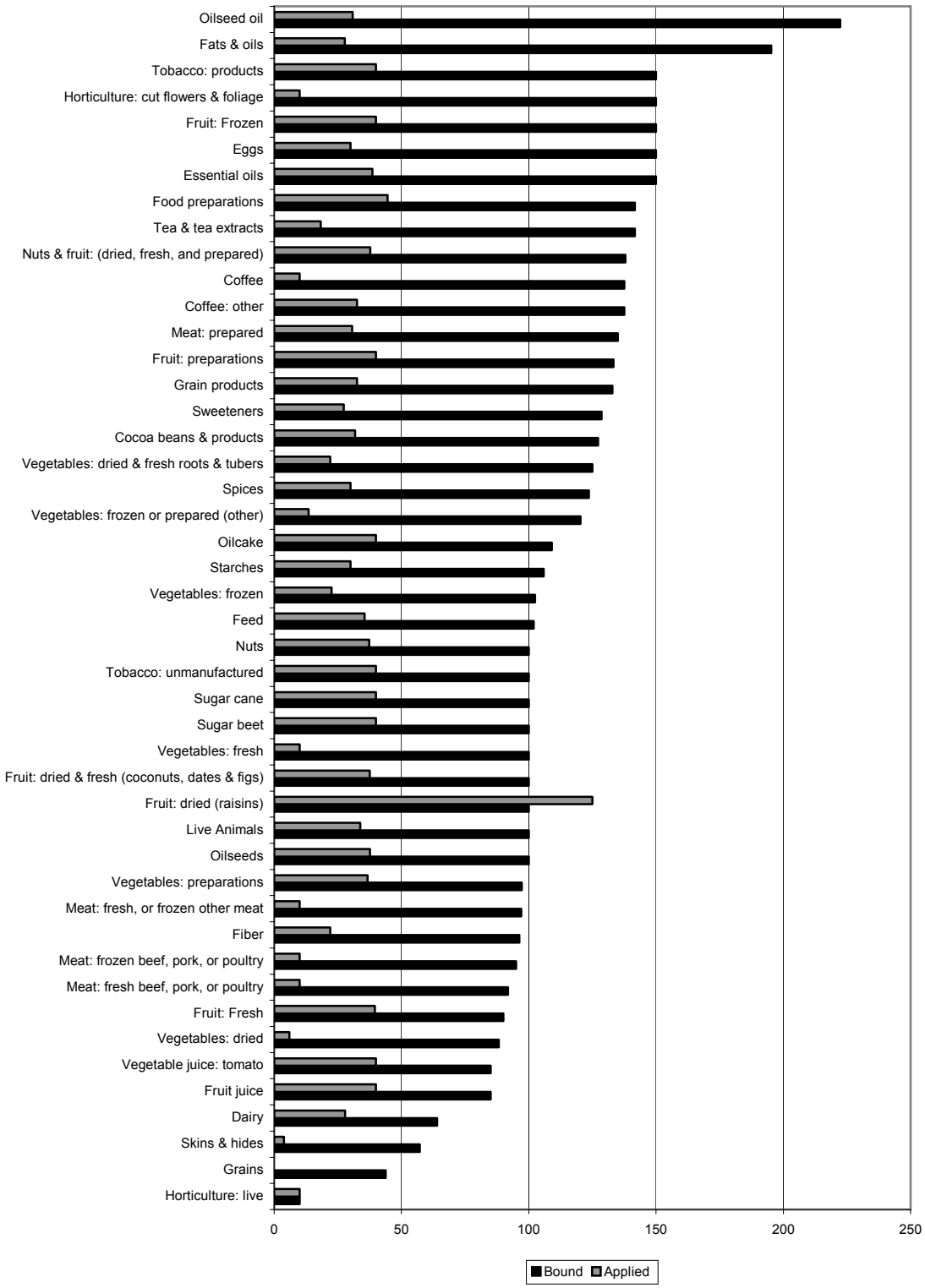
Figure 5 shows average bound tariff and applied tariffs (in 1997) for 46 agricultural commodity groups. Of these, 33 have average bound tariffs at or above 100 percent. For 7 of these groups, the average bound tariffs are 150 percent or higher.

An important feature of India's post Uruguay Round tariff structure is a wide gap that often exists between the bound and applied levels, as shown in Figure 5. Against the simple average bound tariff rate of 115 percent, the average applied rate of basic customs duty (as of April 1, 2002) was 35 percent (Hoda and Gulati, 2005). The WTO reports the simple average applied tariff on agriculture as 41 percent in 2001-02 and 37.5 percent in 2002-03 (WTO, 2002). The WTO figures are slightly higher because they may include special additional duties (SAD) (WTO, 2002). The large gaps between bound and applied rates has two key implications. First, protection levels (even if prohibitive at the applied rates) are not as high as the bound rates. Second, policymakers have room for tariff adjustments as an instrument of agricultural policy within the WTO bound rates.

Even with the various import policy changes implemented subsequent to 1991, agricultural imports remain quite low—less than $2 billion for cereals, cereal preparations, edible oils, pulses, sugar and cashew nuts (see Figure 6). After 1993-94, imports of major agricultural products increase, especially after world commodity prices fell in 1997-98, and the value of imports doubles by 1998-99. Then, in 1998-99, tariff levels sharply rise and imports fall.

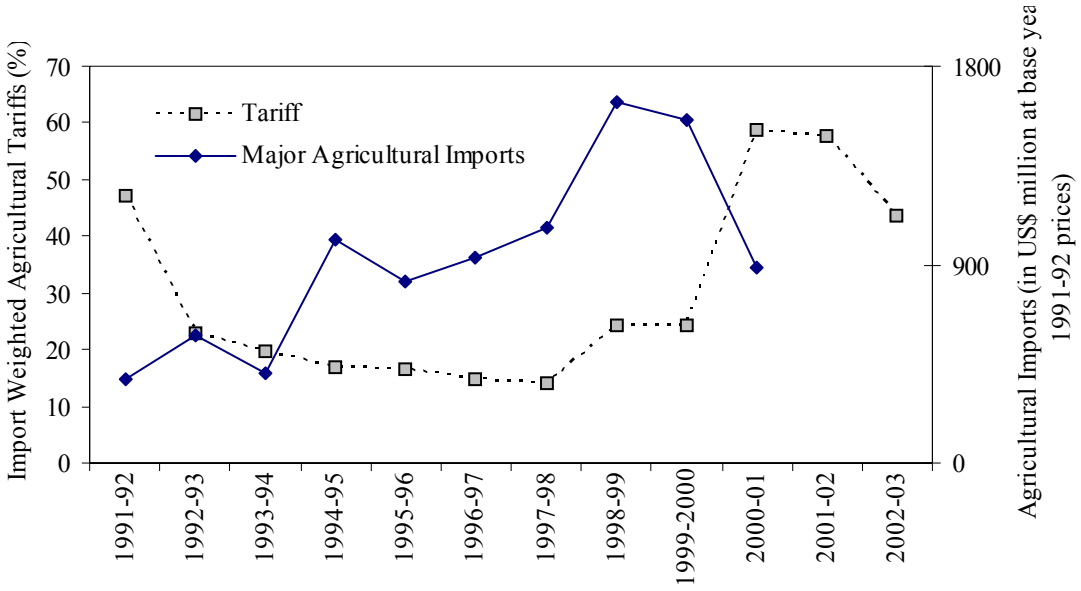
[10] In anticipation of the phasing out of QRs, in 1999 India renegotiated bound rates for some critical commodities. Among these items, lower bound rates apply to certain meats (35 percent), certain dairy products (40-60 percent), certain temperate zone fruits (30-55 percent), cereals (60-80 percent), rape seed oil (75 percent), soybean oil (45 percent), certain prepared meat and vegetable products (55 percent), certain fruit juices (85 percent), hides and skins (25 percent), and wool (25 percent).

Figure 5—WTO URAA Bound Agricultural Tariffs and Applied Tariffs (1997)



Source: WTO Agricultural Trade Policy Commitments Database (USDA/ERS, 2004).

Figure 6—Agricultural Tariffs and Imports, 1991/92-2002/03



Note: Agricultural imports include Cereals and Cereal Preparations, Edible Oils, Pulses, Sugar, and Cashew Nuts.
Sources: RBI (2001); Ahluwalia (2002)

2.4.2 Export Policy

Throughout much of the 1980s, restrictive import policies, direct export restrictions and the overvalued exchange rates imparted a considerable anti-export bias to the Indian economy. Exports of agricultural goods have been restricted through myriad controls that included prohibitions, licenses, quotas, marketing controls and minimum export prices (MEPs). The quantitative controls on exports were often administered through trading enterprises in the public and cooperative sectors, and were maintained, in principle, for the sake of domestic food security (WTO, 2002). Export restrictions have also been applied on some products for environmental and moral reasons.[11] Only a limited number of items, such as wheat and wheat products, barley, maize and other coarse cereals and their flours, ghee (butter oil) and hydrogenated vegetable oils were

[11]For example, exports of beef and tallow fat and/or oil of animal origin, excluding fish oil, are prohibited.

allowed for highly-regulated export subject to ceiling limits. Export licenses were generally required for products such as cattle, milk, cereals, edible oils, and pulses (Hoda and Gulati, 2005). Simultaneously, with a view to improving export competitiveness, the GOI provided support to exports through three instruments: cash incentives to manufacturers of export oriented processed foods, subsidization of freight costs, and income tax exemption on export earnings (Hoda and Gulati, 2005).

Following the 1991 economic reforms, India terminated its policy of granting cash incentives to exports, but retained income tax exemptions for profits from exports. India's agricultural export policies then began to show signs of change with the 1994 opening up of exports of rice. Export policies have been progressively liberalized since then, barring the occasional reversal. Procedurally, the Ministry of Commerce, through the Director General of Foreign Trade, notifies the imposition or elimination of restrictions in order to promote exports while ensuring an "adequate" domestic supply of essential commodities at "reasonable" prices (WTO, 2002). The policy reforms leading to the liberalization of exports include reductions in products subject to state trading, relaxation of export quotas, the abolition of MEPs, and increased credit availability for exports.[12] However, the GOI retains the authority to re-impose minimum export prices at its discretion.

To further encourage exports of value-added agricultural products, agricultural export zones (AEZs) have been established. The purpose of the AEZs is to source raw agricultural products and complete their processing and packaging within a geographical region (GOI, 2001d). This "cluster approach" involves states identifying the regions in which products with export potential are being produced. Through December 2002, the

[12] In the EXIM policy for 2002-2007, quantitative export controls applied only to a limited number of products including onions (exports allowed through STEs and subject to quota); paddy rice, de-oiled groundnut cakes, fodder, rice bran and certain seeds and planting material (exports permitted under licence); and niger seeds, certain seaweeds and gum karaya (exports allowed through STEs). Exporters of all categories of semi-processed hides and skins, and wet blue hides and skins must register with the Council for Leather Exports (indicating price, quantity to be exported etc.) before any products are shipped (Ministry of Commerce, Notification No. 45(RE-99)/1997-2002).

GOI had approved 41 AEZs in 17 states.[13] The central government contributes around 30 percent of the total funding for AEZs, while the state governments and private bodies supply 15 percent and 55 percent, respectively (GOI, 2003b).

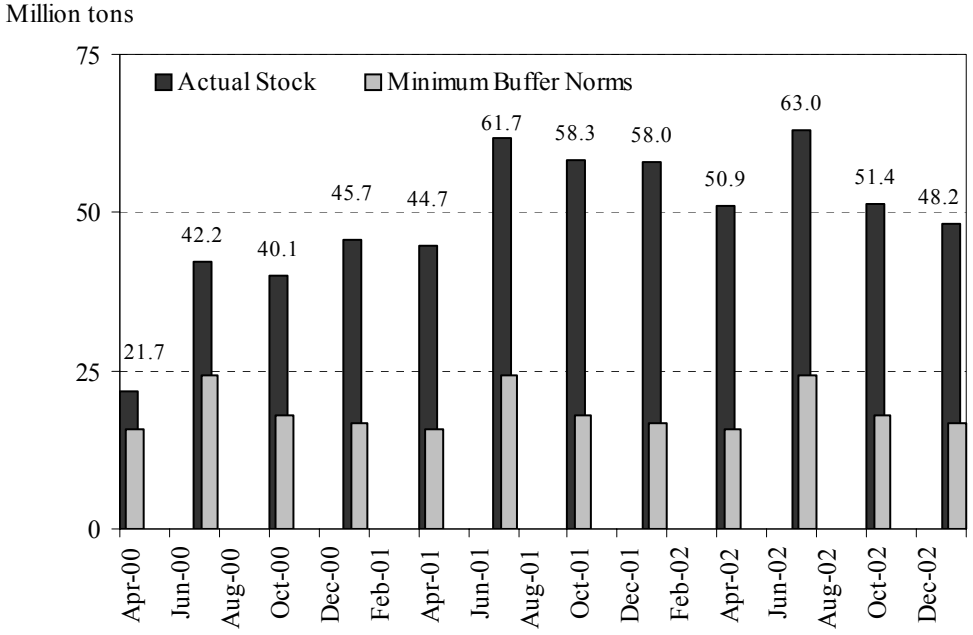
Export subsidization by India rarely has been an issue in the past. However, when world cereal prices were at very low levels the late 1990s, increases in domestic support prices for wheat and rice in India led to increased production and procurement. Consequently, India's food grain stocks grew to unusually large levels compared to usual carry-over quantities (Figure 7). In November 2000, the GOI initiated a policy of subsidies to export cereals, by offering wheat for export at a price "equal to the economic cost minus two years carrying cost but not lower than the central issue price for [those below the poverty line] BPL" (GOI, 2001a). The subsidy was expanded to rice the following year.

Although still small in relation to total domestic production, the export pricing policy decisions resulted in growth of India's exports of food grains to levels previously unseen (Table 4). The GOI has justified its export support policy under the exemption for developing countries from reduction commitments contained in Article 9.4 of the URAA with respect to export subsidies for reducing the costs of marketing and providing favorable internal transport charges on export shipments.[14]

[13] The central government agency responsible for the AEZs is the Agricultural and Processed Foods Products Development Authority (APEDA).

[14] Subsidies to reduce the costs of marketing wheat and rice exports are given at a flat rate without taking into account the f.o.b. value or marketing expenses incurred for each transaction. Due to these discrepancies, Indian export subsidies on food grains could be liable to challenge in WTO (Hoda and Gulati, 2005). India's export subsidy notifications to the WTO for the years 1996-97 to 2000-01 show that it provided relatively small amount of export subsidies through international airfreight assistance for fresh fruits and vegetables, plants and flowers, and eggs (WTO document G/AG/N/IND/3, March 1, 2002).

Figure 7—Record Food Grain Stocks, April 2000-December 2002



Source: GOI (2003c).

Table 4—Wheat and Rice Exports, 2000/01-2002/03

Year (April-March)	Wheat	Rice	Total
		(Million Metric Tons)	
2000-2001	0.81	1.53	2.34
2001-2002	2.65	2.21	4.86
2002-2003	3.57	4.67	8.24

Source: www.indiastat.com.

2.5 DOMESTIC POLICIES

In India, domestic support for agriculture has been provided mainly through two channels: Minimum Support Price (MSP) guarantees for basic staple commodities and provision of inputs subsidies. In addition, a complex array of other policy instruments has been employed.

India has witnessed only limited progress in reforms in the agricultural sector since economic reforms were launched in 1991. For example, only recently were steps taken to removal some of the countless marketing restrictions that exist. Notable among these, the Milk and Milk Products Order (MMPO) was reformed in July 2001 and March 2002 to eliminate restrictions on investments in new processing capacity (GOI, Undated-a). Other notable developments include removal in February 2003 of licensing requirements, stocking limits, and movement restrictions of wheat, paddy/rice, coarse grains, edible oilseeds and edible oils under the Essential Commodities Act of 1955 (GOI, 2002d). In February 2003, remaining restrictions were removed on futures trading on 54 commodities, including wheat, rice, oilseeds and pulses that had been prohibited under the Forward Contract (Regulation) Act of 1952. Despite these market-oriented reforms, India's domestic agriculture policies in recent years have resulted in increased government procurements of food grains and expansion of input subsidies for fertilizer, electricity and irrigation.

2.5.1 Price Support Policies

The domestic price support policies for agriculture have remained largely unaffected by the economic reforms of 1991. Basic staples in India continue to be subject to MSP guarantees. These commodities include paddy rice, wheat, coarse cereals, maize, barley, pulses (i.e. gram, arhar moong, urad), sugarcane, cotton, groundnuts, jute, rapeseed/mustard, sunflower, soyabean, safflower, toria, tobacco, copra, sesamum, and niger seed (GOI, 2001c). The stated objectives of the agricultural price policy are to ensure remunerative prices to the farmers, even out effects of seasonality, and promote

agricultural diversification (GOI, 2001c), although the guaranteed prices can be below prices prevailing in markets. Recommendations concerning the MSP levels are made by the Commission for Agricultural Costs and Prices (CACP). In formulating its recommendation, the CACP considers a number of factors, including input/output price parity, trends in market prices, demand and supply, inter-crop price parity, effects on industrial cost structure, effects on general prices, cost of living, international market prices, and the terms of trade (GOI, Undated-b). CACP recommendations have generally been followed but the MSP can vary from the CACP recommended prices, such as when large bonuses were given for wheat in the years 1996-1999 (Hoda and Gulati, 2005).

India reports its MSP policies as part of the product-specific aggregate measure of support (AMS) in domestic support notifications for the WTO. In its AMS base period and its 1996-1997 notifications, the product specific support is negative because the MSPs are less than the external reference prices for all commodities except sugarcane (see Table 5).[15]

For horticultural and other agricultural commodities not covered by the MSP, there is a Market Intervention Scheme (MIS) of somewhat *ad hoc* support measures. Under the MIS, if the price of a commodity falls below a specific "economic" level the GOI can intervene, at the request of the state governments, by purchasing the product at intervention prices that do not exceed the cost of production (WTO, 2002). Losses incurred in implementing the MIS are shared equally between the central and state governments. Since 1998, the MIS has been used to support a number of horticultural products, including oranges, coriander seed, apples, oil palm, potatoes, red chilies, areca nut, ginger, and onions (WTO, 2002).

[15] Several authors have pointed out that India's calculation of cotton AMS incorrectly compares the MSP for seed cotton (kapas) with the international price for lint (for example, see Hoda and Gulati, 2005). The AMS notifications for 1995-1997 are the latest available at this time.

Table 5—WTO Domestic Support Notifications, 1995-1997

	1995	1996	1997
		US$ Million	
Green Box Payments			
General Services	397.6	239.3	264.6
Public Stockholding for Food Security	1569.7	1708.7	2018.2
Domestic Food Aid	…	…	…
Decoupled Income Support	…	…	…
Income Insurance and safety-net programs	10.9	…	…
Payments for relief from natural disasters	125.0	444.3	443.8
Structural adjustment through producer retirement programs	…	…	…
Structural adjustment through resource retirement programs	…	…	…
Structural adjustment through investment aids	59.2	36.3	76.1
Environment payments	33.2	73.7	70.2
Payments under regional assistance programs	…	…	…
Other	…	…	…
Total	2195.6	2502.3	2872.9
Special and Differential Treatment			
Investments subsidies generally available to agriculture	104.8	1117.3	1142.5
Input subsideis to low income or resource poor producers	149.5	3737.8	4029.3
Total	254.3	4855.1	5171.8
Product Specific AMS			
Rice	-7,577.0	-1,321.3	-1,479.9
Wheat	-9,625.0	-1,280.8	-1,266.4
Coarse cereals	-4,530.4	-1.5	-2.9
Pulses	-1,705.8	…	…
Groundnut	-1,809.3	…	…
Rapeseed and mustard	-1,688.7	…	…
Cotton	-2,106.4	…	…
Soya bean	-191.7	…	…
Tobacco	-181.4	…	…
Jute	-387.6	…	…
Sugar cane	184.4	…	…
Total	-29,618.9	-2,603.6	-2,749.2
Non-Product Specific AMS			
Fertilizer Subsidy	1,864.1	413.6	515.9
Credit Subsidy	102.0	…	…
Subsidy on electricity	2,436.6	373.6	342.5
Irrigation subsidy	1,345.4	143.1	144.9
Subsidy on average supply of seeds	23.9	0.1	0.1
Total	5,772.1	930.3	1,003.5
as % of Value of Production	7.5%	1.1%	1.2%
Value of agricultural production	76,736.0	85,280.0	84,972.0

Source: WTO Notifications.

2.5.2 Input Subsidies

Subsidies to farmers resulting from interventions in fertilizers, electrical power and irrigation began to increase in the mid 1980s, and have continued to climb in current and constant (real) value (Table 6). In recent years, these input subsidies have reached the point of potentially being fiscally unsustainable and subsidies for fertilizer, power and irrigation have also become environmentally harmful (GOI, 2002c). The GOI claims to be gradually moving towards a more deregulated regime while emphasizing the need for investment in power, irrigation and rural infrastructure. In the budget speech for 2002-03, for example, the Minister of Finance highlighted, *inter alia,* an increased allocation of resources for rural roads, irrigation and credit, electrification of villages, rural employment (including through payment in the form of foodgrain), and measures to improve diversification of crops.[16]

Fertilizer

A retention price system (RPS) for fertilizers was introduced in 1977 to insulate farmers from rising prices and to ensure the availability of this input. The difference between the "retention price" or normal cost of production (plus 12-percent post-tax return on investment) and the "notified sales price" (minus a distribution margin) is paid to manufacturers based on specific plants. A subsidy is also paid to cover the cost of transportation to the farming areas where fertilizer utilization is concentrated. Since there is a uniform issue (sales) price for domestic and imported fertilizers, the government also bears the net cost between the delivery cost of imported fertilizers and the price paid by farmers (GOI, 2002c).

[16] To encourage capital investments by farmers the 2002-03 budget also proposes a reduction in import duty on agricultural machinery and implements from 25 percent to 15 percent (GOI, 2002b, Part A, paragraphs 20-26; and Part B, paragraph 143).

Table 6—Estimated Input Subsidies, 1980/81-2002/03

Years	Fertilizer	Power	Irrigation	Total	
	----------(*in Rs. billion*)----------			*at current prices (Rs.bill)*	*at 2000-2001 prices (Rs.bill)*
1980/81	-	3.68	4.12	7.8	43.9
1981/82	2.33	4.47	4.58	11.4	58.2
1982/83	0.82	5.83	5.42	12.1	57.4
1983/84	2.15	7.67	6.32	16.1	70.8
1984/85	12.12	9.97	7.25	29.3	119.7
1985/86	14.22	13.04	7.44	34.7	131.7
1986/87	-0.72	17.06	10.78	27.1	96.6
1987/88	5.27	25.35	19.72	50.3	165.2
1988/89	18.97	30.07	23.54	72.6	187.8
1989/90	28.58	35.94	23.09	87.6	208.4
1990/91	45.58	46.21	25.71	117.5	253.0
1991/92	35.07	58.84	28.68	122.6	231.9
1992/93	32.61	73.44	32.88	138.9	241.7
1993/94	33.52	89.57	34.41	157.5	250.1
1994/95	78.89	112.00	39.54	230.4	334.3
1995/96	96.94	138.38	44.12	279.4	371.8
1996/97	96.32	155.85	44.39	296.6	367.3
1997/98	81.59	190.21	46.56	318.4	369.6
1998/99	83.14	224.96	49.37	357.5	384.5
1999/2000	62.07	262.71	52.18	377.0	390.1
2000/01	72.61	288.14	54.95	415.7	415.7
2001/02	67.34	319.79	57.76	444.9	428.3
2002/03	69.97	356.75	60.56	487.3	453.4

Source: Gulati and Narayanan (2003) for 1980/91 – 2000/01. Later years are authors' trend projections.

Originally nitrogenous, phosphatic and potassic fertilizers were included under the price control subsidy program. However, in 1992 phosphatic and potassic fertilizers were decontrolled. Their prices rose dramatically leading to a fall in usage. To make these fertilizers available to farmers at lower prices, and to encourage balanced use among fertilizers, the central government has continued to provide "a concession"

(subsidy) for decontrolled phosphatic and potassic fertilizers (GOI, 2002c). The total fertilizer subsidy in 2002-03 is estimated at Rs. 112 billion, down from Rs. 138 billion in 2000-01, but still equal to about 3.8 percent of agricultural GDP (GOI, 2003c). The amount spent on the concession scheme for decontrolled fertilizer has increased significantly in recent years. Budgetary provision for the subsidies on decontrolled fertilizers for 2002-03 was Rs. 42 billion, up from Rs. 26 billion in 1997-98 (GOI, 2002c).

More recently, the GOI has committed to undertake modest reforms in urea pricing policy. Based on the recommendations of an Expenditure Reforms Commission, a multi-stage, group-wise concessions scheme is to be established in place of the plant-specific retention price scheme (GOI, 2003c). During the first stage of the reform, urea plants will be placed in one of six groups based on vintage and feedstock, with concession pricing varying by group. During stage two, urea distribution is to be decontrolled, subject to the evaluation of the results in stage one and consultation with the Ministry of Agriculture (GOI, 2003c). Then by March 31, 2006 the Department of Fertilizers will review the implementation of the new subsidy program, assess the availabilities of gas and liquefied natural gas to both public and private sector companies, and decide on the modalities for subsequent reform measures.

While the budgetary expenditure on fertilizer subsidies is large, a portion of the subsidy supports an inefficient fertilizer industry, rather than providing farmers with low cost inputs. Gulati and Narayanan (2003) calculate the implicit fertilizer subsidy accruing to farmers via an import parity price method. The price farmers would have to pay for imported fertilizer assuming free trade is estimated by the c.i.f. price plus internal marketing and transportation costs to where the farmer purchases the fertilizer. Comparing this price with the price that farmers actually pay gives an estimate of the implicit subsidy.

Table 7 shows the actual budgetary outlays and the share of fertilizer subsidies to farmers estimated using this method. Overall, the average portion of the subsidy accruing to farmers over the period 1981-82 to 2002-2003 is nearly 70 percent. Annual values

greater than 100 percent indicate that not only is the entire subsidy reported in the budget going to farmers, but also that the fertilizer industry is being implicitly taxed by not being able to charge the import parity price for fertilizer. This occurs if the import parity price is greater than the retention price so that the industry would have had higher revenues under free trade than under the retention price system.

Table 7—Farmers' Share of Fertilizer Subsidies, 1981/82-2002/03

Year	Import parity measure of subsidy (Rs. billion)	Budgetary subsidy (Rs. billion)	Farmers' share of budgetary subsidy (%)
1981/82	2.33	3.75	62.27
1982/83	0.82	6.05	13.48
1983/84	2.15	10.42	20.66
1984/85	12.12	19.27	62.91
1985/86	14.22	19.24	73.89
1986/87	-0.72	18.97	-3.81
1987/88	5.27	21.64	24.37
1988/89	18.97	32.50	58.37
1989/90	28.58	45.42	62.93
1990/91	45.58	43.89	103.86
1991/92	35.07	48.00	73.05
1992/93	32.61	57.96	56.27
1993/94	33.52	44.00	76.19
1994/95	78.89	52.41	150.52
1995/96	96.94	67.35	143.93
1996/97	96.32	75.78	127.10
1997/98	81.59	99.18	82.26
1998/99	83.14	115.96	71.70
1999/2000	62.07	132.44	46.87
2000/01	72.61		
2001/02	67.34		
2002/03	69.97		

Source: Gulati and Narayanan (2003) for 1980/91 – 2000/2001. Later years are authors' trend projections.

Electrical Power

Under pricing of power to agricultural users is estimated to provide the largest input subsidy to the sector (Table 6). In most states, power to agriculture is offered at a very low price, or in a few cases it is even free. Industrial and commercial power consumers, in contrast, pay prices that exceed the unit cost of supply to compensate for the losses on agricultural power supply (Gulati and Narayanan, 2003). Power subsidies are charged to the states' budgets, and the financial problems of the State Electricity Boards (SEB) are often blamed on their subsidization of agricultural power (Gulati and Narayanan, 2003).

Because agricultural power consumption is not metered and is determined on a residual basis, it can be siphoned off to other uses. Gulati and Narayanan (2003) emphasize that agricultural power consumption is overstated by as much as 40 percent in some cases. As with fertilizer subsidies, a portion of the budgetary subsidy for electricity supports the inefficient supplier, in this case the SEBs. Gulati and Narayanan (2003) estimate the subsidy on power going to the agricultural sector by the difference between cost of supplying electricity to all sectors and the tariff charged to the agricultural sector multiplied by the quantity of electricity that is reported to be supplied to agriculture. Using this approach, with the caveats that agricultural use may be overstated and electricity suppliers inefficient, they find that the estimated subsidy in 2000-01 (Rs. 288 billion) is more than 78 times greater than the 1980-81 figure at current prices (and 19 times greater at constant prices).

Irrigation

Irrigation subsidies, charged against states' budgets, remain a mainstay of Indian agricultural input subsidies despite repeated attempts at reform. In most states, the pricing of canal water does not cover more than 20 percent of the operation and maintenance costs, let alone recover capital costs. While farmers are the clear beneficiaries of such subsidies, like the measurement of fertilizer and power subsidies, calculating irrigation

subsidies can also be problematic. Gulati and Narayanan (2003) compare several methods for calculating irrigation subsidies (Table 8). The first is the GOI's method drawn from the National Accounts Statistics and used to estimate India's irrigation subsidy in its domestic support notification submitted to the WTO. It is calculated by the difference between the cost of supplying water for irrigation and the revenue received as payment from irrigation water users. Gulati and Narayanan (2003) propose instead to follow suggestions by the Vaidyanathan Committee (GOI, 1992) that suggests that pricing of canal water should cover operation and maintenance expenses plus one percent of cumulative capital expenditures. Gulati and Narayanan (2003) apply this method to major, medium and minor irrigation projects and derive the subsidy estimates shown in Table 6.

Other irrigation subsidy programs include the Accelerated Irrigation Benefit Program (AIBP) begun in 1996-97 to assist states complete ongoing irrigation projects. Beginning in 1999-2000, minor irrigation schemes in the northeast region, hill states and drought prone regions were included under AIBP. In addition, effective February 1, 2002, approved medium and major irrigation projects that can be completed within one year are entitled to funding under a Fast Track Program of the AIBP (GOI, 2003c).

Table 8—Comparison of Estimates of Irrigation Subsidies, 1980/81-2002/2003

Years	Government Estimates	Vaidyanathan Committee Method	O&M Method
	----------*in Rs.million*----------		
1980/81	5,810	4,121	2,744
1981/82	6,360	4,578	2,996
1982/83	7,420	5,424	3,589
1983/84	7,930	6,320	4,173
1984/85	10,800	7,255	4,724
1985/86	11,440	7,440	4,656
1986/87	15,200	10,779	7,682
1987/88	16,280	19,715	16,234
1988/89	22,300	23,544	19,588
1989/90	24,390	23,088	18,547
1990/91	24,680	25,713	20,828
1991/92	31,470	28,681	23,429
1992/93	34,890	32,876	27,220
1993/94	39,490	34,414	28,296
1994/95	45,790	39,542	32,889
1995/96	53,990	44,118	36,894
1996/97	62,750	44,394	36,290
1997/98	70,940	46,557	38,692
1998/99		49,367	41,093
1999/2000		52,177	43,495
2000/01		54,954	
2001/02		57,758	
2002/03		60,563	

Source: Gulati and Narayanan (2003) for 1980/91 – 199/2000. Later years are authors' calculations.

Other Input Subsidies

In addition to the interventions discussed above, there are a number of other input subsidy programs. There are several different kinds of subsidies on seeds. For example, the cost of transporting seeds is subsidized in some state with the objective of ensuring universal and timely access (WTO, 2002).[17] The National Seed Policy of 2001 seeks to provide farmers with superior quality seeds. Under the Seed Bank Scheme, introduced in 1999-2000, seeds are also made available in cases of natural calamity and seed storage infrastructure is to be developed. Grants are provided to participating seed corporations for maintenance of certified and foundation seeds. The total cost of the various seed subsidies, however, is relatively minor.

Preferential agricultural credit provided through concessional interest rates, while once a substantial input subsidy, has been progressively phased out. In October 1994, the Reserve Bank of India mostly deregulated the interest rate structure for cooperatives to lend and raise deposits. In August 1996, the Reserve Bank also deregulated the lending rates of regional rural banks. However, to ensure a flow of agricultural credit, 18 percent of net bank credit of all commercial banks is earmarked for agriculture. The Kissan Credit Card (KCC) Scheme was introduced in 1998-99 to facilitate access to short-term credit by farmers. By September 2002, a total of 271,000 cards and credit of Rs. 640 billion had been created under this program (GOI, 2003c). The National Bank for Agriculture and Rural Development (NABARD), the major supplier of rural credit, has also taken several other initiatives to facilitate credit flows (GOI, 2001c).[18]

In the area of broader rural development, a Rural Infrastructure Development Fund (RIDF) has a cumulative value from its inception in 1995-96 to January 3, 2003 of

[17] The subsidy is provided in the states of Sikkim, Himachal Pradesh, Jammu and Kashmir, Uttaranchal and the Hill Areas of West Bengal (Department of Agriculture and Co-operation http://agricoop.nic.in/2seeds.htm).

[18] The initiatives include recapitalization of regional rural banks (RRBs); and preparation of Development Action Plans (DAPs) and Memoranda of Understanding (MoUs) to strengthen Cooperative Banks and RRBs. The RBI has also advised banks to prepare an annual action plan for disbursement of credit to agriculture; accordingly, each bank is preparing a Special Agricultural Credit Plan (SACP). (GOI, 2001c).

Rs. 285 billion (GOI, 2003c). In the Budget Speech of 2002-03, it was announced that the assistance to states provided through RIDF would be linked to reforms in the agriculture and rural sectors. Yet, at least 60 percent of the RIDF for 2003-04 will be directed toward irrigation, flood control, agriculture and allied activities and power systems (NABARD, 2003).

WTO Input Subsidy and Green Box Notifications

India initially reported its fertilizer, electricity, irrigation, seed and credit subsidies to the WTO under non-product specific support commitments. Despite its high levels of recent expenditures, India's non-product specific support has been less than the *de minimis* for developing countries of 10 percent of total value of agricultural production (see Table 5). India's non-product specific AMS decreased from $5,772.1 million in 1995 to $930.3 million in 1997 (still the latest notification available), due to a shift in the accounting of input subsidies from non-product specific support to special and differential treatment.[19] India's green box payments in 1995-1997 are dominated by expenditures on public stockholding for food security and totalled $2,872.9 million in 1997.

[19] See Hoda and Gulati (2005) for details.

3. PSE METHODOLOGY: DESCRIPTION AND ISSUES IN APPLICATIONS TO DEVELOPING COUNTRIES

The methodology of our analysis is the approach utilized by the OECD to measure PSEs (Portugal, 2002) with modifications described below and elaborated more fully by Mullen et al. (2004). Within the PSE, policies are categorized into one of eight subcategories. Market price support (MPS) is defined as the component that is an "indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers arising from policy measures that create a gap between domestic market prices and border prices of a specific commodity measured at the farmgate level" (Portugal, 2002, p. 2). It is calculated based on the difference between the domestic price and an equivalent world price of a commodity. The seven other subcategories of support are measured by budgetary outlays for various types of government payments that support farmers. On average for OECD countries, the total MPS (for all of agriculture) accounted for 63 percent of the total PSE in 2000-2002 (OECD, 2003a). OECD also reports Consumer Support Estimates (CSEs) and General Services Support Estimates (GSSEs) but our analysis for India is limited to PSEs.

3.1 ESTIMATING MARKET PRICE SUPPORT (MPS)

Assuming competitive markets, *ex post* price certainty, and a small open economy whereby a nation's domestic and border policies do not affect world prices, the domestic farmgate price, P_d, is compared to an adjusted reference price, P_{ar}. The types of adjustments made to determine P_{ar} are shown, for an imported and an exported commodity respectively, in equations (1) and (2):

$$(1) \qquad P_{ar} = P_r + (C_p + T_{d1}) - (T_{d2} + M) - Q_{adj} \quad \text{(importable)}$$

$$(2) \qquad P_{ar} = P_r - (C_p + T_{d1}) - (T_{d2} + M) - Q_{adj} \quad \text{(exportable)}$$

The reference price at the border, P_r, is the "world market" c.i.f. price for an importer or f.o.b. price for an exporter expressed in the domestic currency. The reference

price is commonly measured either from observed unit values for imports and exports of the country or from observed international prices adjusted by international transportation costs. Under the latter approach, if the commodity is imported P_r can be imputed from the f.o.b. price of a major exporting country, $P_{exporterfob}$, plus the international freight, T_i, and other international costs (including insurance and margins) of moving the commodity from the exporting country to the importing country, C_i, according to:

$$(3) \qquad P_r = P_{exporterfob} + (T_i + C_i)$$

If the country is an exporter of the commodity, the point of comparison in world markets between the country's export price and the international price takes place as arbitraged at the border of a third country importer (i.e. the c.i.f. price in that third country). Similar to (3), the reference price at the border of the exporting country can be imputed from the c.i.f. price of a major importing country, $P_{importercif}$ minus the costs associated with moving the commodity from the exporting country in question to the importing country according to:

$$(4) \qquad P_r = P_{importercif} - (T_i + C_i).$$

Once a relevant international reference price is determined, it is then further adjusted by the port charges (C_p), the costs of handling, transporting and marketing between the port and the wholesale market (T_{d1}), the costs of handling and transporting (T_{d2}) and marketing and processing (M) the commodity between the farm and the wholesale market, and by any needed adjustment for differences in quality between the domestic and internationally produced commodity (Q_{adj}), as shown in equations 1 and 2.[20] The price gap at the farmgate level, $\Delta P = P_d - P_{ar}$, then is a monetary measure of market price support per unit of output. Ideally, ΔP captures the differences induced by

[20] In the equations $Q_{adj} > 0$ implies that the domestic quality is lower than the quality of the internationally traded commodity.

visible and invisible policy interventions. Expressed in percentage terms relative to the reference price ($\Delta P / P_{ar}$), the price gap is a traditional nominal rate of protection (NRP), or as we refer to it later, the "%MPS." The total MPS for any commodity is given by the per unit price gap multiplied by the level of output.

The difficulties in assessing market price gaps in reality are substantial, especially in developing countries owing to several reasons. First, the developing countries are more likely to utilize border policies or commodity price support programs backed by market interventions and government stockholding. These are policies whose effects are measured in an MPS. Exchange rates also may play an important role in the interpretation of the results. Second, with less developed infrastructure, various costs associated with adjusting the reference price are likely to have larger impacts. Moreover, in the case of large developing countries, MPS or budgetary expenditures may differ substantially among different regions. Third, developing countries may be more likely than developed countries to switch from being an importer to being an exporter of a commodity across years. The relevant international reference price adjustments for internal costs will then differ depending on the trade circumstances as shown in equations (1) and (2) and discussed further below. Fourth, the price gap in developing countries, and difficulties in assessing its policy component, may be accentuated by imperfect competition in the handling, transportation, processing or marketing sectors. Imperfect competition in these sectors would affect the mark-ups, but with different implications than border or price support interventions. Fifth, government polices toward markets or processing and infrastructure investments can raise costs by restricting efficient domestic movement, processing and marketing. These are also policy effects which would influence the observed price gaps, but addressing these sources of inefficiency would require quite different reforms or investments than price support or border protection measures.[21] Sixth, even if competitive market forces are functioning relatively well in the handling, transportation, processing and marketing sectors, acquiring the requisite data on various

[21] We thank Rip Landes for emphasizing this point.

costs may be particularly resource intensive (beyond plausible research budgets) or consistent data over a range of years may simply not exist.

Since a substantial amount of data is required to calculate the price gaps, attempts to assess market price support in a developing country context need to be geared toward trying to reduce the measurement error. The importance of errors related to various within-country adjustments to the reference price will vary among situations. In case of commodities that require complex processing, a substantial determinant of the MPS will be the adjustments to the reference price for these processing costs. In such cases, a comparison is sometimes made between the reference price of the processed commodity and the domestic price of that processed commodity at the wholesale level. Such a comparison might be more accurate than an estimated farmgate comparison given available data, but it does not separate protection (or disprotection) between domestic farmers and processors. This could be an important distinction, especially if processing is inefficient or non-competitive (see Cahill and Legg, 1990 and Doyon et al., 2001).

3.2 BUDGETARY PAYMENTS AND PRODUCT-SPECIFIC PSEs

In the OECD measurement of PSEs, budgetary payments are divided into seven subcategories depending on the conditions of eligibility on which transfers are made to farmers: those based on 1) output; 2) area planted/animal numbers; 3) historical entitlements; 4) input use; 5) input constraints; 6) overall farming income; and 7) miscellaneous payments.[22] The patterns and levels of budgetary expenditures on agricultural support by developing countries are likely to differ substantially from those of wealthier OECD countries. In transition (and developing) economies, particular care must be taken to include budgetary assistance even when it is not associated with actual direct payments (Melyukhina, 2002). Preferential prices for inputs such as fertilizer, electricity, irrigation and transportation are often more important in developing than developed countries, as in the case of India. These subsidies are categorized as budgetary

[22] With the increased use of support payments in developed countries that are at least partially decoupled from current production of any particular crop, the OECD is in the process of redefining if and how different program payments should be allocated to individual commodities (OECD, 2003b).

payments, though subsidies on tradable inputs at the farmgate level may be better measured through a price gap method analogous to the calculation of MPS for output commodities than by government expenditures, as Gulati and Narayanan (2003) have demonstrated.

The calculation of product-specific PSEs requires that budgetary payments be allocated across commodities to determine the budgetary support for a given product, BP_j, where "j" denotes a specific commodity. If such payments are reported by commodity, the procedure is straightforward. However, for payments such as input subsidies or general subsidies such as tax or capital grants, calculations of allocation across commodities can be complicated. In this case, the payments are often distributed on the basis of each commodity's share in total value of agricultural production (Melyukhina, 2002). Other criteria, such as the share of acreage also provide plausible approximations, although each may introduce a measurement error.

Once budgetary payments are allocated among commodities, the product-specific PSE is the sum of the MPS and budgetary support for that commodity. As discussed in Mullen et al. (2004), the product-specific PSE can be expressed on a percentage basis in two ways. The first approach, as in the OECD studies, finds the proportion of gross farm income that is a result of policy measures, using $(VP_j + BP_j)$ as the denominator of its percentage measure, where VP_j is the value of production at domestic producer prices. An alternative ("trade economist's") measure (denominator) is to express support received by farmers as a percentage of the value of output at farmgate-equivalent international prices, VP_i*. Because production is valued at international prices in the %MPS and the trade economist's %PSE denominator, while the PSE numerator includes the MPS and budget payments, the trade economist's %PSE will always be at least as high or higher than the %MPS (assuming net budgetary payments are positive). Quite different numerical representation of the policy effects can arise with the OECD %PSE because the denominator for this measure is the value of farm output at domestic prices plus budget payments.

3.3 CALCULATING TOTAL PSEs

The total PSE expressed in nominal terms for all agricultural producers is the sum of an aggregate MPS (the price gap per unit of each output multiplied by the quantity of output, summed over all outputs included in the analysis) and aggregate budgetary transfers. In the OECD approach, the calculation of aggregate MPS consists of three steps. First, a nominal value of MPS is estimated for individual products, the set of which is known as the covered "MPS commodities." The second step is to sum the product-specific MPS results into an MPS_c for the covered commodities. One method to estimate the total nominal PSE for a country (not used by OECD) is to include only the market price support derived for these commodities in the calculation: $PSE_c = MPS_c + BP$, where *BP* is the total budgetary payments to producers. In the OECD approach, a third step is made to calculate the PSE. The MPS_c for covered commodities is "scaled up" to all products based on the share (k) of the covered commodities in the total value of production. The final step or "MPS extrapolation procedure" can be expressed as $MPS = MPS_c/k$, where MPS is the estimated total market price support.

With the scaling up, the OECD "Total PSE" is calculated as $PSE = MPS + BP$. Either approximation (not scaled up or scaled up) introduces error, and any error is relatively more or less important as the MPS component of the PSE increases relative to the budget payment component. For developing countries, feasible commodity coverage is likely to be less than for the OECD countries, and the assumption imposed by scaling up may be unrealistic if support is concentrated among those products included in the analysis.

Total PSE measures can be expressed on a percentage basis. The measure reported by OECD uses *(VP + BP)* as the denominator (where *VP* is the total value of agricultural production at domestic producer prices). This %PSE gives a "subsidy counter's" measure of support relative to domestic farm revenue. Alternatively, a "trade economist's" measure of support uses *VP** as the denominator to give %PSE relative to the value of output at international prices. Because value of total production at

international prices may not be known, an approximation is required. One approach is simply to subtract MPS_c from *VP*. This corresponds to not scaling up MPS_c in computing the nominal value of PSE because commodities not covered are assumed to have the same value at international and domestic prices. Alternatively, an estimate of *VP** can be based on scaling up the value of production at international prices of the covered commodities by the same "*k*" as above.

3.4 MODIFIED PROCEDURE TO ACCOUNT FOR DOMESTIC MARKET-CLEARING PRICES

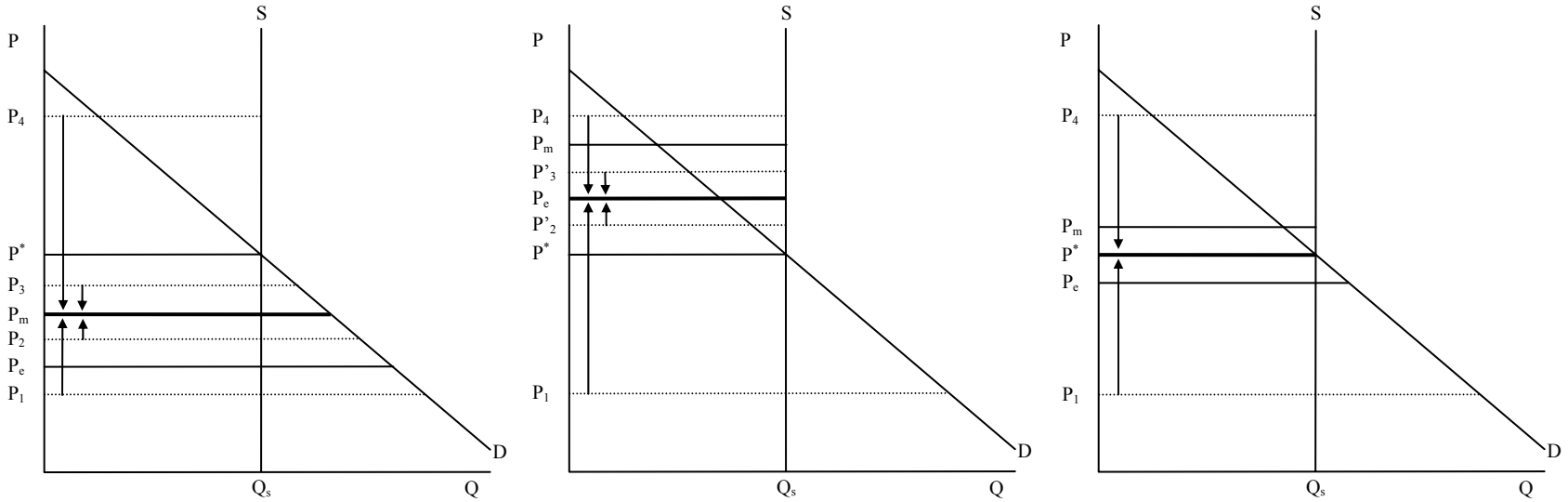
Beyond the practical difficulties in obtaining the necessary data to compute PSEs, another factor is likely to be relevant to their measurement and interpretation for developing countries. World price fluctuations, changes in the government intervention price levels, and domestic supply and demand shocks are all factors that affect whether a country will be importing or exporting, or, alternatively depleting or accumulating stocks (of storable commodities).

Byerlee and Morris (1993) pointed out that the likelihood that any of these factors results in a change in the trade status of a country is greater if the country is near self-sufficiency in a particular commodity. They suggest that under these circumstances (which describe the situation for cereals in many developing countries) agricultural protection indicators computed by the conventional methods of comparing the domestic price to an import or export adjusted reference price can lead to an incorrect estimate of the level and even the direction of protection. Instead, a corrected protection measure may need to be calculated based on a domestic market-clearing equilibrium price as the "adjusted reference price" rather than the import or export price, especially when a country has relatively high internal or external transport costs, so that there is a wide gap between the adjusted reference prices for imports versus exports (from here on, the adjusted reference price for exports will be denoted P_e and for imports P_m). Byerlee and Morris demonstrate this approach for Pakistan, which was more than 85 percent self-sufficient in wheat during 1985-90, had a controlled producer price slightly above the export price and well below the import price, and was a net importer of wheat.

Conventional measures of support showed the domestic price as much as 40 percent lower than the adjusted import reference price. But Byerlee and Morris conclude that if controls were removed the price only would have increased by about 10 percent to a domestic market-clearing level.

Byerlee and Morris provide a more systematic approach than relying on the current direction of trade to dictate the adjusted reference price used to evaluate the MPS component of the PSE, but one that required additional assumptions about elasticities of demand and supply. In order to know which price will be relevant when the policy intervention is removed, one must know the relationships among the autarky equilibrium price, P^*, and the adjusted reference prices P_m and P_e. Because of international and domestic cost adjustments, it is always the case that $P_m > P_e$. When $P^* > P_m$, then P_m is the relevant P_{ar}; when $P_e > P^*$, then P_e is the relevant P_{ar}; and when $P_m > P^* > P_e$, then P^* is the relevant P_{ar}. This price relationship, not the observed trade under the policies in place, determines the level of protection or disprotection relative to the price level that would exist in the absence of the policy interventions. The argument is shown graphically in Figure 8 under the assumption of fixed supply.

Figure 8—Computing the MPS Under Alternative Price Scenarios



a. If $P^* > P_m$, then P_m is the relevant P_{ar} b. If $P_e > P^*$, then P_e is the relevant P_{ar} c. If $P_m > P^* > P_e$, then P^* is the relevant P_{ar}

Figure 1 shows that the relevant reference price depends on the relationship between P^* and P_m and P_e. In the three panels, P_1 - P_4 are possible prices set by domestic policy. As shown in panel 1c, if $P_m > P^* > P_e$, then P^* is the relevant reference price. Whether the domestic policy supports agriculture (at P_4) or disprotects agriculture (at P_1), when the policy is removed the price becomes P^*. Likewise in panels 1a and 1b, regardless of the level of the domestic price set by policy or the corresponding trade pattern, P_m and P_e are the relevant reference prices under the price relationships specified. In the figure and our empirical calculations, we treat annual production as pre-determined (consistent with interpretation of PSEs as transfers to farmers given an observed fixed supply) but allow demand to adjust to clear the market in our counter-factual annual determinations of P^* . If we let the supply also adjust, the P* obviously would be different.

4. REVIEW OF PREVIOUS STUDIES

Several recent studies have evaluated protection and disprotection of Indian agriculture using PSEs and related measures. Gulati and Kelley (1999) estimate nominal protection coefficients (NPCs), effective protection coefficients (EPCs), and effective subsidy coefficients (ESCs) for major crops for the period 1980-1993. The NPC, as described above, is the ratio of domestic price to the adjusted world reference price. The EPC also accounts for protection of tradable inputs. It is defined as the ratio of value added at domestic prices to value added at world reference prices, where value added refers to the difference between output price and the value of all traded inputs used to produce one unit of output. If traded inputs contribute a relatively small portion of total cost of inputs, the NPC and EPC will yield similar results. However, if traded inputs make up a significant portion of the total cost of inputs, there could be a divergence between the two measures. The ESC adjusts, in addition, for subsidies and taxes on non-traded inputs. It is defined as the ratio of value added at domestic prices (adjusted for subsidies and taxes on non-traded inputs) to the value added at world reference prices.

Gulati and Kelley (1999) use both official and shadow exchange rates (assumed to be 20 percent higher on average than official rates) to evaluate the levels of these three policy indicators. They conduct their analysis under the assumption that all major commodities are imported (the importable hypothesis) and also, alternatively, under the assumption that wheat, rice and cotton are exported (the exportable hypothesis). The authors argue that these three commodities are export competitive in the long run.

A USDA study provided the first estimates of PSEs (and also consumer subsidy equivalents, CSEs) for India (USDA-ERS, 1994). This study covers the period 1982-1990, with PSEs computed on the basis of ten commodities ((rice, wheat, maize, sorghum, peanuts (groundnuts), chickpeas, rapeseed, soybean, and medium- and long-staple cotton). The policies covered include price interventions and input subsidies, including fertilizer, electricity, irrigation and credit. Except for cotton, USDA compared

the production-weighted average of the state harvest prices with an annual average world reference price equal to the c.i.f. India (landed) price at the prevailing exchange rate, implying that each commodity is assumed to be imported. Adjustments were made to account for internal transportation and other costs.

In addition to the ERS PSE study, Gulati and Narayanan (2003) estimate PSEs for Indian agriculture over the period 1986-2000 based on 13 commodities (rice, wheat, maize, sorghum, sugar, bajra, gram, groundnut, rapeseed/mustard, soybean, sunflower, cotton and jute) assuming all are imported. They also calculated PSEs assuming that all the products are export competitive (Gulati and Narayanan, 2003 unpublished). Their methodology broadly follows that of ERS or the OECD and they provide one of the few, if not the only, comprehensive PSE estimates for India during the 1990s.

Gulati and Narayanan divide support into product specific (price support) and non-product specific (input subsidies). They use Minimum Support Price (MSP) or corresponding wholesale-level "procurement prices," instead of market farmgate or wholesale price, as their domestic prices, even when market prices exceed the MSP or procurement rates, as often the case. They estimate the price gap for the set of covered commodities as the difference between the domestic price and the landed cost (equal to the c.i.f. price plus port clearance charges) corresponding to the months of the crop's harvest season, when the bulk of the domestically produced commodity is sold. Like the USDA and OECD PSE studies, they take exchange rates at official levels.

Fertilizer, power, irrigation and credit subsidies are included by Gulati and Narayanan within non-product specific support. Fertilizer subsidies are computed from the difference between the import parity level and what the farmer pays, as discussed above. Power subsidy per unit is the difference between the unit cost of power supplied to the economy and the average tariff for agricultural consumers. Irrigation subsidies are based on the National Account Statistics Irrigation subsidy and are estimated by the difference between operating and maintenance expenses and the total direct receipts of major and medium irrigation works. Credit subsidy is the amount foregone on account of

concessional rates of interest on short term lending (six months) lending to the agricultural sector.[23]

Instead of allocating the non-product specific input subsidies among commodities to compute product-specific PSEs, Gulati and Narayanan (2003) include these subsidies only in a total PSE estimate. They express the aggregate PSE as:

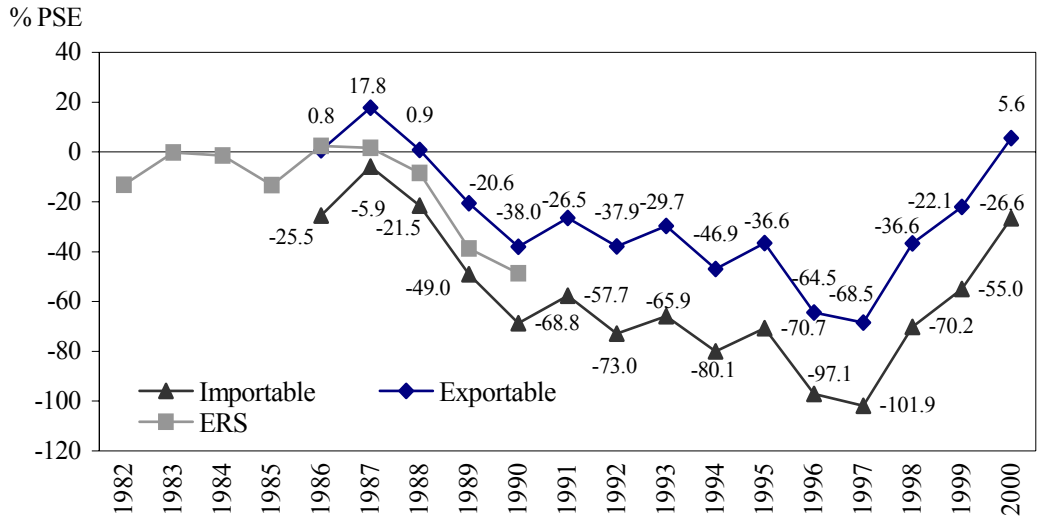
$$\%PSE = \left(\frac{Total\ non-product\ Specific\ Supprt}{Total\ value\ of\ agricultural\ production} \right) * 100 + \left(\frac{Total\ \mathrm{Pr}oduct\ Specific\ Support}{Value\ of\ production\ of\ MPS\ com\mathrm{mod}ities} \right) * 100 \quad (5)$$

This is equivalent to the OECD "scaled up" PSE measure but with only the value of production at domestic prices (not budget payments as well) in the denominator.[24]

Figure 9 shows the PSEs of Gulati and Narayanan (2003) through 2000 under both the importable and exportable hypotheses, together with those from USDA through 1990. PSEs calculated by Gulati and Narayanan (2003) under the importable hypothesis are negative throughout the entire period, implying that agriculture is net taxed. Comparing their results with those of USDA (also computed under the importable hypothesis), the temporal pattern is the same, although the USDA estimates are from 8 to 27 percentage points higher in 1986-1990. Under the exportable hypothesis, negative market price support outweighs the positive non-product specific (input) subsidies in all years except for 1986-1988 and 2000 when market price support turns positive due to relatively low international prices and/or high MSP/procurement prices.

[23] Unlike the USDA study, Gulati and Narayanan (2003) do not take into consideration medium or long term preferential lending nor do they consider defaults as a part of government outlays for credit subsidies.
[24] The second term of Gulati and Narayanan (2003) is equivalent to a scaled up OECD MPS measure because both the numerator and denominator refer only to the covered commodities. Scaling up both the numerator and denominator would not change the percentage support due to product-specific measures.

Figure 9—Producer Subsidy Equivalent and Producer Support Estimates, 1982-2000



Note: Gulati and Narayanan PSE computed on the basis of 12 commodities under importable hypothesis.
Sources: USDA 1994, Gulati and Narayanan (2003) for importable hypothesis and Gulati and Narayanan unpublished data for exportable hypothesis.

5. PRODUCT-SPECIFIC MPS AND PSEs

As discussed above, computing PSEs is an intensive empirical exercise; in order to obtain relatively accurate estimates data for all of the variables in equations (1) and (2) should be available along with subsidy information by commodity. In reality, the empirical estimation of PSEs relies on the available data as well as on and the subjective judgment of the researcher to minimize measurement errors.

5.1 DATA AND OVERVIEW OF CALCULATIONS

Our calculation of PSEs for India draws heavily on previous studies by Gulati et al. (1990), Gulati and Kelley (1999), Gulati and Narayanan (2003), and Gulati and Pursell (forthcoming). In this paper, PSEs are computed from 1985 to 2002 for 11 commodities: cereals (wheat (through 2003), rice, corn, and sorghum), sugar, oilseeds (groundnut, rapeseed, soybean, and sunflower), pulses (chickpeas), and cotton. These crops accounted for an average of 45 percent of the total value of agricultural production

in India during 1985-2002. The value of production at domestic prices, levels of production, and net trade (exports – imports) are shown for each commodity in Table 9.

Prices and Cost Adjustments

Data for computing the MPS is taken directly from the detailed database for 1964-65 to 2001-02 of Gulati and Pursell (forthcoming). A description of the price data and adjustments for each commodity is given in Table 10. The data includes international reference prices for all major Indian crops, exchange rates, international costs and port charges. It also includes production quantities, farmgate or wholesale domestic prices, domestic transport costs, and marketing and processing margins for important producing states.

Sources for international prices in the database vary by commodity and include USDA and FAO for cereals, *Oil World* for some oilseeds, and IMF *International Financial Statistics* (IFS) for various other commodities. Exchange rates are taken from the IFS market rates. International freight for wheat is drawn from an annual series in the *FAO Trade Yearbook*, 1999 and adjusted for subsequent years. International freight for other commodities is given by adjusting the wheat freight rate if other rates are not available.

Domestic prices are taken from *Agricultural Prices in India* (various years) and production data is from *Agricultural Statistics at a Glance* (various years). Estimates of port charges and domestic transportation costs are based on an earlier study by Sharma (1991) and are projected forward using the procedure described in Pursell and Gupta (1996). Marketing costs are taken as a percentage of P_d of each commodity and vary from 5 percent to 10 percent. For products requiring substantial processing, the prices included are at the wholesale (processed) level. For these commodities, the subsequent MPS calculations are made with price comparisons between adjusted references prices and prices of equivalent commodities at the wholesale, not farmgate, level.

Table 9—Production, Value of Production and Net Exports for Eleven Commodities, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Cereals																			
Wheat																			
Production (MMT)	44.1	47.1	44.3	46.2	54.1	49.9	55.1	55.7	57.2	59.8	65.8	62.1	69.4	66.3	71.3	76.4	68.8	73.5	69.3
Value of Production (Bil. Rs)	67.0	73.9	71.8	76.6	93.6	91.2	118.6	125.3	157.3	197.3	230.3	223.6	263.5	315.1	363.6	420.0	398.8	448.5	429.8
Net Trade (MMT)	0.35	0.49	0.49	-2.08	-0.08	0.10	0.58	-2.45	-0.47	0.07	1.45	0.56	-1.73	-2.20	-1.17	1.13	3.06	4.82	3.95
Rice																			
Production (MMT)	58.3	63.8	60.6	56.9	70.5	73.6	74.3	74.7	72.9	80.3	81.8	77.0	81.7	82.5	86.1	89.7	84.9	90.8	
Value of Production (Bil. Rs)	131.1	148.2	144.6	127.3	184.3	221.2	250.9	288.6	329.3	414.7	463.7	466.4	551.7	638.4	724.5	788.6	725.6	772.1	
Net Trade (MMT)	0.25	0.35	-0.45	-0.20	0.45	0.70	0.59	0.60	0.75	4.15	3.70	2.10	3.99	3.35	1.31	1.69	6.30	4.50	
Coarse Grains																			
Corn																			
Production (MMT)	8.4	6.6	7.6	5.7	8.2	9.7	9.0	8.1	10.0	9.6	8.9	9.5	10.8	10.8	11.2	11.5	12.1	13.2	
Value of Production (Bil. Rs)	11.2	11.2	13.4	11.4	16.7	18.0	19.8	29.4	27.2	27.0	37.0	38.4	48.1	42.2	53.5	61.8	60.5	65.2	
Net Trade (MMT)	0.01	0.01	-0.28	-0.20	0.00	0.00	0.00	0.03	0.04	0.02	0.04	0.01	0.01	-0.17	-0.23	0.05	0.02	0.05	
Sorghum																			
Production (MMT)	11.4	10.2	9.2	12.2	10.2	12.9	11.7	8.1	12.8	11.4	9.0	9.3	10.9	7.5	8.4	8.7	7.7	8.3	
Value of Production (Bil. Rs)	19.9	19.5	18.7	26.0	28.1	36.6	29.8	24.4	38.8	30.6	32.6	45.7	53.9	39.0	62.6	68.5	46.0	44.0	
Net Trade (MMT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
Sugar																			
Production (MMT)	6.1	7.0	8.5	9.1	8.8	11.0	12.0	13.4	10.6	9.8	14.6	16.5	12.9	12.9	15.5	18.2	18.5	18.3	
Value of Production (Bil. Rs)	24.6	31.3	38.9	45.8	48.8	66.9	74.7	89.0	84.1	99.5	140.4	170.1	144.4	154.2	186.0	227.0	243.1	240.4	
Net Trade (MMT)	-1.28	-1.69	-1.00	-0.06	0.03	-0.02	0.24	0.59	0.39	-1.47	-0.65	0.94	0.40	-0.98	-1.07	-0.41	1.36	1.03	
Oilseeds																			
Groundnuts																			
Production (MMT)	6.4	5.1	5.9	5.9	9.7	8.1	7.5	7.1	8.6	7.8	8.1	7.6	8.6	7.4	9.0	5.3	6.2	7.1	
Value of Production (Bil. Rs)	29.1	23.6	32.3	38.9	50.5	59.1	72.3	70.9	71.6	68.9	87.4	88.2	107.0	89.3	121.7	67.8	74.2	94.3	
Net Trade (MMT)	0.02	0.04	0.01	0.07	0.04	0.05	0.00	0.05	0.07	0.05	0.09	0.15	0.05	0.06	0.10	0.20	0.16	0.06	
Rapeseed																			
Production (MMT)	3.1	2.7	2.6	3.5	4.4	4.1	5.2	5.9	4.8	5.3	5.8	6.0	6.7	4.7	5.7	5.8	4.2	5.3	
Value of Production (Bil. Rs)	15.7	10.8	11.4	23.9	32.0	23.5	49.0	54.7	43.6	54.8	68.7	68.7	76.6	66.9	86.9	73.2	52.4	70.2	
Net Trade (MMT)	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Soybeans																			
Production (MMT)	1.0	0.9	0.9	1.5	1.8	2.6	2.5	3.4	4.7	3.9	5.1	5.4	6.5	7.1	7.1	5.3	5.9	4.3	
Value of Production (Bil. Rs)	2.7	2.5	3.8	8.5	9.5	13.2	14.6	27.6	34.6	31.1	47.2	51.8	75.6	77.0	63.9	45.8	56.6	41.7	
Net Trade (MMT)	0.00	-0.02	-0.03	0.00	0.00	0.00	0.00	0.00	0.00	-0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sunflower																			
Production (MMT)	0.3	0.4	0.6	0.4	0.6	0.9	1.2	1.2	1.4	1.2	1.3	1.3	0.9	0.9	0.7	0.7	0.9	1.0	
Value of Production (Bil. Rs)	1.1	2.1	4.4	2.4	3.8	6.9	12.6	12.0	12.4	12.9	15.5	14.7	10.3	12.1	8.2	7.9	10.4	15.0	
Net Trade (MMT)	0.00	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	-0.07	-0.08	-0.42	-0.13	-0.55	-0.57	-0.46	-0.05	-0.10	

Table 9—Continued

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Pulses																			
Chickpea																			
Production (MMT)	4.6	5.8	4.5	3.6	5.1	4.2	5.4	4.1	4.4	5.0	6.4	5.0	5.6	6.1	6.8	5.1	3.5	5.1	
Value of Production (Bil. Rs)	19.5	27.7	15.1	14.9	33.1	25.9	36.5	27.2	29.4	52.8	71.7	40.4	58.7	84.6	80.0	63.1	54.5	94.1	
Net Trade (MMT)	-0.03	-0.02	-0.23	-0.21	-0.06	-0.15	-0.10	-0.07	-0.15	-0.06	-0.01	-0.12	-0.38	-0.11	-0.01	-0.06	-0.52	-0.22	
Cotton																			
Production (MMT)	4.3	4.5	3.5	3.3	4.5	5.8	5.0	5.0	5.8	5.5	6.1	6.6	7.3	5.5	6.3	5.9	4.9	5.1	
Value of Production (Bil. Rs)	24.6	21.9	20.9	38.5	38.1	49.4	55.0	67.5	59.1	92.3	144.0	115.1	131.6	126.5	122.2	109.1	94.5	83.2	
Net Trade (MMT)	0.07	0.22	-0.02	0.00	0.23	0.15	0.02	0.19	0.03	-0.07	0.10	0.26	0.04	-0.07	-0.33	-0.32	-0.41	-0.29	
Total Value of Production (Bil Rs)																			
of included commodities	346.4	372.6	375.2	414.2	538.5	611.9	733.9	816.6	887.5	1081.9	1338.5	1323.1	1521.3	1645.3	1873.1	1932.9	1816.7	1968.7	
of all agriculture	790.0	821.1	857.4	855.7	1104.6	1284.3	1441.2	1946.6	2205.0	2717.9	2852.3	3032.3	3478.7	3582.0	4362.4	4550.4	4693.6	5177.2	

Note: Value of production is based on the weighted average value of production in the states included under the importable hypothesis. Cotton production and value of production refers to kapas and net trade to cotton lint.
Source: Gulati spreadsheets; Gulati and Bathla, 2001; USDA-FAS PSD Database, 2004.

Table 10—Reference Price Adjustments: Description and Sources

	Cereals and Coarse Grains			
Category	Wheat	Rice	Maize	Sorghum
Period Coverage (calendar years)	1985-2003	1985-2002	1985-2002	1987-2002
Trade Status	Variable	Variable	Variable	Variable
Reference Domestic Market	Farmgate	Wholesale	Wholesale	Wholesale
Border Price				
• World price ($P_{exporter\ fob}$)	F.o.b. U.S. Gulf, HRW ordinary protein; monthly average for India's harvest season (April-June)	F.o.b. Bangkok, Thai 15% broken; monthly average for India's harvest season (October-January)	F.o.b. U.S. gulf ports, Yellow No.2; monthly average for India's harvest season (October-January)	F.o.b. U.S. gulf ports; monthly average for India's harvest season (October-January)
Sources	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
• International freight ($T_i + C_i$)	U.S. Gulf to India	Freight index constructed from the wheat freight rates	Assumed to equal freight rates for wheat	Assumed to equal freight rates for wheat
Sources	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
• Exchange rate (ER)	Monthly average for harvest season.	Monthly average for harvest season.	Monthly average for harvest season.	Monthly average for harvest season.
Source	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
Domestic Cost Adjustments				
Surplus Regions				
Included states	Haryana and Punjab	Andhra Pradesh and Punjab	Uttar Pradesh, Rajasthan, Madhya Pradesh and Karnataka	Andhra Pradesh, Maharashtra, Karnataka and Madhya Pradesh

Table 10 (continued)

Category	Cereals and Coarse Grains			
	Wheat	Rice	Maize	Sorghum
Port charges (C_p)	In 1983/84 calculated to be Rs. 10.18 per quintal; cost has been projected using the port index	In 1983/84 calculated to be Rs. 10.18 per quintal; cost has been projected using the port index	In 1983/84 calculated to be Rs. 10.18 per quintal; cost has been projected using the port index	In 1983/84 calculated to be Rs. 10.18 per quintal; cost has been projected using the port index
Transportation, handling and marketing costs from port to port-city wholesale market (T_{d1})	No adjustment	No adjustment	No adjustment	No adjustment
Transportation and handling costs from surplus region farmgate/wholesale market to port-city wholesale market ($T_{w:s}$)	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered
Marketing and processing costs in the surplus region (M_s)	6 percent of procurement price (P_d)	5 percent of procurement price (P_d)	10 percent of domestic wholesale price (P_d)	10 percent of domestic wholesale price (P_d)
Quality and process level adjustments (Q_{adj})	No adjustment	No adjustment	No adjustment	No adjustment
Source	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
Domestic Cost Adjustments				Not applicable
Deficit Regions				
Included states	Uttar Pradesh	Uttar Pradesh	Gujarat	

Table 10 (continued)

Category	Cereals and Coarse Grains			
	Wheat	Rice	Maize	Sorghum
Transportation and handling costs from surplus to the deficit region ($T_{d:s}$)	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	
Marketing and processing costs in the deficit region (M_d)	6 percent of procurement price (P_d)	5 percent of procurement price (P_d)	10 percent of domestic wholesale price (P_d)	
Quality and process level adjustments (Q_{adj})	No adjustment	No adjustment	No adjustment	No adjustment
Source	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
Byerlee-Morris Procedure				
Domestic consumption				
Source	*USDA-FAS PSD database, 2004*	*USDA-FAS PSD database, 2004*	*USDA-FAS PSD database, 2004*	*USDA-FAS PSD database, 2004*
Demand elasticity	-0.5	-0.5	-0.5	-0.5

Table 10 (continued)

	Oilseeds			
Category	Groundnuts	Rapeseed	Soybeans	Sunflower
Period Coverage (calendar years)	1985-2002	1985-2002	1985-2002	1987-2002
Trade Status	Variable	Import	Import	Import
Reference Domestic Market	Wholesale	Wholesale	Wholesale	Wholesale
Border Price				
• World price ($P_{exporterfob}$)	F.o.b. U.S. converted from c.i.f. Rotterdam; monthly average of groundnut oil and groundnut meal price for marketing year (October-September)	F.o.b. U.S. converted from c.i.f. Rotterdam; monthly average for India's harvest season (January-June)	F.o.b. U.S. No. 2 yellow converted from c.i.f. Rotterdam; monthly average for India's harvest season (October-March)	F.o.b. converted from c.i.f. Rotterdam; monthly average for marketing year (October-September)
Sources	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
• International freight ($T_i + C_i$)	Assumed to equal 1.6 times those of wheat	Assumed to equal 1.6 times those of wheat	Assumed to equal 1.6 times those of wheat	Assumed to equal 1.6 times those of wheat
Sources	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
• Exchange rate (ER)	Monthly average for marketing year	Monthly average for harvest season	Monthly average for harvest season	Monthly average for marketing year
Source	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
Domestic Cost Adjustments				
Included states	Adhra Pradesh, Gujarat, and Tamil Nadu	Uttar Pradesh and Rajasthan	All India only	All India only

Table 10 (continued)

Category	Oilseeds			
	Groundnuts	Rapeseed	Soybeans	Sunflower
Port charges (C_p)	In 1987/88 calculated to be Rs. 12 per quintal; cost has been projected using the port index	In 1987/88 calculated to be Rs. 12 per quintal; cost has been projected using the port index	In 1987/88 calculated to be Rs. 12 per quintal; cost has been projected using the port index	In 1987/88 calculated to be Rs. 12 per quintal; cost has been projected using the port index
Transportation, handling and marketing costs from port to internal wholesale market (T_{d1})	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered
Marketing and processing costs from port to wholesale (M)	10 percent of wholesale price (P_d)	6 percent of procurement price (P_d)	6 percent of domestic wholesale price (P_d)	6 percent of domestic wholesale price (P_d)
Transportation and handling costs from farm to wholesale market (T_{d2})	No adjustment	No adjustment	No adjustment	No adjustment
Quality and process level adjustments (Q_{adj})	No adjustment	No adjustment	No adjustment	No adjustment
Source	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
Byerlee-Morris Procedure		Not applicable	Not applicable	Not applicable
Domestic consumption				
Source	*USDA-FAS PSD database, 2004*			
Demand elasticity	-0.5			

Table 10 (continued)

		Other crops	
Category	Sugar	Chickpeas	Cotton
Period Coverage (calendar years)	1985-2002	1985-2002	1985-2002
Trade Status	Variable	Importable	Variable
Reference Domestic Market	Wholesale	Farmgate	Farmgate
Border Price			
• World price ($P_{exporterfob}$)	F.o.b. Caribbean ports; monthly average for marketing year (October-September) and further converted into plantation white sugar	Import unit value	F.o.b. U.S. converted from c.i.f. Northern Europe
Sources	*Gulati Worksheet NPC2002.xls*	*FAOSTAT*	*Gulati Worksheet NPC2002.xls*
• International freight ($T_i + C_i$)	The 1989 and 1990 freight rates from Europe to India were provided by STC and are projected using the tramp index.	Not applicable	U.S.-India freight rate
Sources	*Gulati Worksheet NPC2002.xls*		
• Exchange rate (ER)	Monthly average for marketing year.	Monthly average for marketing year.	Monthly average for harvest season.
Source	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*

Table 10 (continued)

Category	Other crops		
	Sugar	Chickpeas	Cotton
Domestic Cost Adjustments			
Included states	Uttar Pradesh, Maharashtra and Tamil Nadu	Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh	All India only
Transportation, handling and marketing costs from port to internal wholesale market (T_{d1})	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	No adjustment	No adjustment
Transportation and handling costs from farm to wholesale market (T_{d2})	No adjustment	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered	Computed for 1980/81 and projected using the weighted rail to road index, with weights depending on the distance covered
Marketing and processing costs from farm to wholesale (M)	3 percent of free sale sugar price	5.5 percent of domestic price.	Average processing margin
Quality and process level adjustments (Q_{adj})	No adjustment	No adjustment	No adjustment
Source	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*	*Gulati Worksheet NPC2002.xls*
Byerlee-Morris Procedure			
Domestic consumption		Not applicable	Not applicable
Source	*USDA-FAS PSD database, 2004*		
Demand elasticity	-0.5		

In case of importables, the major consumption region is assumed to be the port cities, for example, Mumbai. Reference prices at the border for imported commodities are calculated according to equation (3) for the quality level that most closely resembles that produced in India.[25] Reference prices at the border for export commodities are taken as the export prices of major competitors, $P_{exporterfob}$, for an equivalent quality level. This represents a departure from equation (4) and implicitly assumes that the international freight from the competing exporting country to a third-country importer and from India to a third-country importer are equal.

On the timeframe for annual prices (the full year or harvest season only) we use average harvest season prices for India where available. If the large majority of farmers sell their products during the harvest season, then seasonal prices are the best indicators of the incentives to farmers resulting from the difference between domestic and international prices. In cases where we use domestic harvest season prices, international prices and exchange rates pertaining to the same timeframe are utilized. We calculate the MPS based on all domestic production, rather than marketable surplus, thereby making the assumption that producers value all of their production at the domestic price, even if some is consumed on-farm.

Surplus and Deficit Regions

Farmers in various Indian states receive different levels of protection or disprotection from agricultural policy owing to some state-level agricultural policies, and the interstate movement restrictions that were in place until 2002. For most of the major commodities in India, the Gulati-Pursell data allows representative analysis at the state level. Important producing states or regions are divided into "net surplus" and "net deficit" areas. In calculating the MPS price gap, the point of comparison between the

[25] Given the small trade volumes of the major commodities in India, there is substantial variation between import and export unit values and the commonly applied international prices series (i.e. U.S. hard red winter wheat f.o.b. U.S. Gulf, U.S. number 2 yellow corn f.o.b. U.S. Gulf, and Thai rice prices f.o.b. Bangkok). See Cheng (2004) for comparisons between unit values and international prices. Instead of using unit values, we follow Gulati et al. (1990) and, except in the case of chickpeas, select international prices for the quality level that is comparable to that produced domestically.

imported commodity and the commodity produced in the surplus region is assumed to be the wholesale market in the port city, with the adjusted reference price for a "net surplus" region under the importable hypothesis given by:

$$(5) \qquad P_{ar_s} = P_{\exp orterfob} + (T_i + C_i) + (C_p) - (T_{w:s} + M_s)$$

where the transportation costs from the port to the port-city wholesale market (T_{d1}) are assumed inconsequential, $T_{w:s}$ is the transportation cost from the surplus region to the port-city wholesale market, and M_s is marketing costs in the surplus region. The adjusted reference price for a deficit region can then be computed, following the procedure of Gulati et al. (1990) and Pursell and Gupta (1996), as either the adjusted reference price given by equation (1) for imports coming directly to the deficit region, or as the adjusted reference price of a nearby surplus region plus the transportation, handling and marketing costs from the surplus region to the deficit region, given by:

$$(6) \qquad P_{ar_d} = P_{ar_s} + (T_{d:s} + M_d)$$

where $T_{d:s}$ is the transportation cost from the surplus to the deficit region and M_d is marketing costs in the deficit region.

If the commodity is an export, only surplus regions are included in our analysis. In this case the adjusted reference price is:

$$(7) \qquad P_{ar} = P_{\exp orterfob} - (C_p) - (T_{d2} + M)$$

which is essentially equation (2) with T_{d1} assumed inconsequential and quality of the domestic and international commodity assumed to be equivalent.

Once state-level adjusted reference prices are derived, state-level nominal MPS can be computed. These results are then aggregated for the included states and the total expanded to an estimate of the national average MPS (see Pursell and Gupta, 1996). A national average P_m and P_e can also be computed using the value of production in the

included states as the weights. It is the national average import and export adjusted reference prices that are compared to a P^* estimated at the national level to determine the adjusted reference price in application of the MPS modified procedure.

Domestic Market Clearing Prices

The direction of net trade varies across years for many commodities in India. For seven commodities (rice, wheat, corn, sorghum, sugar, groundnuts and cotton), we compute and compare the MPS and %MPS under both the assumption that the commodities are importables ("importable hypothesis") and exportables ("exportable hypothesis") to demonstrate the effects of various adjustments. We also compute a domestic market-clearing price P^* at the national level for six of these commodities (except cotton) and we report MPS and %MPS (labeled "modified procedure") for which the relevant reference price each year is chosen based on whether P^* is above, below, or between P_m and P_e, as discussed above. Using these results, PSEs and %PSE can be calculated for any of the adjusted reference price assumptions.

In calculating the annual (post-harvest) domestic market-clearing price, we assume that *ex post* supply is fixed within the year. With supply fixed, computing P^* requires additional data on the price elasticity of demand and domestic consumption quantity and prices paid. The demand elasticity estimates available in the literature vary widely depending on the model and data used, and our calculation of P^* will vary depending on the elasticity assumed. Not binding ourselves to any particular estimate, we use -0.5 as an illustrative value, as used in Gulati and Kelley (1999).[26] We supplement the Gulati and Pursell database with total national domestic consumption for 1985-2003 from the USDA-FAS Production, Supply and Demand database (USDA-FAS, 2004d) and use the wholesale prices in our dataset to approximate the consumer price.

[26] See Dev et al. (2004) for recent discussion of demand being even more inelastic, about -0.2. As a sensitivity analysis we also computed results for this more inelastic demand parameter.

Input Subsidies

Aggregate estimates of subsidies on fertilizer, power and irrigation are from Gulati and Narayanan (2003) and are trend projected for 2001/02 and 2002/03 (see Table 6). To calculate commodity-specific PSEs, fertilizer subsidies are allocated across commodities based on the commodity's share of fertilizer usage, while irrigation and power subsides are distributed based on the share of irrigated area, as reported in USDA, 1994 (see Table 11). We have not included seed or credit subsidies in our analysis because their values have been small in recent years.

Table 11—Shares of Fertilizer Usage and Irrigated Area by Crop

	Share of Fertilizer Use %	Share of Irrigated Area %
Wheat	27.65	31.05
Rice	34.72	30.86
Corn	1.23	1.95
Sorghum	2.47	1.24
Chickpea	2.5	2.29
Groundnut	2.77	2.21
Rapeseed	1.51	4.65
Soybean	0.3	1.18
Sunflower	0.28	0.46
Sugar	7.12	5.18
Cotton	7.14	4.1
Other	12.31	14.83
Total	100.00	100.00

Note: Sunflower share of fertilizer use is estimated by the ratio of rapeseed:sunflower production in 1985-2003*rapeseed share of fertilizer use. Soybean and sunflower share of irrigated area is given by the ratio of soybean:sunflower production in 1985-2003*share of irrigated area for "other oilseeds" in worksheet "Irrigated area."

Sources: USDA 1994 (for irrigation); Indiastat 2003 for fertilizer.

5.2 CEREALS

5.2.1 Wheat

India is one of the world's largest producers and consumers of wheat. An MSP has been and remains in place at which the government procures wheat, providing a price floor for farmers. The effects of the restrictions on domestic wheat movements among states and even districts, and the stocking limits on private traders have been to drive down the "farm harvest price" to the MSP. Thus, throughout the period of analysis, the MSP is treated as the price received by producers.

Since wheat is a storable commodity, the gap between annual supply and demand is absorbed by the sum of net stock accumulation and net exports. Although wheat is essentially a non-traded commodity (net trade less than 500,000 tons or less than 1 percent of domestic production) in over one-third of the years between 1985-2003, there is also some variability in net exports and changes in stocks (Figure 10). If supply is greater than demand for any given year, stocks are accumulating or the country is a net exporter, or both and the reverse if supply is less than demand. Sometimes the trade and stock adjustments work in opposite directions: for example, with stocks rising and net imports occurring.

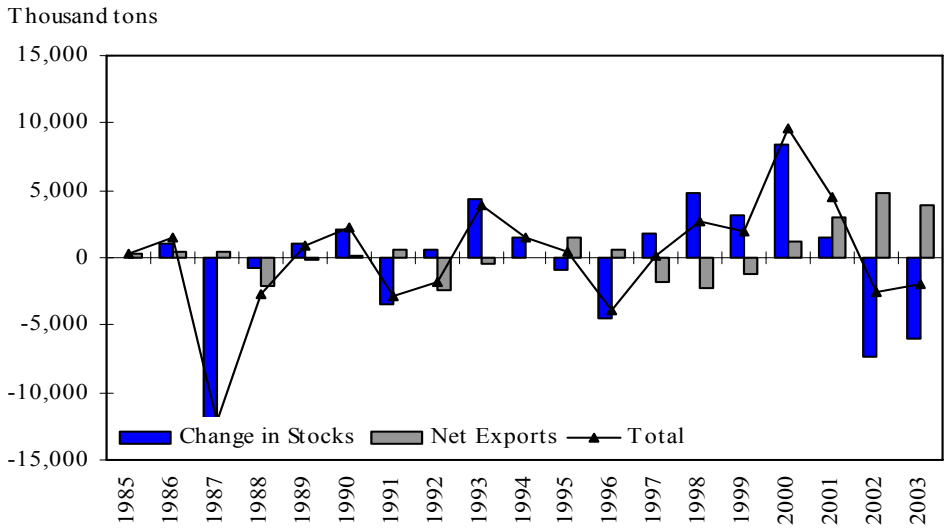
Wheat and other cereal imports have been subject to state trading by the FCI. From 1985 to 1994, India imported very little wheat except in two years (1988 and 1992) when production fell short of domestic consumption. Wheat exports were restricted until 1995. The Indian government then moved wheat onto the list of freely exportable goods. As exports started to pick up, there was upward pressure on domestic wheat prices and the government hastily banned exports in 1996 and opened up imports of wheat at zero tariff.[27] Initially very low levels of imports followed since domestic prices were below

[27] The motivation behind this policy change reflects an interesting aspect of the political economy of trade policy. In particular, the roller flourmills in southern India succeeded in securing the right to import wheat. The roller flourmills had always complained about the constraints they face in procuring wheat (grown mainly in the northern states). They argue for instance, that the northern industry, which is closer to the central government and has better bargaining power gains from discriminatory pricing of the FCI's open market sale of wheat (Business Line, 2001).

world prices. But in the following years, especially from 1998 onwards, the world prices of wheat and other agricultural commodities fell. In the United States and other developed countries cash subsidy payments and other support to farmers were increased, allowing exports to continue even with low prices. India imported some wheat in 1998 and 1999, despite bumper crops harvested in these years. The MSP also continued to rise. This led to a situation where imports were coming in even as domestic food grain stocks reached unprecedented levels, and wheat stocks built up that could only be exported with subsidies because the domestic price was higher than the world price.

To stem the flow of imports, the GOI raised the import duty from zero to 50 percent on December 1, 1999, still well within its WTO bound rate of 100 percent. The government also started selling wheat stocks to private traders at concessional rates for export, as discussed above and estimated to be about 75 percent of the MSP in 2001 (USDA-FAS, 2002). Under these policies, over the past three years India has emerged as a net exporter of low quality wheat, shipping an estimated 5 million tons in 2002-03 to South and Southeast Asia and the Middle East.

Figure 10—Wheat Net Exports and Changes in Stocks, 1985-2003



Source: USDA-FAS PSD database, February 2004.

Wheat %MPS

Price comparisons and annual estimates of the wheat %MPS for 1985 to 2003 are shown under several alternative assumptions in Table 12. In our calculations, the MPS is computed based on the difference between the MSP for wheat (P_d in Table 12) taken as a proxy for domestic farmgate price and the adjusted reference prices. The reference prices for exports ($P_{exporterfob}$ in Table 12) are taken in dollars as the price of U.S. hard red winter wheat f.o.b. U.S. Gulf. Adding the international transportation costs to India from the source at U.S. Gulf ports gives P_{cif}, a dollar reference price for imports. Multiplication of these two prices by the exchange rate gives the unadjusted reference prices in rupees per ton for Indian exports and imports, respectively. The unadjusted reference prices are not shown in Table 12. Instead the average adjusted reference prices (P_m and P_e) are given, following equations (1) and (2), as modified for the state-level analysis (equations (6)-(8)) and aggregation, and using the other assumptions and adjustments summarized in Table 10. Estimates of the national-level market-clearing autarky prices (P^*) are also shown.

Under the importable hypothesis, we computed the wheat MPS for two key surplus states (Haryana and Punjab) and one important deficit state (Uttar Pradesh). We then aggregate the results to a national level, as described above. Under the exportable hypothesis, we compute the wheat MPS by state for Haryana and Punjab and derive our national estimate from these results. The national estimates for the %MPS are shown for both the importable and exportable hypothesis in Table 12 (these estimates are labelled "Adjusted Reference Price"). Table 12 also displays a simplified %MPS based on the difference between the MSP and a reference price at the border without internal adjustments (c.i.f. under the importable hypothesis and f.o.b. for exportables, labelled "Unadjusted Border Price").

Table 12—Wheat Prices, %MPS and PSE Under Various Assumptions, 1985-2003

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	154	139	116	115	136	174	125	143	146	140	152	192	197	151	121	109	122	128	140
P_{cif} (US$/MT)	184	169	141	140	179	215	165	184	188	181	196	235	241	194	163	150	164	169	181
Exchange Rate (Rs/US$)	12.5	12.5	12.8	13.4	16.1	17.3	20.5	25.9	31.3	31.4	31.4	34.7	35.8	40.8	42.9	44.1	46.9	49.0	47.4
P_d (Rs/MT)	1520	1570	1620	1660	1730	1830	2150	2250	2750	3300	3500	3600	3800	4750	5100	5500	5800	6100	6200
P_m (Rs/MT)	2200	2009	**1693**	**1771**	2795	3608	3261	4654	5760	5537	6017	8061	8509	7747	6853	6482	7538	8125	8414
P_e (Rs/MT)	**1504**	1295	995	1007	1607	**2352**	1832	**2908**	**3652**	**3340**	**3614**	**5459**	**5767**	**4676**	3624	3146	4023	4459	4721
P^* (Rs/MT)	1496	**1468**	2318	1847	**1671**	1657	**2363**	2393	2355	3134	3411	4032	3789	4357	**4730**	**3928**	**5152**	**6225**	**6544**
Wheat %MPS Estimates																			
Importable Hypothesis																			
Adjusted Reference Prices	-31.0	-21.9	-4.3	-6.3	-38.2	-49.3	-34.1	-51.7	-52.3	-40.5	-41.9	-55.4	-55.4	-38.7	-25.6	-15.2	-23.1	-25.0	-26.4
Unadjusted Border Price (c.i.f.)	-33.7	-25.6	-9.9	-11.7	-40.1	-50.9	-36.6	-52.7	-53.3	-41.9	-43.1	-56.0	-55.9	-40.1	-27.1	-17.0	-24.7	-26.5	-27.8
Difference	2.8	3.7	5.5	5.4	1.9	1.6	2.4	1.0	1.0	1.5	1.3	0.6	0.5	1.3	1.5	1.8	1.6	1.5	1.4
Exportable Hypothesis																			
Adjusted Reference Prices	1.0	21.2	62.8	64.9	7.7	-22.2	17.4	-22.6	-24.7	-1.2	-3.1	-34.1	-34.1	1.6	40.7	74.8	44.2	36.8	31.3
Unadjusted Border Price (f.o.b.)	-21.0	-9.9	9.6	7.8	-21.2	-39.2	-16.1	-39.4	-40.0	-24.7	-26.5	-46.0	-46.2	-22.9	-2.1	14.9	1.0	-2.5	-6.2
Difference	22.1	31.1	53.2	57.1	28.9	17.1	33.4	16.8	15.3	23.5	23.4	12.0	12.1	24.5	42.8	59.9	43.2	39.3	37.5
Modified Procedure	1.0	7.0	-4.3	-6.3	3.5	-22.2	-9.0	-22.6	-24.7	-1.2	-3.1	-34.1	-34.1	1.6	7.8	40.0	12.6	-2.0	-5.3
Wheat PSE Under Modified Procedure																			
MPS (Rs. bil)	0.7	4.8	-3.2	-5.1	3.2	-26.0	-11.7	-36.7	-51.6	-2.4	-7.5	-115.4	-136.4	4.9	26.4	120.0	44.6	-9.2	-23.9
Budgetary Payments (Rs. bil)	8.7	10.3	8.4	15.5	21.9	26.2	34.9	36.9	42.0	47.8	68.9	83.5	88.8	96.1	108.2	114.9	126.6	135.8	148.9
Nominal PSE (Rs. bil)	9.4	15.1	5.2	10.3	25.1	0.2	23.2	0.2	-9.6	45.4	61.4	-32.0	-47.6	101.0	134.5	235.0	171.2	126.6	125.1
PSE (%)																			
Trade Economist Denominator	14.2	21.9	6.9	12.6	27.8	0.2	17.8	0.1	-4.6	22.7	25.8	-9.4	-11.9	32.6	39.9	78.3	48.3	27.7	27.6
OECD Denominator	12.4	17.9	6.5	11.2	21.7	0.2	15.1	0.1	-4.8	18.5	20.5	-10.4	-13.5	24.6	28.5	43.9	32.6	21.7	21.6

Note: Relevant P_{ar} is in **bold** (see discussion in text). Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

Under the importable hypothesis, the %MPS results with and without internal adjustments are quite similar.[28] There is, however, a greater difference between unadjusted reference prices and adjusted P_e under the exportable hypothesis, and thus in the respective %MPS. The %MPS results with the adjusted reference price under the exportable hypothesis are greater than for the unadjusted reference price by 12.0 percent (in 1996) to 59.9 percent (in 2000). Recall that in the specification of P_e for an export C_p, $T_{w:s}$ and M are subtracted from the unadjusted reference price with no offsetting additions. In this case, the MPS based on a comparison of domestic prices and unadjusted reference prices has a systematic downward bias that can be large when internal adjustments are important.

On the substantive issue of levels of protection or disprotection, we focus on the estimates of the %MPS with adjusted reference prices. The results under the exportable hypothesis are greater than those under the importable hypothesis because P_e is always less than P_m. There are large fluctuations in the %MPS over time, partly being counter-cyclical to international price movements and partly reflecting changes in the domestic support price.

Generally, the level of protection (disprotection) increases (decreases) when world prices are low and decreases (increases) when world prices are high. The %MPS is consistently negative under the importable hypothesis but varies from -4.3, -6.3 and -15.2 percent in 1986, 1987 and 2000, respectively, when world prices were relatively low, to -55.4 percent when world prices peaked in 1996 and 1997. Under the exportable hypothesis, the %MPS has a similar pattern, being highest in 2000 (74.8 percent) when the combination of rising support prices and falling world prices increased the level of protection, and lowest in 1996 and 1997 (-34.1 percent) when world prices were high.

Disprotection under the importable hypothesis is less, and wheat is protected under the exportable hypothesis during 2001-2003 rather than disprotected in the 1990s.

[28] Recall in the specification of P_m for imports C_p is added to the unadjusted reference price, $T_{w:s}$ and M_s are subtracted from P_r for a surplus region and $T_{d:s}$, and M_d are added back to P_{ars} to obtain the adjusted reference price for a deficit region. The net adjustment is small when aggregated across regions.

We estimate that subsidies required to export wheat (P_d - P_e) briefly reached 75 percent in 2000, similar to the estimate by USDA-FAS (2002), and averaged almost 50 percent during 2000-2003.

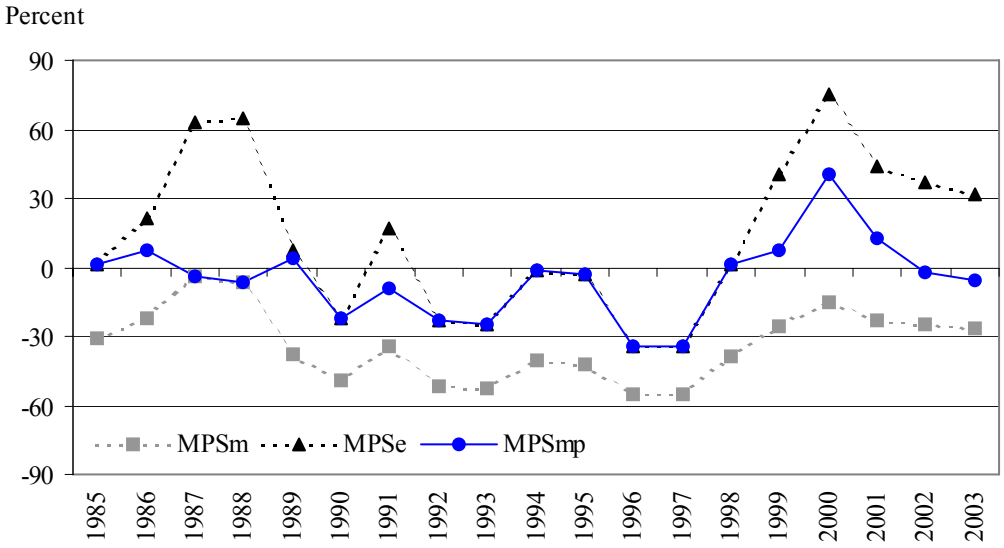
The relevant adjusted reference prices under our modified procedure are shown in bold in Table 12 (to recall, when $P^*>P_m$, then P_m is the relevant P_{ar}; when $P_e>P^*$, then P_e is the relevant P_{ar}; and when $P_m>P^*>P_e$, then P^* is the relevant P_{ar}). The %MPS is shown in Table 12 and the movements of the %MPS under this modified procedure compared with those under the importable and exportable hypotheses are shown in Figure 11. Under the modified procedure, the relevant reference price varies across years. The relevant P_{ar} is P^* in 1986, 1989 and 1991, P_m in 1987 and 1988, and P_e in 1985 and 1990. In these various years, if the policy interventions were removed, wheat, in principle, would have been not traded, imported and exported, respectively. By 1990, the domestic price, P_d was below the relevant P_{ar} and %MPS was negative (-22.2 percent in 1990 and -9.0 percent in 1991). During 1992-1998, P_e is the relevant P_{ar}, meaning that without policy interventions, India would have been an exporter in these years. Because the %MPS is negative in all of these years except 1998, producers were disprotected relative to P_e. Part of the rise in disprotection resulted from relatively strong world prices during this period and part from a nominal depreciation of the Indian currency of 80 percent between 1990 and 1993 (depreciation raises the adjusted reference price in domestic currency).[29]

During 1999-2003, we estimate that P^* is the relevant reference price for wheat in India, implying that without policy interventions India would be self-sufficient in wheat production, but would not import or export (or experience changes in intervention stock levels). This is because P_m is "too high" for imports to be competitive and P_e is "too low" relative to P^* for exports to be profitable in the world market. The %MPS from the

[29] Currency misalignment and its effects on the MPS and PSE for India and China are evaluated by Cheng and Orden (2005). Overall, they find the Indian currency was overvalued about 15 percent through 1993 compared to estimated equilibrium levels. For wheat, the overvaluation lower %MPS by an average of -4.1 percent in 1985-89 and -4.7 percent during 1991-93. With the substantial nominal devaluation, the exchange rate has since moved closer to the equilibrium.

modified procedure reaches a high of 40.0 percent in 2000. The estimated level of protection is less than under the conventional exportable assumption. In 2002 and 2003, the domestic price is slightly below P^*, corresponding to decreasing stocks, and resulting in a small negative %MPS in these years, compared to positive support under the export hypothesis and a continued need for export subsidies given actual domestic and world prices.

Figure 11—India Wheat %MPS Under the Modified Procedure versus Importable and Exportable Hypotheses, 1985-2003



Source: Authors' calculations.
Note: MPS_m, MPS_e and MPS_{mp} are computed under the importable and exportable hypotheses and the modified procedure, respectively.

Wheat PSEs

To calculate the product-specific %PSE for wheat, we take the MPS based on the choice of autarky or adjusted import or export reference price under our modified procedure as our estimate for each year and compute the nominal MPS value for total wheat production (see Table 12).[30] To the MPS, we add the budgetary payments allocated to wheat producers, which include 27.65 percent of the total fertilizer subsidies and 31.05

[30] Results under the importable and exportable hypotheses are available on request.

percent of the power and irrigation subsidies (see Table 11). Adding the nominal MPS for wheat and the budgetary payments allocated to wheat gives the nominal wheat PSE.

In Table 12, we have computed the wheat %PSE under both the OECD and "trade economists" approaches to choosing the denominator. The %PSE according to the trade economist's approach is always greater than the OECD or subsidy counter's approach (labeled "OECD Denominator" in Table 1) when the PSE is positive and smaller (in absolute value) when the PSE is negative. These results follow from the relationship between the two denominators.[31] The difference in the case of wheat in India is often small and mostly less than 10 percent. An exception is when the MPS is a large positive number. For example, in 2000, the %PSE under the trade economist's approach is 78.3 percent, compared to 43.9 percent under the subsidy counter's approach, a difference of 34.4 percent.

5.2.2 Rice

India is the world's second largest producer, consumer and exporter of rice. Exports of common rice from India were essentially banned until 1994 but recently India has become a major supplier of common as well as basmati rice, exporting 4 MMT in 2002 (Figure 12). The government actively intervenes in the rice market through price support and procurement operations, and since April 2001, also through export subsidies, estimated at 50 percent of procurement prices (Wailes, 2003).

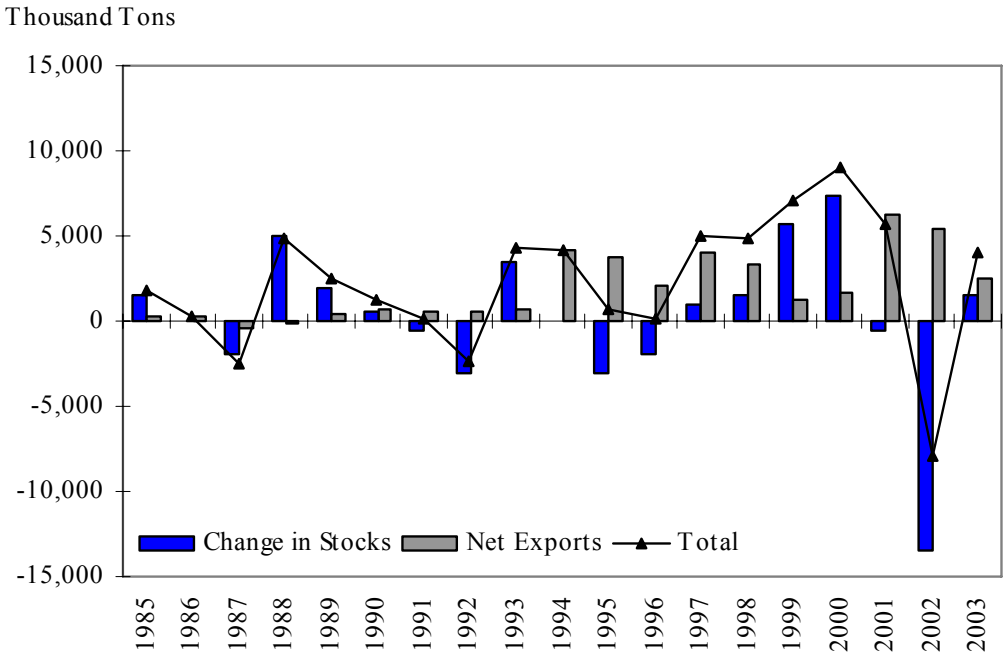
In addition to the purchase operations for extending price support to farmers for paddy rice, the FCI also procures rice under the statutory levy system imposed under the Essential Commodities Act, 1955 whereby state governments require millers and dealers to deliver from 10 to 75 percent of their turnover at prices announced separately for each state (Hoda and Gulati, 2005). As discussed above, support prices for food grains have increased steadily since 1996 resulting in accumulation of large stocks. In terms of

[31] The value of production at domestic prices is its value at adjusted reference prices plus the nominal MPS. The subsidy counter denominator is larger when product-specific PSE is positive because (MPS + BP) for the commodity is greater than zero. Conversely, when the product-specific PSE is negative, the subsidy counter denominator is smaller in absolute value because (MPS + BP) is less than zero.

possible imports, in 2002-03 the applied tariff on milled rice was 70 percent, while that on paddy, brown rice and broken rice was 80 percent.

For rice, we compute the MPS for two major producing and net surplus states (Andhra Pradesh and Punjab) and one major producing but net deficit state (Uttar Pradesh) under the importable hypothesis (Table 13). Under the exportable hypothesis, we compute the MPS for Andhra Pradesh and Punjab. The export price, $P_{exporterfob}$, is for Thai 15 percent broken rice during the peak paddy harvest season in India (October to January), P_d is the weighted average procurement price (wholesale level) of rice in the three states, and price adjustments are as described in Table 10. For rice and subsequent commodities under the importable and exportable hypotheses only the results with the adjusted reference price are reported.[32]

Figure 12—Rice Net Exports and Changes in Stocks, 1985-2003



Source: USDA-FAS PSD database, February 2004.

[32] The results for the unadjusted border prices are available upon request, but having demonstrated that the internal adjustments are important for wheat, especially under the exportable hypothesis, we do not continue to show the comparison for other crops.

The %MPS results in Table 13 and Figure 13 show that except in the mid 1980s and in 2000-2002 rice has been disprotected in India. Under our modified procedure, P_e is the relevant adjusted reference price from 1988 through 2000, meaning that if policy interventions were removed India would have been a net exporter of rice. Following the removal of the ban on rice exports in 1994, India's exports of rice went up from less than 1 million to about 5 million tons in 1995-96, making India the second largest exporter of rice in that year. Domestic prices in India were lower than the reigning international prices both during the period of the export ban and when world prices peaked in 1995-1997. However, with the international prices falling in the late 1990s, domestic prices were comparable to the international prices and India's rice exports turned sluggish. Although the MPS remains negative under the importable hypothesis, the MPS estimated under the export hypothesis or modified procedure turn mostly positive, implying that domestic prices are higher than the relevant adjusted reference prices in 2000-2002. Because the domestic price has been greater than the adjusted international price for exports in 2000-2002, the government has had to grant export subsidies on rice in recent years in order to continue shipments abroad. Our estimates of the necessary export subsidies are in the order of 35-40 percent in 2001 and 2002.

The PSEs for rice are also given in Table 13, again using the reference prices from the modified procedure, and allocating 34.72 percent of the total fertilizer subsidies and 30.86 percent of the irrigation and power subsidies to rice in accord with its share of fertilizer use and irrigated area. The PSE estimates broadly follow the same pattern and sign as the MPS. In recent years, increasing input subsidies have raised the %PSE compared to the %MPS.

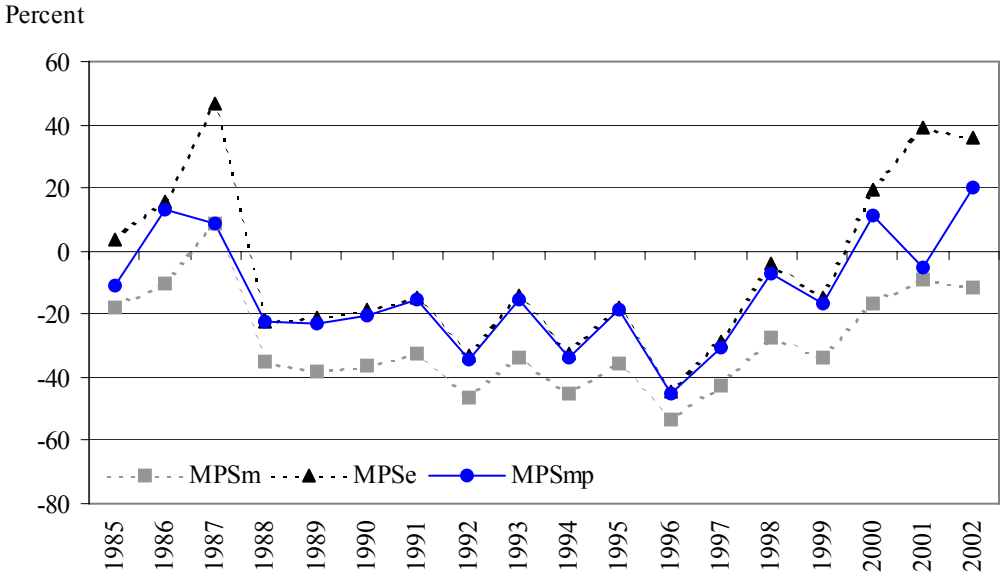
Table 13—Rice Prices, %MPS and PSE Under Various Assumptions, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	209	200	159	254	258	256	254	254	237	278	254	346	304	255	272	216	174	173	
P_{cif} (US$/MT)	228	220	175	271	286	284	281	281	264	306	284	375	333	284	300	244	202	201	
Exchange Rate (Rs/US$)	12.3	12.1	13.0	13.0	15.0	16.9	18.1	25.9	26.0	31.4	31.4	35.0	35.8	38.0	42.4	43.5	46.6	48.1	
P_d (Rs/MT)	2245	2320	2386	2239	2613	3005	3375	3861	4515	5162	5665	6057	6745	7734	8418	8780	8535	8494	
P_m (Rs/MT)	2726	2586	**2199**	3453	4234	4714	5013	7179	6786	9456	8763	13006	11815	10699	12659	10507	9353	9580	
P_e (Rs/MT)	2206	**2051**	1656	**2879**	**3381**	**3777**	**3996**	**5858**	**5339**	**7809**	**6955**	**11020**	**9708**	**8349**	**10118**	**7873**	6597	6724	
P^* (Rs/MT)	**2515**	2030	2285	2841	2659	2965	3402	3920	4890	4721	5250	6689	6017	7471	7724	5578	**9020**	**7059**	
Rice %MPS Estimates																			
Importable Hypothesis	-17.7	-10.3	8.5	-35.2	-38.3	-36.3	-32.7	-46.2	-33.5	-45.4	-35.4	-53.4	-42.9	-27.7	-33.5	-16.4	-8.7	-11.3	
Exportable Hypothesis	3.7	15.4	46.9	-22.2	-21.0	-18.8	-14.4	-33.2	-14.2	-32.8	-17.6	-44.8	-28.9	-4.0	-14.9	19.5	39.2	35.6	
Modified Procedure	-10.8	15.4	8.5	-22.2	-21.0	-18.8	-14.4	-33.2	-14.2	-32.8	-17.6	-44.8	-28.9	-4.0	-14.9	19.5	-5.4	20.3	
Rice PSE Under Modified Procedure																			
MPS (Rs. bil)	-15.8	17.2	11.3	-36.4	-54.2	-56.8	-46.2	-149.1	-60.1	-212.6	-105.5	-382.0	-242.2	-50.7	-146.3	81.4	-41.1	130.3	
Budgetary Payments (Rs. bil)	9.5	11.3	8.3	15.7	23.1	28.1	38.0	39.2	44.1	49.9	74.2	90.0	95.2	101.4	113.5	118.7	131.1	139.9	
Nominal PSE (Rs. bil)	-6.3	28.5	19.7	-20.6	-31.0	-28.7	-8.1	-109.9	-15.9	-162.7	-31.3	-292.0	-147.0	50.6	-32.8	200.1	85.5	256.9	
PSE (%)																			
Trade Economist Denominator	-4.3	21.7	14.8	-12.6	-13.0	-10.3	-2.7	-25.1	-4.1	-25.9	-5.5	-34.4	-18.5	7.3	-3.8	28.3	11.2	40.1	
OECD Denominator	-4.5	17.9	12.9	-14.4	-15.0	-11.5	-2.8	-33.6	-4.3	-35.0	-5.8	-52.5	-22.7	6.8	-3.9	22.1	10.0	28.6	

Note: Relevant P_{ar} is in **bold** (see discussion in text). Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

Figure 13—Rice %MPS Under the Modified Procedure versus Importable and Exportable Hypotheses, 1985-2002

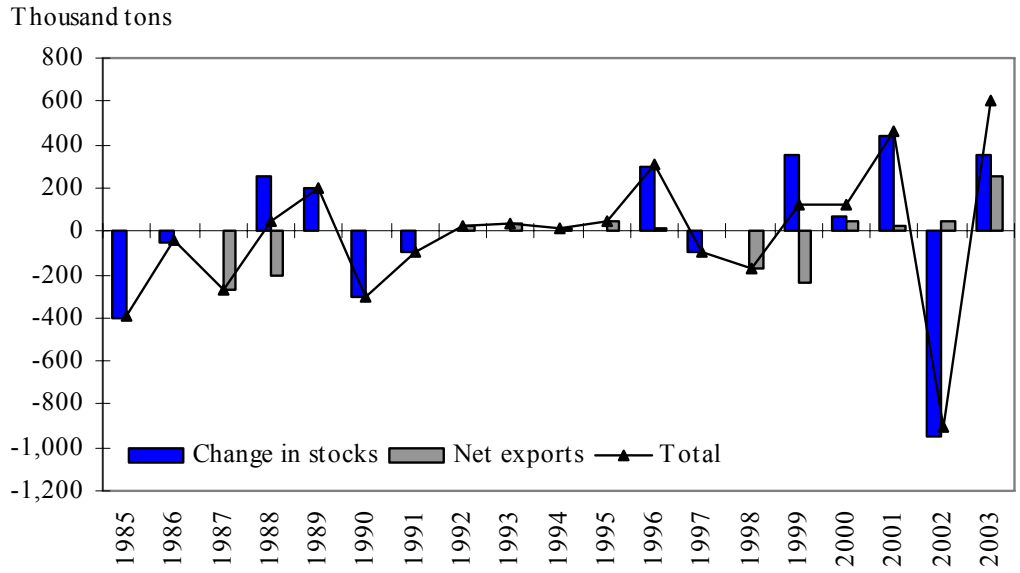


Note: MPS_m, MPS_e and MPS_{cc} are computed under the importable and exportable hypotheses and the modified procedure, respectively.
Source: Authors' calculations.

5.3 COARSE GRAINS

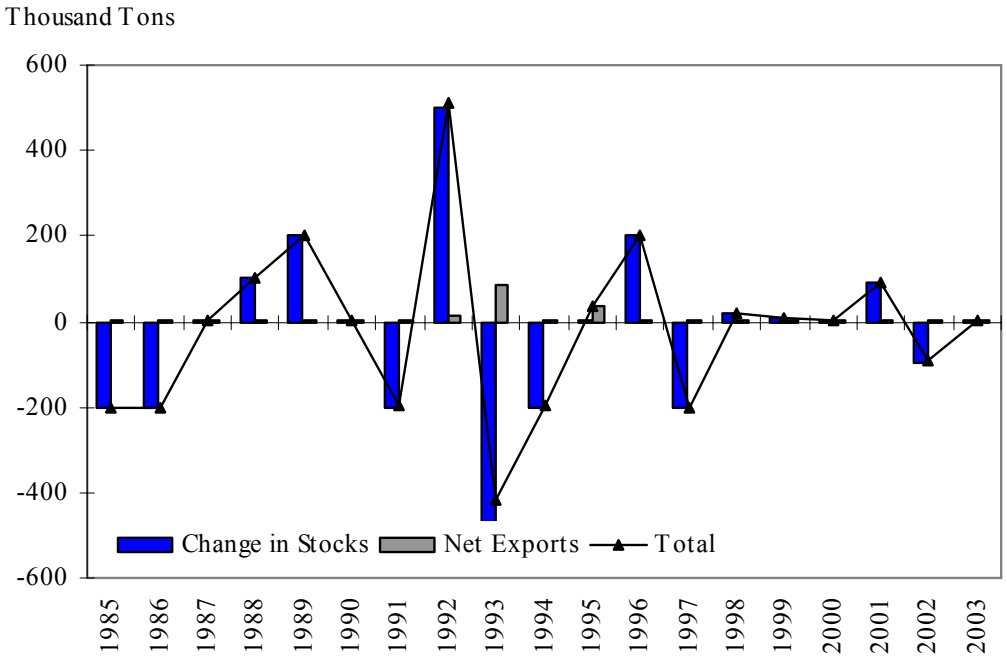
India is an important producer and consumer of coarse grains with an annual crop of around 25-35 MMT. Corn production makes up roughly 40 percent of coarse grain production, with sorghum and millet contributing 25 percent each and barley makes up about 5 percent. Coarse grains are typically planted in non-irrigated and marginal areas during the monsoon season, thus production can be highly variable depending on rainfall (USDA-FAS, 2004b). A large portion of coarse grain production, particularly of sorghum and millet goes to food use. Trade in coarse grains is small for India, less than 1 percent of domestic production (see Figures 14 and 15 for net exports of corn and sorghum).

Figure 14—Corn Net Exports and Changes in Stocks, 1985-2003



Source: USDA-FAS PSD database, February 2004.

Figure 15—Sorghum Net Exports and Changes in Stocks, 1985-2003



Source: USDA-FAS PSD database, April 2004.

5.3.1 Corn

Since 1999, India has produced and consumed around 11-13 MMT of corn annually, which makes India a relatively small producer, consumer and trader of corn in the world market. Although there is a minimum support price for corn, procurement is infrequent.[33] In the early 1990s, the feed industry pressured the GOI to liberalize imports to supply the expanding livestock sector, particularly the poultry sector which is among the fastest growing sectors in Indian agriculture (Narayanan and Gulati, 2003a). Under the EXIM policy of 1992-97, the feed industry was permitted to import maize without license based on actual usage and subject to registration. Imports of maize for other uses

[33] In 2000 and 2001, bumper crops of maize in the southern states of Andhra Pradesh and Karnataka brought down domestic prices. The governments of these two states responded by procuring in excess of 2.8 million tons of maize in November 2000 through March 2001 (Narayanan and Gulati, 2003a).

continued to be routed through parastatals, though imports were insignificant until 1998 when over 200,000 tons came in.

Quantitative trade restrictions on maize were abolished in 1999 and India established a TRQ with an initial limit of 350,000 tons permitted at an in-quota tariff rate of 15 percent. Exports of maize were subject to quantitative ceilings set by the government until 2002. Corn imports exceeded 100,000 metric tons in only four years since 1985 and India was a net exporter of over 100,000 metric tons of corn in 2003.

We compute the MPS under the importable and exportable hypotheses and the modified procedure using four net surplus states (Uttar Pradesh, Rajasthan, Karnataka, and Madhya Pradesh) and (except under the exportable hypothesis) one net deficit state (Gujarat). The domestic price, P_d is the weighted average October to January wholesale market price in each of the states and $P_{exporterfob}$ is the export price of U.S. number 2 yellow corn for the same months. With the limited trade in corn, we find that P^* is the relevant adjusted reference price under our modified procedure in 11 out of 18 years 1985-2002 (see Table 14 and Figure 16). Generally, the %MPS is relatively low for corn, with either slight protection or disprotection. Corn is estimated to be protected in 1987-88 when world prices were low, while disprotection peaks in 1994 at -20.2 percent. Similar to wheat, P^* is the relevant adjusted reference price for corn in 1999-2002, during which time India's corn %MPS is in the range of 2.0 percent to 5.8 percent.

To compute the PSE, we add the MPS under the modified procedure and the budgetary payments (Table 14). The budgetary payments allocated to corn production are relatively small (1.23 percent of the total fertilizer subsidies and 1.95 percent of the total irrigation and power subsidies), yet the MPS and PSE differ in sign in 1991, 1992 and 1998 when the %MPS is slightly negative and the addition of positive budgetary payments makes the PSE positive.

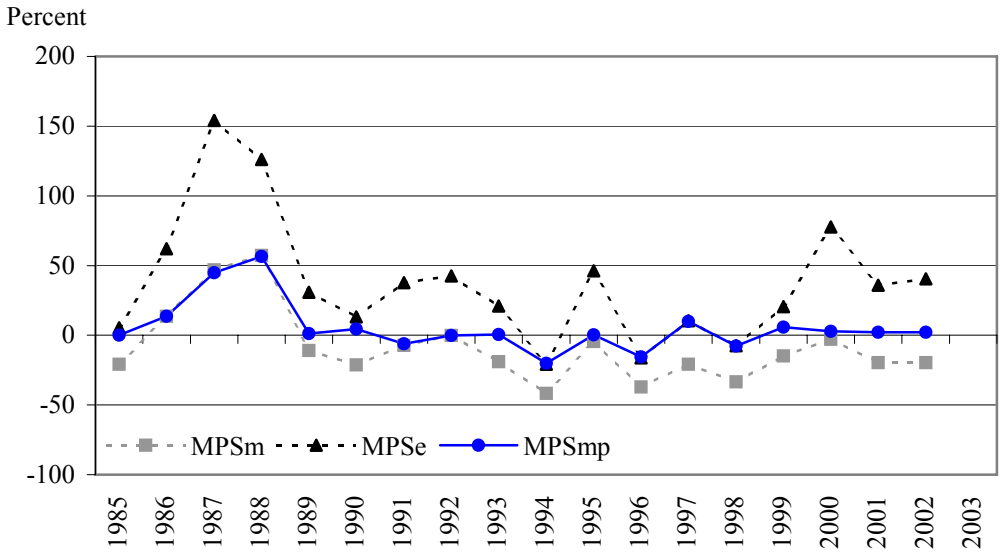
Table 14—Corn Prices, %MPS and PSE Under Various Assumptions, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	118	105	70	83	118	108	102	108	94	118	100	148	121	121	97	88	92	90	
P_{cif} (US$/MT)	148	135	96	109	161	150	143	149	137	160	145	192	165	165	139	130	134	132	
Exchange Rate (Rs/US$)	12.3	12.1	13.0	13.0	15.0	16.9	18.1	25.9	26.0	31.4	31.4	35.0	35.8	35.8	42.4	43.5	46.6	48.1	
P_d (Rs/MT)	1329	1689	1775	1999	2023	1862	2214	3646	2720	2803	4172	4023	4455	3898	4803	5365	4995	4942	
P_m (Rs/MT)	1676	**1488**	**1225**	**1277**	2271	2364	2386	**3655**	3354	4750	4370	6378	5629	5841	5641	5520	6216	6151	
P_e (Rs/MT)	1260	1035	697	881	1550	1639	1604	2575	2240	**3513**	2825	**4766**	4012	**4220**	3999	3004	3530	3547	
P^* (Rs/MT)	**1327**	1880	1733	2183	**1998**	**1784**	**2358**	3732	**2707**	2782	**4160**	3988	**4052**	3987	**4541**	**5213**	**4895**	**4843**	
Corn %MPS Estimates																			
Importable Hypothesis	-20.8	13.6	46.9	57.3	-10.9	-21.3	-7.2	-0.2	-18.9	-41.6	-4.6	-37.1	-20.9	-33.4	-14.9	-2.8	-19.7	-19.7	
Exportable Hypothesis	5.4	62.1	154.1	126.1	30.8	13.1	37.8	42.6	21.0	-20.8	46.2	-16.2	10.3	-7.6	20.5	77.6	35.8	40.5	
Modified Procedure	0.1	13.6	46.9	57.3	1.3	4.4	-6.1	-0.2	0.5	-20.8	0.3	-16.2	9.9	-7.6	5.8	2.9	2.0	2.0	
Corn PSE Under Modified Procedure																			
MPS (Rs. bil)	0.0	1.3	4.2	4.1	0.2	0.8	-1.3	-0.1	0.1	-6.8	0.1	-7.1	4.3	-3.5	2.9	1.7	1.2	1.3	
Budgetary Payments (Rs. bil)	0.5	0.6	0.5	0.9	1.3	1.5	2.0	2.1	2.5	2.8	3.9	4.8	5.1	5.6	6.4	6.9	7.6	8.2	
Nominal PSE (Rs. bil)	0.5	1.9	4.7	5.1	1.5	2.3	0.7	2.1	2.6	-4.0	4.0	-2.3	9.4	2.1	9.3	8.6	8.8	9.5	
PSE (%)																			
Trade Economist Denominator	4.4	19.3	50.7	69.5	9.0	13.1	3.2	7.0	9.7	-11.8	10.9	-5.1	21.6	4.7	18.4	14.4	14.9	14.9	
OECD Denominator	4.2	16.2	33.6	41.0	8.3	11.6	3.1	6.6	8.8	-13.4	9.8	-5.4	17.8	4.4	15.5	12.6	13.0	12.9	

Note: Relevant P_{ar} is in **bold** (see discussion in text). Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

Figure 16—Corn %MPS Under the Modified Procedure versus Importable and Exportable Hypotheses, 1985-2002



Note: MPS_m, MPS_e and MPS_{cc} are computed under the importable and exportable hypotheses and the modified procedure, respectively.
Source: Authors' calculations.

5.3.2 Sorghum

India ranks among the top three sorghum producing and consuming countries with output of 7-8 MMT. Food use accounts for nearly 90 percent of total sorghum consumption in 1985-2003 (USDA-FAS, 2004b).[34] Sorghum is essentially not traded in most years and trade was less than 100,000 tons in every year over the period 1985-2003 (Figure 15). Grain sorghum imports are subject to an 80 percent duty and are restricted to the FCI. There is a MSP for sorghum, however it is generally below the market price.

We have computed the MPS and PSE for sorghum under the importable, exportable and modified hypotheses for four major producing states (Andhra Pradesh, Maharashtra, Karnataka and Madhya Pradesh). P_d is the weighted average harvest season (October-January) wholesale price in the four states and $P_{exporterfob}$ is the October-January average price of sorghum, f.o.b. U.S. Gulf. Table 15 and Figure 17 give the %MPS for sorghum.

[34] The high tannin content of India's sorghum restricts is use in poultry rations, but its use in production of starch and alcohol is increasing (FAS, 2004).

Table 15—Sorghum Prices, %MPS and PSE Under Various Assumptions, 1985-2002

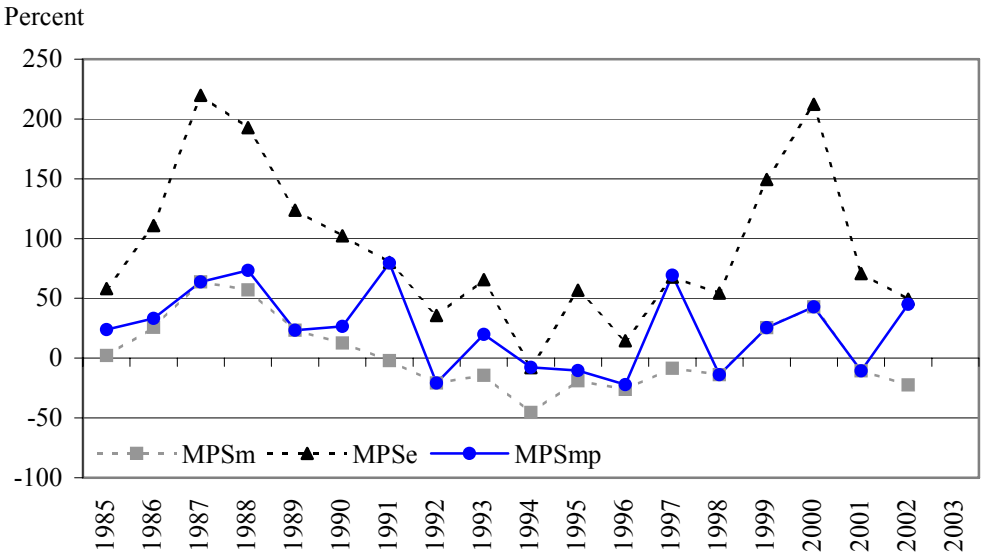
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	108	95	70	77	107	103	101	108	94	114	98	147	108	112	90	82	97	95	
P_{cif} (US$/MT)	138	125	95	103	151	145	142	149	136	156	143	191	152	156	133	124	139	138	
Exchange Rate (Rs/US$)	12.3	12.1	13.0	13.0	15.0	16.9	18.1	25.9	26.0	31.4	31.4	35.0	35.8	38.0	42.4	43.5	46.6	48.1	
P_d (Rs/MT)	1743	1911	2030	2130	2765	2838	2555	3008	3026	2679	3632	4893	4932	5180	7429	7889	5965	5326	
P_m (Rs/MT)	1704	1520	**1239**	1356	**2243**	2520	2608	**3800**	3532	4897	4476	6631	5396	**6020**	**5915**	**5522**	**6666**	6864	
P_e (Rs/MT)	1111	920	655	731	1235	1413	**1424**	2212	1826	**2900**	2302	4252	**2912**	3369	3029	2553	3507	3591	
P^* (Rs/MT)	**1407**	**1433**	2162	**1229**	3872	**2244**	473	5060	**2522**	1532	**4047**	**6294**	1619	6562	8151	5918	6798	**3672**	
Sorghum %MPS Estimates																			
Importable Hypothesis	2.3	25.8	63.8	57.2	23.3	12.6	-2.0	-20.8	-14.3	-45.3	-18.9	-26.2	-8.6	-14.0	25.6	42.9	-10.5	-22.4	
Exportable Hypothesis	58.1	110.8	219.8	192.7	123.8	102.4	80.2	35.7	65.6	-7.9	56.8	14.5	67.7	54.4	149.3	212.2	70.7	49.2	
Modified Procedure	23.9	33.4	63.8	73.3	23.3	26.4	80.2	-20.8	20.0	-7.9	-10.3	-22.3	67.7	-14.0	25.6	42.9	-10.5	45.0	
Sorghum PSE Under Modified Procedure																			
MPS (Rs. bil)	3.8	4.9	7.3	11.0	5.3	7.7	13.2	-6.4	6.5	-2.5	-3.7	-13.1	22.1	-6.3	12.7	20.5	-5.4	13.7	
Budgetary Payments (Rs. bil)	0.5	0.6	0.3	0.7	1.1	1.4	2.0	2.0	2.1	2.4	3.8	4.7	4.9	5.0	5.5	5.4	6.0	6.3	6.9
Nominal PSE (Rs. bil)	4.3	5.5	7.6	11.7	6.5	9.1	15.2	-4.5	8.6	-0.2	0.1	-8.4	26.9	-1.4	18.2	26.0	0.6	20.0	
PSE (%)																			
Trade Economist Denominator	27.1	37.5	66.7	77.9	28.3	31.4	91.6	-14.5	26.6	-0.5	0.3	-14.3	84.7	-3.0	36.6	54.2	1.2	65.9	
OECD Denominator	21.3	27.3	40.0	43.8	22.0	23.9	47.8	-17.0	21.0	-0.5	0.3	-16.7	45.8	-3.1	26.8	35.1	1.2	39.7	

Note: Relevant P_{ar} is in **bold** (see discussion in text). Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

The results show that the domestic autarky price under our modified procedure fluctuates relative to world prices, mostly with P^* above P_e but varying in relation to P_m (P^* is the relevant adjusted reference price in eight years and P_m in seven years). Sorghum is often relatively more protected compared to corn. Also we observe a counter-cyclical pattern similar to wheat, rice and corn. The %MPS is positive and particularly high in the late 1980s as world prices fell to low levels and domestic prices rose in response a drought-reduced supply. Then, the %MPS turns slightly negative during the mid 1990s when world prices peaked. As world prices dropped again in the late 1990s, the %MPS turns positive but is somewhat instable among years. Only an estimated 6 percent of sorghum area is irrigated (USDA-FAS, 2004b). To compute the sorghum-specific PSE, we assumed that sorghum accounts for 2.47 percent of total fertilizer use and 1.24 percent of total power and irrigation usage, and allocate the input subsidies accordingly.

Figure 17—Sorghum %MPS Under the Modified Procedure versus Importable and Exportable Hypotheses, 1985-2002

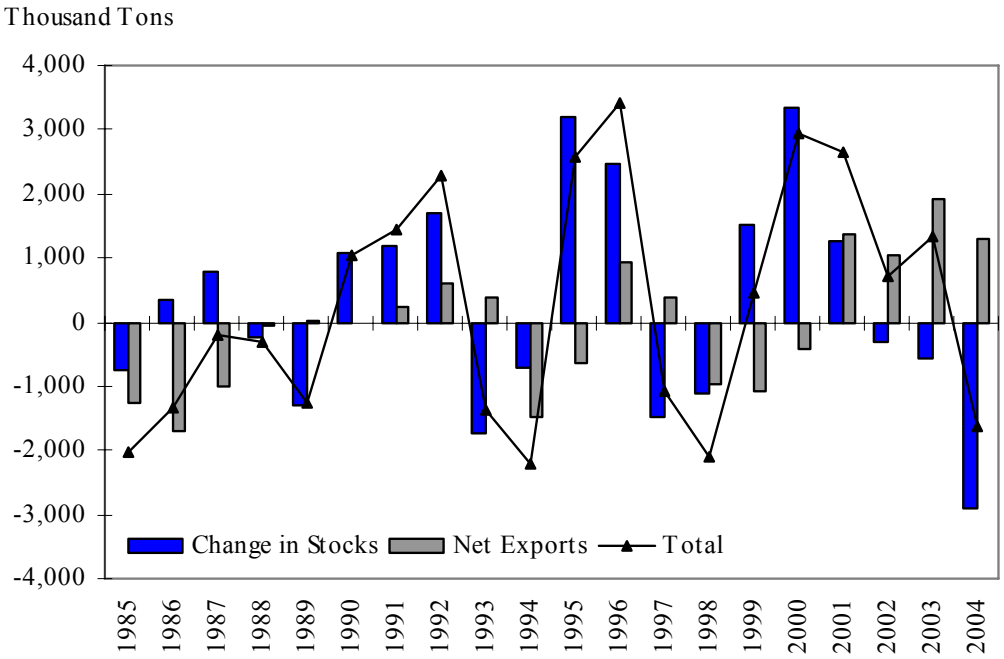


Note: MPS_m, MPS_e and MPS_{cc} are computed under the importable and exportable hypotheses and the modified procedure, respectively.
Source: Authors' calculations.

5.4 SUGAR

India, followed by the EU and Brazil, is the world's largest sugar producer, accounting for about 15 percent of world production in 1999-2003. India is also the largest sugar consuming country, with domestic consumption averaging 19.4 MMT (in raw sugar equivalents) during this period (USDA-FAS, 2004d). India is not among the major sugar net importing or exporting countries, but four consecutive years of record production resulted in India being a net exporter of more than one million tons annually during the period 2000-2003 (Figure 18). This amount is a relatively small proportion of the 35-45 MMT of annual world trade, but still represents an important reversal from India's net importer status previously.

Figure 18—Sugar Net Exports and Changes in Stocks, 1985-2004



Source: USDA-FAS PSD database, December 2003.

Sugar is included under the Essential Commodities Act of 1955, and its marketing and distribution by state and private mills are highly regulated. Since interventions in the sugar market were introduced in 1951, the goals of the policy regime has been to regulate prices received by producers and ensure that specified quantities of sugar are available for distribution to consumers at low controlled prices (Pursell and Gupta, 1996). The current domestic sugar market policies encompass cane and processed sugar pricing rules and controls on sugar market releases.[35]

For sugar, the GOI establishes "statutory minimum prices" (SMPs) for each region and the state governments often augment the SMPs by an additional 20 to 30 percent, except in recent years (FAS, 2004). Sugar mills are obliged to pay producers the effective state advised price (SAP) for sugarcane, which has been increasing in recent years. This has raised India's cost of sugar production to an estimated US$270 to US$280 per ton, compared to an average of US$172 for sugar production in the major low cost producing countries (USDA-FAS, 2004c; Mitchell, 2004).[36]

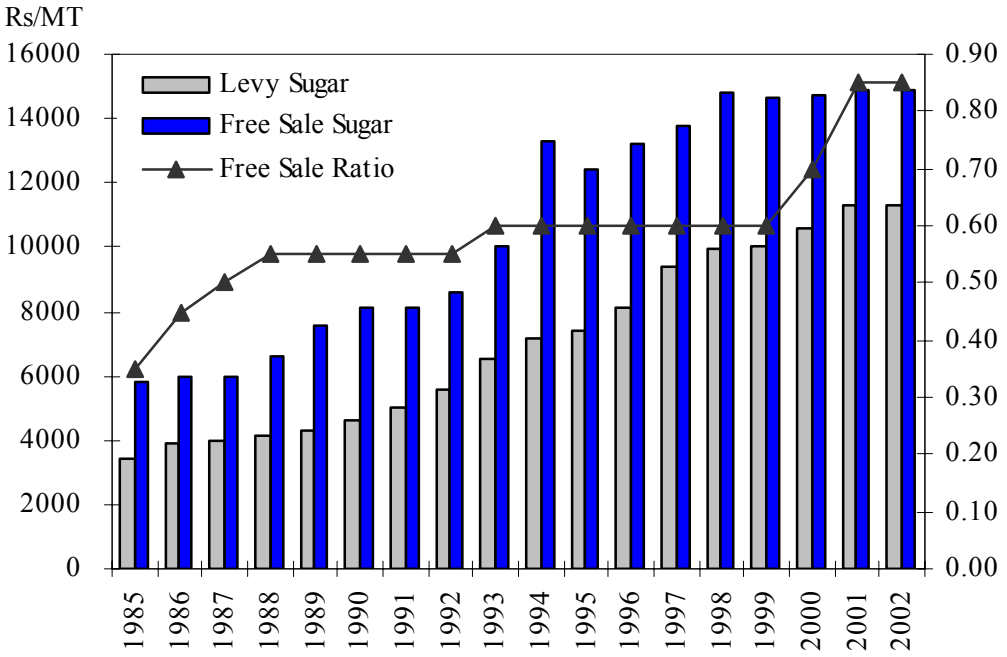
The government also regulates the release of sugar from mills. Mills are required to sell a portion of their production, known as "levy sugar" to the government at less than market prices. The government then sells this sugar to consumers below the poverty line through the Public Distribution System (PDS). The levy price of sugar is determined based on the SMP in each region, sugar recovery rates, and costs. Since mills typically have to pay farmers the SAP, which can be greater than the SMP on a raw sugar

[35] Other government policies affecting sugar markets include a new ethanol production program, launched in January 2003, and a Sugar Development Fund (SDF). Recently, the SDF, supported by a levy of Rs. 140 per ton of sugar, has been used to pay for maintenance of buffer stocks, internal and international freight subsidies for exports of sugar, and loans at concessional interest rates for power generation and ethanol production facilities, as well as for research and extension directed at sugarcane and sugar production (USDA-FAS, 2004c). The central government has also recently announced Rs. 32.4 billion (US$706 million) in low interest loans to selected state governments to enable sugar mills to pay farmers the difference between the SAP and SMP (USDA-FAS, 2004c).

[36] Some private sugar mills refused to purchase cane at the SMP at the start of the 2002/03 (October/September) marketing year and filed a case in the Supreme Court of India against the state governments' policy of arbitrarily fixing the SAP. In an interim ruling, the court ordered the mills to pay the central government announced SMP until a final decision is taken (USDA-FAS, 2004c). State-owned mills continue to pay the SAP, although their payment backlogs to farmers are up to two to three times greater than those of the private mills (USDA-FAS, 2004c).

equivalent basis, sales at the levy price represent a loss to the mills that they are supposed to recoup from the sale of "free sugar" at market prices (Pursell and Gupta, 1996). Figure 19 shows the average levy and free market price, and the "free sale ratio" quantities sold at each price for the three large producing states of Uttar Pradesh, Maharashtra, and Tamil Nadu during 1985-2002. The proportion of free sale sugar has increased over time. The government also levies an excise tax on free sale sugar and operates a quarterly sales quota release program that restricts free sugar marketing.[37]

Figure 19—Sugar Free Sale and Levy Prices and Ratio of Quantities, 1985-2002



Source: Gulati and Pursell database.

India's sugar imports and exports are also highly regulated. There is an import duty of 60 percent plus a countervailing duty (CVD) of Rs. 850 per ton on raw and refined sugar. Imported sugar is also subject to the levy sugar obligation, the sugar release quota system, and other domestic regulations (USDA-FAS, 2004c).

[37] Before 2002, the marketing quotas were operated on a monthly basis.

To encourage the sugar exports, the GOI recently has offered incentives to exporters including an internal freight subsidy of up to Rs. 1000 per ton to cover freight costs from the mill to port that began in July 2002. In February 2003, an ocean freight subsidy of Rs. 350 per ton was offered and beginning in October 2003, the government reimbursed handling and marketing costs up to Rs. 500 per ton. Exports are also exempt from levy requirements, release quotas, local taxes cess, and other domestic regulations. State governments also provide export subsidies. For example, Maharashtra provides an export subsidy of Rs. 2500 per ton to their sugar mills (USDA-FAS, 2004c).

The MPS and PSE measures for sugar in India are computed using the three major producing states. World prices, international freight, and internal transport and marketing costs are handled in similar ways to the other commodities (Table 10). However, due to the complex sugar pricing policies the domestic price is the weighted average of the free sale sugar price and the levy sugar price, where the weights reflect the proportion of free sale to levy sugar mandated by the government. The free sale sugar price (quoted in the nearest major city) is adjusted by deducting marketing and traders' margins between the mill and major city, excise taxes and cess to give the price actually received by the mills (Pursell and Gupta, 1996).

Table 16 and Figure 20 present the %MPS results for sugar. Large fluctuations in the %MPS calculations over 1985-2002 are primarily due to swings in the adjusted reference price of sugar. The estimates suggest that sugar is highly protected in the late 1980s, becomes slightly disprotected in the early to mid 1990s and reverses to increasing levels of protection in the late 1990s. From 1997-2002, the estimated %MPS is positive. Since India was a net exporter in 1997 and again in 2001-2004, our analysis suggests that export subsidies on the order of 35-85 percent were necessary to make Indian sugar competitive on the world market. This is consistent with the FAS cost comparisons and the policy setting in which internal and international freight subsidies, and additional concessions on sugar exports were given in recent years.

Table 16—Sugar Prices, %MPS and PSE Under Various Assumptions, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	142	182	185	245	343	395	297	275	270	318	390	301	276	250	177	190	237	181	
P_{cif} (US$/MT)	153	191	197	262	359	411	313	290	288	332	406	316	291	265	193	206	252	196	
Exchange Rate (Rs/US$)	12.4	12.4	13.0	13.4	15.7	17.2	20.8	25.9	29.1	31.4	31.6	35.2	35.9	40.1	42.8	44.1	46.8	48.5	
P_d (Rs/MT)	4002	4456	4570	5025	5581	6086	6205	6643	7930	10116	9590	10341	11186	11993	11971	12474	13135	13137	
P_m (Rs/MT)	**1902**	**2364**	**2541**	**3517**	**5678**	7114	6530	7534	**8429**	**10449**	12927	11242	**10538**	**10761**	**8476**	**9318**	**12049**	**9725**	
P_e (Rs/MT)	1484	1949	2047	2906	4959	6329	5639	**6473**	7145	9172	**11477**	**9643**	8831	8908	6421	7194	9828	7419	
P^* (Rs/MT)	6612	6782	6205	6665	8199	**6663**	**6483**	6206	11597	16035	8479	8065	15166	17515	13996	11170	12155	15078	
Sugar %MPS Estimates																			
Importable Hypothesis	110.5	88.5	79.8	42.9	-1.7	-14.5	-5.0	-11.8	-5.9	-3.2	-25.8	-8.0	6.1	11.5	41.2	33.9	9.0	35.1	
Exportable Hypothesis	169.6	128.6	123.2	72.9	12.5	-3.8	10.0	2.6	11.0	10.3	-16.4	7.2	26.7	34.6	86.4	73.4	33.6	77.1	
Modified Procedure	110.5	88.5	79.8	42.9	-1.7	-8.7	-4.3	2.6	-5.9	-3.2	-16.4	7.2	6.1	11.5	41.2	33.9	9.0	35.1	
Sugar PSE Under Modified Procedure																			
MPS (Rs. bil)	12.9	14.7	17.2	13.7	-0.8	-6.3	-3.3	2.3	-5.3	-3.3	-27.6	11.5	8.4	15.8	54.3	57.4	20.1	62.4	
Budgetary Payments (Rs. bil)	1.8	2.1	1.4	2.7	4.1	5.1	7.0	7.0	7.8	8.8	13.5	16.4	17.2	18.1	20.1	20.7	22.9	24.4	
Nominal PSE (Rs. bil)	14.7	16.8	18.6	16.5	3.3	-1.2	3.6	9.3	2.5	5.5	-14.2	27.8	25.6	33.9	74.4	78.2	43.0	86.8	
PSE (%)																			
Trade Economist Denominator	125.5	101.0	86.3	51.4	6.6	-1.7	4.6	10.7	2.8	5.4	-8.4	17.5	18.8	24.5	56.5	46.1	19.3	48.8	
OECD Denominator	55.7	50.3	46.3	33.9	6.2	-1.7	4.4	9.7	2.7	5.1	-9.2	14.9	15.8	19.7	36.1	31.6	16.2	32.8	

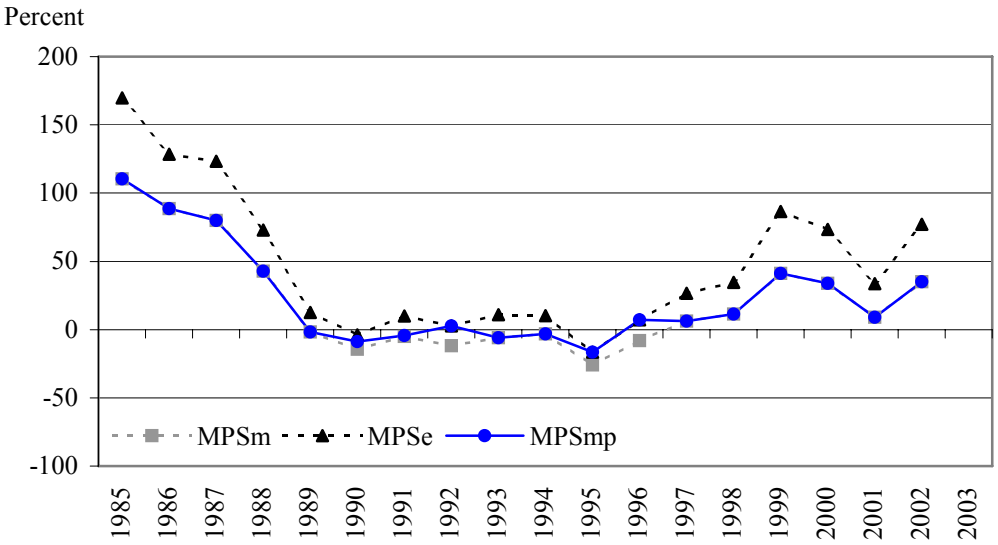
Note: Relevant P_{ar} is in **bold** (see discussion in text). Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

Turning to the %PSE, we capture the additional impact of the fertilizer, power and irrigation subsidies on the sugar sector. About 85 percent of the total sugarcane area is irrigated and sugarcane uses large quantities of power as well (Pursell and Gupta, 1996). We estimate that sugarcane production accounts for 7.12 percent of the total fertilizer usage and 5.18 percent of the total irrigated area in India.

The trade economist's %PSE exceeds the %MPS by an average of 10.5 percentage points. As with other commodities, when protection or disprotection is relatively large, the differences between the %PSE with the trade economist and OECD denominators are large, for example during 1985-87 the two %PSEs average 104.3 and 50.8 percent, respectively. But the differences between these two support measures are not as large in recent years when sugar has been protected.

Figure 20—Sugar %MPS Under the Modified Procedure versus Importable and Exportable Hypotheses, 1985-2002

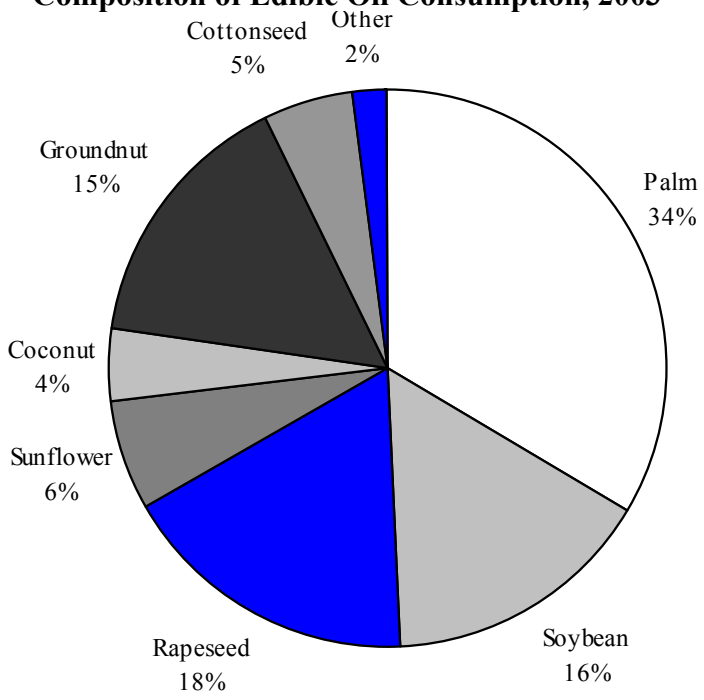


Note: MPS_m, MPS_e and MPS_{cc} are computed under the importable and exportable hypotheses and the modified procedure, respectively.
Source: Authors' calculations.

5.5 OILSEEDS

India is the fifth largest producer of oilseeds, producing around 20-25 MMT annually. Domestic production of 6-7 MMT of edible oils in recent years is less than domestic demand of around 10 MMT, and thus imports of 4 MMT have been necessary (GOI, 2003). The composition of India's edible oil consumption has shifted away from groundnut (peanut) and rapeseed oils, which accounted for 53 percent and 25 percent of consumption in the early 1970s, to greater consumption of palm and soybean oils. In 2003, palm and soybean oils made up 34 percent and 16 percent, respectively of oil consumption (Figure 21).

Figure 21—Composition of Edible Oil Consumption, 2003

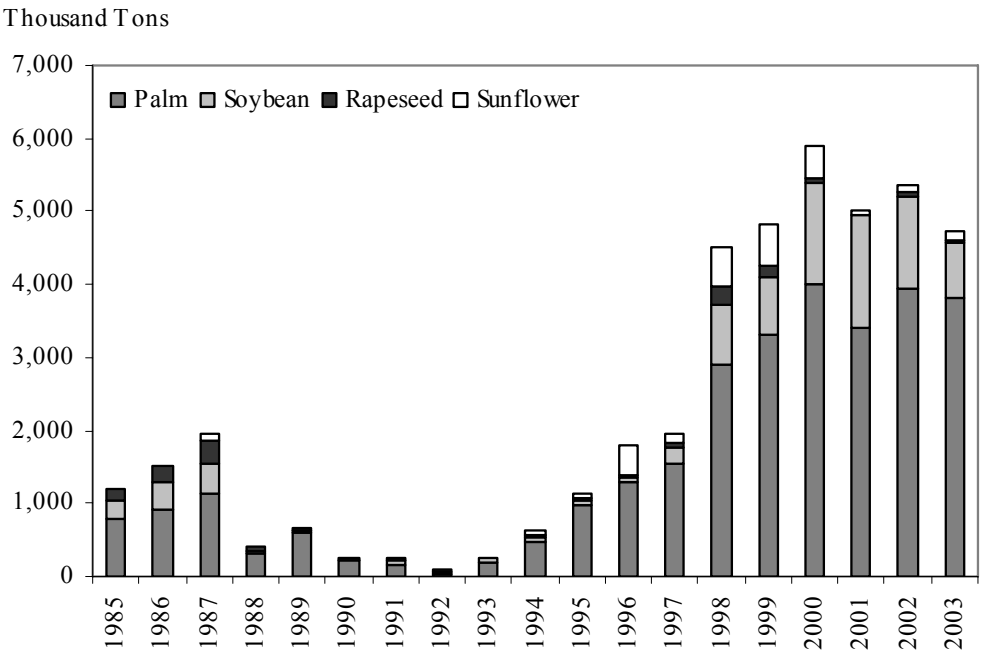


Note: Total consumption is 11.4 MMT.

Edible oils are India's biggest agricultural import. Palm products constituted over 70 percent of the total edible oil imports in 2003 followed by soybean oil which accounts for about one-quarter (Figure 22). The rising consumption of palm and soybean oils in

recent years is due to a greater access for imports and an increased domestic production of soybeans (Dohlman et al., 2003). India exports small amounts of sesame and niger seed. The exports of Hand Picked Select (HPS) peanuts average around 100,000 tons. India is a large exporter of oilseed cake since its domestic demand as a livestock feed is limited. Soybean meal was India's sixth largest agricultural export by value in 2002 and India was the seventh largest soybean meal exporter in the world that year (Table 2).

Figure 22—Imports of Major Edible Oils, 1985-2003



Source: USDA-FAS PSD database, April 2004.

Starting in 1986, India began to pursue an import substitution strategy in the oilseed sector. Import restrictions accorded a high level of protection to edible oils and oilseeds. As a result, domestic oilseed production grew from 10 MMT in 1980 to 21 MMT by 1993. Though India imported some edible oils during the 1980s, this was tightly controlled through canalization (State Trading Corporation and the Hindustan Vegetable Oil Corporation). Imports of oilseeds, also canalized, were practically non-existent. By the early 1990s, India had achieved near self-sufficiency in edible oils but

domestic prices were about 60 percent higher than world prices (Pursell and Gulati, 1995).

Import policy reforms were undertaken in the oilseed sector in 1994. The government freed imports of major edible oils (palmolein first, others a year later with the notable exception of coconut oil) and started reducing import duties over successive years. Tariffs fell from 65 percent in 1994 to 30 percent, then to 20 percent, and finally to 15 percent on crude edible oils by December 1999, against WTO bound rates of 45 percent for crude and refined soybean oil and 300 percent for other edible oils.[38]

As world prices fell in the late 1990s, there was a surge in imports exceeding 5 MMT per annum in 1999-2003 (Figure 22). India's self-sufficiency in oils dropped from 97 percent in 1993 to 55 percent in 2001. In the face of ensuing political pressure from the domestic vegetable oil industry, the GOI began to increase the import duty on edible oils in 2000 and to set more differentiated rates among them through a tariff rate value (TRV) system (Dohlman et al., 2003). By August 2001, the basic tariff rates stood at 30 percent for oilseeds and oilmeals, 75 percent for crude edible oils not subject to the TRV system, and 85 percent for refined sunflower-safflower oil and refined rapeseed oil (USDA-FAS, 2003d). Importantly, the imports of oil seeds are restricted through phytosanitary and import licensing procedures, and imports in most years are negligible (USDA-FAS, 2003d).

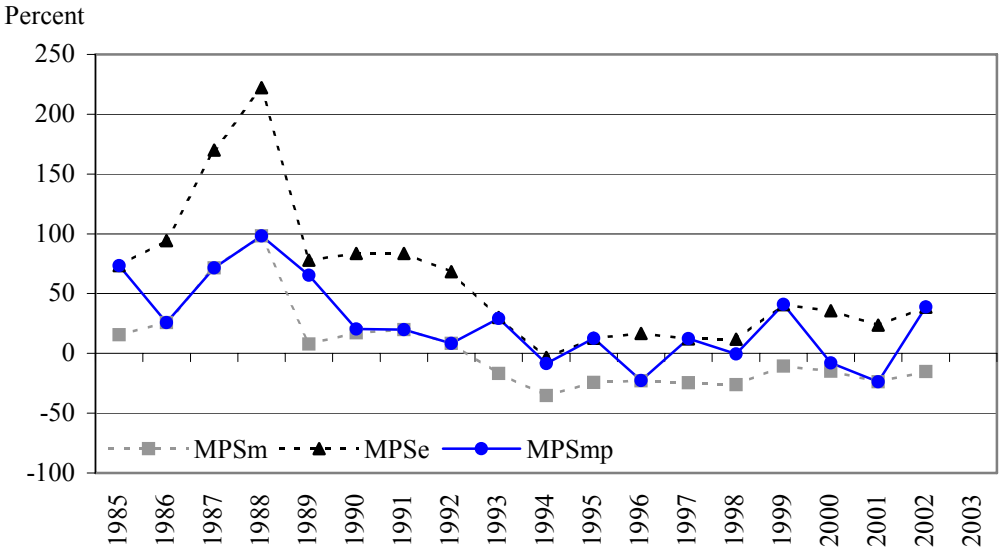
Domestic processing of India's two main oilseeds (groundnut and mustard) is reserved for small-scale industries. Thus, a noteworthy feature of India's domestic oilseed policy is that protection is targeted at the small-scale oil crushers rather than oilseed farmers. Gulati and Kelley (1999) find oil processors are relatively less efficient than oilseed farmers because oil processors are unable to take advantage of economies of scale.

[38] Rapeseed and sunflower-safflower oils which were subject to TRQs and over-quota duties of 75 percent and 85 percent, respectively (Dohlman, et al., 2003).

We compute %MPS and %PSEs for four major oilseeds: groundnut (Table 17 and Figure 23), rapeseed (Table 18 and Figure 24), soybean (Table 19 and Figure 24) and sunflower (Table 20 and Figure 24). We report estimates under the importable and exportable hypotheses and modified procedure for groundnuts, while for the other oilseeds we only report estimates as importables. This is because the most likely scenario is for oilseeds being imported rather than exported given the margins of comparative disadvantage that India has in these products.

For groundnuts, the relevant adjusted reference price fluctuates across the years 1985-2002, with P_m, P_e and P^* each indicated as relevant in five or more years. The general pattern of %MPS again indicates protection when world prices are relatively low in the late 1980s and less protection (even disprotection) when world prices are higher in the 1990s. Groundnut %PSEs remain mostly positive. For the 1986-1993 period, the %MPS indicates that other oilseeds were mostly protected in India. Price protection turns to disprotection since the mid 1990s. Again, for rapeseed and sunflower, but not for soybeans, the %PSEs generally remain positive.

Figure 23—Groundnuts %MPS Under the Modified Procedure versus Importable and Exportable Hypotheses, 1985-2002



Note: MPS_m, MPS_e and MPS_{cc} are computed under the importable and exportable hypotheses and the modified procedure, respectively.
Source: Authors' calculations.

Table 17—Groundnut Prices, %MPS and PSE Under Various Assumptions, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	243	224	185	185	220	270	293	267	256	335	351	328	354	311	262	252	242	233	
P_{cif} (US$/MT)	277	258	214	213	268	317	339	313	304	382	401	377	404	361	310	299	290	280	
Exchange Rate (Rs/US$)	12.4	12.4	13.0	13.4	15.7	17.2	20.8	25.9	29.1	31.4	31.6	35.2	35.9	40.1	42.8	44.1	46.8	48.5	
P_d (Rs/MT)	4514	4601	5495	6646	5227	7301	9629	10003	8369	8794	10844	11630	12380	12111	13553	12897	11928	13276	
P_m (Rs/MT)	3903	**3660**	**3202**	**3350**	4847	6230	**8031**	**9226**	10065	13576	14336	15102	16410	16382	15178	15147	**15619**	15673	
P_e (Rs/MT)	**2604**	2370	2030	2061	2935	3976	5244	5943	6437	9102	**9630**	9968	**11020**	10819	**9614**	9500	9641	**9567**	
P^* (Rs/MT)	2372	5728	5427	11231	**3161**	**6068**	8500	13902	**6475**	**9598**	8618	**15022**	8730	**12177**	-4417	**14022**	15840	3151	
Groundnut %MPS Estimates																			
Importable Hypothesis	15.6	25.7	71.6	98.4	7.8	17.2	19.9	8.4	-16.9	-35.2	-24.4	-23.0	-24.6	-26.1	-10.7	-14.9	-23.6	-15.3	
Exportable Hypothesis	73.3	94.1	170.0	222.3	77.9	83.5	83.7	68.3	29.9	-3.3	12.7	16.8	12.2	11.9	40.8	35.6	23.6	38.7	
Modified Procedure	73.3	25.7	71.6	98.4	65.4	20.3	19.9	8.4	29.2	-8.4	12.7	-22.6	12.2	-0.5	40.8	-8.0	-23.6	38.7	
Groundnut PSE Under Modified Procedure																			
MPS (Rs. bil)	12.3	4.8	13.5	19.3	20.0	10.0	12.0	5.5	16.2	-6.3	9.8	-25.7	11.8	-0.5	35.4	-5.9	-23.0	26.3	
Budgetary Payments (Rs. bil)	0.7	0.8	0.6	1.1	1.7	2.1	2.9	2.9	3.3	3.7	5.5	6.7	7.1	7.5	8.4	8.7	9.6	10.2	
Nominal PSE (Rs. bil)	13.0	5.7	14.1	20.4	21.7	12.1	14.9	8.4	19.5	-2.6	15.3	-19.0	18.8	7.0	43.7	2.8	-13.4	36.5	
PSE (%)																			
Trade Economist Denominator	77.6	30.2	74.8	104.2	71.0	24.6	24.6	12.9	35.1	-3.5	19.7	-16.7	19.8	7.8	50.7	3.7	-13.8	53.8	
OECD Denominator	43.7	23.2	42.8	51.0	41.5	19.7	19.8	11.4	26.0	-3.6	16.5	-20.0	16.5	7.2	33.6	3.6	-16.0	35.0	

Note: Relevant P_{ar} is in **bold** (see discussion in text). Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments). Domestic prices are for pods. International pod prices are taken as 0.7 times the kernel price (see Table 10).

Source: Authors' calculations.

Table 18—Rapeseed Prices, %MPS and PSE Under the Importable Hypothesis, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	360	296	218	220	182	196	189	175	169	198	261	260	260	294	201	172	178	189	
P_{cif} (US$/MT)	408	344	259	261	252	264	254	240	237	265	333	331	331	365	269	240	246	257	
Exchange Rate (Rs/US$)	12.7	12.4	12.9	13.2	15.7	17.2	19.7	25.9	29.6	31.4	31.4	35.2	35.8	40.0	42.7	43.8	46.7	48.8	
P_d (Rs/MT)	5098	4044	4383	6922	7310	5691	9363	9342	9075	10282	11920	11446	11507	14230	15359	12650	12458	13155	
P_m (Rs/MT)	5819	4889	3938	4105	4685	5363	5918	7283	8215	9675	12057	13334	13641	16674	13435	12464	13575	14741	
Rapeseed/Mustard %MPS Estimates																			
Importable Hypothesis	-12.4	-17.3	11.3	68.6	56.0	6.1	58.2	28.3	10.5	6.3	-1.1	-14.2	-15.6	-14.7	14.3	1.5	-8.2	-10.8	
Rapeseed/Mustard PSE Under Importable Hypothesis																			
MPS (Rs. bil)	-2.2	1.2	1.2	9.7	11.5	1.4	18.0	12.1	4.1	3.2	-0.8	-11.3	-14.2	-11.5	10.9	1.1	-4.7	-8.5	
Budgetary Payments (Rs. bil)	1.0	1.3	1.3	2.2	2.8	3.2	4.0	4.6	5.4	6.3	8.2	9.9	10.8	12.2	14.0	15.6	17.1	18.6	
Nominal PSE (Rs. bil)	-1.2	2.4	2.4	11.9	14.3	4.5	22.1	16.7	9.6	9.5	7.5	-1.4	-3.4	0.8	24.9	16.7	12.3	10.1	
PSE (%)																			
Trade Economist Denominator	-6.9	23.8	23.8	84.0	69.6	20.4	71.2	39.0	24.3	18.4	10.7	-1.7	-3.8	1.0	32.7	23.1	21.6	12.8	
OECD Denominator	-7.4	19.3	19.3	45.7	41.0	17.0	41.6	28.1	19.5	15.6	9.7	-1.8	-3.9	1.0	24.7	18.7	17.8	11.4	

Note: Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

Table 19—Soybean Prices, %MPS and PSE Under the Importable Hypothesis, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	223	196	181	216	284	207	212	210	203	242	209	257	271	257	201	188	186	170	
P_{cif} (US$/MT)	271	244	222	257	354	274	278	275	271	310	281	327	342	327	269	256	254	238	
Exchange Rate (Rs/US$)	12.5	12.2	13.0	13.0	15.1	17.0	18.4	25.9	26.9	31.4	31.4	35.2	35.8	38.4	42.4	43.5	46.6	48.3	
P_d (Rs/MT)	2667	2786	4208	5508	5285	5087	5858	8130	7300	7913	9258	9600	11692	10775	9017	8683	9658	9777	
P_m (Rs/MT)	3833	3418	3346	3873	6033	5336	5876	8075	8319	10943	10071	12957	13785	14224	13058	12814	13602	13246	
Soybean %MPS Estimates																			
Importable Hypothesis	-30.4	-18.5	25.8	42.2	-12.4	-4.7	-0.3	0.7	-12.3	-27.7	-8.1	-25.9	-15.2	-24.2	-30.9	-32.2	-29.0	-26.2	
Soybean PSE Under Importable Hypothesis																			
MPS (Rs. bil)	-1.2	-0.6	0.8	2.5	-1.4	-0.6	0.0	0.2	-4.8	-11.9	-4.1	-18.1	-13.5	-24.6	-28.6	-21.8	-23.1	-14.8	
Budgetary Payments (Rs. bil)	0.2	0.3	0.3	0.5	0.7	0.8	1.0	1.1	1.4	1.6	2.0	2.4	2.7	3.0	3.5	3.9	4.3	4.7	
Nominal PSE (Rs. bil)	-1.0	-0.3	1.1	3.1	-0.7	0.1	0.9	1.3	-3.5	-10.3	-2.1	-15.7	-10.9	-21.6	-25.1	-17.9	-18.8	-10.2	
PSE (%)																			
Trade Economist Denominator	-24.3	-9.2	36.6	51.4	-6.1	1.0	6.4	4.8	-8.8	-24.0	-4.1	-22.4	-12.2	-21.3	-27.2	-26.5	-23.6	-18.0	
OECD Denominator	-32.1	-10.1	26.8	33.9	-6.5	1.0	6.0	4.6	-9.7	-31.7	-4.3	-28.9	-13.9	-27.0	-37.3	-36.0	-31.0	-21.9	

Note: Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

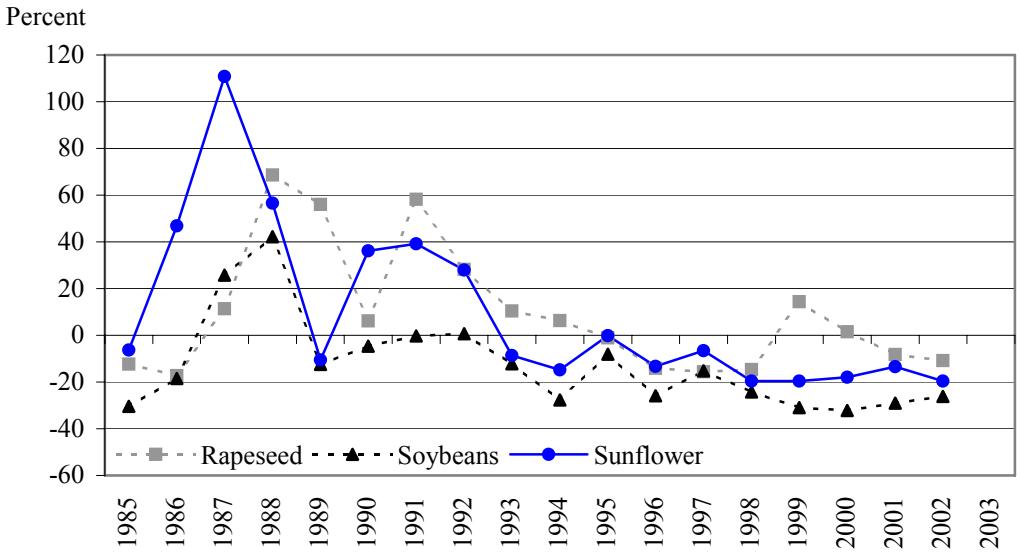
Table 20—Sunflower Prices, %MPS and PSE Under the Importable Hypothesis, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	270	196	183	228	315	231	262	209	241	289	278	277	236	289	238	195	200	276	
P_{cif} (US$/MT)	318	244	223	269	384	299	328	274	309	356	350	348	307	360	306	263	268	344	
Exchange Rate (Rs/US$)	12.4	12.4	13.0	13.4	15.7	17.2	20.8	25.9	29.1	31.4	31.6	35.2	35.9	40.1	42.8	44.1	46.8	48.5	
P_d (Rs/MT)	4094	5019	6958	6400	6001	7870	10565	10181	9167	10550	12298	11788	11536	12869	11815	10786	12285	14972	
P_m (Rs/MT)	4370	3418	3300	4088	6707	5777	7589	7957	10026	12373	12322	13604	12342	16010	14698	13148	14191	18615	
Sunflower %MPS Estimates																			
Importable Hypothesis	-6.3	46.8	110.9	56.5	-10.5	36.2	39.2	27.9	-8.6	-14.7	-0.2	-13.3	-6.5	-19.6	-19.6	-18.0	-13.4	-19.6	
Sunflower PSE Under Importable Hypothesis																			
MPS (Rs. bil)	-0.1	0.7	2.3	0.9	-0.4	1.8	3.6	2.6	-1.2	-2.2	0.0	-2.3	-0.7	-3.0	-2.0	-1.7	-1.6	-3.6	
Budgetary Payments (Rs. bil)	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.9	1.1	1.2	1.3	1.5	1.6	1.8	1.9	
Nominal PSE (Rs. bil)	0.0	0.8	2.5	1.1	-0.1	2.2	4.0	3.1	-0.6	-1.6	0.9	-1.2	0.5	-1.6	-0.5	-0.1	0.2	-1.7	
PSE (%)																			
Trade Economist Denominator	2.9	56.2	116.9	71.2	-3.5	43.2	44.3	33.3	-4.3	-10.3	5.7	-6.8	4.3	-10.9	-5.0	-1.1	1.3	-9.2	
OECD Denominator	2.8	36.0	53.9	41.6	-3.6	30.2	30.7	25.0	-4.5	-11.5	5.4	-7.3	4.1	-12.2	-5.2	-1.1	1.3	-10.2	

Note: Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

Figure 24—Rapeseed, Soybeans and Sunflower %MPS Under the Importable Hypothesis, 1985-2002



Source: Authors' calculations.

5.6 PULSES

India is the world's largest producer, consumer and importer of pulses. India accounts for about one quarter of world production and consumption of pulses and 10 percent of global imports, amounting to about 6 percent of domestic consumption during 1995-2001 (Price et al., 2003). Unlike most other agricultural commodities and food products, over the past 20 years imports of pulses have been unrestricted and subject to low tariffs, currently around 10 percent (USDA-FAS, 2003b).

5.6.1 Chickpeas

Chickpeas are the most common pulse crop grown in India, but there is also significant production of several others (particularly, pigeon peas, black matpe and mung beans). The state of Madhya Pradesh accounts for over one quarter of pulse production. Pulses are grown mostly on non-irrigated marginal land, not in the irrigated areas where improved varieties of wheat and rice dominate (Price et al., 2003; USDA-FAS, 2003b).

Minimum support prices are generally below market prices for pulses and pulse consumption has declined despite rising incomes over the last twenty years. Price et al. (2003) attribute this decline to reduced supplies and increased prices of pulses relative to other foods, particularly cereals, fruits, vegetables, and dairy products. In addition to minimum support prices, some states impose taxes on inter-state shipments of certain pulse varieties in order to protect their farmers from competition. Tamil Nadu, for example, imposes a 4 percent tax on yellow/green peas and chickpeas that are brought into the state (Price et al., 2003).

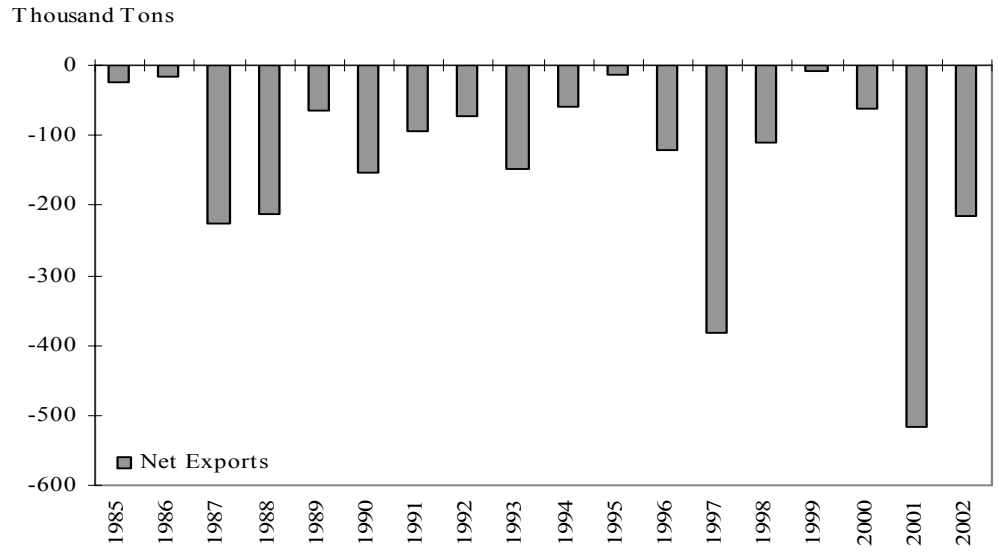
Net exports of chickpeas is shown in Figure 25. Imports show substantial variability. Price et al. (2003) assert that imports are less correlated with variations in domestic production than with the availability of international supplies, and that world prices are an important factor affecting import levels. Burma has been the largest exporter of chickpeas to the Indian market, supplying over 70 percent of total chickpea imports in recent years.

We compute the national level MPS and PSE for chickpeas under the importables hypothesis based on the state-level results for Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh. P_d is the April-March marketing year weighted average wholesale price of the four states. Adjusted reference prices are based on annual Indian import unit values for chickpeas; we assume that the quality differences between imported and domestically produced chickpeas are negligible. The resulting %MPS estimates for 1985-2002 vary from -61.3 percent and -37.5 percent in 1995 and 1999, respectively, to over 25 percent in 1986, 1991, 1998 and 2002 (Figure 26 and Table 21). With few policy-based trade barriers, these fluctuations may reflect marketing channel constraints on importing and exporting when domestic prices deviate from import price levels. India imported only small quantities in the years when the %MPS is estimated to be negative, but did not become an exporter.

Table 21 shows that the PSE has the same pattern as the MPS, because the budgetary payments allocated to chickpeas are small (2.50 percent of total fertilizer subsidies and 2.29 percent of total irrigation and power subsidies). Only when the MPS

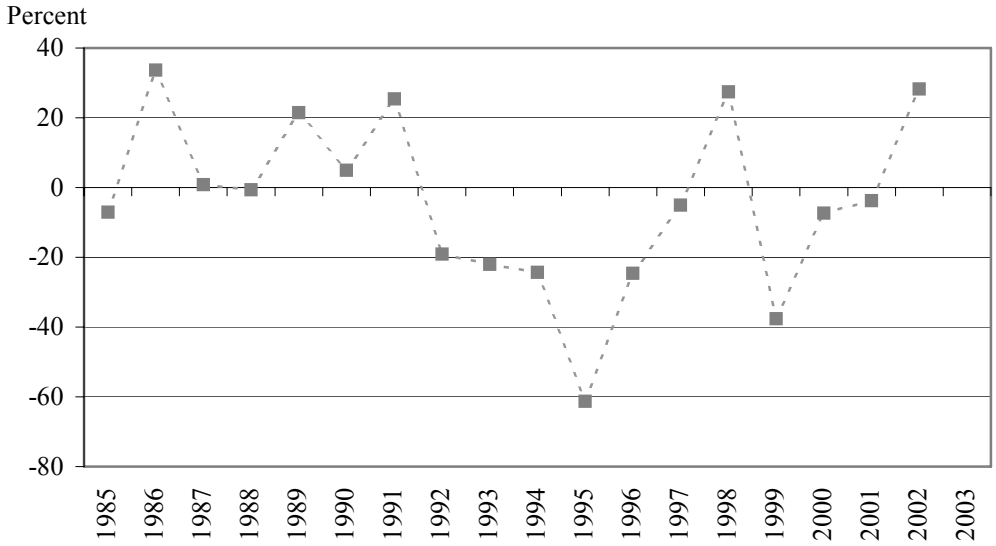
estimates assume small negative values in 1988, 1997, 2000 and 2001 are the MPS and PSE of opposite signs.

Figure 25—Chickpea Net Exports, 1985-2002



Source: FAOSTAT, 2004

Figure 26—Chickpea %MPS Under the Importable Hypothesis, 1985-2002



Source: Authors' calculations.

Table 21—Chickpea Price, %MPS and PSE Under the Importable Hypothesis, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)																			
Import Unit Value (US$/MT)	414	320	278	342	396	376	329	350	340	468	939	337	330	314	465	323	371	325	
Exchange Rate (Rs/US$)	11.9	12.2	12.8	13.0	14.5	16.7	17.9	24.5	26.4	31.4	31.4	33.5	35.5	37.2	42.1	43.3	45.7	47.7	
P_d (Rs/MT)	4284	4776	3326	4101	6446	6130	6818	6590	6658	10597	11137	8122	10540	13796	11769	12325	15473	18564	
P_m (Rs/MT)	4612	3574	3299	4126	5307	5839	5436	8145	8539	14009	28795	10772	11104	10823	18870	13304	16078	14470	
Chickpea %MPS Estimates																			
Importable Hypothesis	-7.1	33.6	0.8	-0.6	21.5	5.0	25.4	-19.1	-22.0	-24.4	-61.3	-24.6	-5.1	27.5	-37.6	-7.4	-3.8	28.3	
Chickpea PSE Under Importable Hypothesis																			
MPS (Rs. bil)	-1.5	7.0	0.1	-0.1	5.8	1.2	7.4	-6.4	-8.3	-17.0	-113.7	-13.2	-3.1	18.2	-48.3	-5.0	-2.1	20.8	
Budgetary Payments (Rs. bil)	0.7	0.8	0.6	1.2	1.7	2.1	2.8	2.9	3.2	3.7	5.4	6.6	7.0	7.5	8.4	8.8	9.7	10.3	
Nominal PSE (Rs. bil)	-0.8	7.8	0.7	1.1	7.5	3.3	10.2	-3.5	-5.1	-13.3	-108.3	-6.6	3.9	25.7	-39.9	3.8	7.5	31.1	
PSE (%)																			
Trade Economist Denominator	-3.8	37.6	5.0	7.2	27.7	13.4	35.0	-10.5	-13.4	-19.1	-58.4	-12.3	6.2	38.7	-31.1	5.5	13.3	42.4	
OECD Denominator	-3.9	27.3	4.7	6.7	21.7	11.8	25.9	-11.7	-15.5	-23.6	-140.3	-14.0	5.9	27.9	-45.2	5.2	11.8	29.8	

Note: Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments).

Source: Authors' calculations.

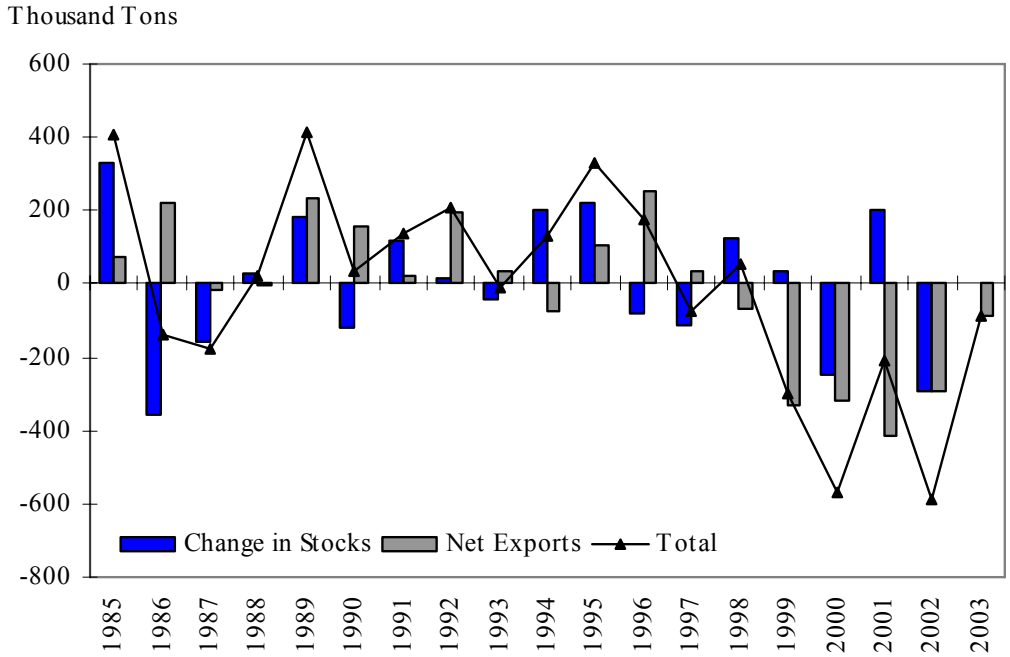
5.7 COTTON

India is the third largest producer and consumer of cotton after the United States and China. India has traditionally been both an exporter and importer of different cotton varieties (long and short staple) depending on local harvests and demand from the large textile industry (Figure 27). Import and export policy was, however, characterized by heavy intervention by the government. Quantitative restrictions on imports were replaced by tariffs in April 2001 and the basic duty on raw cotton has recently been 10 percent. Exports were also restricted through quotas until July 2001. Restrictions on cotton yarn were not removed until January 2002. Exports to developed countries such as the EU and U.S. continued to be restricted through 2004 under the phase-in of the WTO's Agreement on Textiles and Apparel. Since 1999, India has primarily been an important importer of cotton. There has been a steady import of extra long staple cotton due to its shortage relative to a strong demand and also due to failure of the north Indian crop in 2001-02.

India's cotton production policies are less interventionist than for some other commodities, particularly the foodgrains, oilseeds and sugar. The Cotton Corporation of India (CCI) is responsible for implementing the MSP system among the states. The cotton MSPs are typically below the market prices and the CCI functions are generally limited to commercial operations.[39] The GOI also has a statutory hand hank yarn policy that requires 50 percent of a mill's output of yarn destined for the domestic market to be produced in the form of hank yarn for use by the handloom industry. The government subsidizes the sale of handloom products and provides interest rate subsidies on loans to the textile industry for technology upgrades (USDA-FAS, 2004a).

[39] Until recently the state of Maharashtra had a monopoly cotton procurement scheme that it has dismantled to allow private traders to purchase cotton directly from farmers (USDA-FAS, 2004a).

Figure 27—Cotton Net Exports and Changes in Stocks, 1985-2003



Source: USDA-FAS PSD database, April 2004.

Following Gulati and Pursell (forthcoming), the MPS for cotton is calculated under the importable and exportable hypotheses on the basis of seed cotton or *kapas*. The farmer sells cotton to the mills where it gets converted to cotton lint and cottonseed.[40] Although India produces short, medium, medium long, and long staple cotton, we have based our calculations on the simplifying assumption that production is of the medium staple variety. In 2000-01, medium and medium long staple cotton made up 54 percent of production, followed by long (36 percent), short (7 percent) and extra long staple (3 percent).

Since cotton kapas is not traded internationally, as in Gulati and Pursell (forthcoming), we compute the U.S. f.o.b. price of cotton kapas as:

[40] Because of the complex interactions between cotton and textiles and apparel production, consumption and trade, we did not attempt to estimate an autarky cotton price using the procedure applied to other crops above.

*(9) Kapas f.o.b. U.S. = (1 1/8" cotton lint CIF Europe – $T_{EU:US}$ + 1.903 * U.S. cottonseed price)/ 2.94*

where $T_{EU:US}$ is the international freight between the EU and U.S. and the conversion between kapas and its products, cotton lint and cottonseed, is given by:

(10) 294 kg cotton kapas = 100 kg lint + 190.3 kg cottonseed.

Under the importable hypothesis, the kapas f.o.b. U.S. price plus the international freight from the U.S. to India provides the unadjusted reference price at the border. The reference price at the border is adjusted by subtracting the trading margin and domestic transport costs from the production region in Gujarat to Bombay, where it is assumed that the competition between the domestically produced cotton and the imported cotton occurs. Under the exportable hypothesis, the kapas f.o.b. U.S. price gives the reference price at the border (in Bombay).[41] The internal adjustments are computed as under the importable hypothesis.

Table 22 and Figure 28 shows that the resulting %MPS varies over time under both hypotheses. Levels of support or disprotection are modest except in 1988 following a sharp increase in domestic prices. After the late 1980s, there is a trend towards decreased levels of protection and even increasing levels of disprotection under the importable hypothesis in 1998-2002. Under the exportable hypothesis, cotton receives positive support but again the level declines in recent years, a shift in contrast with wheat, rice and sugar. With large imports coming into India in 1999-2002, one would expect the adjusted reference price to be less than or equal to the domestic price in order for imports to be competitive. A quality difference may explain this result, in part because imports of the extra long staple variety command a premium price.

[41] In the case of cotton, insurance cost assumed to equal one percent of the f.o.b U.S. price of cotton lint are subtracted.

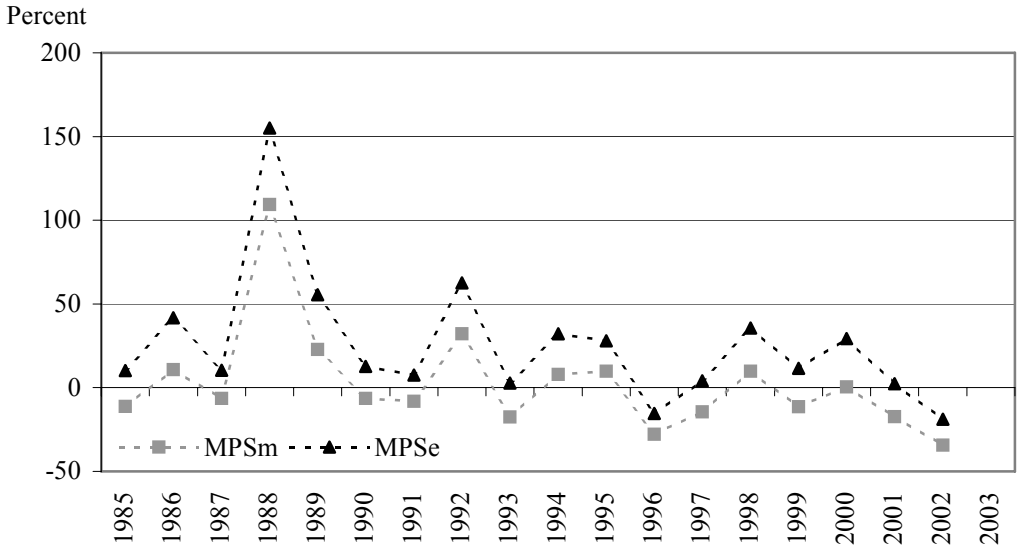
Table 22—Cotton Prices, %MPS and PSE Under the Importable and Exportable Hypotheses, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Price Data																			
$P_{exporterfob}$ (US$/MT)	597	466	597	553	559	640	743	474	521	576	769	774	678	603	591	486	564	564	
P_{cif} (US$/MT)	629	498	624	579	586	659	759	504	544	603	800	799	699	627	609	513	589	589	
Exchange Rate (Rs/US$)	12.7	12.3	13.0	13.1	15.3	17.1	18.9	25.9	28.2	31.4	31.4	35.2	35.9	39.3	42.5	43.6	46.6	48.5	
P_d (Rs/MT)	5662	4920	5938	11833	8538	8487	10963	13625	10164	16860	23750	17550	18132	22862	19494	18555	19462	16162	
P_m (Rs/MT)	6373	4438	6346	5651	6956	9070	11935	10313	12318	15617	21611	24309	21218	20808	22022	18471	23551	24641	
P_e (Rs/MT)	5139	3469	5381	4639	5489	7528	10191	8382	9887	12756	18568	20750	17413	16856	17479	14349	19003	19909	
Cotton %MPS Estimates																			
Importable Hypothesis	-11.2	10.9	-6.4	109.4	22.7	-6.4	-8.1	32.1	-17.5	8.0	9.9	-27.8	-14.5	9.9	-11.5	0.5	-17.4	-34.4	
Exportable Hypothesis	10.2	41.8	10.3	155.1	55.5	12.7	7.6	62.6	2.8	32.2	27.9	-15.4	4.1	35.6	11.5	29.3	2.4	-18.8	
Cotton PSE Under Importable Hypothesis																			
MPS (Rs. bil)	-3.1	2.1	-1.4	20.1	7.0	-3.4	-4.9	16.4	-12.5	6.8	13.0	-44.3	-22.4	11.4	-15.8	0.5	-19.9	-43.6	
Budgetary Payments (Rs. bil)	1.6	1.9	1.1	2.2	3.6	4.5	6.2	6.1	6.7	7.5	11.8	14.4	15.1	15.5	17.2	17.3	19.3	20.3	
Nominal PSE (Rs. bil)	-1.5	4.0	-0.4	22.3	10.6	1.1	1.3	22.5	-5.8	14.3	24.8	-29.9	-7.3	26.9	1.3	17.8	-0.6	-23.3	
PSE (%)																			
Trade Economist Denominator	-5.5	20.3	-1.6	121.5	34.2	2.0	2.2	44.0	-8.1	16.7	18.9	-18.8	-4.7	23.4	1.0	16.4	-0.5	-18.4	
OECD Denominator	-5.8	16.8	-1.6	54.9	25.5	2.0	2.2	30.6	-8.9	14.3	15.9	-23.1	-5.0	18.9	1.0	14.1	-0.5	-22.6	
PSE Under Exportable Hypothesis																			
MPS (Rs. bil)	2.3	6.5	2.0	23.4	13.6	5.6	3.9	26.0	1.6	22.5	31.4	-21.0	5.2	33.2	12.6	24.7	2.2	-19.3	
Budgetary Payments (Rs. bil)	1.6	1.9	1.1	2.2	3.6	4.5	6.2	6.1	6.7	7.5	11.8	14.4	15.1	15.5	17.2	17.3	19.3	20.3	
Nominal PSE (Rs. bil)	3.8	8.3	3.1	25.6	17.1	10.0	10.1	32.1	8.3	30.0	43.3	-6.6	20.3	48.8	29.8	42.1	21.5	1.0	
PSE (%)																			
Trade Economist Denominator	17.2	53.8	16.1	169.8	70.1	22.9	19.7	77.2	14.4	42.9	38.4	-4.8	16.1	52.3	27.2	49.9	23.3	1.0	
OECD Denominator	14.7	35.0	13.9	62.9	41.2	18.6	16.5	43.6	12.6	30.0	27.8	-5.1	13.8	34.3	21.4	33.3	18.9	1.0	

Note: Prices are for kapas (see text). Multiplication of $P_{exporterfob}$ and P_{cif} by the exchange rate gives the unadjusted reference prices in rupees (P_r in equations 1 and 2, respectively, which are not shown in the table). P_m and P_e (shown above) are the adjusted reference prices from those equations (see text for discussion of the adjustments). Source: Authors' calculations.

Adding fertilizer, power and irrigation subsidies to the MPS for cotton gives the cotton PSE. We assume that cotton production accounts for 7.14 percent of total fertilizer use and 4.10 percent of total irrigation and power usage. The %PSEs in Table 22 show the same pattern as the %MPS. Aside from the unusual year 1988, the %PSE results under the importable hypothesis ranging from -18.8 percent in 1996 to 44.0 percent in 1992 with the trade economist denominator, and from -23.1 percent in 1996 to 30.6 percent in 1992 with the OECD denominator. Under the exportable hypothesis the %PSE is positive in all years except for 1996 when world prices peaked.

Figure 28—Cotton %MPS Under the Importable and Exportable Hypotheses, 1985-2002



Source: Authors' calculations.

6 LIVESTOCK SECTORS

Our analysis of market price support and PSEs does not include livestock products. However, in this section we briefly review recent assessments made by other analysts of the dairy and poultry sectors.

6.1 DAIRY

India is the second largest milk producer after the EU, and among the top ten milk consuming countries. India has the largest number of cows producing milk (36.5 million) but the lowest yield of cow milk (Table 23). Unlike the other major dairy producing countries, buffalo milk makes up the majority (56 percent) of total milk production in India (USDA-FAS, 2003a). Buffaloes are relatively more productive than indigenous cows, but less productive than crossbred cows (Sharma, Rakotoarisoa and Gulati, 2004).[42] The fat-based pricing system favors buffalo milk compared to cow milk (USDA-FAS, 2003a).

Smallholder farms each with one to two cows dominate the milk production system and have benefited from the Operation Flood program launched in 1970-71. The goal of Operation Flood was to provide an additional source of income to small and marginal farmers and landless labourers in rural areas. Through a network of cooperatives, the program established a marketing link between rural producers and urban consumers (Sharma, Rakotoarisoa and Gulati, 2004). This took place in an autarkic environment where domestic production was protected from imports of dairy products by quantitative restrictions, other non-tariff barriers, and the routing of imports through the Indian Dairy Corporation. Exports of dairy products were also restricted.

Coinciding with the move towards liberalization in the early 1990s, the dairy industry was deregulated to encourage private investment and technology advancement in

[42] For example, in March 2002 for buffalo milk the average price ranged from Rs. 12.30 to Rs. 14.50 per liter (US$ 267 to US$ 315 per MT) for 7 percent fat, 9 percent solid not fat (SNF) compared to cow milk that was priced at Rs. 8.50 to Rs. 12.50 per liter (US$ 185 to US$ 272 per MT) for 4 percent fat, 8.5 percent SNF (USDA-FAS, 2003a).

the sector. By March 2003, the GOI had abolished restrictions on production and retained only regulations relating to food safety and hygiene (GOI, Undated-a).

Table 23—Major Milk Producing Countries, 2003

Country	Cows In Milk (1,000 HEAD)	Cows Milk Production (1,000 MT)	Average Yield Per Cow (MT/HEAD)	Other Milk Production (1,000 MT)	TOTAL Production (1,000 MT)
European Union-15	19,750	115,450	5.85	2,450	117,900
India	36,500	36,500	1.00	47,500	84,000
United States	9,090	77,075	8.48	0	77,075
Russian Federation	11,700	32,500	2.78	0	32,500
Brazil	15,300	22,860	1.49	0	22,860
China	3,417	15,550	4.55	1,120	16,670
New Zealand	3,842	14,346	3.73	0	14,346
Ukraine	4,715	13,306	2.82	277	13,583
Poland	2,967	11,966	4.03	30	11,996
Australia	2,298	10,636	4.63	0	10,636

Source: USDA-FAS PSD database (01/15/2004)

Trade in fluid milk is negligible due to lack of transportation infrastructure and effective demand. However, ultra heat treated (UHT) milk is gaining acceptance in the domestic market and some cooperatives have begun to export UHT milk to the Middle East (USDA-FAS, 2003a). Imports of non-fat dry milk (see figure 29), butter oil, yoghurt, curdled milk, whey, grated cheese, and blue veined cheese are permitted under open general license at a tariff rate of 30.4 percent (USDA-FAS, 2003a). Effective June 2000, a TRQ for skimmed milk powder was established with a quota of 10,000 tons at a 15 percent duty, and an over-quota tariff of 60 percent. Exports of non-fat dry milk totalled 23,000 tons in 2003 (Figure 24). Exports of other dairy products are negligible (USDA-FAS, 2003a).

While we have not included the dairy sector in the PSEs computed in this study, Sharma, Rakotoarisoa and Gulati (2004) compute NPCs under the importable hypothesis at shadow exchange rates for milk powder, butter, ghee (butter oil) and recombined milk for four metropolitan areas (Mumbai, Calcutta, Chennai and Delhi) representing four regions of India for the period 1975-2000. Table 24 presents their all India results (aggregated based on production weights) for 1985-2000 with conversion to a %MPS measure using two alternative reference prices for each product.[43] The first "f.o.b. North Europe" is the given export price of each dairy product. The second "Netherlands Domestic Price" accounts for the export subsidy component of the EU export price. The Netherlands domestic price is approximately equal to the f.o.b. North Europe price plus the export subsidy given by the EU on dairy products (Sharma, Rakotoarisoa and Gulati, 2004).

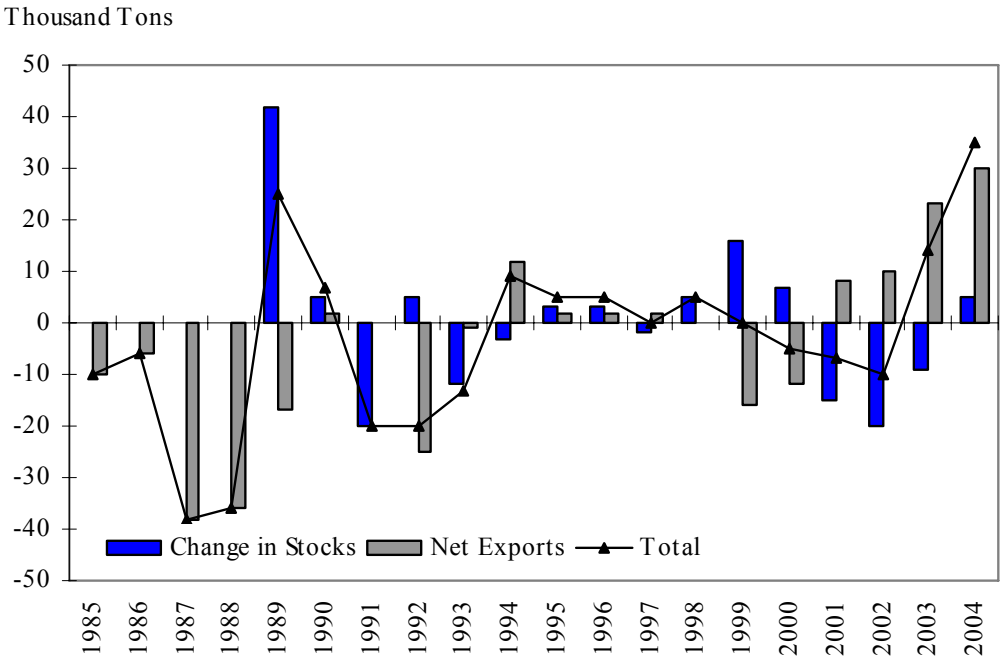
The %MPS results using an adjusted reference price based on the Netherlands domestic price are considerable lower, and in most cases of opposite sign than the results using an adjusted reference price based on f.o.b. North Europe prices. Sharma, Rakotoarisoa and Gulati attribute the gradual reduction in the %MPS over time to an improvement in world prices from the late 1980s to the mid-1990s and to depreciation of the rupee. The %MPS of butter and ghee based on f.o.b. North Europe reference prices

[43] (NPC-1)*100 = %MPS

increase in the late 1990s to 2000 because of falling world prices for these products during this time period.

Interestingly, India's milk powder %MPS is negative in several years in the mid 1990s to 2000, even based on the f.o.b. North Europe reference price. This indicates that India's domestic milk powder is competitive with imported milk powder and may be export competitive. India was a net exporter of skim milk powder in all years between 1994 and 2000, except 1998 and 1999 (when the %MPS for milk powder based on the f.o.b. North Europe price is positive).

Figure 29—Nonfat Dry Milk Net Exports and Changes in Stocks, 1985-2003



Source: USDA-FAS PSD database, January 2004.

Table 24—India Dairy Percent MPS under Alternative World Prices, 1985-2000

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Dairy %MPS Estimates																		
Skim Milk Powder Based On:																		
FOB North Europe	128.9	114.8	78.6	21.0	24.2	18.6	20.2	9.6	21.3	-6.7	-20.3	-8.1	-7.1	3.2	10.8	-24.4		
Netherlands Domestic Price	7.9	-21.6	-24.7	-21.7	-8.6	-31.8	-28.4	-30.5	-21.8	-34.8	-41.5	-34.2	-33.1	-38.1	-32.1	-50.0		
Butter Based On:																		
FOB North Europe	130.2	179.3	238.9	104.9	74.9	148.2	102.6	75.7	110.0	84.6	57.0	135.7	108.4	89.4	159.9	151.8		
Netherlands Domestic Price	-17.2	-27.1	1.8	-8.2	-22.4	-22.5	-26.0	-41.4	-25.2	-21.0	-12.8	-11.6	-5.4	-15.5	-28.9	-31.0		
Ghee Based On:																		
FOB North Europe	133.1	196.3	244.1	111.1	72.6	121.8	105.4	69.4	95.4	101.5	50.8	75.4	60.5	49.0	104.1	89.9		
Netherlands Domestic Price	-19.4	-25.9	-4.9	-16.4	-29.0	-29.7	-27.0	-44.0	-33.2	-19.9	-26.4	-32.6	-26.3	-32.5	-41.8	-45.8		
Milk Based On:																		
FOB North Europe	201.9	207.0	192.7	76.4	54.8	86.7	68.0	39.9	75.1	44.9	21.2	44.4	50.3	50.4	76.2	36.3		
Netherlands Domestic Price	16.6	-10.2	0.4	-7.0	-13.1	-18.9	-21.2	-32.9	-15.5	-20.8	-25.8	-22.0	-13.5	-22.5	-27.0	-36.2		

Note: All are at shadow exchange rates.
Source: Sharma, Rakotoarisoa and Gulati (2004).

6.2 POULTRY

India ranks as the sixth largest poultry producer in the world after the United States, Brazil, the European Union, China and Mexico. India's poultry meat production is estimated to have grown at a rate of six percent annually during the 1980s, 11 percent annually during the 1990s, and 19 percent annually during 1997-2002 (Landes et al., 2004). Fuelled by increased vertical integration, particularly in southern India, production reached 1.6 million tons in 2003 and is projected to total 1.8 million tons in 2004 (FAS-PSD). Poultry meat accounts for 6 percent of total meat consumption in India, while fish makes up more than half and bovine meat (cow and buffalo) accounts for 29 percent of meat consumption, according to FAO data (Landes et al., 2004).[44] Consumers prefer fresh poultry and typically broilers for home consumption are purchased live and slaughtered in small, local shops (USDA-FAS, 2003e). Consumer preferences and lack of cold storage facilities constrain demand for chilled and processed poultry products. Processed poultry products constitute only about 7 percent of total poultry meat production (USDA-FAS, 2003e).

The poultry sector receives less government assistance than other sectors. The Agricultural and Processed Products Export Development Authority, a government export promotion agency, provides cold storage and airfreight subsidies for export of eggs and egg products, primarily to the Middle East (USDA-FAS, 2003e). Government assistance to the poultry sector totalled Rs. 72 million (US$1.6 million) in 2002/03 and is budgeted at Rs. 85 million (US$1.8 million) in 2003/04 (FAS, 2003). India has no restrictions on foreign direct investment in the poultry industry (Landes et al., 2004).

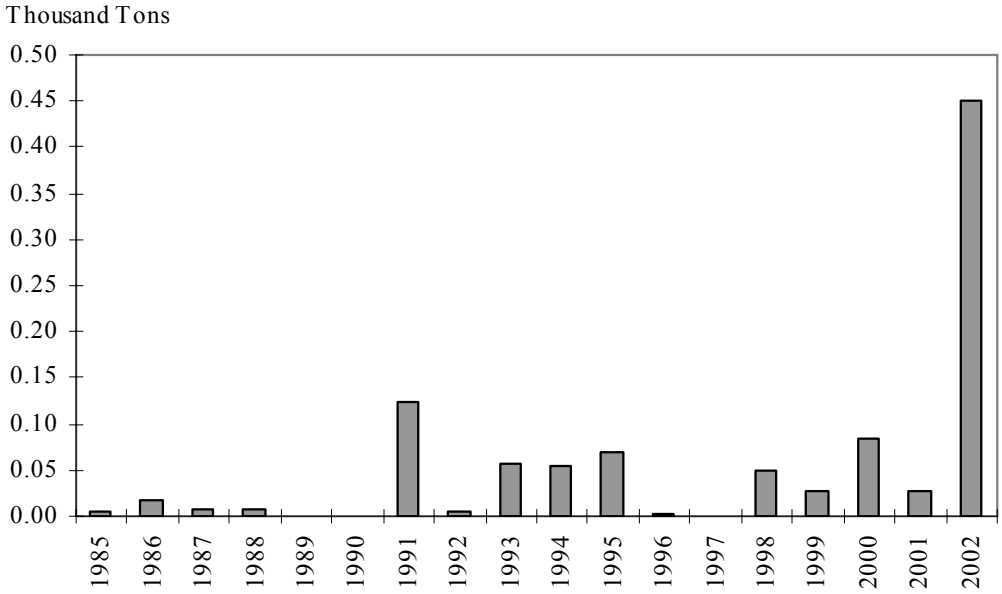
India eliminated its quantitative restrictions on poultry meat imports in April 2001. Imports of poultry meat products, as well as breeding stock, are now subject to tariffs ranging from 40 percent for grandparent stock to 108 percent for poultry meat to

[44] The figure for bovine meat is controversial and surprisingly high in the predominantly Hindu country (Landes et al., 2004).

141 percent for processed poultry products. Phytosanitary regulations and clearance procedures add to the protection provided to the poultry industry by high tariff.

India also exports some poultry meat (Figure 30). A comparison of production costs in India and other major producing countries reveals that while Brazil is the lowest cost producer, India's cost of production appears to be competitive with the United States and Thailand, both major exporters (Table 25). Farm gate prices in the southern, western and eastern regions of India (US$0.48 to US$0.66 per kg live weight in 2001) are between those of two major low cost producers: Brazil (US$0.48 per kg live weight) and Thailand (US$0.68 per kg live weight). This would seem to indicate that India is internationally competitive in poultry meat production. However, other studies have indicated that India is only price competitive in eggs, and is not competitive in whole chicken or chicken products (Mehta, 2003).

Figure 30—Chicken Meat Net Exports, 1985-2002



Source: FAOSTAT, 2004

Table 25—Broiler Variable Cost of Production and Farm Gate Prices by Country, 2001

Country	Variable Cost (US$/kg live weight)	Farm Gate Price (US$/kg live weight)
Brazil	0.38	0.48
Indonesia	--	0.74
Philippines	0.94	0.78
Taiwan	--	1.03
Thailand	0.61	0.68
United States	0.56	0.87
India:		
North	0.62	0.84
West	0.59	0.48
East	0.55	0.52
South	0.60	0.66

Note: -- is not available
Source: Landes et al. (2004)

7. TOTAL PSE

The analysis above has presented commodity-specific MPS and PSE results for eleven crops and brief discussion of the dairy and poultry sectors. For the crops, budget support in the form of subsidies for fertilizer, electricity and irrigation have been allocated on the basis of estimated usage (for fertilizer) and irrigated acreage (for electricity and irrigation subsidies). In calculating market price support, we have paid attention to international and domestic transportation, marketing and processing costs that cause a wedge between adjusted reference prices for imports versus exports. We have evaluated these costs on a regional basis for all crops except soybeans, sunflower and cotton. We have also estimated autarky prices that might prevail in the absence of policy interventions for six commodities (rice, wheat, corn, sorghum, sugar and groundnuts) for which the patterns of trade show fluctuations between net imports and exports in various years. For these commodities, we have evaluated support as %MPS and %PSE under a procedure of selecting the appropriate reference price based on the relationship among the estimated autarky, import and export adjusted reference prices, and compared the %MPS results to those derived when the importable and exportable hypotheses is applied in all years.

A summary of the results of the commodity-specific analysis using the modified procedure to select adjusted reference prices for the six crops, while assuming that rapeseed, soybeans, sunflowers, chickpeas and cotton are imported, is shown in Table 26.[45] Wheat, rice and sugar dominate these results numerically. For example, in 2002 these three commodities are estimated to receive two-thirds of the budget support (Rs. billion 300.1 out of a total for all of agriculture of of Rs. billion 444.9). Likewise, the nominal PSE of these three commodities was Rs. billion 470.3, compared to a nominal value for the eleven commodities of Rs. billion 619.8, a share of 75.9 percent. But these three commodities also account for nearly 75 percent of the value of production of the

[45] Results under the importable and exportable hypotheses are also shown in earlier tables and summary tables are available upon request.

Table 26—Summary of the Commodity-Specific PSEs under the Modified Procedure, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Cereals																			
Wheat																			
PSE (Rs. bil)	9.4	15.1	5.2	10.3	25.1	0.2	23.2	0.2	-9.6	45.4	61.4	-32.0	-47.6	101.0	134.5	235.0	171.2	126.6	125.1
MPS (Rs. bil)	0.7	4.8	-3.2	-5.1	3.2	-26.0	-11.7	-36.7	-51.6	-2.4	-7.5	-115.4	-136.4	4.9	26.4	120.0	44.6	-9.2	-23.9
BP (Rs. bil)	8.7	10.3	8.4	15.5	21.9	26.2	34.9	36.9	42.0	47.8	68.9	83.5	88.8	96.1	108.2	114.9	126.6	135.8	148.9
PSE (%)	12.4	17.9	6.5	11.2	21.7	0.2	15.1	0.1	-4.8	18.5	20.5	-10.4	-13.5	24.6	28.5	43.9	32.6	21.7	21.6
Rice																			
PSE (Rs. bil)	-6.3	28.5	19.7	-20.6	-31.0	-28.7	-8.1	-109.9	-15.9	-162.7	-31.3	-292.0	-147.0	50.6	-32.8	200.1	85.5	256.9	
MPS (Rs. bil)	-15.8	17.2	11.3	-36.4	-54.2	-56.8	-46.2	-149.1	-60.1	-212.6	-105.5	-382.0	-242.2	-50.7	-146.3	81.4	-41.1	130.3	
BP (Rs. bil)	9.5	11.3	8.3	15.7	23.1	28.1	38.0	39.2	44.1	49.9	74.2	90.0	95.2	101.4	113.5	118.7	131.1	139.9	
PSE (%)	-4.5	17.9	12.9	-14.4	-15.0	-11.5	-2.8	-33.6	-4.3	-35.0	-5.8	-52.5	-22.7	6.8	-3.9	22.1	10.0	28.6	
Coarse Grains																			
Corn																			
PSE (Rs. bil)	0.5	1.9	4.7	5.1	1.5	2.3	0.7	2.1	2.6	-4.0	4.0	-2.3	9.4	2.1	9.3	8.6	8.8	9.5	
MPS (Rs. bil)	0.0	1.3	4.2	4.1	0.2	0.8	-1.3	-0.1	0.1	-6.8	0.1	-7.1	4.3	-3.5	2.9	1.7	1.2	1.3	
BP (Rs. bil)	0.5	1.9	4.7	5.1	1.5	2.3	0.7	2.1	2.6	-4.0	4.0	-2.3	9.4	2.1	9.3	8.6	8.8	9.5	
PSE (%)	4.2	16.2	33.6	41.0	8.3	11.6	3.1	6.6	8.8	-13.4	9.8	-5.4	17.8	4.4	15.5	12.6	13.0	12.9	
Sorghum																			
PSE (Rs. bil)	4.3	5.5	7.6	11.7	6.5	9.1	15.2	-4.5	8.6	-0.2	0.1	-8.4	26.9	-1.4	18.2	26.0	0.6	20.0	
MPS (Rs. bil)	3.8	4.9	7.3	11.0	5.3	7.7	13.2	-6.4	6.5	-2.5	-3.7	-13.1	22.1	-6.3	12.7	20.5	-5.4	13.7	
BP (Rs. bil)	0.5	0.6	0.3	0.7	1.1	1.4	2.0	2.0	2.1	2.4	3.8	4.7	4.9	5.0	5.5	5.4	6.0	6.3	
PSE (%)	21.3	27.3	40.0	43.8	22.0	23.9	47.8	-17.0	21.0	-0.5	0.3	-16.7	45.8	-3.1	26.8	35.1	1.2	39.7	
Sugar																			
PSE (Rs. bil)	14.7	16.8	18.6	16.5	3.3	-6.2	3.1	-4.9	2.5	5.5	-35.4	1.5	25.6	33.9	74.4	78.2	43.0	86.8	
MPS (Rs. bil)	12.9	14.7	17.2	13.7	-0.8	-11.3	-3.9	-11.9	-5.3	-3.3	-48.9	-14.8	8.4	15.8	54.3	57.4	20.1	62.4	
BP (Rs. bil)	1.8	2.1	1.4	2.7	4.1	5.1	7.0	7.0	7.8	8.8	13.5	16.4	17.2	18.1	20.1	20.7	22.9	24.4	
PSE (%)	55.7	50.3	46.3	33.9	6.2	-1.7	4.4	9.7	2.7	5.1	-9.2	14.9	15.8	19.7	36.1	31.6	16.2	32.8	
Oilseeds																			
Groundnuts																			
PSE (Rs. bil)	13.0	5.7	14.1	20.4	21.7	12.1	14.9	8.4	19.5	-2.6	15.3	-19.0	18.8	7.0	43.7	2.8	-13.4	36.5	
MPS (Rs. bil)	12.3	4.8	13.5	19.3	20.0	10.0	12.0	5.5	16.2	-6.3	9.8	-25.7	11.8	-0.5	35.4	-5.9	-23.0	26.3	
BP (Rs. bil)	0.7	0.8	0.6	1.1	1.7	2.1	2.9	2.9	3.3	3.7	5.5	6.7	7.1	7.5	8.4	8.7	9.6	10.2	
PSE (%)	43.7	23.2	42.8	51.0	41.5	19.7	19.8	11.4	26.0	-3.6	16.5	-20.0	16.5	7.2	33.6	3.6	-16.0	35.0	
Rapeseed																			
PSE (Rs. bil)	-1.2	2.4	2.4	11.9	14.3	4.5	22.1	16.7	9.6	9.5	7.5	-1.4	-3.4	0.8	24.9	16.7	12.3	10.1	
MPS (Rs. bil)	-2.2	1.2	1.2	9.7	11.5	1.4	18.0	12.1	4.1	3.2	-0.8	-11.3	-14.2	-11.5	10.9	1.1	-4.7	-8.5	
BP (Rs. bil)	1.0	1.3	1.3	2.2	2.8	3.2	4.0	4.6	5.4	6.3	8.2	9.9	10.8	12.2	14.0	15.6	17.1	18.6	
PSE (%)	-7.4	19.3	19.3	45.7	41.0	17.0	41.6	28.1	19.5	15.6	9.7	-1.8	-3.9	1.0	24.7	18.7	17.8	11.4	
Soybean																			
PSE (Rs. bil)	-1.0	-0.3	1.1	3.1	-0.7	0.1	0.9	1.3	-3.5	-10.3	-2.1	-15.7	-10.9	-21.6	-25.1	-17.9	-18.8	-10.2	
MPS (Rs. bil)	-1.2	-0.6	0.8	2.5	-1.4	-0.6	0.0	0.2	-4.8	-11.9	-4.1	-18.1	-13.5	-24.6	-28.6	-21.8	-23.1	-14.8	
BP (Rs. bil)	0.2	0.3	0.3	0.5	0.7	0.8	1.0	1.1	1.4	1.6	2.0	2.4	2.7	3.0	3.5	3.9	4.3	4.7	
PSE (%)	-32.1	-10.1	26.8	33.9	-6.5	1.0	6.0	4.6	-9.7	-31.7	-4.3	-28.9	-13.9	-27.0	-37.3	-36.0	-31.0	-21.9	
Sunflower																			
PSE (Rs. bil)	0.0	0.8	2.5	1.1	-0.1	2.2	4.0	3.1	-0.6	-1.6	0.9	-1.2	0.5	-1.6	-0.5	-0.1	0.2	-1.7	
MPS (Rs. bil)	-0.1	0.7	2.3	0.9	-0.4	1.8	3.6	2.6	-1.2	-2.2	0.0	-2.3	-0.7	-3.0	-2.0	-1.7	-1.6	-3.6	
BP (Rs. bil)	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.9	1.1	1.2	1.3	1.5	1.6	1.8	1.9	
PSE (%)	2.8	36.0	53.9	41.6	-3.6	30.2	30.7	25.0	-4.5	-11.5	5.4	-7.3	4.1	-12.2	-5.2	-1.1	1.3	-10.2	

Table 26—Continued

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Pulses																			
Chickpea																			
PSE (Rs. bil)	-0.8	7.8	0.7	1.1	7.5	3.3	10.2	-3.5	-5.1	-13.3	-108.3	-6.6	3.9	25.7	-39.9	3.8	7.5	31.1	
MPS (Rs. bil)	-1.5	7.0	0.1	-0.1	5.8	1.2	7.4	-6.4	-8.3	-17.0	-113.7	-13.2	-3.1	18.2	-48.3	-5.0	-2.1	20.8	
BP (Rs. bil)	0.7	0.8	0.6	1.2	1.7	2.1	2.8	2.9	3.2	3.7	5.4	6.6	7.0	7.5	8.4	8.8	9.7	10.3	
PSE (%)	-3.9	27.3	4.7	6.7	21.7	11.8	25.9	-11.7	-15.5	-23.6	-140.3	-14.0	5.9	27.9	-45.2	5.2	11.8	29.8	
Cotton																			
PSE (Rs. bil)	-1.5	4.0	-0.4	22.3	10.6	1.1	1.3	22.5	-5.8	14.3	24.8	-29.9	-7.3	26.9	1.3	17.8	-0.6	-23.3	
MPS (Rs. bil)	-3.1	2.1	-1.4	20.1	7.0	-3.4	-4.9	16.4	-12.5	6.8	13.0	-44.3	-22.4	11.4	-15.8	0.5	-19.9	-43.6	
BP (Rs. bil)	1.6	1.9	1.1	2.2	3.6	4.5	6.2	6.1	6.7	7.5	11.8	14.4	15.1	15.5	17.2	17.3	19.3	20.3	
PSE (%)	-5.8	16.8	-1.6	54.9	25.5	2.0	2.2	30.6	-8.9	14.3	15.9	-23.1	-5.0	18.9	1.0	14.1	-0.5	-22.6	
Total - Modified Procedure																			
PSEc (Rs. bil)	35.2	89.4	80.3	90.1	68.9	17.2	104.3	-37.0	22.1	-97.4	-9.7	-341.6	-89.5	268.6	259.0	625.2	360.7	619.8	
PSE (Rs. bil)	42.8	155.3	148.7	132.5	64.9	-60.2	91.5	-257.9	-151.5	-483.2	-281.4	-1144.1	-586.5	209.9	128.2	961.8	273.4	905.3	

Note: OECD Denominator. Chickpeas, rapeseed, soybeans, sunflower and cotton are evaluated under the importable hypothesis.
Source: Authors' calculations.

eleven commodities (Table 9). Thus, on average, in 2002 the other eight covered commodities received a share of the nominal PSE about proportional to their value in production.

The calculation of a "Total PSE" for agriculture is derived from the commodity-specific estimates of MPS and total budget support. Results for the total PSE are shown in Table 27 and Figure 31, again using the modified procedure to select adjusted reference prices for rice, wheat, corn, sorghum, sugar and groundnuts and assuming that rapeseed, soybeans, sunflowers, chickpeas and cotton are imported. As discussed above, we compute total MPS_c and PSE_c without scaling up the estimated market price support, as well as total MPS and PSE using the scaling up procedure.

In broad terms, a counter-cyclical pattern to protection and support, versus disprotection, of agriculture is evident at the aggregate level. Support is provided in the mid 1980s when world prices were low, turns to disprotection through the 1990s, and emerges as protection and support again after 1998 when world prices are again relatively low.

The relative importance of budget payments for input subsidies versus output market price interventions in providing recent support is evident from a comparison of MPS_c for the eleven covered commodities to the BP for agriculture. In the period 1985-1988, positive market price support exceeded budgetary payments, so price support accounted for 52 percent of the total support provided, as measured by the PSE_c. In the period 1989-1997, market price support was negative in each year and remained large enough in magnitude to result in negative support measured by PSE_c in five years. This is in contrast to 1998-2002, when BP has exceeded MPS_c so even when aggregate price support is negative, the sum of price and budget support (PSE_c) is positive.

In the recent two years in which market price support has been positive (2000 and 2002), it accounts for only 39.7 percent of support measured by the PSE_c (MPS_c of 423.3 Rs. billion versus budget payments of 821.9 Rs. billion for the two years). In those years in which MPS_c has been negative (1998, 1999 and 2001), the budget support

provided has been five times as large (a total of 1,091.6 Rs. Billion versus MPS_c of -203.3 Rs. billion).

When the MPS_c component of the PSE is relatively small, it makes relatively little difference whether the scaling up procedure is applied or not (as in 1985, 1989, 1991, 1998, 1999 or 2001, see Table 27 and Figure 31). In contrast, when world prices were high in 1996 and the negative nominal MPS_c was more than double the positive budget support (Rs. billion -621.0 compared to Rs. billion 279.4), the scaled up PSE (Rs. billion -1,144) is more than three times larger in magnitude than the PSE_c without scaling up (Rs. billion -341.6).

In percentage terms, both the $\%PSE_c$ without scaling up (-10.3 percent using the OECD denominator) and the total %PSE with scaling up (-34.5 percent) and are their most negative in 1996.[46] The PSE_c reaches 12.7 percent and the %PSE reaches 19.5 percent in 2000, their highest positive values. The PSE_c results over the 1985-2002 period show positive support for agriculture of nearly 10 percent in the mid 1980s that declines to a nearly neutral policy effect in the mid 1990s. Support drops to its lowest value (disprotection) when world prices were high in 1996 then rises during 1997-2002 to a level again around 10 percent. The scaled up PSE follows a similar pattern over time, but shows higher support (near 20 percent) in the 1980s falling to greater percentages of disprotection from 1992-1997.

For purposes of comparison, the total PSEs calculated under the exportable and importable hypotheses for all commodities in all years are shown in Tables 28 and 29 and Figures 32 and 33. Results under the exportable hypothesis are relatively close to those under the modified procedure, especially during the mid 1990s. Support for agriculture is

[46] Our discussion focuses on $\%PSE_c$ and %PSE measured using the OECD denominator but Table 27 (and Tables 28 and 29 below) also report the %PSE using the "trade economist" denominator. For total value of production at international adjusted reference prices we have approximated simply by subtracting the nominal MPS for our 11 covered commodities from the value of total agricultural production at domestic prices. The results with the OECD denominator are again larger (smaller) in absolute value than those for the trade economist denominator when the $\%PSE_c$ or %PSE is negative (positive), but the differences are small in most years. For either denominator, the difference between the $\%PSE_c$ and %PSE can be large and they can be of different signs.

estimated to be somewhat higher in the 1980s and during 1998-2002 under the exportable hypothesis, particularly when measured with scaling up to the PSE.

The results under the importable hypothesis also show a similar pattern over time to the results under the modified procedure but the magnitude of the estimates differs to a greater extent. Disprotection of agriculture measured either by PSE_c or PSE is more pronounced in the 1989-1997 period under the importable hypothesis than under the modified procedure. Scaling up has a more pronounced effect because MPS_c is larger in magnitude under the importable hypothesis. In subsequent years, agriculture is slightly supported without scaling up but remains slightly disprotected even during 1998-2002 under the importable hypothesis and the scaled up PSE.

Under both the importable and exportable hypotheses, the level of estimated disprotection in the 1990s as measured by the scaled up PSE is less in magnitude than estimated earlier by Gulati and Narayanan (2003). For example, in our analysis disprotection measured by the PSE falls to its lowest values, –59.4 percent under the importable hypothesis and –28.7 percent under the exportable hypothesis, in 1996, compared to declines to –101.9 percent and –68.5 percent, respectively, in 1997 in the analysis by Gulati and Narayanan (see Figure 9).

As noted above, Gulati and Narayanan make their calculations with MSP or procurement prices even when these prices are below those prevailing in domestic markets. Moreover, the denominator for their PSE measure does not include budget payments (see the equation in Section 4). Both these factors contribute to the more negative estimates of the PSE. Additionally, without scaling up we report a greater difference with the earlier results under both the importable and exportable hypotheses. Thus, all three dimensions of our analysis—how price comparisons are made under the importable or exportable hypothesis, whether market price support measured for the covered commodities is scaled up to apply (implicitly) to other commodities, and whether autarky prices are considered as possibly relevant reference prices each affect the reported MPS and PSE results and their interpretation.

Table 27—Total PSE Under the Modified Procedure, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Measured Support (Rs. bil)																		
MPS_c	5.9	54.7	53.2	39.8	-3.7	-70.4	-13.3	-159.6	-116.9	-254.9	-240.1	-621.0	-386.1	-49.8	-98.5	248.3	-55.0	175.0
BP	29.3	34.7	27.1	50.3	72.6	87.6	117.5	122.6	138.9	157.5	230.4	279.4	296.6	318.4	357.5	377.0	415.7	444.9
Covered Share	0.44	0.45	0.44	0.48	0.49	0.48	0.51	0.42	0.40	0.40	0.47	0.44	0.44	0.46	0.43	0.42	0.39	0.38
MPS (Rs. bil)	13.4	120.6	121.6	82.1	-7.6	-147.8	-26.0	-380.5	-290.4	-640.7	-511.8	-1424	-883	-108.4	-229.3	584.8	-142.3	460.4
PSE (Rs. bil)																		
PSE_c	35.2	89.4	80.3	90.1	68.9	17.2	104.3	-37.0	22.1	-97.4	-9.7	-341.6	-89.5	268.6	259.0	625.2	360.7	619.8
PSE	42.8	155.3	148.7	132.5	64.9	-60.2	91.5	-257.9	-151.5	-483.2	-281.4	-1144	-586	209.9	128.2	961.8	273.4	905.3
PSE (%)																		
OECD Denominator																		
PSE_c	4.3	10.4	9.1	9.9	5.9	1.3	6.7	-1.8	0.9	-3.4	-0.3	-10.3	-2.4	6.9	5.5	12.7	7.1	11.0
PSE	5.2	18.1	16.8	14.6	5.5	-4.4	5.9	-12.5	-6.5	-16.8	-9.1	-34.5	-15.5	5.4	2.7	19.5	5.4	16.1
Trade Economist Denominator																		
PSE_c	4.5	11.7	10.0	11.0	6.2	1.3	7.2	-1.8	1.0	-3.3	-0.3	-9.4	-2.3	7.4	5.8	14.5	7.6	12.4
PSE	5.5	22.2	20.2	17.1	5.8	-4.2	6.2	-11.1	-6.1	-14.4	-8.4	-25.7	-13.4	5.7	2.8	24.3	5.7	19.2

Source: Authors' calculations.

Table 28—Total PSE Under the Exportables Hypothesis, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Measured Support (Rs. bil)																		
MPS_c	38.5	88.0	144.0	99.9	32.7	-24.0	66.0	-101.3	-70.6	-215.8	-189.4	-538.3	-324.2	49.0	89.1	502.4	422.1	476.8
BP	29.3	34.7	27.1	50.3	72.6	87.6	117.5	122.6	138.9	157.5	230.4	279.4	296.6	318.4	357.5	377.0	415.7	444.9
Covered Share	0.44	0.46	0.44	0.48	0.49	0.48	0.51	0.42	0.41	0.40	0.47	0.44	0.44	0.47	0.43	0.44	0.40	0.39
MPS (Rs. bil)	86.8	192.2	324.9	206.1	66.4	-50.0	128.7	-239.5	-174.0	-537.4	-401.1	-1229	-733	104.9	204.8	1147.1	1056.8	1216.7
PSE (Rs. bil)																		
PSE_c	67.8	122.7	171.1	150.2	105.3	63.6	183.5	21.3	68.3	-58.3	41.0	-258.8	-27.7	367.3	446.6	879.4	837.8	921.7
PSE	116.2	226.9	352.0	256.4	139.0	37.7	246.2	-117.0	-35.0	-379.9	-170.7	-949	-436	423.3	562.3	1524.1	1472.5	1661.6
PSE (%)																		
OECD Denominator																		
PSE_c	8.3	14.3	19.3	16.6	8.9	4.6	11.8	1.0	2.9	-2.0	1.3	-7.8	-0.7	9.4	9.5	17.8	16.4	16.4
PSE	14.2	26.5	39.8	28.3	11.8	2.7	15.8	-5.7	-1.5	-13.2	-5.5	-28.7	-11.6	10.9	11.9	30.9	28.8	29.6
Trade Economist Denominator																		
PSE_c	9.0	16.8	24.1	19.9	9.8	4.9	13.4	1.0	3.0	-2.0	1.4	-7.3	-0.7	10.4	10.5	21.8	19.6	19.6
PSE	16.5	36.1	66.1	39.5	13.4	2.8	18.8	-5.4	-1.5	-11.7	-5.2	-22.3	-10.4	12.2	13.5	44.8	40.5	42.0

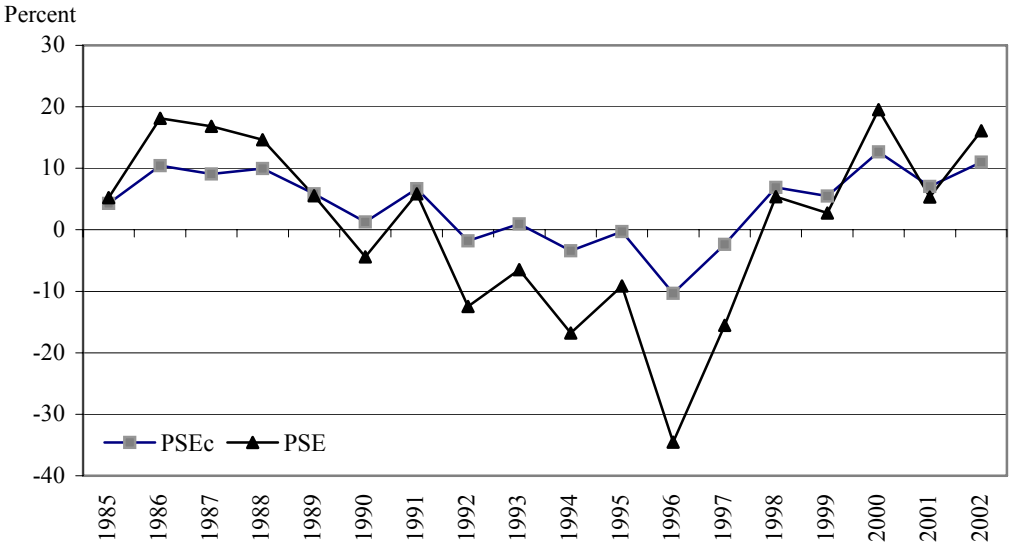
Source: Authors' calculations.

Table 29—Total PSE Under the Importables Hypothesis, 1985-2002

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Measured Support (Rs. bil)																		
MPS_c	-51.7	-5.8	53.2	5.5	-143.2	-217.4	-153.0	-369.7	-393.1	-584.3	-611.1	-980.9	-839.2	-496.0	-530.7	-192.5	-263.2	-280.4
BP	29.3	34.7	27.1	50.3	72.6	87.6	117.5	122.6	138.9	157.5	230.4	279.4	296.6	318.4	357.5	377.0	415.7	444.9
Covered Share	0.44	0.45	0.44	0.48	0.49	0.48	0.51	0.42	0.40	0.40	0.47	0.44	0.44	0.46	0.43	0.42	0.39	0.38
MPS (Rs. bil)	-118.0	-12.8	121.6	11.4	-293.7	-456.2	-300.4	-881.4	-976.6	-1468.0	-1302.3	-2248	-1919	-1079.9	-1236.1	-453.2	-680.1	-737.4
PSE (Rs. bil)																		
PSE_c	-22.4	28.9	80.3	55.9	-70.6	-129.8	-35.4	-247.2	-254.1	-426.8	-380.7	-701.5	-542.6	-177.7	-173.3	184.4	152.5	164.5
PSE	-88.6	21.9	148.7	61.8	-221.1	-368.6	-182.9	-758.8	-837.6	-1310.5	-1071.8	-1969	-1622	-761.5	-878.6	-76.3	-264.4	-292.6
PSE (%)																		
OECD Denominator																		
PSE_c	-2.7	3.4	9.1	6.2	-6.0	-9.5	-2.3	-11.9	-10.8	-14.8	-12.3	-21.2	-14.4	-4.6	-3.7	3.7	3.0	2.9
PSE	-10.8	2.6	16.8	6.8	-18.8	-26.9	-11.7	-36.7	-35.7	-45.6	-34.8	-59.4	-43.0	-19.5	-18.6	-1.5	-5.2	-5.2
Trade Economist Denominator																		
PSE_c	-2.7	3.5	10.0	6.6	-5.7	-8.6	-2.2	-10.7	-9.8	-12.9	-11.0	-17.5	-12.6	-4.4	-3.5	3.9	3.1	3.0
PSE	-9.8	2.6	20.2	7.3	-15.8	-21.2	-10.5	-26.8	-26.3	-31.3	-25.8	-37.3	-30.1	-16.3	-15.7	-1.5	-4.9	-4.9

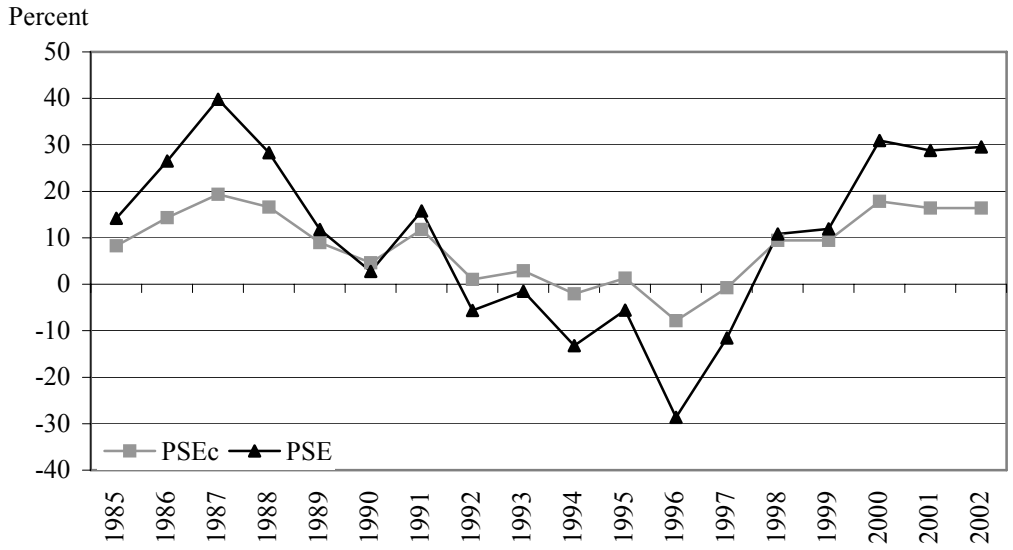
Source: Authors' calculations.

Figure 31—Estimates of Total PSE Under the Modified Procedure Without and With "Scaling Up,"1985-2002



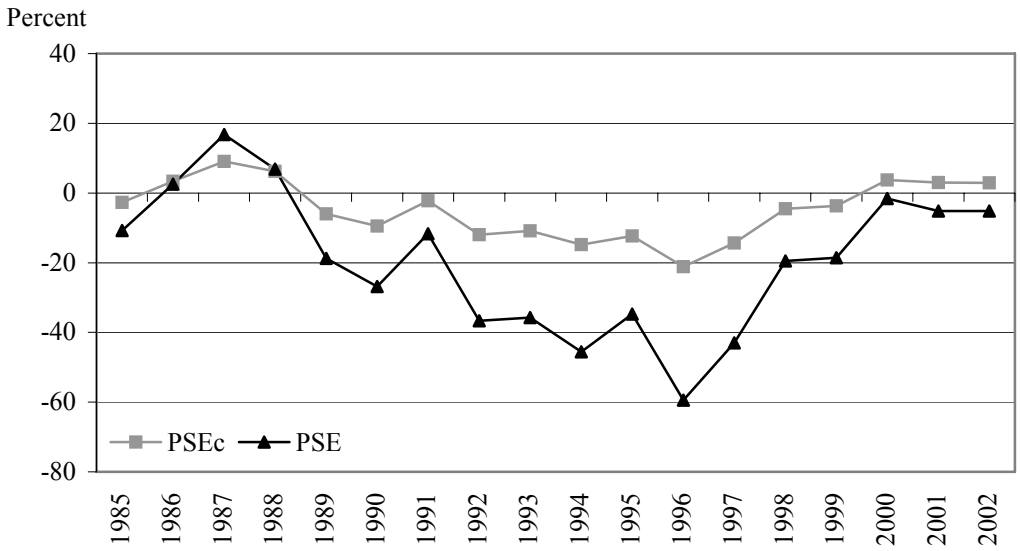
Note: Computed with the OECD denominator. PSE_c is without scaling up; PSE is with scaling up (see text for discussion).
Source: Authors' calculations.

Figure 32—Estimates of Total PSE Under the Exportable Hypothesis Without and With "Scaling Up,"1985-2002



Note: Computed with the OECD denominator. PSE_c is without scaling up; PSE is with scaling up (see text for discussion).
Source: Authors' calculations.

Figure 33—Estimates of Total PSE Under the Importables Hypothesis Without and With "Scaling Up,"1985-2002



Note: Computed with the OECD denominator. PSE_c is without scaling up; PSE is with scaling up (see text for discussion).

Source: Authors' calculations.

8. SUMMARY AND CONCLUSIONS

In this study, we evaluate the protection and support versus disprotection of agriculture in India primarily by examining market price support for eleven crops and budgetary expenditures on agriculture over 1985-2002. We draw heavily from the extensive price-comparison and subsidy-measurement data sets and analysis developed earlier by Gulati and his co-authors, often using disaggregated analysis for representative surplus and deficit states. This allows us to explore how key adjustments and assumptions impact the results. We show for wheat, for example, that ignoring factors such as internal transport costs, marketing margins and quality differences in the market price support component of the PSE can result in an inaccurate measure, especially when wheat is assumed an exportable. We then base our analysis on comparisons of domestic and adjusted reference prices that take these costs into account, as developed in the database of Gulati and co-authors.

Using different variants of the PSE, we also extend the earlier analysis to demonstrate how several other types of adjustments and assumptions influence the calculations. In the OECD approach, for example, the MPS for the covered commodities is "scaled up" to all products based on the share of the covered commodities in the total value of production. The scaling up procedure leads to a MPS of greater absolute value than the MPS for the covered commodities, and can result in PSEs of different sign than the non-scaled up version. We also examine two ways in which the percentage PSE can be reported, depending on whether the denominator is the value of domestic farm revenue or the value of agricultural output at international prices.

In addition to these adjustments, we also find that the usual procedure of computing the MPS based on a comparison of domestic price to an adjusted reference price that corresponds to the current direction of net trade can be problematic, especially when a country is near self-sufficiency. Since there are many factors influencing the current direction of trade, net trade status may not be the best determinant of which

adjusted reference price to use. To address the reference price issues, we follow the Byerlee and Morris (1993) procedure to compute the level of protection or disprotection relative to the relevant adjusted reference price that would exist in the country if the policy interventions were removed.

Overall, our results indicate that support is largely counter-cyclical, rising when world prices are low (as in the mid 1980s and 1990s) and falling when world prices are high (as in the early 1990s). Our results also demonstrate the increased importance of budgetary payments for input subsidies in providing support to agriculture in recent years. Yet, in the aggregate for both price support and budgetary expenditures, the counter-cyclical dimension of agricultural policy (as opposed to a clear trend from 1985 through 2002) characterizes our assessment.

The magnitudes of estimated support for agriculture are also important. We replicate the relatively high levels of subsidies reported by other studies as required to export wheat and rice from India in some recent years, even when we report a lower level of subsidization under our modified procedure. More broadly, we report less disprotection of agriculture in India in the 1990s than in earlier studies. Partly this difference is explained by differences in the mechanics of our calculations, and partly by our application of the modified procedure for choosing reference prices. A large component of this difference also rests on whether or not the price support evaluated for covered commodities is scaled up to apply to commodities that are not covered.

There are also fertile areas for future research. Estimates of adjustment costs used in domestic-to-border price comparisons, such as transportation and processing costs or marketing margins, are crucial variables in the analysis and merit being re-examined and further updated. Resolving what are the most reasonable assumptions about reference prices, or extending the analysis to additional crops and livestock to reduce uncertainty in the analysis will also contribute to fuller understanding of the net stance of policy toward agriculture and how it has evolved over time.

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