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Working Paper

Speculation on agricultural commodities: A brief overview

Diskussionspapier, No. 2013-14

Provided in Cooperation with:

Martin Luther University of Halle-Wittenberg, Chair of Economic Ethics

Suggested Citation: Pies, Ingo; Prehn, Sören; Glauben, Thomas; Will, Matthias Georg (2013) : Speculation on agricultural commodities: A brief overview, Diskussionspapier, No. 2013-14, ISBN 978-3-86829-605-1, Martin-Luther-Universität Halle-Wittenberg, Lehrstuhl für Wirtschaftsethik, Halle (Saale), <https://nbn-resolving.de/urn:nbn:de:gbv:3:2-21287>

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Ingo Pies, Sören Prehn, Thomas Glauben, Matthias Georg Will

Speculation on Agricultural Commodities: A Brief Overview

Diskussionspapier Nr. 2013-14

des Lehrstuhls für Wirtschaftsethik
an der Martin-Luther-Universität Halle-Wittenberg,
hrsg. von Ingo Pies,
Halle 2013

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ISBN 978-3-86829-604-4 (gedruckte Form)
ISBN 978-3-86829-605-1 (elektronische Form)
ISSN 1861-3594 (Printausgabe)
ISSN 1861-3608 (Internetausgabe)

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Abstract

This short essay on financial speculation with agricultural commodities offers (1) a survey of the real economy factors that caused recent hunger crises, (2) an overview of academic research on the impact of index-based financial speculation on agricultural futures markets, and (3) a discussion of political measures that are appropriate for improving global food security. The arguments are supported by numerous graphs.

Key Words: speculation, futures market, hunger, food security, index funds

Kurzfassung

Diese Kurzdarstellung bietet einen Überblick (1.) über die realwirtschaftlichen Ursachen der jüngsten Agrarpreiskrisen sowie (2.) über die wissenschaftliche Evidenz zu der Frage, inwiefern die Agrarpreiskrisen durch index-basierte Terminmarktgeschäfte von Finanzinvestoren hervorgerufen worden sein könnten. Ferner wird (3.) kurz erläutert, welche politischen Optionen geeignet bzw. ungeeignet sind, die globale Nahrungssicherheit nachhaltig zu fördern. Die Argumentation wird mit zahlreichen Abbildungen belegt.

Schlüsselwörter: Agrarspekulation, Terminmarkt, Hunger, Nahrungssicherheit, Indexfonds

Speculation on Agricultural Commodities: A Brief Overview

Ingo Pies, Sören Prehn, Thomas Glauben, Matthias Georg Will*

In the following brief overview, we (1) discuss the reasons within the real economy for the recent crises in the agricultural markets, (2) describe the econometric evidence for the claim that index-based futures market speculations may have contributed to these crises, and (3) we highlight several policy options that may support sustainable global food security. We illustrate our arguments with the help of numerous graphs in the appendix.

1. Real Economy Triggers for Recent Agricultural Crises

After significant price increases for agricultural commodities in the years 2008 and 2011, protests and riots occurred globally (Figure 1-1). Agricultural economists ascribe these price increases to a complex interplay of several factors, most of which have their roots in the real economy, while some in effect were caused by political errors.¹ The extent to which individual factors influenced the rising prices (and resulting crises) is a matter of some controversy and requires further research: however, a review of the literature indicates that the following factors played a decisive role (Figure 1-2).

- Demand for food increased faster than supply due to an interplay of structural and macroeconomic factors. This situation was reinforced by efforts to subsidize bio energy. As a consequence, stocks of wheat, rice, corn and soya steadily declined from 2002 to 2008.
 - The weak US dollar raised the global demand for US crops in the period before 2008.
 - Global population growth combined with a global increase in per capita income boosted the consumption of meat, which in turn increased the demand for agricultural commodities, especially animal feedstuff (Figure 1-3).
 - The promotion of bio energy led to competition between the use of commodities as a fuel as opposed to as a food (food vs. fuel dilemma). The area available for food production has been considerably reduced, because the use of agricultural commodities as fuel sources increased sharply.
- In 2007, adverse meteorological events caused significant price increases that were exacerbated by low stock inventories: as a consequence, many market participants were taken by surprise.²

* This overview was prepared for the Hearing on Trade and Food Security by the Committee on International Trade of the European Parliament, Brussels, July 10th, 2013. – This paper sketches insights developed by Pies (2012), Will et al. (2012), Prehn et al. (2013) and Pies (2013). For an early German version cf. Pies et al. (2013).

¹ For an overview, cf. the analyses by Trostle (2008), Headey and Fan (2010), Meijerink et al. (2011), Tangermann (2011) and Trostle et al. (2011).

² In 2007, several supply shocks were caused by meteorological events: drought in south eastern Europe, second drought within two years in Russia and Ukraine, crop failure of winter wheat in the US, drought in North African countries producing wheat and barley, drought in Turkey, third year of a once-in-a-century drought in Australia, frost and drought reduce the crop of barley and corn in Argentina. Cf. Trostle (2008; p. 21).

- Many countries reacted to these price increases by initiating policies that, in retrospect, contradicted the expectation formation of market participants, causing severe difficulties for the price discovery process. These highly controversial policies were taken by both exporting and importing countries (Figure 1-4).³
- The tremendous increase in commodity prices was halted by two simultaneous events: (a) the global bumper crop of 2008 that was triggered by high price expectations, and (b), the bankruptcy of Lehmann Brothers in the USA and the following global recession.
- The falling prices initially encouraged an increase in the volume of agricultural stocks.
- Structural long-term factors became increasingly important with respect to pricing in the commodity markets as these positive factors tended to balance the negative effects of the enormous macroeconomic shocks and the global recession.
- In 2010, history repeated itself: weather-related bad harvests caused adverse supply shocks⁴, and markets experienced enormous price rises. Stock inventories decreased, many exporting countries again reacted with protectionist policies,⁵ and importing countries countered by tightening supplies even further (Figure 1-6).

In order to fully understand these events, one must appreciate the central role of agricultural stocks in influencing price formation in the agricultural commodity markets.

Figure 1-7 illustrates the fact that identical supply shocks can have extremely different effects depending on the level of stock inventories. If inventories are full, the effects of shocks are mitigated. If inventories are empty, shocks instead have a strong impact on the inelastic part of the demand curve, and cause non-linear and extreme price surges.

Figure 1-8 documents global wheat stock trends since 1960. However, the dataset has some weaknesses because many private stocks are not listed in public statistics. Furthermore, Chinese inventories are often treated separately because they exist primarily for political reasons, and are permanently withdrawn from the global market. We interpret Figure 1-8 to highlight the correlation between price explosions and historically low stocks in 2007/2008.

2. The Alleged Financial Triggers for Recent Agricultural Crises

Before 2008, passive index funds had emerged as new actors on futures markets. These funds invested considerably large amounts of money in the commodity sector: agricultural commodities are an important subcategory of their investments (Figure 2-1). There was a popular suspicion as early as 2008 that the significant price increases might have their root not in the real economy, but instead in the financial economy. Many assumed

³ Besides protectionist measures taken by exporting countries, many importing countries took internal measures most of which proved to be counter-productive, further aggravating the crisis. Cf. Figure 1-5.

⁴ The following weather-related supply shocks occurred after June 2010: drought and widespread fires in Russia, a drought reduces the crop of fall wheat in the USA, and heavy rain falls harm wheat farming in Australia. After January 2011, the following adverse meteorological events occurred: a drought in China harms wheat farming, frost damage harms wheat farming in India, and crop failures of fall wheat are estimated to be about 10% in Russia. Cf. Trostle et al. (2011; Table 2, p. 18).

⁵ Cf. Götz et al. (2013) and Pall et al. (2013).

that the futures market activities of passive index funds had exerted an alarming effect on spot market prices for agricultural commodities.

However, such suspicions, although popular, are not well-founded: Compared to traditional speculators in the commodity markets, “long-only” index funds apply a trading strategy that is crucially different: They trace the market trend. Underlying this strategy is a calculus that makes these index funds attractive for large capital investors with an interest in hedging inflation risk. To guarantee a certain risk profile, index funds create portfolios with constant weights of different commodities. In order to hold these weights constant, they have to steadily re-balance their portfolios, selling items that have become more expensive and buying items that have become cheaper. Thus, in contrast to traditional speculators, index funds do not behave in a discretionary manner. Their strategy is not active, but passive. Figure 2-2 gives an overview of the differences between non-commercial speculators and passive index funds. From a theoretical perspective, passive index funds have a price stabilizing effect. Thus, they counter price increases. Furthermore, they provide liquidity to futures markets even in times of decreasing prices when traditional speculators are reluctant to do so.⁶

Empirically, there are three findings that immediately cast serious doubt on the idea that index fund speculation has caused explosions in agricultural prices.

- Figure 2-3 highlights the time lag observable in the futures market for wheat between the increase in the volumes of index funds’ passive investments and the increase in futures prices. This graph illustrates that the increase of investment volume considerably preceded the price increases. We find similar patterns for corn (Figure 2-4) and soy (Figure 2-5).
- If it were true that the financialization of commodity markets led to an excessive increase in futures prices, these increases could have spread to the spot markets only through growing stocks. However, during the relevant time periods, stocks were not rising but falling, as shown by the data above.
- Between January 2006 and April 2008, prices of different agricultural commodities evolved rather differently. This empirical pattern is hard to reconcile with the suspicion, noted above, voiced by critics of index funds:⁷
 - Futures markets in which index funds are strongly engaged show a great diversity of price movements: corn +175%, soy +120%, soy oil +172%, wheat (CBOT) +159%, wheat (KBOT) +136%, cotton +36%, whereas the prices for cattle declined by 9%.
 - Index funds are not engaged in the futures market for rice. However, rice prices grew by 168%.
 - We can find relatively strong price increases for goods that are not traded on future markets, and that are not included in index funds investments: apples +58%, beans +78%.

In spite of these findings, academic researchers vigorously debated whether index fund speculation might have had a negative impact on global food security. A comprehensive

⁶ Cf. Prehn et al. (2013).

⁷ Cf. Irwin, Sanders, and Merrin (2009; table 2, p. 383).

review of the empirical literature on this topic is summarized here and represents the current state of knowledge:⁸

- The majority of econometric studies indicate that futures market speculation by passive index funds had *no* significant impact on the price volatility of agricultural commodities (Figure 2-6).
- The majority of econometric studies indicate that futures market speculation by passive index funds had *no* significant impact on the price levels of agricultural commodities (Figure 2-6).
- The majority of econometric studies that are explicitly focused on the political implications of their empirical findings *warn* against over- or mis-regulating futures markets. The consensus within the literature is to caution against acquiescing to popular demands for strict regulation or even prohibition of index funds, because any such political reform may inhibit the functioning of futures markets. This would be neither in the interest of investors nor in the interest of starving people (Figure 2-7).

Many agricultural economists agreed with this assessment of the literature review and documented their accord in an open letter to German Federal President Joachim Gauck, written on December 19, 2012 and signed by 40 professors. This letter highlights the imbalance in the public discourse about the effect of any regulation of agricultural futures markets. It makes clear that many popular beliefs ignore and contradict the current state of academic knowledge.⁹

3. Policy Recommendations

Food shortage is much more than a glaring violation of human dignity. Hunger violates both Article 25 of the Universal Declaration of Human Rights and the codified human right to food in Article 11 of the UN Social Charter. This code applies equally to young and old, male and female. However, the following insight justifies a special focus on pregnant women and on mothers with infants: the 1000-days-rule implies that children can suffer irreversible damages in physical and psychical capabilities if they are malnourished or suffer starvation during gestation and up until 24 months after birth. Therefore, fighting global hunger is a moral matter of the first order.

In order to effectively and sustainably improve global food security, we have to take into account some structural long-term trends that are likely to last for the foreseeable future. In particular, we have to be alert to a growing demand for agricultural commodities. In 2050, world population is projected to be about 9.3 billion with a significantly

⁸ The literature review by Will et al. (2012), which was inspired by the earlier study of Shutes et al. (2012), summarizes 35 econometric studies. For a very short overview of the results cf. Glauben et al. (2012).

⁹ Cf. Althammer et al. (2012). We would like to point to another piece of circumstantial evidence: resource economists and agricultural economists have researched a similar question – the impact of passive index funds on commodity markets. The latter group examined the impact on agricultural commodity markets, while the first group examined the impact on resource markets (especially for crude oil). Both scientific debates took place nearly independently of each other. Nevertheless, both debates arrived unanimously at the same results – the concerns raised by the civil society organizations are not well-founded. Their alarm was a false alarm. For an overview from the point of view of agricultural economics cf. Irwin and Sanders (2012), for an overview from the point of view of resource economics cf. Fattouh et al. (2012).

higher per capita income compared to today's population. Furthermore, the consumption of meat is projected to increase, boosting the demand for agricultural commodities, especially animal feedstuff.

During the 20th century, the prices of agricultural commodities declined despite a growing global population (Figure 3-1). Since the global population and hence food demand is expected to continue growing, only an increase in supply can prevent scarcity and the corresponding food insecurity.

If the increase in global food supply is to be generated in a sustainable, i.e. both socially acceptable as well as environmentally friendly manner, it is of vital importance to continue and even strengthen the trend of the last twenty years. Increases in supply were not primarily achieved by enlarging acreage, intensifying irrigation or using more fertilizers. Instead, the most important source of growth was the application of advanced knowledge to increase total factor productivity in agriculture (Figure 3-2).

We conclude with the following policy recommendations.

- To improve global food security, national and international politics should support all measures that sustainably increase the production of agricultural commodities.
 - Research funding should be focused on two areas: projects aimed at improving the productivity of big farms should be complemented by projects whose purpose is to enhance production technology and the management know-how of smallholders.
 - To optimize the potential of know-how transfers, we should pursue every possible option, for example, cooperation among researchers, training of experts, and access to direct foreign investment.
 - Concurrently, we should encourage more investment in the agricultural sector, both private as well as public. This will require a redeployment of development aid.
- To improve global food security, governments must avoid imposing policies that are detrimental to the markets. We identify two important areas:
 - Prevention of protectionist tendencies: during the crises, political measures were taken that impeded or even prohibited food exports and aggravated the price hikes of agricultural commodities. Subsequent political measures by importing countries demanding more food supplies, exerted additional upward pressure on prices. This happened in 2007/08 and 2010/11. These international events had disastrous consequences and reveal a common failure among states to properly coordinate their policies. Therefore, we need to re-enforce a free-trade regime that prevents states from causing panic in the agricultural markets thereby triggering emergencies that are preventable.
 - Reform of the subsidization of bio energy: the European Union has formulated very ambitious goals for switching to renewable energies in order to become less dependent on fossil fuels (like oil, coal or gas) and protect against climate change. In this regard, bio energy plays an important role. Therefore, it might be unrealistic to expect, as some indeed do, that we should totally withdraw from its development. However, we believe it is necessary to adjust the production of bio energy and to reconcile it with global food security, thus overcoming the fuel versus food dilemma.
- Additionally, the regulation of commodity futures markets can play an important role in improving global food security:

- From an economic perspective, the aim of the European Market Infrastructure Regulation (EMIR), which is to increase market transparency, is well-founded. Improved transparency will increase the information efficiency of the futures markets. In this respect, the European Union has had a regulation deficit when compared with the US.
- Currently, the Markets in Financial Instruments Directive (MiFID) is being revised. This directive will regulate the financial stock markets as well as the futures markets of agricultural commodities. Some civil society organizations are lobbying for high market barriers for index funds. They demand strict position limits and even want to ban index funds from the agricultural futures market.¹⁰ Such claims lack a scientific justification. The consequences of implementing these demands would be to impair the functionality of agricultural markets: the measures would distort competition and reduce the liquidity of futures markets. Governments should avoid such mistakes in the interest of the hungry.

Figure 3-3 documents US price trends for crude oil and onions between 2002 and 2012. For crude oil, the US can rely on an effectively-functioning futures market. However, there is no futures market for onions in the US. This market was banned in 1958 because of alleged harmful effects of speculation.

Against this background, Figure 3-3 is a compelling example that futures market transactions tend to reduce volatility. The trends (Figure 3-3) illustrate why most agricultural economists are skeptical or even hostile towards entry barriers (like strict position limits) because they are convinced that such barriers are a counterproductive means of improving global food security.

Summary

- If one wants to improve global food security in a sustainable manner, one needs an appropriate diagnosis of the food crises of 2008 and 2011.
- The popular diagnosis that futures market operations by index funds were responsible for catastrophic price increases is – to the best of our knowledge – wrong.
- Instead, the dramatic price increases experienced in recent years were caused by shocks and structural developments in the real economy and intensified by political coordination failures.
- Global food security will not be improved by introducing entry barriers for futures markets. Those who desire to effectively combat hunger in the world have to take real-economy precautions to ensure that food supplies will match the projected increase in demand.
- Based on this diagnosis, we make the following recommendations.
 - Governments should correct erroneous policies (e.g., protectionism, over-hasty support of bio energy) and should avoid instituting onerous policies (e.g., over-regulation of futures markets).
 - To improve global food security, the worldwide production of agricultural commodities must be increased in a sustainable way, i.e. socially acceptable

¹⁰ Cf. attac (2012). For a detailed overview and critical analysis of the alarming campaign by civil society organizations against index fund speculation with agricultural commodities cf. Pies (2012).

as well as environmentally friendly. Instead of fostering the use of additional inputs of land, water and fertilizer, governments should concentrate on encouraging innovation, thus raising total factor productivity. This requires additional effort in the fields of know-how generation and transfer.

Appendix

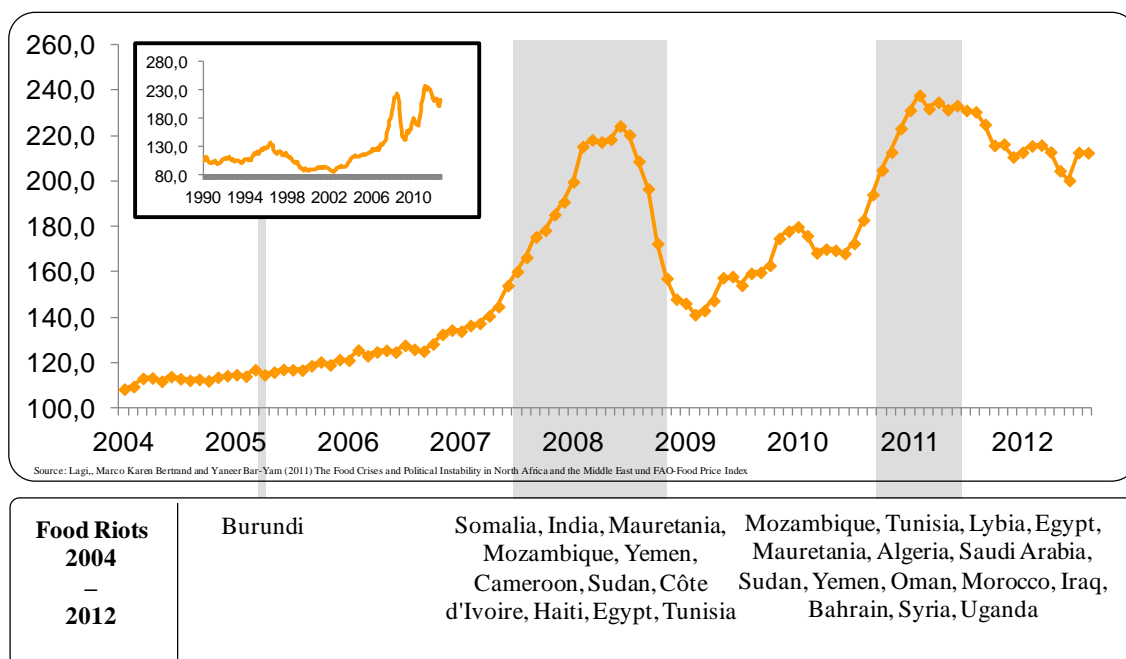


Figure 1-1: Food Price Developments with Dramatic Consequences, 2004-2012¹¹

Price index for weighted prices according to the amount of traded wheat, rice, corn and soya

Index: January 2002=100

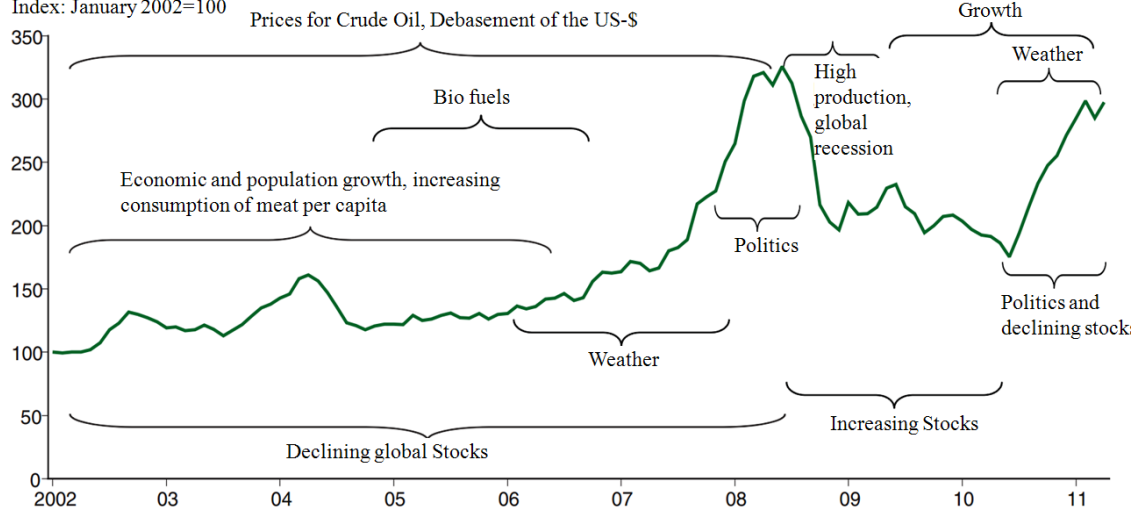


Figure 1-2: The Impact of the Real Economy on Agricultural Prices, 2002 to 2011¹²

¹¹ Source: Own graph utilizing the FAO Food Price Index as well as data from Lagi et al. (2011).

¹² Source: Trostle et al. (2011; Figure 5, p. 9).

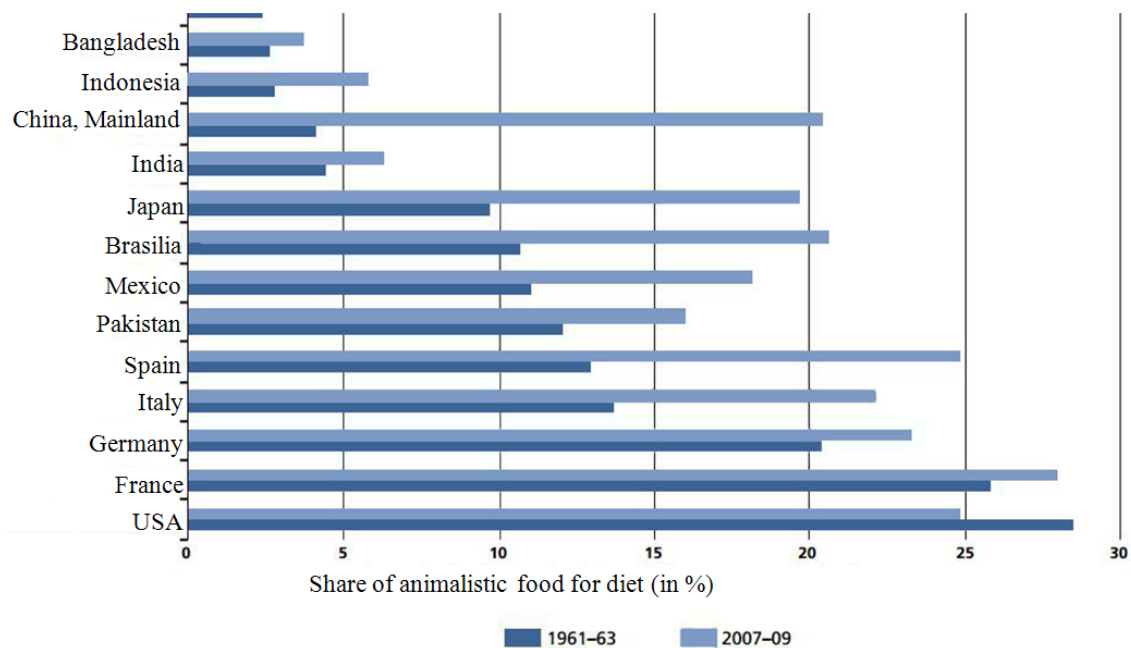


Figure 1-3: The average share of animalistic foods (in %) in the energy input of daily diet, 1961 to 2009¹³

Exporting countries reduce supply (beginning in autumn 2007)	Importing countries increase demand (beginning in January 2008)
<ul style="list-style-type: none"> China withdraws subsidies for export. China, Argentina, Russia, Kazakhstan, and Malaysia increase export tariffs. Argentina, Ukraine, India and Vietnam introduce quantitative export restrictions for wheat and rice. Ukraine, Serbia and India forbid exports of wheat. Egypt, Cambodia, Vietnam and Indonesia forbid exports of rice. India forbids exports of rice (except Basmati). 	<p>The following countries reduced import tariffs:</p> <ul style="list-style-type: none"> India (for wheat flour) Indonesia (soya and wheat) Serbia (wheat) Thailand (pork) EU (grain) <p>The following countries increased their stocks for rice by means of public purchases:</p> <ul style="list-style-type: none"> Philippines Malaysia

Figure 1-4: Political Reactions during the Crisis in 2007/8¹⁴

¹³ Source: IFAD, WFP and FAO (2012; Figure 12, p. 19).

¹⁴ Source: Own table, utilizing data from Trostle (2008; pp. 23-24) and – especially for the rice market – the detailed overview by Dawe and Slayton (2011; Figure 9.2, p. 175).

	Afr	Asi	Lat	Sum
Countries	33	26	22	81
Foreign Trade Policy				
Restrictions on exports (up to prohibition of exports)	8	13	4	25
Relaxation of import restrictions (Suspense of customs duty)	18	13	12	43
Internal Trade Policy				
Targeted tax reductions (e.g. reduced VAT rate)	14	5	4	23
Sale of stocks for low prices	13	15	7	35
Price ceilings (including prohibition of hoarding)	10	6	5	21
Support for Supply Side				
Input Subsidies (e.g. cheap-rate loans, fuel subsidies)	12	11	12	35
Subsidies for fertilizers and seeds	4	2	3	9
Interventions (e.g. state programs for regrating farm produce)	6	4	5	15
Market support (e.g. public price information)	4	9	2	15
Support for Demand Side				
Income policies (public employment programs)	4	8	4	19
Ear-marked money transfers to poor people	6	8	9	23
Direct food supply for people in need	5	9	5	16

Figure 1-5: Policy Measures in 81 States in Reaction to the Crisis in 2006-2008¹⁵

¹⁵ Source: Owh table utilizing data from Demeke et al. (2009).

Exporting countries reduce supply (beginning in August 2010)	Importing countries increase demand (from December 2010 till March 2011)
<ul style="list-style-type: none"> • Russia bans export of wheat. • Belarus incurs a crop failure of 30% for canola oil and bans exports. 	<ul style="list-style-type: none"> • Turkey suspends tariffs on wheat imports for the public sector. • China, Jordan and Algeria tremendously increase their imports of wheat. • Bangladesh, Taiwan and Russia reduce tariffs for imports of some agricultural commodities. • Afghanistan, Indonesia, Agypt, Iraq and Tunesia tremendously increase their imports of wheat. • The European Union suspends tariffs for importing barley and wheat for feed. • Turkey suspends tariffs on wheat imports of the private sector.

Figure 1-6: Political Reactions during the Crisis in 2010/11¹⁶

¹⁶ Source: Own table, utilizing data from Trostle et al. (2011; Table 3, p. 20).

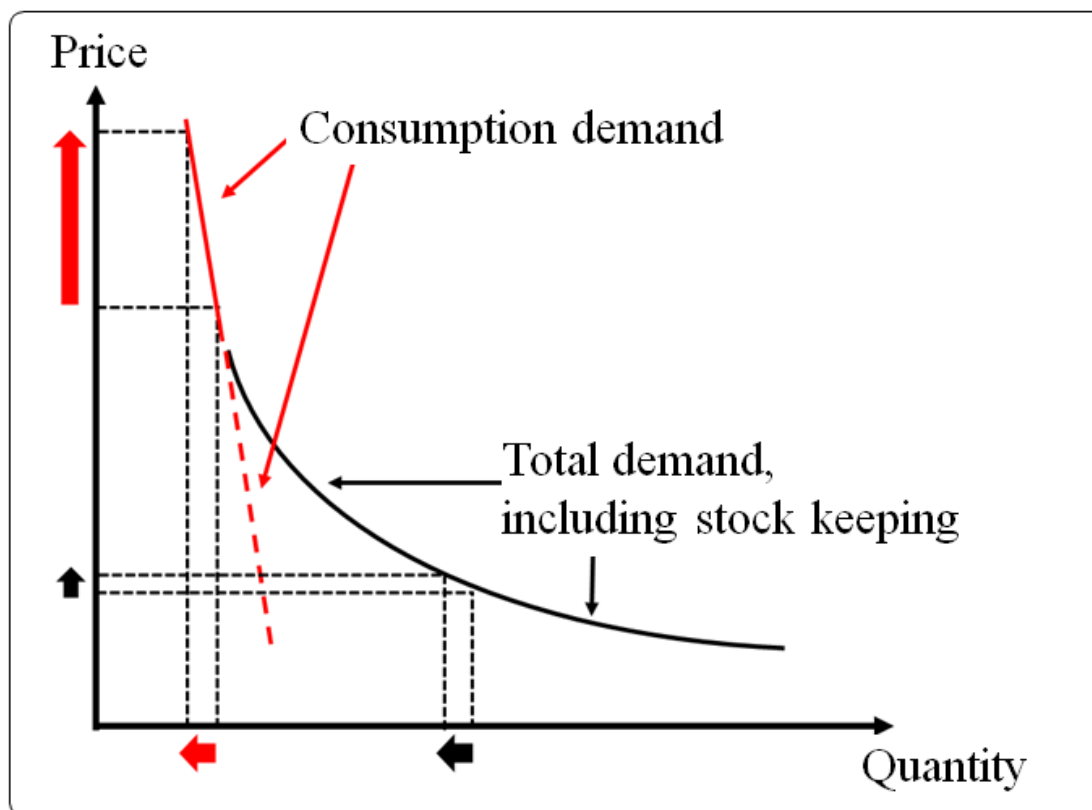


Figure 1-7: Non-linear price effects on the market for agricultural commodities¹⁷

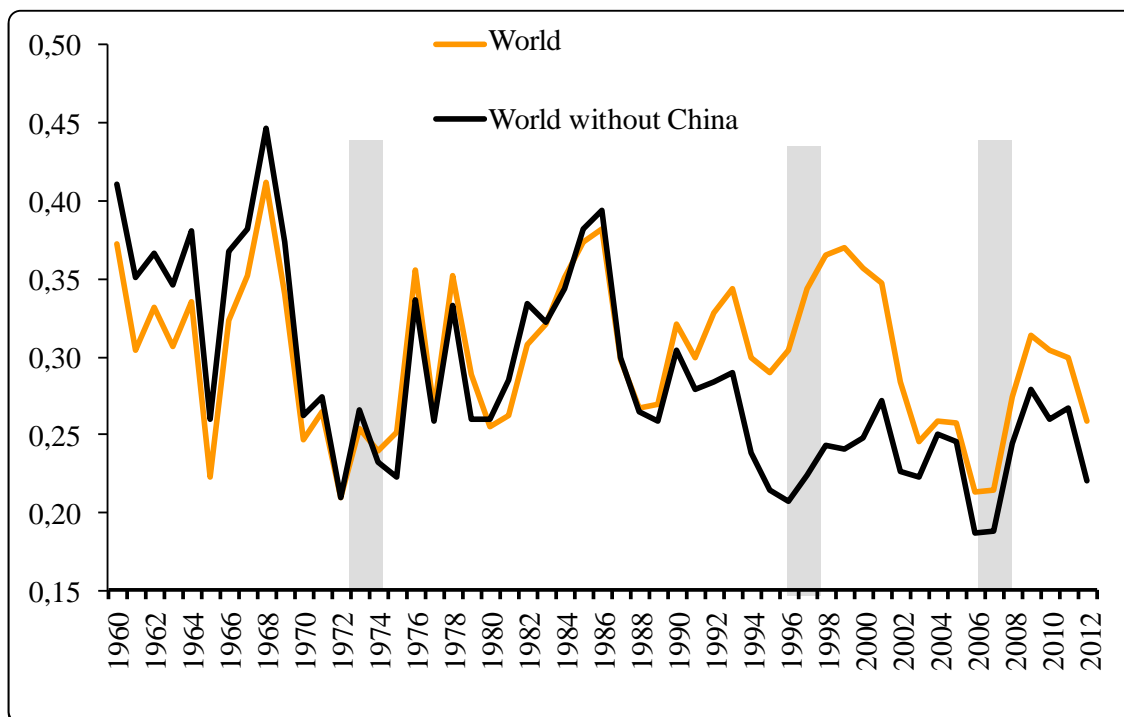


Figure 1-8: Stock-to-Use-Ratio as an Indicator for Crises (Wheat)¹⁸

¹⁷ Source: Wright (2011; Figure 7, p. 38).

¹⁸ Source: Own graph, utilizing data from USDA Foreign Agricultural Service (2013).

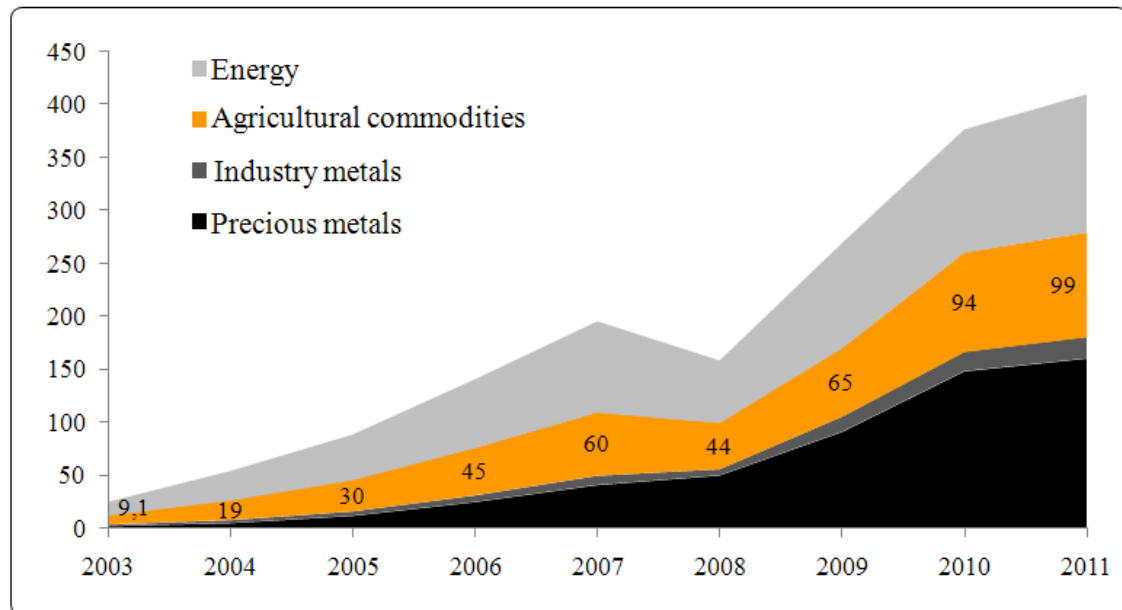


Figure 2-1: Total Commodity Assets under Management in billion US \$, 2003-2011¹⁹

Non-Commercials

- Long and short
- Discretionary (active)
- Partly collateralized
- Information function
- Liquidity function
- Insurance function



Speculation

Index Funds

- Long-only
- Not discretionary (passive)
- Fully collateralized
- No information function
- Liquidity function
- Insurance function



No Speculation

Figure 2-2: The Differences between Non-Commercials and Passive Index Funds²⁰

¹⁹ Source: Own graph utilizing data from Barclays Capital (2011).

²⁰ Source: Own table.

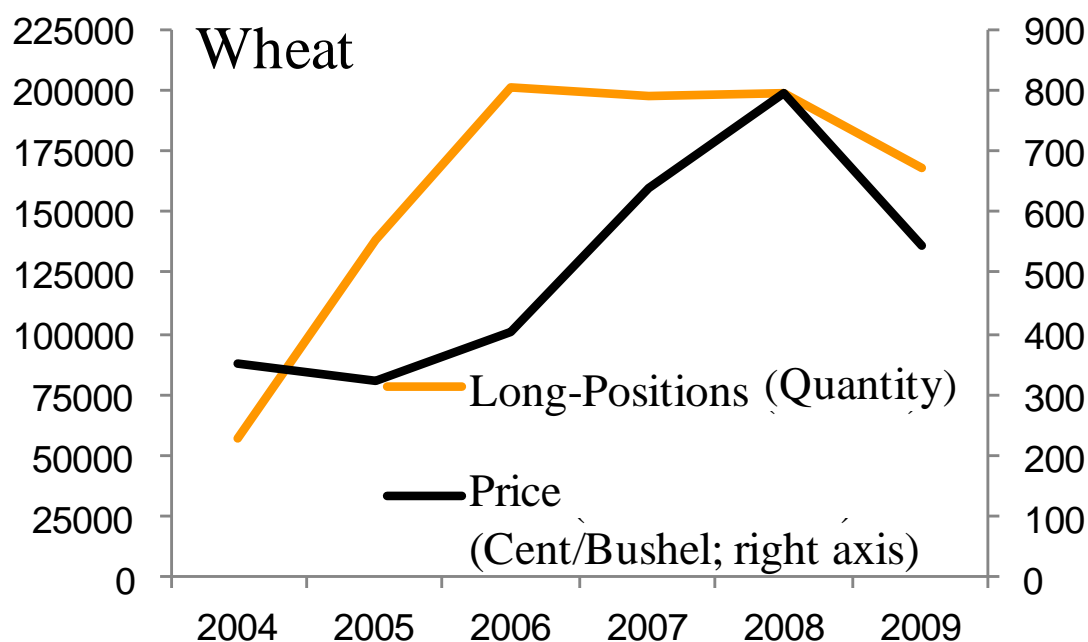


Figure 2-3: Index Volume (left scale) and Futures Price (right scale) in the Futures Market for Wheat (CBOT), 2004-2009²¹

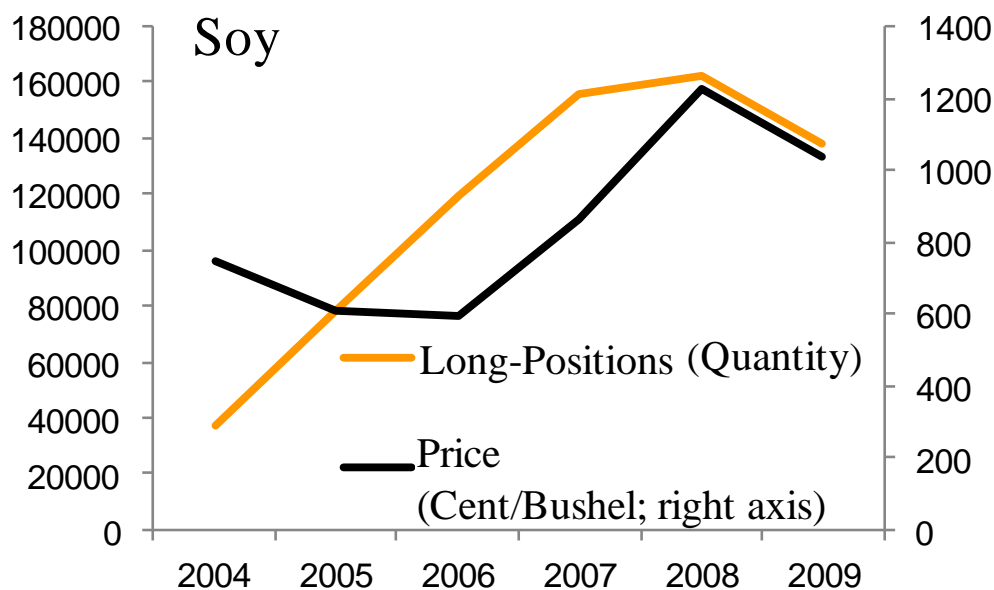


Figure 2-4: Index Volume (left scale) and Futures Price (right scale) in the Futures Market for Soy (CBOT), 2004-2009²²

²¹ Source: Own graph, utilizing data from Sanders and Irwin (2011; table 1, p. 525).

²² Source: Own graph, utilizing data from Sanders and Irwin (2011; table 1, p. 525).

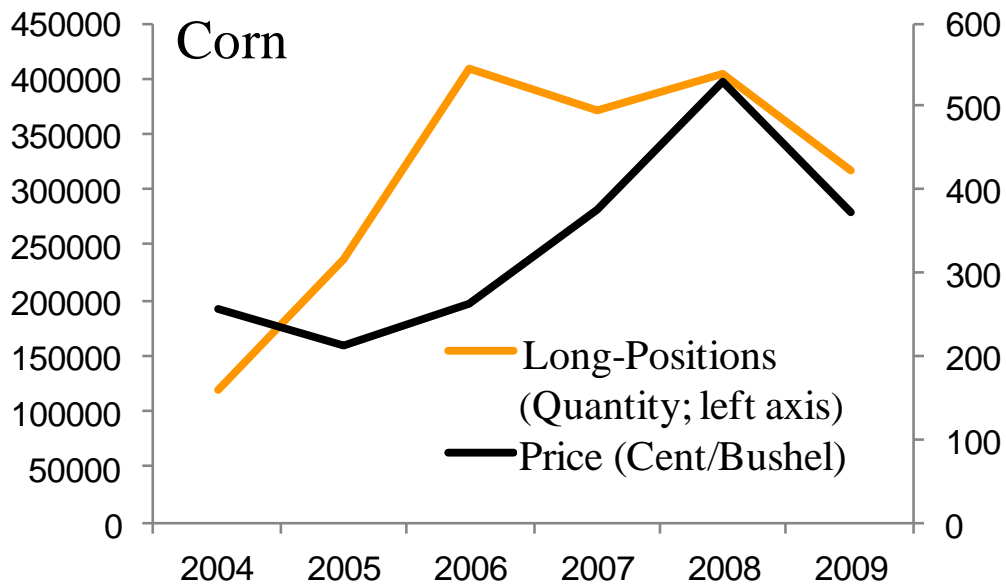


Figure 2-5: Index Volume (left scale) and Futures Price (right scale) in the Futures Market for Corn (CBOT), 2004-2009²³

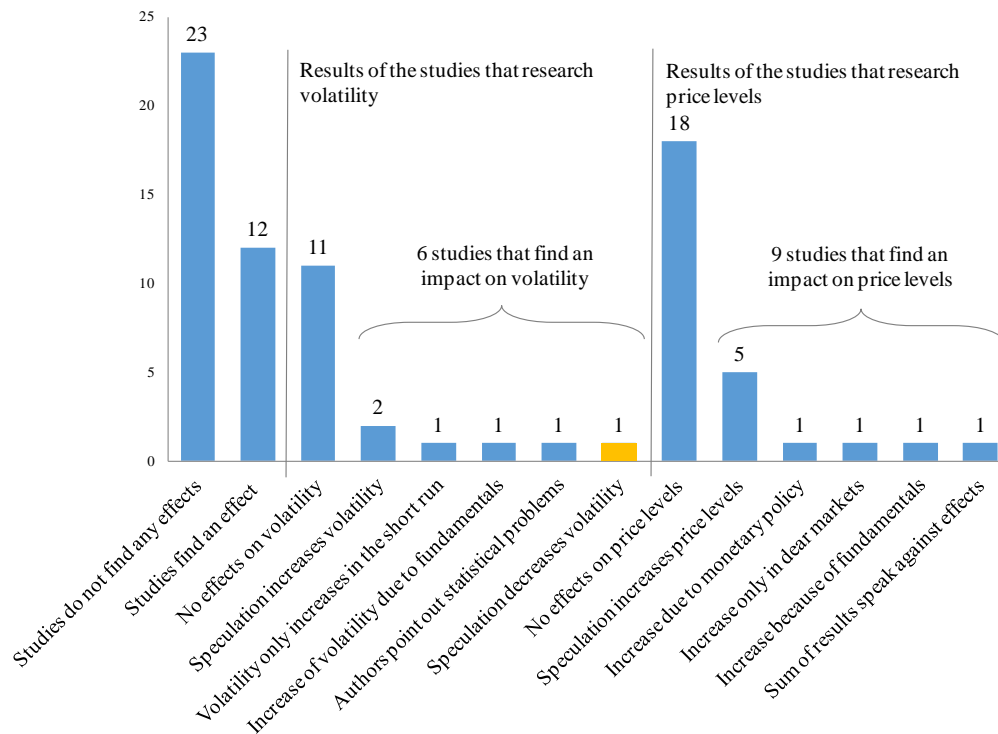


Figure 2-6: Empirical Evidence by 35 Econometric Studies²⁴

²³ Source: Own graph, utilizing data from Sanders and Irwin (2011; table 1, p. 525).

²⁴ Source: Own graph, utilizing data from Will et al. (2012; tables 1 and 2, p. 10 and p. 11).

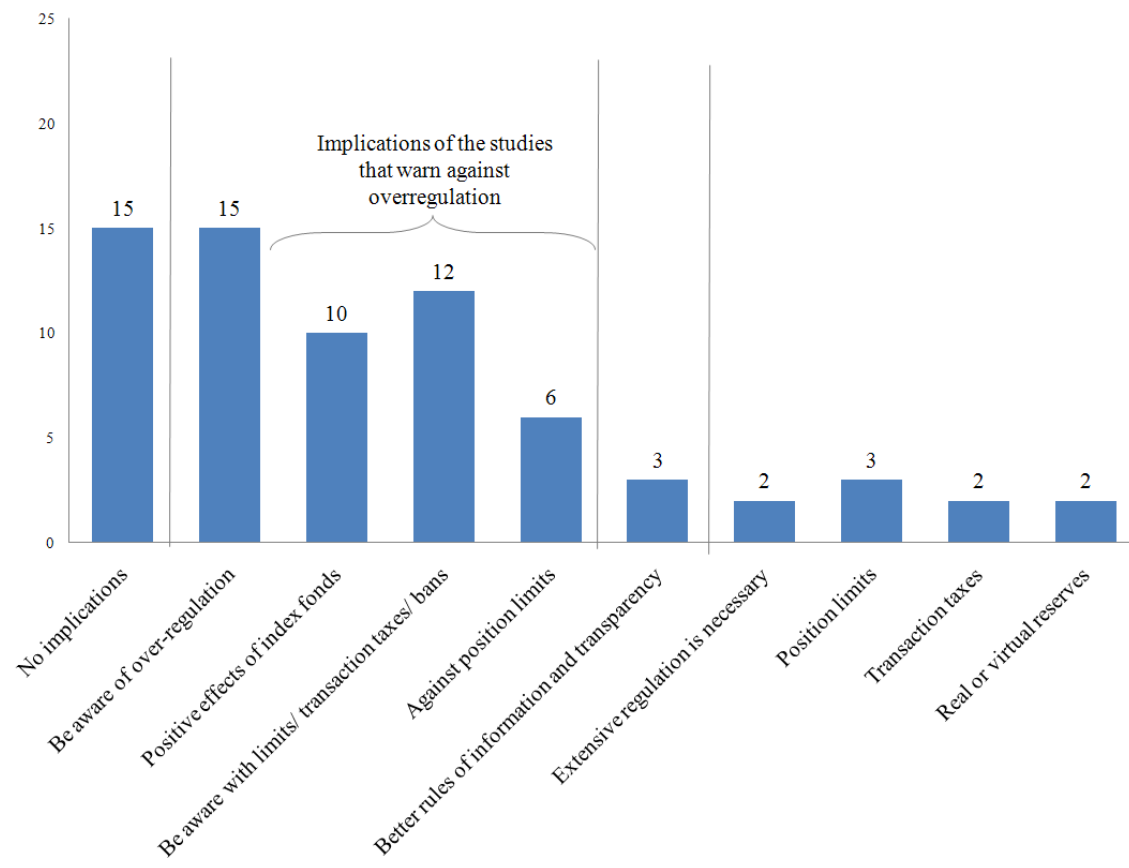


Figure 2-7: Policy Recommendations by 35 Econometric Studies²⁵

²⁵ Source: Own graph, utilizing data from Will et al. (2012; tables 1 and 2, p. 10 and p. 11).

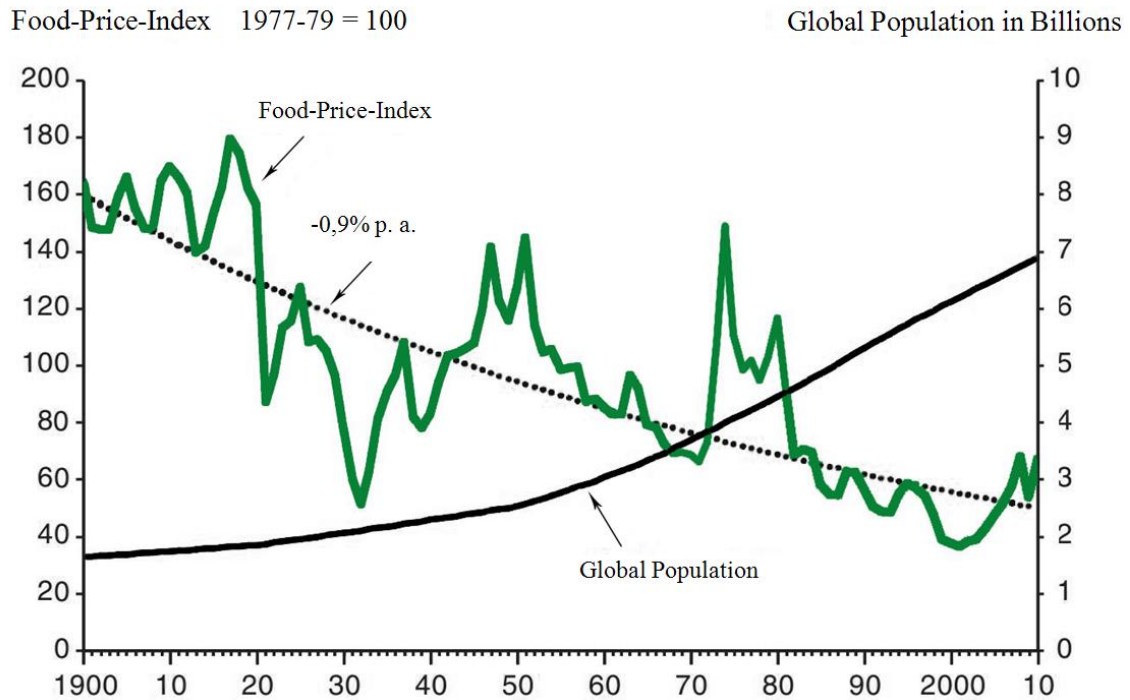


Figure 3-1: Real Food Prices Decreased Since 1900 Despite of an Increasing Global Population, 1900-2010²⁶

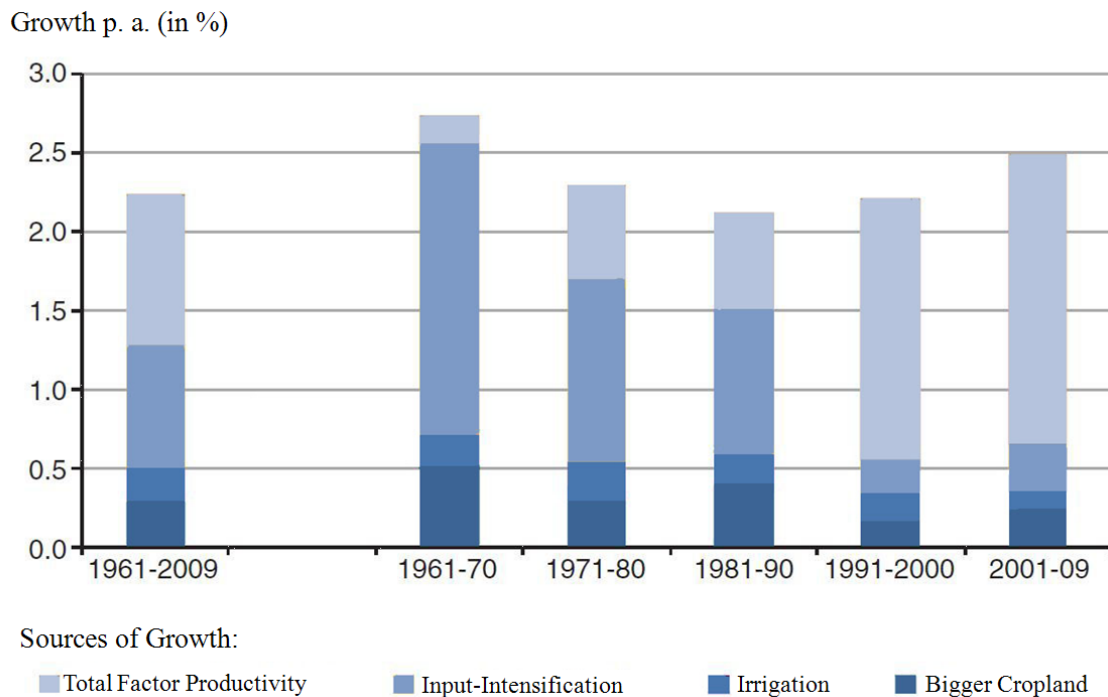


Figure 3-2: Sources of Growth for Global Food Production, 1960-2009²⁷

²⁶ Source: Fuglie and Wang (2012; Figure 1, p. 2).

²⁷ Source: Fuglie and Wang (2012; Figure 3, p. 4).

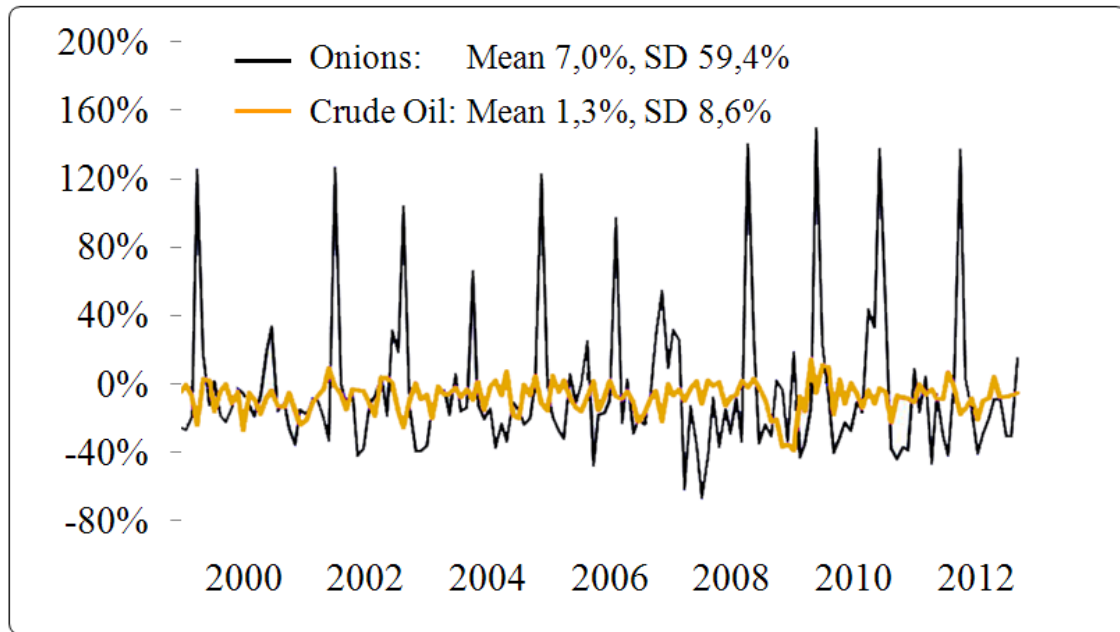


Figure 3-3: The Price Development of Onions (without Futures) and Crude Oil (with Futures) in Comparison, 2002-2012²⁸

²⁸ Source: Perry (2012).

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²⁹ Als kostenloser Download unter <http://ethik.wiwi.uni-halle.de/forschung>. Hier finden sich auch die Diskussionspapiere der Jahrgänge 2003-2009.

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