

ABRIDGED WHITE PAPER SUMMARY

THE ECONOMICS OF COMMODITY TRADING FIRMS



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The trading of the basic commodities that are transformed into the foods we eat, the energy that fuels our transportation and heats and lights our homes, and the metals that are present in the myriad objects we employ in our daily lives is one of the oldest forms of economic activity. Yet, even though this activity traces its origins into prehistory, commodity trading is often widely misunderstood, and, as a consequence, it is often the subject of controversy. So too are the firms that engage in it.

This whitepaper is intended to help demystify the commodity trading business. In it, I describe some salient features of the commodity trading business and commodity trading firms, and utilize a variety of economic concepts to analyze and explain them.

SECTION I discusses the basics of commodity trading, focusing on the three major transformations that commodity traders undertake.

SECTION II summarizes the various risks that commodity trading firms face.

SECTION III examines the financing of commodity trading firms, their ownership structure, their provision of funding to their customers, and the question of whether commodity trading firms pose systemic risks.

An unabridged version of this white paper, which includes full charts, references and additional content, is available in English at www.trafigura.com.





THE BASICS OF COMMODITY TRADING

Commodity trading firms are all essentially in the business of transforming commodities in space (logistics), in time (storage), and in form (processing). Their basic function is to perform physical "arbitrages" which enhance value through these various transformations.

Although all commodity traders engage in transformation activities, they are tremendously diverse. They vary in size, the commodities they trade and transform, the types of transformations they undertake, their financing, and their form of ownership.

A. COMMODITY TRANSFORMATIONS

Virtually all agricultural, energy, and industrial commodities must undergo a variety of processes to transform them into things that we can actually consume. These transformations can be roughly grouped into three categories: transformations in space, transformations in time, and transformations in form.

Spatial transformations involve the transportation of commodities from regions where they are produced (supply regions) to the places they are consumed. The resources where commodities can be efficiently produced, such as fertile land or mineral deposits, are almost always located away from, and often far away from, the locations where those who desire to consume them reside. Transportation—transformation in space—is necessary to bring commodities from where they are produced to where they are consumed.

Just as the locations of commodity production and consumption typically do not align, the timing of commodity production and consumption is often disjoint as well. This is most readily seen for agricultural commodities, which are often produced periodically (with a crop being harvested once a year for some commodities) but which are consumed continuously throughout the year. But temporal mismatches in production and consumption are not limited to seasonally produced agricultural products. Many commodities are produced at a relatively constant rate through time, but are subject to random fluctuations in demand due to a variety of factors. For instance, wells produce natural gas at a relatively steady rate over time, but there can be extreme fluctuations in the demand to consume gas due to random changes in the weather, with demand spiking during cold snaps and falling when winter weather turns unseasonably warm. Commodity demand can also fluctuate due to macroeconomic events, such as a financial crisis that causes economic activity to slow. Supply can also experience random changes, due to, for instance, a strike at a copper mine, or a hurricane that disrupts oil and gas production in the Gulf of Mexico.

These mismatches in the timing of production and consumption create a need to engage in temporal transformations, namely, the storage of commodities. Inventories can be accumulated when supply is unusually high or demand is unusually low, and can be drawn down upon when supply is unusually low or demand is unusually high. Storage is a way of smoothing out the effects of these shocks on prices, consumption, and production. Furthermore, the other transformations (in space and form) require time to complete. Thus, commodity trading inevitably involves a financing element.

Moreover, commodities often must undergo transformations in form to be suitable for final consumption, or for use as an input in a process further down the value chain. Soybeans must be crushed to produce oil and meal that can be consumed, or serve as the input for yet additional transformations, as when the meal is fed to livestock or the oil is used as an ingredient in a snack. Crude oil must be refined into gasoline, diesel, and other products that can be used as fuels.

Commodities undergo transformations in space through transportation...

...in time through storage...

...and in form through processing

Though often overlooked, blending and mixing are important transformations in form. Consumers of a commodity (e.g., a copper smelter that uses copper concentrates as an input) frequently desire that it possess a particular combination of characteristics that may require the mixing or blending of different streams or lots of the commodity.

Most commodities undergo multiple transformations of all three types between the farm, plantation, mine or well, and the final consumer. Commodity trading firms are vital agents in this transformation process.

B. VALUE CREATION IN COMMODITY TRADING

Commodity trading is, in essence, the process of transforming commodities in space, time, and form. Firms that engage in commodities trading attempt to identify the most valuable transformations, undertake the transactions necessary to make these transformations, and engage in the physical and operational actions necessary to carry them out. The creation of value in commodities trading involves optimizing these transformations.

This is an inherently dynamic process because the values of the myriad possible transformations vary over time due to shocks to supply and demand. For instance, a good harvest of a commodity in one region will typically make it optimal to store additional quantities of that commodity, and to transport the additional output to consumption locations.

The process of making transformations is constrained by technology and available infrastructure. For instance, transportation technology and resources—ocean freight, rail, barge, truck, pipelines—determine the set of possible spatial transformations. Similarly, storage capacity determines the feasible inter-temporal transformations.

Constraints on transformation possibilities can vary in severity over time. Severe constraints represent “bottlenecks”. One important function of commodity traders is to identify these bottlenecks, and to find ways to circumvent them. This can be achieved by finding alternative ways to make the transformation, and/or investing in additional infrastructure that alleviates the constraints.

Sometimes bottlenecks are not physical, but are instead the consequence of regulatory or legal restrictions. At present, the primary bottleneck that is impeding the movement of newly abundant North American crude to markets where it is scarcer is the US law that largely prohibits the export of crude oil. Even there, traders are finding ways to alleviate the constraint. For instance, market participants are investing in “splitters” (“mini-refineries”) that transform crude oil that cannot be exported, into refined products that can be sold abroad.

The primary role of commodity trading firms is to identify and optimize those transformations. An important determinant of the optimization process is the cost of making the transformations. These costs include transportation costs (for making spatial transformations), storage costs (including the cost of financing inventory), and processing/refining costs. These costs depend, in part, on constraints/bottlenecks in the transformation processes. All else equal, the tighter the constraints affecting a particular transformation process, the more expensive that transformation is.

Commodity traders characterize their role as finding and exploiting “arbitrages”. An arbitrage is said to exist when the value of a transformation, as indicated by the difference between the prices of the transformed and untransformed commodity, exceeds the cost of making the transformation.

Traders buy and sell physical commodities. The profitability of these activities depends on the difference between the prices of the transformed and untransformed commodities, rather than their level. As will be discussed in more detail subsequently, price levels affect the profitability of commodity trading primarily through their effect on the cost of financing transactions, and their association with the volume of transactions that are undertaken.

In essence, commodity traders are the visible manifestation of the invisible hand, directing resources to their highest value uses in response to price signals. Given the complexity of the possible transformations, and the ever-changing conditions that affect the efficient set of transformations, this is an inherently dynamic, complex, and information-intensive task.

Value creation opportunities in commodity trading depend on the economic environment. Volatile economic conditions increase value creation opportunities. Supply and demand shocks can cause geographic imbalances that create spatial arbitrage opportunities for traders. Greater volatility also makes storage more valuable, thereby creating inter-temporal arbitrage opportunities.

Commodity traders aim to optimize transformations

They overcome bottlenecks...

...and incur transportation, storage, and processing costs...

...to realize physical arbitrage

Greater economic volatility is also associated with greater volatility in relative prices, and in particular in temporary mispricings that create trading opportunities.

Moreover, major secular economic shifts can create imbalances that drive trade and increase arbitrage opportunities. The dramatic growth of China in the past 20 years, and particularly in the last decade, is an example of this.

These factors explain why the profitability of commodity trading has tended to be greatest during periods of economic volatility, such as the Iranian Revolution, the Gulf War, and the collapse of the Soviet Union, and during periods of rapid growth concentrated in a particular country or region.

C. COMMODITY TRADING FIRMS

A large and diverse set of firms engages in commodity trading. Indeed, the diversity is so extensive, and occurs along so many dimensions, that it is difficult to make generalizations.

Some commodity trading firms are stand-alone entities that specialize in that activity. For instance, well-known trading firms such as Trafigura and Vitol are independent and engage almost exclusively in commodity transformation activities.

Other commodity traders are subsidiaries or affiliates of other kinds of firms. For instance, many banks have (or had) commodity trading operations. Prominent examples include J. Aron (part of Goldman Sachs since 1981), Phibro (once part of Citigroup and before that Salomon Brothers, though it is now not affiliated with a bank), and the commodity trading divisions of Morgan Stanley, J. P. Morgan Chase, and Barclays (to name some of the most prominent).

Other commodity trading entities are affiliated with larger industrial enterprises. Most notably, many "supermajor" oil companies (such as Shell, BP, and Total) have large energy trading operations (though some, notably Exxon, do not). Pipeline and storage operators ("midstream" firms such as Kinder Morgan and ETP in the United States) in energy often engage in trading as well.

Commodity trading firms also differ by the breadth of the commodities they trade. Some are relatively specialized, trading one or a few commodities. Others trade a broader set of commodities but within a particular sector. For instance, the traditional "ABCD" firms - ADM, Bunge, Cargill, and Louis Dreyfus - concentrate on agricultural commodities, with lesser or no involvement in the other major commodity segments (although Cargill does have a sizable energy trading operation). As another example, some of the largest trading firms such as Vitol, Mercuria, and the energy trading-affiliates of the oil supermajors, focus on energy commodities, with smaller or no presence in other commodity segments. One major trading firm, Glencore, participates in all major commodity segments, but has a stronger presence in non-ferrous metals, coal, and oil and is in addition a very large mining company. Another, Trafigura, is a major energy and non-ferrous metals trader.

Firms with a presence in a particular sector (e.g., agriculture) also vary in the diversity of commodities they trade. For instance, whereas Olam participates in 18 distinct agricultural segments, Bunge focuses on two and other major firms are active in between three and seven different segments.

Furthermore, firms in a particular segment differ in their involvement along the marketing chain. Some firms participate upstream (e.g., mineral production or land/farm ownership), midstream (e.g., transportation and storage), and downstream (e.g., processing into final products or even retailing). Others concentrate on a subset of links in the marketing chain.

Commodity trading firms also vary substantially in size. There are large numbers of small firms that tend to trade a single commodity and have revenues in the millions of dollars. At the other end of the spectrum, the largest traders participate in many markets and have revenues well over \$100 billion.

Firms that engage in commodity trading also exhibit diverse organizational forms. Some, including many of the most prominent (Cargill, Louis Dreyfus, Koch Industries), are privately owned. Some of these non-public traders are funded by private equity investors: TrailStone (Riverstone Holdings) and Freepoint Commodities (Stone Point Capital) are well-known examples. Others (e.g., ADM and Bunge) are publicly traded corporations. Some are affiliates or subsidiaries of publicly traded firms. Yet others are organized as master limited partnerships with interests traded on stock exchanges: Kinder Morgan, ETP, and Plains All American are examples of this.

They are more profitable during periods of upheaval

Commodity trading firms vary by scope and scale

They may own assets upstream, midstream or downstream

They can be privately owned or publicly listed



THE RISKS OF COMMODITY TRADING

In engaging in transformation activities, commodity traders face a wide array of risks, some of which can be managed by hedging, insurance, or diversification, but for others that must be borne by the firms' owners. Crucially, most commodity trading firms do not speculate on movements in the levels of commodity prices. Instead, as a rule they hedge these "flat price" risks, and bear risks related to price differences and spreads—basis risks.

Risk management is an integral part of operations. Although as a general rule commodity trading firms are hedgers, firms have different risk management policies, pursue different risk management strategies, and have different risk management procedures in place.

A. RISK CATEGORIES

Commodity trading involves myriad risks. What follows is a relatively high level overview of these risks. Note that some risks could fall into more than one category. As will be seen, a crucial function of commodity traders is to manage these risks. This risk management essentially involves transferring risks that commodity traders do not have a comparative advantage in bearing to entities that do: this allows them to generate value by concentrating on their core transformation activities.

Flat Price Risk. Traditional commodity trading involves little exposure to "flat price" risk. In the traditional commodity trading model, a firm purchases (or sells) a commodity to be transformed (e.g., transported or stored), and hedges the resulting commodity position via a derivatives transaction (e.g., the sale of futures contracts to hedge inventory in transit) until the physical position is unwound by the sale (or purchase) of the original position. The hedge transforms the exposure to the commodity's flat price into an exposure to the basis between the price of the commodity and the price of the hedging instrument. (I discuss basis risk in more detail below).

Of course, hedging is a discretionary activity, and a firm may choose not to hedge, or hedge incompletely, in order to profit from an anticipated move in the flat price, or because the cost of hedging is prohibitively high. Moreover, particularly as some commodity firms have moved upstream into mining, or into commodities with less developed derivatives markets (e.g., iron ore or coal), they typically must accept higher exposure to flat price risks.

Basis Risk. Hedging involves the exchange of flat price risk for basis risk, i.e., the risk of changes in the difference of the price between the commodity being hedged and the hedging instrument. Such price differences exist because the characteristics of the hedging instrument are seldom identical to the characteristics of the physical commodity being hedged. For instance, a firm may hedge a cargo of heavy Middle Eastern crude with a Brent futures contract. Although the prices of these tend to move broadly together, changes in the demand for refined products or outages at refineries or changes in tanker rates or myriad other factors can cause changes in the differential between the two.

Basis risks generally arise from changes in the economics of transformation during the life of a hedge. Changes in transportation, storage, and processing costs affect relative prices across locations, time, and form. Sometimes these basis changes can be extreme when there are large shocks to the economics of transformation: for example, the explosion of a natural gas pipeline that dramatically reduced transportation capacity into California in late-2000 caused a massive change in the basis between the price of gas at the California border and at the Henry Hub in Louisiana (the delivery point for the most liquid hedging instrument). As another example, in the

Trading firms hedge physical commodities with derivatives...

...to exchange flat price risk for basis risk...

past three to four years, the basis between West Texas Intermediate crude oil and internationally traded crude oils has become larger, and substantially more variable, due to the dramatic increase in US oil production and to infrastructure constraints.

Basis risk can also vary by commodity. The basis for refined industrial metals tends to be less volatile than the basis for metal concentrates hedged using futures contracts on refined metals.

Basis risks can also arise from the opportunistic behavior of market participants. In particular, the exercise of market power in a derivatives market—a corner or a squeeze—tends to cause distortions in the basis that can inflict harm on hedgers. For instance, it was reported that Glencore lost approximately \$300 million in the cotton market in May–July, 2011 due to extreme movements in the basis that were likely caused by a corner of the ICE cotton futures contract. Basis and calendar spread movements are consistent with another squeeze occurring in cotton in July, 2012. Squeezes and corners have occurred with some regularity in virtually all commodity markets. In the last three years alone, there have been reports (credibly supported by the data) of squeezes/corners in cocoa, coffee, copper, and oil.

Spread Risk. From time to time commodity trading firms engage in other kinds of “spread” transactions that expose them to risk of loss. A common trade is a calendar (or time) spread trade in which the same commodity is bought and sold simultaneously, for different delivery dates. Many commodity hedges involve a mismatch in timing that gives rise to spread risk. For instance, a firm may hedge inventory of corn in October using a futures contract that expires in December.

Calendar spreads are volatile, and move in response to changes in fundamental market conditions. The volatility of spreads also depends on fundamental conditions. For instance, time spreads tend to be more volatile when inventories are low than when they are high. Spreads can also change due to manipulative trading of the type that distorts the basis.

Margin and Volume Risk. The profitability of traditional commodity merchandising depends primarily on margins between purchase and sale prices, and the volume of transactions. These variables tend to be positively correlated: margins tend to be high when volumes are high, because both are increasing in the (derived) demand for the transformation services that commodity merchants provide.

This derived demand changes in response to changes in the demand and the supply for the commodity. A decline in demand for the commodity in the importing region will reduce the derived demand for logistical services. The magnitude of the derived demand decline depends on the elasticity of supply in the exporting region. The less elastic the supply, the more the underlying demand shock reduces the derived demand for logistical services. This occurs because the bulk of the impact of the demand decline is borne by the price in the exporting region rather than the quantity traded, leaving the margin between purchase and sales prices and the quantity of the commodity shipped only slightly affected.

This means that variations in the quantity of commodity shipments, as opposed to variations in commodity flat prices, are better measures of the riskiness of traditional commodity merchandising operations. (Similar analyses apply to the effects of supply shocks, or shocks to different kinds of transformation such as storage or processing.)

It should be noted further that many commodity firms benefit from self-hedges. For instance, a decline in the demand for a commodity (e.g., the decline in the demand for oil and copper during the 2008–2009 financial crisis) reduces the demand for logistical services provided by commodity trading firms, but simultaneously increases the demand for storage services. A firm that supplies logistical services and operates storage facilities therefore benefits from an internal hedge between its storage and logistics businesses; the decline in demand in one is offset by a rise in demand in the other.

These considerations highlight the danger of confusing the riskiness of commodity prices with the riskiness of commodity trading, i.e., the provision of commodity transformation services. Although changes to underlying supply and demand for commodities affect demand for transformation services, the latter tend to be less volatile (especially when underlying demand and supply are highly inelastic), and because there are frequently negative correlations (and hence self-hedges) between the demands for different types of transformations.

Operational Risk. Commodity firms are subject to a variety of risks that are best characterized

*...or when traders corner
or squeeze a commodity in
derivatives markets*

*Margins and volumes tend
to rise and fall together*

*Commodity trading firms
are exposed to volumes not
prices*

as “operational”, in the sense that they result from the failure of some operational process, rather than from variations in prices or quantities. The list of potential operational risks is large, but a few examples should suffice to illustrate. A firm that transports a commodity by sea is at risk to a breakdown of a ship or a storm that delays completion of a shipment, which often results in financial penalties.

A particularly serious operational risk is rogue trader risk, in which a trader enters into positions in excess of risk limits, without the knowledge or approval of his firm. The firm can suffer large losses if prices move against these positions. A rogue trader caused the demise of one commodity trading company, Andre & Cie. The copper trading operation of Sumitomo suffered a loss in excess of \$2 billion due to rogue trading that lasted nearly a decade.

Contract Performance Risk. A firm that enters into contracts to purchase or sell a commodity is at risk to the failure of its counterparty to perform. For instance, a firm that has entered into contracts to buy a commodity from suppliers and contracts to sell the commodity to consumers can suffer losses when the sellers default. In particular, sellers have an incentive to default when prices rise subsequent to their contracting for a sales price, leaving the commodity trading firm to obtain the supplies necessary to meet its contractual commitments at the now higher price, even though they are obligated to deliver at the (lower) previously contracted price.

This is a chronic problem in the cotton market, and this problem became particularly acute beginning in late-2010. Initially, many cotton producers reneged on contracts to sell cotton when prices rose dramatically. Subsequently, cotton consumers reneged on contracts when prices fell substantially. As a result, several commodity trading firms suffered large losses in cotton that had materially adverse effects on their overall financial performance. Contract performance has also been an issue in sales of iron ore and coal to Chinese and Indian buyers: this has tended to result in traders dealing with such buyers only on a spot basis.

Market Liquidity Risk. Commodity trading (including specifically hedging) frequently requires firms to enter and exit positions quickly. Trading risks are lower, to the extent that it is possible to enter and exit without having a large, adverse impact on prices. That is, trading is less risky, and cheaper, in liquid markets.

Liquidity can vary across commodities; e.g., oil derivative markets are substantially more liquid than coal or power derivatives markets. Moreover, liquidity can vary randomly—and substantially—over time. Liquidity can decline precipitously, particularly during stressed market periods. Since market stresses can also necessitate firms to change positions (e.g., to sell off inventory and liquidate the associated hedges), firms can suffer large losses in attempting to implement these changes when markets are illiquid and hence their purchases tend to drive prices up and their sales tend to drive prices down. As frequent traders, commodity trading firms are highly sensitive to variations in market liquidity. Declines in liquidity are particularly costly to trading firms. Moreover, firms that engage in dynamic trading strategies (such as strategies to hedge financial or real options positions) are especially vulnerable to declines in market liquidity. Furthermore, to the extent that declines in liquidity are associated with (or caused by) market developments that can threaten commodity traders with financial distress, as can occur during financial crises, for instance, liquidity is a form of “wrong way” risk: under these conditions, firms may have to adjust trading positions substantially precisely when the costs of doing so are high.

Funding Liquidity Risk. Traditional commodity merchandising is highly dependent on access to financing. Many transformations (e.g., shipping a cargo of oil on a very large cruise carrier) are heavily leveraged (often 100%) against the security of the value of the commodity. A commodity trading firm deprived of the ability to finance the acquisition of commodities to transport, store, or process cannot continue to operate.

Risk management activities can also require access to funding liquidity. A firm that hedges a cargo of oil it has purchased by selling oil futures experiences fluctuating needs for (and availability) of cash due to the margining process in futures. If prices rise, the cargo rises in value but that additional value is not immediately realized in cash. The short futures position suffers a loss as a result of that price increase, and the firm must immediately cover that loss of value by making a variation margin payment. Thus, even if the mark-to-market values of the hedge and the cargo move together in lockstep, the cash flows on the positions are mismatched. Maintaining the hedge

There are risks of a counterparty failing to perform

There are liquidity risks for funding, in markets, and when hedging

requires the firm to have access to funding to bridge this gap.

Funding liquidity is often correlated with market liquidity, and these types of liquidity can interact. Stressed conditions in financial markets typically result in declines of both market liquidity and funding liquidity. Relatedly, stresses in funding markets are often associated with large price movements that lead to greater variation margin payments that increase financing needs. Moreover, declines in market liquidity make it more costly for firms to exit positions, leading them to hold positions longer; this increases funding needs, or requires the termination of other positions (perhaps in more liquid markets) to reduce funding demands.

Currency Risk. Most commodity trading takes place in US dollars, but traders buy and/or sell some commodities in local currency. This exposes them to exchange rate fluctuations.

Political Risk. Commodities are produced, and to some degree consumed, in countries with political and legal systems characterized by a weak rule of law. Commodity trading firms that operate in these jurisdictions are exposed to various risks not present in OECD countries. These include, inter alia, the risk of expropriation of assets; the risk of arbitrary changes in contract terms at which the firms have agreed to purchase or sell commodities; and outright bans on exports.

Such risks exist in OECD economies as well, though to a lesser degree. For instance, OECD countries sometimes intervene in commodity markets in attempts to influence prices. Thus, there is a continuum of political risks, and although some countries pose very high levels of such risk, it is not absent in any jurisdiction.

Legal/Reputational Risk. Various aspects of commodity trading give rise to legal and reputational risks for commodity trading firms. Many commodities are potential environmental hazards, and firms are subject to legal sanctions (including criminal ones) if their mishandling of a commodity leads to environmental damage. These risks can be very large, particularly in oil transportation.

Furthermore, commodity trading firms frequently operate in countries in which corruption is rife, making the firms vulnerable to running afoul of anti-corruption laws in the United States, Europe, and elsewhere. Moreover, commodities are sometimes the subject of trade sanctions. Since these sanctions create price disparities of the type that commodity firms routinely profit from, they create an enticement for trading firms to attempt to evade the sanctions. As a final example, commodity trading firms may have opportunities to exercise market power in commodity markets; indeed, their expertise regarding the economic frictions in transformation processes that make such kinds of activities profitable and their size make them almost uniquely positioned to do so. The exercise of market power in this way is sometimes referred to as manipulation, or cornering: such actions cause prices to diverge from their fundamental values and leads to distortions in commodity flows.

B. RISK MANAGEMENT

Commodity trading firms universally emphasize their expertise in risk management, and the importance that they place on managing risks (price risks in particular). They utilize a variety of tools to achieve risk control objectives. Most notable among these are hedging using derivatives (e.g., selling crude oil futures or a crude oil swap to hedge a cargo of crude oil) and diversification across commodities and integration of different links in the value chain.

As noted above, hedging transforms the nature of a firm's risk exposure from flat price risk to basis risk. These basis risks can be material, also as noted above.

Diversification across commodities makes firm financial performance less dependent on idiosyncratic events in any particular commodity. Given the nature of commodities, particular markets or submarkets are prone to large shocks that can seriously impair the profitability of operating in those markets. Diversification is a way of reducing the overall riskiness of a commodity trading firm. This is particularly important for privately-held firms that have limited ability to pass idiosyncratic risks onto diversified shareholders. Most large trading firms are widely diversified. Many smaller firms are more specialized, and less diversified. The latter are obviously more vulnerable to adverse developments in a particular market.

Diversification can also reduce a trading firm's exposure to basis risk. Dealing in multiple commodities diversifies away basis risk to the extent that basis movements exhibit little correlation across commodities.

Commodity trading firms often operate in territories with a weak rule of law

Many commodities pose potential environmental hazards

Legal sanctions and reputational damage can be substantial

Integration in the value chain also tends to reduce risk. As noted earlier, there can be self-hedges in the value chain, as in the case of storage on the one hand and through-put-driven segments on the other. Moreover, shocks at one level of the value chain often have offsetting effects (or at least, cushioning effects) on others. For instance, a supply shock upstream that raises prices of raw materials tends to depress processing margins. Integrating upstream and processing assets can stabilize overall margins, thereby reducing risk. Again, this is particularly useful for privately held firms that cannot readily pass on risks through the equity market, or for firms subject to other financing frictions. Moreover, it is more valuable across segments of the marketing chain where markets are not available to manage price risk at these stages of the chain, or these markets are relatively illiquid (e.g., iron ore, alumina and bauxite, or coal).

Although commodity trading firms emphasize their risk management orientation and prowess, they have considerable discretion in their ability to manage—and assume—risks.

Risk measurement is a crucial component of risk management. Most commodity trading firms utilize Value-at-Risk as a risk measurement tool. The limitations of this measure are well known. In particular, commodity trading firms incur model risk (including risks associated with the estimation of parameter inputs). Such model risks have been implicated in large losses in virtually every market and type of trading firm (e.g., banks, hedge funds), and they must be considered a serious concern for trading firms as well, especially given the fact that these firms have extensive involvement in commodities and markets for which pricing, volatility, and correlation information is particularly scarce (especially in comparison to financial markets).

Integration in the value chain can reduce overall risk



FIRM STRUCTURE AND OWNERSHIP

Commodity trading firms utilize a variety of means to fund their transformation activities. Different commodity traders use different funding strategies involving mixes of types of debt and debt maturities, and these funding strategies are aligned with the types of transformations firms undertake, and the types of assets they use to undertake them. Many firms are investing more heavily in physical assets as the profitability of pure physical arbitrage comes under pressure. There is a trend towards increased vertical integration for some firms, but this is not uniform.

Sometimes commodity marketing, financing, and risk management services are bundled in structured transactions with commodity trading firms' customers. Offering these services to customers exploits trading firms' expertise in merchandising and risk management, utilizes the information commodity trading firms have, and provides better incentives to customers.

A. THE FINANCING OF COMMODITY TRADING FIRMS

Like all firms, commodity traders need to finance their operations. Their choices of funding strategies—their capital structures—influence the efficiency of their operations, and are crucial determinants of their ability to withstand economic shocks. Moreover, since the debt and equity issued by commodity trading firms connects them to the broader financial system, capital structure also determines the vulnerability of trading firms to financial market conditions—including financial crises—and the influence of commodity trading firms (and hence commodity market conditions) on the stability of the broader financial markets.

An examination of the available information on the financing of commodity trading firms indicates that the diversity of commodity trading firm business strategies is mirrored in the diversity of their financing strategies. Firms differ in their gearing/leverage; the forms of leverage that they employ; and their ownership of their equity. Moreover, these differences in financing strategies co-vary with the kinds of transformations that firms undertake: firms that are more physical asset intensive finance themselves differently than firms that are engaged in more traditional pure trading activities. Relatedly, as the business strategies of trading firms are evolving, their financing strategies are evolving as well.

Financial statement information available for some of the largest trading firms illustrates these points. Notably, trading firms are much less highly leveraged than banks, to which they are sometimes compared: some have argued that commodity trading firms should be subject to regulations similar to banks.

There is a relationship between the leverage of commodity trading firms and characteristics of the asset side of their balance sheets. In particular, there is a strong correlation between the fixed asset intensity of commodity trading firms, and their leverage. Pure trading firms that own relatively few fixed assets tend to be more highly leveraged than firms that also engage in processing or refining transformations that require investments in fixed assets.

The structure of the liabilities of commodity trading firms is somewhat distinctive, and also co-varies with the structure of the asset side of their balance sheets. Specifically, short-term liabilities dominate the balance sheets of trading firms. Firms engaged in more fixed asset intensive transformations (such as processing) have a greater proportion of long-term liabilities. There is therefore an alignment between the asset and liability structures of commodity trading firms' balance sheets.

Asset intensive firms' financing strategies differ from pure trading operations

Available balance sheet information also indicates that commodity trading firms do not engage in maturity transformation as do banks. Indeed, to the extent that commodity trading firms engage in maturity transformation, it is the reverse of the borrow short-lend long transformation that makes bank balance sheets fragile, and which makes banks (and other financial intermediaries) subject to runs and rollover risk. Specifically, for the commodity trading firms studied, current assets exceed current liabilities. As a whole, commodity trading firms run far less liquidity risk than do financial intermediaries like banks or shadow banks.

Commodity trading firms have less liquidity risk than financial intermediaries

B. THE LIABILITY STRUCTURES OF COMMODITY TRADING FIRMS

There is a close connection between the nature of transformation activities, and how they are financed.

Consider, for instance, the financing of most short-term arbitrages involving spatial transformation, storage, and blending. Firms rely extensively on bank borrowings to finance these transformation activities. In particular, they engage in large amounts of relatively short-term borrowings, including borrowings through unsecured credit lines arranged with banks, frequently through syndication arrangements. Moreover, they typically maintain bilateral credit lines with banks that can be drawn upon to fund the purchase of commodities and the issuance of credit instruments, such as letters of credit, utilized in the merchandising of commodities. These are generally used to finance each transaction at 100% of collateral values, and are marked to market periodically (e.g., weekly, or more often during periods of large price movements). They are referred to as “self-liquidating” because they are repaid upon the receipt of payments from the purchasers of the commodity. Given that these borrowings are secured by commodities that are often saleable in liquid markets, marked to market, and hedged, and that these exposures have relatively short maturities, they present less credit risk to the lending banks than unsecured credit, or credit secured by less liquid collateral.

In the past decade, some commodity trading firms have also arranged non-traditional short-term financings that could be characterized as “shadow bank” transactions. These include the securitization of inventories and receivables, and inventory repurchase transactions. Borrowings secured by inventories pose limited credit risk to the lender, especially to the extent that these inventories are in relatively liquid commodities (e.g., deliverable aluminum held in an LME warehouse) and are located in jurisdictions where there is little risk of perfecting legal title; borrowings secured by less liquid commodities, and in some jurisdictions, pose greater risks. Commodity receivables that back some securitization structures historically have exhibited very low rates of default, and rates of default did not rise appreciably even during the 2008-2009 crisis period. Moreover, these structures do not generally exhibit the maturity mismatches that contributed to runs on the liabilities of some securitization vehicles during the financial crisis. Indeed, in some of these structures, the liabilities have longer maturities than the underlying assets, meaning that the challenge they face is replenishing the assets, rather than rolling over the liabilities.

These non-bank financing vehicles may become increasingly important because broader financial trends may constrain the availability of, and raise the cost of, traditional sources of transactional financing. Historically, banks, and especially French banks, have been major suppliers of credit to commodity trading firms; five banks, three of them French, are reported to provide 75% of the commodity trade finance for Swiss-based trading firms. Deleveraging post-crisis and dollar funding constraints on European/French banks have led to a reduction in bank extensions of commodity credit. This has led to increases in funding costs and reductions in the flexibility of credit arrangements. The impending Basel III rules impose greater capital charges on commodity lending and trade finance generally, which could further reduce bank supply of commodity credit.

Fears of a large reduction in financing available from traditional sources were particularly acute in early-2012, but have abated somewhat. Moreover, according to statements by industry participants, the impact has been minimal for larger, more creditworthy trading firms. Nonetheless, the seismic changes in bank regulation, and the potential for further changes going forward, mean that the traditional commodity trading funding models may not be sustainable. Thus, it is advisable to consider how commodity firms could replace reduced transactional bank funding.

Non-bank financing is becoming more important

A scaling back of lending by traditional suppliers of commodity finance would create opportunities for new suppliers less severely constrained (e.g. US banks that can obtain dollar financing more readily, and non-European regional banks looking to invest export-driven dollar flows), but given the relationship-specific nature of bank lending these new suppliers would likely be less efficient than the incumbents. Moreover, global rules like Basel III will impact banks internationally. The reduction in traditional sources of credit would also encourage greater reliance on shadow bank-type funding arrangements.

Any future reductions in traditional forms and sources of commodity finance would be likely to have greater impacts on smaller commodity trading firms than on the larger ones. This would tend to increase concentration in commodity trading activities. Moreover, it should be noted that some of the higher funding costs would be shifted to commodity suppliers (in the form of lower prices) and commodity consumers (in the form of higher prices): that is, higher costs will be associated with higher margins. Given the relative inelasticity of commodity supply and demand, a large fraction of these higher costs will be shifted via prices in this fashion, and the impact on commodity trading volumes will be modest.

One area that deserves further study is the possibility that the reduction in traditional sources of funding for commodity trading could lead to funding squeezes during times of market stress. Traditional commodity finance has been quite flexible and responsive to market conditions. Sharp reductions in the supply of commodity financing from traditional sources would likely result in a decline in the responsiveness of the funding of commodity trading activities to extraordinary conditions in the commodity or financial markets. This could lead to funding squeezes during periods of such conditions that could lead to disruptions in commodity trading; that is, the contraction of traditional sources of commodity finance will likely increase future funding liquidity risk.

C. THE OWNERSHIP OF COMMODITY TRADING FIRMS: PUBLIC VS. PRIVATE

One important aspect of the capital structure of commodity trading firms is the ownership of equity. As noted before, some commodity trading firms are listed firms with publicly traded equity, but others are private firms. Although all small commodity trading firms are private, the relationship between size and equity ownership is complex. Some very large commodity trading firms are private, while other firms that are similar in terms of size and market participation are listed, public firms.

The ABCD firms provide an interesting illustration. Although these firms are broadly comparable in terms of size and breadth and depth of market segment participation, ADM and Bunge are publicly traded, but Cargill and Louis Dreyfus are private. There is thus evidently an element of indeterminacy in the choice of public or private ownership.

This indeterminacy reflects fundamental trade-offs that are particularly challenging for commodity trading firms. A primary advantage of private ownership is the superior alignment of incentives between managers and equity owners. Managers who own small (or no) stake in an enterprise have an incentive to act in ways that benefit themselves, but are harmful to equity holders. For instance, they may consume excessive perquisites, invest in low-returning prestige or empire-building projects, or run ill-advised risks: the managers enjoy the benefits of these activities, but the outside investors bear the costs. In contrast, manager-owners have lower (and perhaps no) incentive to engage in these wasteful behaviors. Moreover, owner-managers have a stronger incentive to monitor their peers, and do so more effectively, than do diffuse outside-equity owners. More generally, since owner-managers more completely internalize the costs and benefits of their decisions than do the managers of public firms, they have a stronger incentive to exert effort, control costs, manage risks, and make value-enhancing investments.

D. COMMODITY TRADING FIRMS AS FINANCIAL INTERMEDIARIES

Not only is the funding of commodity firms an important aspect of the trading business: so is the fact that trading firms also play a role in financing the commodity trade.

Specifically, firms involved in commodity trading often provide various forms of funding to their customers. Thus, these firms supply financial intermediation services to their customers.

Reductions in traditional sources of finance will have a bigger impact on smaller firms

Private ownership aligns incentives between owners and managers

This intermediation takes the forms of traditional trade credit, and more complex structured transactions that bundle financing, risk management, and marketing services.

The practice of commodity trading firms extending trade credit to those they sell to is a venerable one. These receivables (along with inventories) represent the bulk of the current assets on the balance sheets of trading firms.

An established economics literature provides an explanation for the prevalence of such trade financing. A firm selling a commodity to a customer frequently has better information on this buyer than would a bank, due to the trading firm's intimate knowledge of the buyer's operations, how it will employ the commodity, market conditions in the buyer's region, etc. This permits the trading firm to evaluate creditworthiness better than the bank, and to monitor the creditor more effectively than the bank.

Furthermore, trade credit is often less subject to opportunistic behavior by the borrower. One concern about any credit transaction is that the funds lent are diverted for other than their intended purpose. Cash is more fungible, and hence more easily diverted, than a commodity used as an input: converting the input to cash would require the buyer to incur transactions costs, transportation costs, and other expenses. Moreover, such activity is subject to risk of detection by the commodity trading firm that sold the input on credit, due to its information on commodity transactions and movements in the markets it serves. The lower susceptibility to diversion means that trade credit expands the borrowing capacity of commodity buyers. Commodities are cheaper, and credit to obtain them more abundant, when commodity trading firms provide trade credit to their customers.

In addition to traditional trade credit, firms involved in commodity trading (including, notably, some banks that have physical commodity trading operations) increasingly provide structured financing to their suppliers and their buyers. A common element of these structures is an off-take agreement, whereby a trading firm agrees to purchase a contractually specified quantity of a commodity (e.g., copper concentrate or gasoline) from a producer (e.g., a miner or refiner) usually at a floating price (benchmarked to some market price, plus or minus a differential). These contracts can vary in duration (e.g., a year, or multiple years) and quantity (e.g., the fraction of a mine's output, or its entire production).

One common structure that utilizes an off-take is a prefinancing. Three parties are involved: a borrower (a producer), a trading company, and a bank. The producer and the trading company enter into a prepay agreement, and the bank lends money to the producer. Upon delivery of the commodity from the producer to the trading firm, the trading firm pays (some or all of) the amounts it owes under the off-take agreement to the bank to repay the loan. In this arrangement, the bank has no recourse to the trading firm (as long as it performs under the off-take agreement), and bears all the credit risk associated with the loan to the producer.

Another structure is a commodity prepay. There are two major variants of this structure, but under each the trading firm and a commodity seller enter into an off-take agreement, funding is provided to the producer (the prepayment), and the terms of the off-take arrangement are set to repay the prepaid amount.

In the first variant, the bank provides limited recourse financing to the trading firm, and the trader assigns the rights under the off-take agreement to the bank as a security. The trading firm provides funds to the producer, but the bank absorbs the credit risk on the loan, although in some instances the trading firm may keep a risk participation (e.g.10%).

In the second variant, the bank provides full recourse financing to the trading firm, which makes a loan to the producer. In this variant, the trading firm, rather than the bank, bears the risk that the producer will not repay the prepaid amount. It is common for the trading firm to offload all or some of this credit risk by entering into an insurance policy. Depending on the terms of the financing provided by the bank to the trading firm, the bank may be the loss payee on this insurance policy.

Another common structure offered by commodity trading firms is a tolling arrangement, whereby a firm supplies a commodity processor (e.g., an oil refiner) with an input (e.g., oil) and takes ownership of the processed commodity (e.g., heating oil, jet fuel, and gasoline). The trading firm pays a fixed fee to the processor, pays the market price to acquire the input, and receives the market price for the refined products.

*Commodity trading firms
extend trade credit...*

*and provide structured
financing...*

*...that bundles financial,
logistical, and marketing
activities*

These structures bundle together multiple goods and services. For instance, in a simple off-take agreement, the trading firm provides marketing services and hedging (because the seller is guaranteed a price, and the commodity firm is at risk to price changes over the life of the contract). A prepay incorporates these elements and a financing element as well. The seller receives cash up-front, in exchange for a lower stream of payments in the future: the discount on the sales price is effectively the interest on the prepay amount.

A tolling agreement bundles input sourcing, output marketing, price risk management, and working capital financing. The working capital element exists because the commodity trading firm has to finance the input from the time it is purchased until it can realize revenue from the sale of the refined good after processing is complete.

The various elements of these bundles could be provided separately. Instead of entering a tolling arrangement, for instance, a refinery could source its own input and market its own output, hedge its input purchases and product sales in the futures markets, and finance its working capital needs by borrowing from a bank. Instead of engaging in a prepay, a miner could market its own output, hedge its price risk on the derivatives markets, and borrow from a financial institution or the capital markets.

However, there are frequently efficiencies that can be captured by bundling these transactional elements into a single structure. By exploiting these efficiencies, firms trading commodities (which, notably, can include banks as well as non-bank trading firms) reduce transactions costs and allocate risks more efficiently, thereby benefiting commodity producers and consumers.

Moreover, trading firms specialize in marketing and logistics, and there are scale economies and scope economies in these activities. It may be cheaper for a big trading firm to provide marketing and logistical services, thereby eliminating the need for the refiner or the power plant to pay the overhead associated with such activities. Smaller, or less sophisticated firms (e.g., a refiner in an emerging market) are likely to benefit most from delegating marketing, logistics, and risk management services to specialist firms that can exploit scale and scope economies.

Thus, there are strong complementarities that make it beneficial to bundle financing, logistical, and marketing activities for some firms that process commodities.

*Bundling services can
reduce transaction costs*

E. ASSET OWNERSHIP BY COMMODITY TRADING FIRMS

There is substantial variation in asset ownership across commodity trading firms. Some firms own assets at all stages of the value chain—upstream, midstream, and downstream. Some have investments at all stages for some of the commodities they trade, but in only one or two of the stages for others.

One generalization is that all major commodity trading firms own midstream assets, such as storage facilities and terminals, although some firms participate in some commodity markets purely as traders, with no asset ownership. Moreover, some of the increased asset intensity is driven by increasing investments in midstream assets. Generalizations are more difficult to make about upstream and downstream assets. Given the complexity of the markets, I will focus on a few representative cases to illustrate some of the factors at work.

Trading firm asset ownership cannot be viewed in isolation. Especially in energy, commodity firms are acquiring assets that other firms are divesting for strategic reasons. Thus, understanding patterns and trends in commodity trading firms requires an understanding of patterns and trends in other companies, such as large oil companies.

I now consider trading firm investments in midstream, downstream, and upstream assets.

Midstream Investments. Commodity merchandisers have long invested in midstream assets such as storage facilities and terminals. Historical data and systematic statistics are lacking, but some documentation dating back to the early-20th century illustrates this point. The Federal Trade Commission's (FTC) Report on the Grain Trade analyzed terminal and country grain marketing around 1920. With some alarm, the FTC documented that merchandisers tended to control terminal grain elevators, country elevators, and grain export facilities. It noted that 80% of terminal elevator capacity was owned by "private dealers in grain." Even ostensibly "public" elevators that stored grain for third-parties were largely owned by grain dealers, and they utilized this capacity in their merchandising activities. With respect to country elevators and warehouses, the FTC

*All major firms own
midstream assets*

found that 35% were “line elevators” owned and operated by large grain merchants.

As noted above, this continues to be the case in the grain and cotton trades today. The major agricultural trading firms own storage and logistical facilities.

Transactions costs economics sheds considerable light on the need for trading firms to control storage facilities and terminals. Specifically, the concept of “temporal specificity” is of particular relevance for midstream assets. A temporal specificity exists when even a short delay in obtaining (or selling) a good imposes a large loss on the buyer (or seller). Under these circumstances, the seller (or buyer) has considerable bargaining power that he can exploit. Moreover, the wide bargaining range induces wasteful haggling, that sometimes results in a failure to complete what would have been a mutually beneficial transaction.

This is perhaps best illustrated by a commodity trading example, namely, storage. One of the main functions of commodity storage is to smooth out supply and demand shocks: the amount of a commodity in store should go down (or up) when demand is unexpectedly high (or low), or supply is unexpectedly low (or high). These shocks occur continuously, and particular in volatile market conditions can be large in magnitude. Optimal utilization of storage capacity requires timely response to these shocks.

Consider a firm that has put a commodity in store in a facility that it does not own, or control under some contract or lease. There is an increase in demand, making it optimal for the firm to take the commodity from storage and sell it (or consume it itself). The operator of the storage facility realizes that the value of the commodity to the customer is maximized if the customer can access it quickly to respond to the demand shock, and is worth less if access is delayed. This gives the storage facility operator the ability to extract some of this value by threatening to delay performance. Although the terms of the storage contract may attempt to preclude such conduct, contracts are incomplete (i.e., all contingencies cannot be set out in the contract, leaving room to attempt to evade performance by taking advantage of one of these contractual gaps), and are costly to enforce (meaning that the storer might prefer to capitulate to the storage operator's demand rather than go to court). Moreover, since timely access to the stored good is essential and getting the contract enforced is likely to be time consuming, capitulation becomes a more reasonable alternative.

These problems can be avoided if the firm that stores the commodity controls the storage facility, either by owning it, or obtaining control via a long-term contract or lease arrangement that is not subject to opportunistic conduct by the asset owner or user. This logic can explain the phenomenon noted by the FTC almost a century ago: the decline in “public” warehousing and merchandiser ownership (or control) of storage facilities. It can also explain the ownership (or control by lease/contract) of storage facilities across major commodities by trading firms.

Similar arguments obtain for other fixed logistic assets, such as terminals. Executing an arbitrage transaction frequently requires unpredictable, rapid and timely access to such an asset, and this creates a temporal specificity that the asset operator can exploit to extract a super-competitive price from the firm attempting to execute the arbitrage. If the firm executing the arbitrage owns the asset, however, such a “holdup” cannot occur.

It should be noted further that the possibility for such holdups reduces the incentive to seek out arbitrage opportunities, because the operator of the logistics facility can extract some of the value that the arbitrageur's efforts create. If the arbitrageur owns the asset, however, it can capture fully the value of the arbitrage, and therefore has a stronger incentive to seek out and exploit such value-enhancing transactions.

Not all logistic assets are equally susceptible to temporal specificity-related holdups. Standardized bulk ships (or tankers) operating on heavily-trafficked routes are relatively immune, for instance. If a carrier attempts to hold up a shipper, the shipper can readily find another carrier: competition sharply mitigates the potential for a holdup. However, fixed logistic assets for which there are few alternatives are more susceptible to this problem. Thus, one expects that commodity traders need not own standardized bulk carriers or tankers, but have a far stronger incentive to own terminals or storage facilities. This prediction is largely borne out in practice.

The analysis also has implications for the factors that cause changes in the incentive for trading firms to integrate into ownership of logistic assets. The more fleeting are arbitrage opportunities,

Trading firms want to control delivery and reduce transactions costs

Storage ownership ensures timely access to goods

the more acute are temporal specificities and the greater incentive to integrate. Recent developments in some commodity markets, notably the oil market, are consistent with this prediction. Due to information technology, greater ability to monitor the activities of competing traders (e.g., by tracking vessel movements in real time), and the substantial increase in price transparency in the energy markets, the duration of arbitrage opportunities has declined substantially. Immediate access to logistic assets and storage facilities is therefore more valuable for firms that are primarily engaged in executing arbitrages. This helps explain increased investment of traditional trading houses in midstream logistic assets and storage facilities, which is a major driver of the increased asset intensity of some of these firms.

Supply and demand shocks in the commodity markets can increase the demand for midstream infrastructure that is needed to facilitate commodity flows. Moreover, the needed new infrastructure often exhibits characteristics that make it economical for those that are going to utilize it, build it and own it, at least for some period. In particular, the infrastructure often exhibits substantial scale economies at efficient scale, and due to these scale economies infrastructure assets may be geographically dispersed, with only a small number of facilities serving a particular tributary territory. Moreover, it is often specialized to optimize its efficiency. Furthermore, it is fixed to a specific location: in the language of transactions cost economics, it is “site specific.” Finally, some traders control flows of the commodity sufficient to utilize a large fraction of the asset’s capacity.

All of these factors create the potential for serious opportunism problems if the major users of the new assets (traders controlling commodity flows) do not own them. Specialization of the asset, site specificity and scale economies that make it efficient for a single piece of infrastructure to serve a substantial portion of the commodity flows for a large region, and the fact that large traders control flows of the commodity that can utilize a substantial fraction of the asset’s capacity mean that bargaining and contracting hazards arise if the trader that controls the commodity flows does not control the asset. If the parties attempted to deal through a long term contract, the asset owner could attempt to evade performance under the contract to extract a better deal from the trader: the trader may find it better to agree because alternative ways of moving the commodity are substantially more costly (because they are out of position relative to the trader’s commodity flows, or not optimized to meet the trader’s needs). Similarly, the trader could threaten to evade performance by diverting its flows elsewhere, unless the asset owner makes concessions. If the trader controls a substantial fraction of the flows that use the asset, if it carries through on the threat the asset will operate well below capacity, meaning that the asset owner may feel compelled to make concessions in order to avoid idling the bulk of the facility. Thus, the combination of traders that control large commodity flows, with assets that are specialized to facilitate those flows and which must operate at scale, creates the conditions for ongoing and wasteful disputes between the trader and the asset owner. This problem can be eliminated if the trader owns the asset.

In sum, commodity trading firms have always owned and operated midstream assets, like terminals, blending facilities, and storage facilities. The nature of these assets makes it efficient for firms merchandising large commodity flows to own them: this reduces transactions costs. Moreover, major changes in supply and demand patterns have led to the need for new infrastructure, which large commodity trading firms have accommodated through investment and ownership, thus increasing their fixed asset intensity.

This increased intensity is sometimes explained as the result of commodity trading firms investing in assets that offer “optionality”. This explanation is incomplete. Optionality (defined as adjusting the use of the asset in response to unexpected supply and demand shocks and the associated relative price changes) is a necessary condition for ownership of an asset, but not a sufficient one. Bulk cargo ships and tankers offer substantial optionality (in terms of routes and sometimes cargoes), but a trading company does not need to own a bulk carrier or tanker to exploit that optionality because ships are mobile, and because there are competitive charter markets with large numbers of buyers and sellers: a trader can exploit a ship’s flexibility and optionality by chartering it when needed. Many infrastructure assets, in contrast, are sufficiently unique (in terms of location, configuration, size, etc.) that something analogous to a ship chartering market is not feasible. For these assets, ownership is necessary to exploit their optionality efficiently.

There are strong economic reasons for traders to own midstream infrastructure

Owning midstream assets creates transactions cost efficiencies

Downstream Assets. One of the notable developments in energy markets in recent years is the integration of some large trading firms into the fuel and lubricants retail, distribution, and downstream distribution businesses.

The downstream activities of trading firms are primarily concentrated in emerging markets, or rapidly developing regions of advanced countries. These markets tend to be relatively small, and have underdeveloped infrastructures and therefore require additional investment. Moreover, local capital markets are relatively undeveloped. The market sizes are insufficient to support a large number of efficiently-scaled retailers, wholesalers, and distributors (as is the case in far larger markets, such as the United States). If these businesses were operated separately, it is likely that firms at each segment of the marketing chain would have market power, leading to potential for multiple monopoly markups and the potential for opportunistic behavior if firms in the different segments attempted to use long term contracts to mitigate the markup problem. These factors tend to make vertical integration more efficient than separate ownership of retail, wholesale, and distribution segments.

Further, markets in these countries tend to be highly regulated, and often adopt price controls. In some, the quality of governance is poor. It is well known that such conditions tend to favor vertical integration.

Economic considerations therefore strongly favor the integration of midstream and downstream functions in fuel markets in emerging economies, and these activities have historically been integrated in these markets. The previous owners were the oil majors, and the integration of trading firms into this sector is the flip side of the exit of the majors.

Majors have been becoming less integrated generally because returns in downstream businesses do not compare favorably with those that can be earned in the very capital-intensive upstream exploration and production activities. Trading firms that can efficiently supply inputs into the downstream markets in emerging economies are the natural buyers for these businesses. So the tale of vertical integration by commodity traders is also very much a story of disintegration by oil majors.

Recently some traditional trading houses (including Gunvor and Vitol) have acquired oil refineries. These acquisitions are again to a considerable degree a reflection of developments in the broader oil industry, in particular the serious erosion in refining economics in Europe. One major refiner, Petroplus, went bankrupt, and the financial performance of European refineries generally has led refiners to shed capacity. Some of this capacity has been idled: from 2006 to 2013, European refining capacity (crude distillation units) declined 7.5%. Trading firms have found it economical to purchase and operate some of the capacity that was no longer sufficiently profitable for traditional refiners to retain.

The major agricultural trading firms that merchandise grains and oilseeds also process these commodities. For instance, Cargill and ADM process wheat, corn, and soybeans. Bunge processes soybeans.

Processed agricultural products are typically marketed to a large, diverse, and geographically dispersed group of customers. Efficient performance of this marketing function requires the same skills and resources required to merchandise unprocessed agricultural products, including most notably expertise in logistics. Further, expertise in sourcing, storing, and transporting unprocessed agricultural products can be utilized to acquire efficiently inputs for processing operations. Thus, there are complementarities between merchandising of unprocessed and processed agricultural products, providing an incentive for trading firms to engage in processing.

Upstream investments. There are some instances of upstream integration in agricultural products. Olam and Wilmar own palm oil plantations, and Cargill recently announced an investment in a major Ukrainian agricultural producer, UkrLandFarming. Again, transactions costs economics explains how these decisions can increase value. The plantations are large (due to scale economies), and obviously site-specific, and Olam and Wilmar market large quantities of oil: ownership avoids the inefficiencies that arise from bilateral monopoly.

It should also be noted that the companies own and operate processing facilities on the plantations. Again, this makes sense from a transactions costs economics perspective. Similar considerations obtain in the case of Cargill and UkrLandFarming. The inefficiencies of having a

Trading firms invest downstream in emerging economies and developing markets

Energy and metals traders integrate upstream

large buyer and a large seller dealing at arms length can be mitigated if the buyer has an ownership stake in the seller (or vice versa).

Integration upstream has been more common in energy and industrial metals. For instance, Glencore (especially with its merger with Xstrata) has become in effect an integrated mining company. Mercuria has upstream oil and coal assets, and Vitol owns upstream oil assets as well. Trafigura owns mines in Spain and Peru, and recently sold off another in Peru that it had owned since 1997.

Transactions costs considerations again explain some of the benefits of integrating processing and marketing operations. Repeated negotiation of short term agreements between the operator of a mine, say, and a trading firm that is capable of marketing all (or a large fraction) of its output is likely to be costly because of the small numbers bargaining problem inherent in this situation. Integration can avoid that problem.

Commodity Trading Firms and Vertical Disintegration in Commodity Markets. Although much public discussion of commodity trading firms focuses on their increasing integration, it is important to note that commodity trading has also contributed to vertical disintegration. As pointed out by Coase long ago, markets and firms are different ways of carrying out transactions. When markets become cheaper to use, some transactions that used to take place within vertically integrated firms (e.g., the supply of crude oil to a refinery) can be undertaken in markets instead, and the upstream and downstream parts of the firm can be separated. By facilitating liquid, competitive markets in crude oil and refined products, commodity trading firms made it more economical to carry out many transactions that had taken place within integrated firms on markets instead. The rise of refining independents and the retreat of oil majors from refining reflects in large part the efficiencies created by commodity trading firms.

Commodity trading generates market efficiencies

F. SYSTEMIC RISK AND COMMODITY TRADING

In recent years commodity trading firms have received much more public scrutiny. Since the Financial Crisis in particular, some (including some regulators) have questioned whether they pose risks to the financial system analogous to banks, and hence should be regulated similarly to banks. In reality, however, commodity trading firms are unlikely to be a source of systemic risk.

Systemic risks were defined by then Federal Reserve Chairman Ben Bernanke in 2009 as "developments that threaten the stability of the financial system as a whole and consequently the broader economy, not just that of one or two institutions." Stanford Professor John Taylor says that for a risk to be systemic, (1) there must be a risk of a large triggering shock (such as a natural disaster or the failure of a firm or firms,) (2) there must be a risk of the shock propagating through the financial system via contagion or chain reaction, and (3) the financial disruption must affect the broader macro-economy.

Systemic risks threaten the financial system and the broader economy

Given these definitions, here are some arguments as to why commodities trading firms do not pose systemic risks.

Commodity firms are not really that big, especially in comparison to major banks. The assets of Glencore, the largest commodity trading firm, total slightly more than \$100 billion, which ranks it approximately 240th of world publicly traded corporations in terms of assets. Comparing just to major banks, Glencore's assets are approximately equal to the 60th largest bank (by assets) in the world.

The balance sheets of trading firms are not fragile in the same way that banks' balance sheets are. In comparison to banks, commodity trading firms are not heavily leveraged. Whereas large bank leverage ratios (measured by book value of assets divided by book value of equity) range between 9 and 14 for large US banks and between 9.6 and 37 for large European banks, the median leverage for commodity trading firms I have examined is 4. In terms of net debt, many commodity trading firms are not leveraged at all because current assets exceed total liabilities. Furthermore, the most important factor contributing to financial crises throughout history is the fact that banks engage in "maturity transformation", but commodity trading firms do not.

Commodity trading firms are not even remotely as important as issuers of credit as banks. One reason that bank failures can be systemically catastrophic is the central role of banks in the supply of credit. If banks fail, or become financially distressed in large numbers, they reduce

the amount of credit that they supply, which reduces investment and consumption (especially of durable goods) in the economy. Commodity trading firms do issue credit to commodity consumers and producers, but ultimately the source of the bulk of this credit is banks.

For the most important commodities, there is relatively little concentration among commodity trading firms. In the crude oil market, two of the largest traders (Vitol and Trafigura) each account for about 6% of freely traded oil. Concentrations are somewhat higher in metals. Thus concentration is small in commodities that represent a relatively large fraction of trade, and the markets in which concentration is larger represent very small fractions of trade. This means that the failure of a commodity trading firm is unlikely to disrupt severely the trade in any major commodity.

Furthermore, the assets used in commodity trading are readily redeployable, meaning that the financial distress of a trading firm has at most a modest impact on the capacity to trade and transform commodities, and then for only a short interval of time. In the event of distress of a trading firm, its physical assets and employees can move to other firms.

Recent experience shows that even large disruptions of the logistical system have very modest effects on the broader economy. As noted throughout, one of the primary functions of commodity trading firms is to make transformations in space and time—logistical transformations. Even if the assets utilized by a distressed trading firm to make these transformations are not redeployed immediately, the impact on the broader economy will almost certainly be minor. Recent experience demonstrates that even a major disruption of the logistical system in a major economic region does not cause an appreciable decline in the world economy. Specifically, the Japanese earthquake and tsunami in 2011 wreaked massive havoc on the single most important trading region in the world, but this had only very small effects on the world economy.

*Commodity trading firms
are not a source of
systemic risk*

Commodity trading firms transform commodities in space, time, and form in order to enhance their value. Their function is to move commodities from low value uses to high value ones. In so doing, they enhance the wealth and welfare of both the producers and consumers of commodities. It may seem paradoxical, but commodity trading raises the prices that producers receive, and lowers the prices that consumers pay. It is not paradoxical, however, because commodity traders are both buyers and sellers, and are in the business of earning a margin between sales and purchase prices: they care little about the level of prices overall. Competition on margins between traders tends to narrow price differentials and encourages traders to improve the process of transforming commodities from what producers produce to what consumers consume.

They do not do this out of altruism. Moreover, their activities are not uniformly beyond reproach. But the profit motive and intense competition combine to create a powerful tendency for these firms to create value, of which they take a relatively small portion.

By highlighting the role of transformations, and analyzing them in detail, I have attempted to provide a conceptual framework for analyzing commodity trading and evaluating the role of commodity trading firms. Hopefully this will contribute to a more informed public discussion of commodity trading, and how it can be improved through good policy.

