

Conversations with Supply Chain Managers

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**CONVERSATIONS WITH SUPPLY CHAIN MANAGERS**  
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**I. Introduction and context**

**A. Information sources**

The following description of supply chain formation is based primarily on phone and personal interviews with supply chain professionals and consultants from a range of industries including but not restricted to high tech, consumer products and services, entertainment, food, furniture, family and entertainment, consulting and other b-to-b services, automotive, and large complex engineered products. Most of these interviews were conducted between September 2009 and January 2010, but some earlier interactions have been incorporated as appropriate. Potentially identifying information has been removed to preserve anonymity, which was promised to the respondents.

**B. Context**

Supply chains are collections of independent or semi-independent (in terms of decision making authority and performance metrics as profit or responsibility centers) firms that join together via a network of contracts and understandings to bring a product to market. The total profit available to the members of the supply chain equals the revenue produced by the final output minus the raw material and value-adding costs incurred along the chain. Each firm in the chain recognizes that by cooperative effort they have a joint opportunity to make money, but each also wants (all else equal) to capture more of the available surplus for themselves.

We will describe the process from the perspective of a firm who designs a new product and wishes to bring it to market, but does not have ownership or control over the resources required to make that happen. How does the supply chain form? The managers contacted were specifically asked this question. Sometimes, the original contact in the company referred the author to another manager who was closer to that specific process.

In most of the conversations it was implicit that the identity and boundaries of candidate supply chain partners were fixed and not in flux. That is, actions such as vertical integration (pursued for a variety of reasons such as scale, bargaining power, or acquiring a special technology) that would change the boundaries of a firm were not discussed in detail. Also, it was generally assumed that candidate firms at each tier were known. In many supply chains, such firms must be on an “approved vendor list” (AVL). See the Appendix for the due diligence involved in vetting a supplier for the AVL. The reason for such vetting is obvious. The firms interviewed were predominantly recognizable companies with brands that could be significantly damaged by poor quality or safety performances anywhere in the chain. So, it makes sense that the firm will expend some energy to protect its brand. However, despite this brand exposure (and some recent well-publicized problems in remote tiers of some supply chains), the firms’ diligence in

monitoring the chain seldom extended beyond its immediate suppliers. We will return to this point below.

Tier 1 suppliers compete on more than just price. Typically, a supplier will be selected based on a balanced scorecard of considerations including price, capacity, quality, delivery, supply history and familiarity, culture, and a desire to maintain a diversity of viable suppliers. In addition, many of respondents in these interviews described a growing practice of buyers allowing suppliers to engage in design work.

The “old days” featured a sequential process by the designing firm:

- Ideation
- R&D and market assessment
- Engineering specifications
- Purchasing request for quotes (RFQ’s) from suppliers
- Quotes returned
- Review the quotes with finance, iterate as necessary
- Contract
- Deliver and launch

Today, firms may also source some of the early activities in this list. Some firms have systems for getting new product ideas from suppliers (or even open-source problem identification and solution systems that anybody can contribute to). We did not discuss the decentralization of these early decisions in detail. However, some creative input from suppliers was routinely requested for cost reductions (more on this below). The parent firm will work with selected suppliers to optimize the product’s performance and cost, leveraging the suppliers’ better understanding of their production processes. Suppliers generally welcome these additional tasks, perceiving increased margins in these value-adding activities.

In summary we assume that what is being supplied (the nature of the performance required of the suppliers) is known and the candidate firms on the AVL are known. The task is to choose, among the many potential candidates, the specific firm(s) who will provide the required inputs at an acceptable cost.

### **C. Supply chain structure**

Most of the conversations referred to a standard multi-tier supply chain as shown in figure 1. Tier 0 contains only the firm that will bring the final product to market but requires inputs from a tier 1 supplier to do so, who in turn requires inputs from tier 2, etc.

While this was the predominant model in the interviews, we mention here some variations on this standard theme that came up in discussion. In one, illustrated in figure 2, the selected tier 1 firm is the final assembler but the tier 0 firm negotiates separately with a tier 2 firm, which will ship its inputs to the tier 1 assembler. Following are two scenarios under which this can happen:

- a) The tier 2 firm provides a key, strategic input. That is, the key tier 2 firm is essentially a monopolist (labeled 2' in figure 2) supplying some unique functionality. In these cases, there is probably some design and other work that has to be worked out between the tier 0 firm and the key tier 2' firm. The tier 0 firm negotiates directly with this tier 2' firm, and arranges for their inputs to be delivered directly to the tier 1 assembler. The tier 0 and tier 2' firms bargain more as equals (bilateral monopoly) than as a system in which either player has a preponderance of bargaining power.
- b) The tier 2' firm provides semi-standard inputs, but the tier 0 firm can use their clout and overall volumes (across several products) to negotiate a better price from firm 2' than would obtain if the tier 1 firm negotiated with firm 2'. So, the tier 0 firm negotiates the price with the tier 2' firm but arranges for firm 2' to send its product directly to the tier 1 firm for assembly into the finished product.

Sometimes all terms of delivery are negotiated between the tier 0 firm and the tier 2' firm, and sometimes only some terms are decided between those firms and others are negotiated between the tier 2' firm and the tier 1 assembler. For example, in some cases price is negotiated between tiers 0 and 2', but in other cases only features and functionality are discussed between these two and price is negotiated between firm 2' and the tier 1 assembler. In the latter case, the tier 0 firm only cares about the delivered price from the tier 1 supplier. For some more exotic variations on this theme, see the Appendix.

In general, these instances of the tier 0 firm reaching further upstream than tier 1 were more the exception than the rule in the conversations. It costs time and resources to maintain upstream relations (beyond tier 1), so tier 0 firms do not do this routinely. Tier 0 firms carefully consider where they want to invest in upstream visibility, based on where they believe the advantages outweigh the increased overhead. For the most part, according to these respondents, they leave the upstream (tiers 2 and higher) negotiations to their tier 1 supplier. We will return to this point below.

## **II. The standard process of supply chain formation**

The standard process of supply chain formation as described by the respondents is as follows:

1. The tier 0 firm wants to bring a product to market, estimates its cost based on prior experience, and conducts concept and market tests sufficient to identify the quantity (or quantity range) it can and wants to sell.
2. The tier 0 firm understands what sort of service it needs from a tier 1 supplier to bring the product to market, and requests quotes from two to five (three was most common) tier 1 firms based on those needs.
3. The tier 1 suppliers turn around and negotiate with their tier 2 suppliers. The results of these negotiations along with the tier 1 firms' internal processes identify the supply costs for the tier 1 firms.

4. The tier 1 competitors respond with quotes to tier 0.
5. The tier 0 firm chooses a single tier 1 supplier based on a balanced scorecard of considerations including price, capacity, quality, delivery, supply history and familiarity, culture, and a desire to maintain a diversity of viable suppliers.
6. The tier 0 firm begins working with the selected tier 1 supplier to further define the contractual parameters of delivery (further discussions on cost are also common) and to move forward toward product launch.
7. After launch, unexpected events can re-open negotiations if they were not already anticipated in the contract.

This process reflects a rational cost/benefit calculation that balances the power of more information and/or negotiations with the overhead expense of those activities. For example, quantity is fixed first and then supply price negotiated, whereas cost can also influence quantity so there could potentially be repeated rounds of price-quantity negotiations. But, in all interviews a quantity or quantity range was specified first. Apparently, the time and overhead of such lengthy negotiations was not believed to add value in excess of cost (at least for familiar products for which the tier 0 firms believe they can accurately estimate costs prior to negotiations). We explore this further below.

Likewise, one might expect that after tier 1 gets a contract and supply price from tier 0, this information may influence the negotiated price between tiers 1 and 2. But, if those negotiations were re-opened and resulted in a change in that transfer price, that might force tiers 1 and 0 to re-open negotiations as well. The truncated sequential model described above closes faster at reduced overhead expense.

Finally, trust plays a significant role in the testimony. Trust between a buyer and seller is built on a history of solid cooperation. Trusted, often-used incumbent suppliers play a significant role in reducing overhead costs by working without detailed contingency contracts that attempt to anticipate all possible predicaments.

We now provide more detail on each stage of this standard process.

### **1. Market assessment and cost “knowledge” results in a quantity (or quantity window) forecast**

Most firms determine volume ranges prior to requesting quotes from their tier 1 suppliers. The firms and consultants interviewed had a lot of experience in their markets, and they felt that they could estimate volumes and costs for new products. Most interviewees cite careful market research and concept tests to estimate revenues at several price points, and due diligence to estimate what the new product should cost and how many should sell. They go to bid with specs for look, features, performance and quantity (or quantity range) driven by this analysis, and with an idea of what the returning quotes “should” be. As

long as things align with expectations all will be well. While this was the dominant testimony from the respondents, it raises some questions.

*Can the tier-0 firm accurately estimate costs?*

In most cases the relevant supply base for a new product included legacy suppliers or possibly new suppliers who have or can acquire bolt-on technologies (that is, the technology already exists somewhere, is well-understood, and can be acquired). Legacy suppliers and the buyer understand the behavioral aspects of their relationship, and are familiar with each other. Most of the interviewees expressed confidence that at least for products using familiar technologies and suppliers they could accurately estimate what the costs should be. This was less true for new-to-the-world products and/or new and unfamiliar suppliers.

Information is power in negotiations, and the tier 0 firms go to great lengths to figure out what things should cost. This effort can include reverse engineering, trying to back out component costs from published (competitor's) prices for different product configurations, direct inspection of suppliers, and other efforts. In one company part of a floor was allocated to tearing down and estimating the cost of components and subassemblies provided by suppliers. In the words of the president of this company, they "trust but verify." Some companies have detailed strategies for assessing supply costs from rapid plant assessments based on broad-aisle plant tours. They arrive as a team and each member has an assigned task. One person looks at inventory, another at capital stock, another at labor, etc. They convene after the tour and compare notes, trying to reconstruct the supplier's cost structure.

Some firms use cost modeling. For example, the buyer may think, "Let's see we're 60% of their volume and their plant is worth X so the full cost should be something like Y." Another type of cost model is based on regression analysis of historical prices as a function of engineering characteristics. This approach has intuitive appeal, but one respondent cautioned that applied naively it can mask some important cost effects of different processes. For example, if 100 units are made the cost per part is probably higher than if 1000 are made, due to the fixed costs of production. So either fixed costs should be handled separately in the data, or some quantity discount applied. Also, the cost of a product from a high volume, low overhead, standard-production plant should be lower than the cost for exactly the same product from a low volume, custom-production plant. If the data set mixes up small run and longer run production, and/or different types of firms, then the resulting regression model will not really predict the best cost from the best supplier.

Sometimes input prices are public knowledge. For example, the price of traded commodities is readily available, and if these dominate the material costs for an input the buyer can estimate value adding costs and acceptable margins and come up with an input price that should be about right. One firm, which was vertically integrated back to near-commodity inputs, stated that they can estimate costs to within plus or minus 10%.

Cost estimation can be difficult for brand new technologies. In these cases, the tier 0 firm might contact the equipment manufacturer for the processing technologies used by their tier 1 suppliers, to find out more about what production costs should be.

Of course, an easy way to know costs is to deal with a supplier who opens their books. One respondent said he would rather deal with such a supplier, and will pay more to get this. Another respondent cautioned that even with an open-book supplier one has to be careful about “double books.” According to this respondent, some suppliers keep one set of books to show to buyers, and another for their real operations. This was mentioned in the context of trying to ensure compliance with worker safety issues (limiting workers’ hours per week below a specified maximum). The supplier had one set of records to show the buyer, but another to record their real operations in which workers worked much longer hours.

One firm believed they had a better understanding of costs than even their suppliers did. This firm used high volumes of commodity materials in their products (constituting a high % of total cost) so it was a business imperative to understand the commodity markets. Understanding and modeling commodity prices is a complicated exercise, and they believed they could do it better than their suppliers. So, they believed that sometimes they knew what things should cost even better than their suppliers did.

However, this confidence from the tier 0 respondents that they could accurately predict costs was not totally credible to at least one tier 1 supplier. The respondent in this firm observed that one of their tier 0 buyers did not understand costs at all, because they had relinquished all manufacturing and had lost that knowledge base. The tier 1 respondent described the tier 0 buyer as marketing dominated and that their market research usually revealed the obvious, everybody wants something for nothing. So, cost targets based on these market surveys were unrealistically low. In a typical case, all bidding tier 1 suppliers would return quotes higher than the targeted costs because the original expectations were not realistic. This would then initiate reconciliation activities (see point II.6 below). The respondent noted that it would be better if the tier 0 firm had a better understanding of costs to begin with, because that would reduce the overhead expense of the negotiations significantly.

*If the tier 0 firm knows the costs, why not offer to just cover those costs and give very little extra? That is, why not drive suppliers to their indifference point and take every nickel?*

Theoretically, if a firm knew the supplier’s cost structure they could make them a take-it-or-leave-it offer at their indifference point, in effect asking for “every nickel.” Yet, other than sourcing commodities with a lot of competitors and standardized products, this is not what happens. Why? Several reasons were suggested by the testimony.

a) Rigorously following this strategy will bankrupt suppliers. Since sunk costs are sunk, the supplier’s indifference point is determined by their variable costs only. That is, in theory a buyer could offer to cover the supplier’s variable costs, but very little more, and

the supplier should choose to accept this rather than having capacity lie idle. But, even if the supplier has no alternative buyers to sell their capacity to, so they rationally “should” accept an offer at variable cost, under this scenario they will lose money overall (sunk costs are sunk, but real). So, the long-term viability of a tier 1 supplier requires at least that full costs, not just variable costs, are covered. Since it is costly to vet and develop relationships with new suppliers, the long-term viability of incumbent suppliers is in the best interests of the tier 0 firm.

It was specifically mentioned by several respondents that historically beating up suppliers on price resulted, in the long run, in a tier 1 consolidation into fewer, larger suppliers each with more bargaining power. This, in turn, resulted in the (few remaining) suppliers getting higher margins. One way to dissuade consolidation is to negotiate more egalitarian margins now. Most respondents believed that suppliers should “get their margins” even beyond full costs. However, one respondent also noted that we may see a trend back toward low supplier margins as new suppliers spring up in China and India, and we return to an environment with a surplus of competition in each tier. So, this respondent wondered whether supplier margins were cyclical, driven by a natural cycle of consolidation – margins – entry into the business – lower margins – consolidation.

When one talks about the tier 0 firm consciously choosing to “grant” the tier 1 firm more or less margin, it is implicit that they have the power to do this. That is, the tier 0 firm has complete bargaining power but realizes it is in its own long term best interests to cover suppliers’ full costs and keep them viable for future contracts. But, while keeping suppliers viable is good and forcing them into bankruptcy is bad, this logic alone would argue for keeping suppliers “just” viable. Yet, it was apparent in the testimony that this was not the case, even for the respondent who said his firm would pay for open books from the suppliers. In that case his firm might know exactly both the full and variable cost of inputs, yet this respondent said he would still give the supplier acceptable margins. So, enlightened self-interest is important but is not working in isolation.

b) The implicit assumption in (a) is that suppliers have no other options. But, in reality they do. The respondents interviewed represented (for the most part) large firms with high volume products. Several said specifically that there are just a few tier 1 suppliers that can handle their volumes and demands, and each of these tier 1 firms had alternative tier 0 firms that they can work with. So, the situation is one where the tier 0 firm has alternative suppliers to choose from (which would give bargaining power to tier 0) but the tier 1 suppliers also have alternative buyers they can work with (bargaining power to the suppliers). So, bargaining power is actually more balanced between tiers 0 and 1, and this results in a division of potential profit that gives acceptable margins to both parties. Tier 1 suppliers will get margins even above full cost, not because of tier 0 largesse but because they have alternatives that translate into power in the negotiations.

c) The tier 0 firm wants tier 1 partners who value the relationship and want to maintain it, so they can engage important non-price issues that benefit from mutual trust and cooperation. This means treating suppliers “fairly,” and granting them acceptable margins. Many respondents said explicitly that they wanted good, mutually supportive



and beneficial relations with their tier 1 suppliers. One said specifically that he behaves differently vis-à-vis supply negotiations than his boss's boss probably thinks he does. He really tries to sell the firm to suppliers, not vice versa. He is attentive to costs but believes the relationship is very important, more so than rounding to the fourth decimal place on cost. Still another respondent noted that in recent years the most successful firms work more collaboratively with their suppliers, and this manifests itself in wide-ranging discussions about how the overall supply chain performance and cost can be better. By talking about more than just price, opportunities arise for joint gains that might be missed in more formulaic negotiations. For example, if you know there is a customer segment that will wait a little longer for delivery you might give a supplier more time flexibility in exchange for a lower price. One respondent said he used to think they were doing a good job by getting the best price deal, but they were not. By talking about more dimensions of the relationship they found they could do much better. This spills over into design. He said he has observed that if they say at a negotiation that some design feature really does not have to be there, suppliers can sometimes offer dramatic improvements.

Finally, the power tables can turn. One respondent noted that if there is a surprise shortage of an input (as has happened in his industry repeatedly), he wants his firm to be high on their supplier's priority list for allocations, not low. They are conscious of treating everybody fairly, because tables can turn unexpectedly. He also wants suppliers to feel that they want to do business with him again.

d) Working with some tier 0 firms is more difficult and costly than others, resulting in prices higher than what inputs "should" cost. For example, "bad" buyers will demand a lot of engineering and process changes post-contract but will resist paying more for these. This translates into overhead costs for maintaining a supply relationship. So, some tier 0 firms get better price quotes than others, even for essentially the same products/services, because of the way suppliers envision the relationship unfolding. One respondent claimed some suppliers jump their costs as much as 30% for troublesome firms. So, there can be a difference between what something "should" cost based only on materials and processing technology, and what it actually costs when the overhead expenses of the transaction and relationship is included. Since this latter is driven by the processes of interaction, which is under the control of the parties, this is an opportunity for cost reduction.

*If the tier 0 firm knows the costs, why go out for bid? They could just choose a supplier and make an offer with acceptable margins.*

Overwhelmingly firms go out for two to five competitive bids, with three the most common number mentioned. Competitive bidding has at least two attractive features. First, it can reveal true costs as firms compete to underbid each other, and second it alters the power in negotiations. The first reason implies that, despite their stated confidence, tier 0 firms may not always understand costs. Firms may believe they mostly understand costs but want to verify their intuition with a reality check, and also put themselves in a

stronger negotiating position. Testimony in support of these hypotheses include the following.

- a) The tier 0 firm needs to understand the market with some objective check, to be sure that they aren't letting relationships get in the way of good business.
- b) The market moves. If there is any uncertainty that something may have changed in the supply chain's cost structure, then competing bids can reveal that truth. For example fuel cost and wage instabilities have a ripple effect through the economy that is complex and difficult to forecast. The net effect on supply costs, however, can be revealed by suppliers bidding against each other for business.
- c) When working with new products or working with a new source, initially the buyer may not really understand the cost structure. In this case they can either work with the supplier on how to produce it (and take cost out) which builds mutual cost knowledge, or broaden the supply base and let competition reveal costs. The latter would involve going out for multiple bids.
- d) Inviting competitive bids alters the power in negotiations. Going out for multiple bids changes the context from one of bilateral monopoly to a single tier 0 monopolist facing several competing suppliers. The general notion that "if somebody offers me lower costs, all else is equal I can take it" is part of business ethos and not perceived as an "unfair" act that can poison future relations. That is, the tier 0 firm can get higher margins with the RFQ bidding process than with bilateral negotiations, and still maintain a sense of fairness in its relationships with its supply base.
- e) A bidding process can increase transparency in competition. At one firm the author witnessed an on-line auction in which suppliers bid for some business from the tier 0 firm. The process was much as described above, but automated. Price bids came in (in real time during the auction) and identified some potential winners. But then the tier 0 firm selected the actual winner based on a more balanced scorecard of attributes, including incumbency and familiarity. Then, the "winning" firm was to be engaged in detailed, and strenuous, negotiations. It was clear the tier 0 firm wanted to give the business to a particular incumbent supplier, and eventually did so. I asked why, if that was their predisposition, they ran the auction at all? Why not just go to the incumbent and work with them? They responded that the auction was really an information revelation device, to convince the incumbent that there are alternatives out there, and further what those alternatives are willing to bid for the business. This helps them in their negotiations with the incumbent.

*Isn't there a quantity-price interaction? Why fix quantity first and then ask for prices?*

The predominant model suggested in the interviews was one where market research and an ex ante belief by the tier 0 firm that they understand costs drive the market volume forecasts, and these are then given to suppliers with a RFQ for supplying those quantities. Interestingly, even when the system breaks down (bids come in too high) and the tier 0 –

tier 1 team is seeking resolution, quantities were not frequently mentioned as the thing that got adjusted. Rather, when cost bids are not consistent with the tier 0 firm's expectations the most common response was vigorous interventions to seek cost adjustments. That is, the sequential model of deciding quantity first and supply cost second was dominant in the feedback. Why would quantities be semi-fixed?

First, although quantities did not seem to be dramatically adjusted from forecasts, firms did recognize quantity-cost relationships in their contracts with suppliers. Many respondents mentioned that higher volumes should beget lower prices due to economies of scale driven by fixed costs. Some firms try to build those contingencies into the contract, to avoid hassles and possible arbitration downstream. That is, firms can negotiate tiered pricing at different volume levels. However, this does not answer the question of why purchase quantities are not more frequently adjusted in response to the outcome of the bidding process. Possibilities, based on these interviews, include:

a) Bounded rationality: The sequential bidding process may be a labor-saving, overhead reducing device. In theory, if market research had forecasted sales at many different price levels, and bidding and negotiations revealed costs at many different quantity levels, then the tier 0 firm would have all the information they need to optimally adjust either quantities or price. Since they tend not to do that, perhaps some pieces of this puzzle are missing. The market research techniques used may reveal only one or a few points on the demand curve. Likewise, since negotiations take time it is possible that generating a complete cost curve would be costly in time and effort. Given that most of the points on the demand and/or cost curve will not be used, it might be inefficient to estimate them all. This is especially true if the tier 0 firm believes its ex ante cost estimates are roughly accurate, so the likelihood of actually using outlier points is very low. So, fixing quantities would be a rational thing to do if the cost of information acquisition is high.

b) Negotiated prices already include volume risk: Contract details vary, but volume risk will surely have a price. One company mentioned that there are items they cannot run out of and will negotiate a unit price whatever the quantity, because they want to be covered. Presumably they will pay for the volume risk this imposes on the supplier. Some contracts include guaranteed quantity purchases by the tier 0 firm from the tier 1 supplier over time, but then the tier 0 firm will expect a price reduction in return for that assurance. In short, quantity risks are priced by both parties to the contract.

c) Volume uncertainty may be low: Sometimes a product inherently has low volume risk, and this certainty can be valued by suppliers who will offer a better price. For example, this would be the case if a large retail chain wanted to make a one-time spot buy for a product. Then, the tier 0 firm (who sells to the retailer) will know they need to provide a fixed number of units and even the timing of the deliveries. Another firm said they have little volume risk because they try to stick with booked sales, and negotiate supply only to the level of sales they know is firm. For companies where building to order makes economic sense (for example low-volume, high-margin complex products with very expensive subassemblies) this is one way to reduce demand uncertainty.

d) Organizational barriers might sustain a sequential approach: Profits will equal  $(p-c)Q$  where  $p$  is market price,  $c$  is cost, and  $Q$  is quantity sold. Organizationally  $p$  and  $Q$  are the responsibility of marketing/sales, but  $c$  is procurement/operations. So, the procurement team works on that which they can work on,  $c$ , rather than the other components of profit. In addition, it is possible that quantities and prices have already entered other planning processes. For example, finance may have generated plans based on the projected revenues from the market research done prior to going out for bids. So, there may be institutional commitments to the revenues from this product launch that make changing it organizationally difficult. A variation on this theme would be some internal consequences for visibly “being wrong.” One interesting anecdote was that sometimes post-launch surprises (e.g. sales volumes do not reach expectations) that change supply costs (with fixed costs sunk, full costs rise with depressed volumes) will not be addressed head-on. That is, the purchase costs will remain as is, but assurances will be given the supplier that they will be made whole in some other way (reducing their contractual commitments to cost reductions, or getting a good deal on a future contract). The reason for this is that the decision makers did not want others (higher up) in the organization to see a cost variance. It was better for them to hide the cost escalations in some less visible form.

e) Volume risk is spread over multiple contracts: This has already been alluded to in (d) above. Some of the volume risk can be spread over multiple contracts. One respondent whose tier 0 firm gives the tier 1 supplier quantity planning forecasts (volume forecasts) said they cannot commit to those targets although suppliers always want them to sign a “take or pay” contract. They do not sign off on that. However, this is where incumbency is critical. If actual volumes are way out of line with targets, with an incumbent there are many ways to treat all fairly. They can either do something now or wait for the next product or contract. There are a range of discussions that can take place. With a new supplier the norms of behavior are not yet set and trust in the viability of the relationship not firm. In that case, they need to address unexpected surprises right away, with more limited options. We provide more detail on post-contract surprises in section II.6 below.

## **2. Requests for quotes (RFQ’s)**

When product specs and volume ranges have been determined by the tier 0 firm, several pre-approved (that is, on the approved vendor list or AVL) tier 1 suppliers are asked to submit quotes for the business. In these conversations the number of tier 1 firms asked to bid ranged from 2 to 5, with 3 the most often mentioned number. This number reflects a compromise between the competitive advantages of having more suppliers bidding against each and the following constraints and costs:

- a) There are typically a limited number of tier 1 suppliers that can handle the volumes and other demands of these tier 0 firms. So, the feasible set is small to begin with.
- b) The tier 0 firms do not want to vet a lot of bids, as each one incurs time and expense.

c) For some products that tier 1 suppliers have to engage in some engineering work just to bid on the sourcing contract, and will work with tier 0 engineers to do that. But, the contract is not signed yet and they may not be chosen. So, they can put in a lot of engineering time yet not get the contract. The expense for this, of course, enters the tier 1 firm's cost structure. So, another reason for tier 0 firms to limit the number of tier 1's that they ask for quotes is that, over time, this may lower the overall costs incurred in the industry (which in theory could increase returns to all firms, all else equal).

The tier 0 firm asks that bids be returned within a fixed time interval, ranging from 2 - 4 weeks for most products to 5 - 6 months for complex engineered sub-assemblies. All players understand that the business will be awarded based on a balanced scorecard of considerations and not just price.

### **3. The tier 1's do their own estimating and negotiating with tier 2**

The tier 1 firms will revise the bid pack to just that information that their suppliers (in tier 2) need, and then go out to two or three potential tier 2 firms for quotes or discussions, prior to responding to the RFQ. They may also take time to discuss internally if the contract is a good one for them (since it may tie up a lot of their capacity and so remove them from other markets).

The volume estimate provided by the tier 0 firm allows the potential suppliers to estimate own costs, allocations, etc. Suppliers will do a detailed analysis before providing their quote, especially if the quote is formal and semi-binding (within the specified volume range) upon award. While detailed, this must be done efficiently because they have a limited time to respond with a quote. A common quoted turnaround time for quotes from tier 2 was about two weeks (but longer for complex engineered subassemblies). Fortunately, mirroring the tier 0 situation, tier 1 suppliers believe they have a good idea what their bill-of-material cost will be at a component level as they too largely draw from a group of established suppliers and piece-parts. For example, one tier 1 supplier said that 80% of what they are asked to do they believe they know what the costs should be and they just estimate these based on what they know, and then they may hold negotiations over the remaining 20%. Another respondent noted that while the tier 1 firms know the capabilities of their tier 2 suppliers (that is, can estimate costs), they still negotiate terms. So this mirrors the tier 0 situation, where negotiations take place despite a confidence that costs are known.

A tier 1 supplier's choice of which tier 2 to work with is important because once a part goes through validation the supplier and process cannot (or, should not) be changed without informing the tier 0 firm, and that firm is hesitant to approve changes because changes incur risk. Once something is in a product and working, nobody wants to change the process. So, all firms in the chain are pretty much married to each other for that product barring some extraordinary circumstances (this is less true for pure commodity inputs, which are more substitutable).

When the tier 1 firms receive the tier 2 quotes they roll them up into their own costs, which then drive the quote that they return to the tier 0 firm. So, the tier 1-2 activities largely mirror the tier 0-1 activities.

It is interesting that despite the fact that the actual transfer price between tiers 0 and 1 has not yet been finalized, these tier 1 – tier 2 negotiations are relatively firm. This seems to depend on everybody's confidence that the actual costs in the system are known to most parties, and so the eventual outcome can be predicted relatively accurately. In cases where expectations are violated (see part II.6 below), the tier 1 suppliers may go back to tier 2 and reopen negotiations.

**4. The tier 1's respond with a price quote to the tier 0 firm, along with other information they believe the tier 0 firm wants for the balanced scorecard they use to award the business.**

This is self-explanatory. The tier 1's are competing for the business and so put their best case forward. Despite the repeated references to cooperation and trust in these discussions, this is not an unworldly context.

*Unilateral profit-maximizing games that tier 1's can play*

There are several unilateral profit maximizing games that tier 1 suppliers play in this system.

a) If a tier 1 firm can combine volumes from several tier 0 buyers to get lower input costs, they can sometimes keep those profits. Or, they may negotiate a lower price from tier 2 by speculatively upping the volumes needed for the tier 0 contract, and this lower price might help them reduce costs to serve other contracts. This reduction may be kept as profit, or may be used to help them reach their required productivity improvements for the contract (usually 1% to 2% cost reduction per year over a 3-4 year contract). Similarly, in some contexts the tier 0 firm will bypass tier 1 to negotiate a great price for a part from a tier 2 firm (see figure 2), and have the part shipped to the tier 1 supplier for assembly. The tier 1 firm may buy more than they need for the tier 0 contract, and use the surplus, cheaper inputs to serve other contracts (including from competitors to the tier 0 firm). Some of the contractual tactics used by tier 0 firms to combat these practices are listed in the Appendix (under "exotic contracting").

b) The tier 1 firm may move off the approved vendor list (AVL) and buy parts from a broker at greatly reduced prices, pocketing the difference.

c) One respondent noted that in his industry tiers 2 and 3 often do not like working through tier 1 firms, and that any supplier that can bypass the tier 1 firm and work directly with tier 0 will do so, because:

i. They want to deal directly with the consumer of their work, feeling they can do a better job without the information filter of the tier 1 firm.

- ii. They want the tier 0 firm to know them and believe they are more than a commodity, because commodity suppliers get beaten up on price.
- iii. Some tier 1 firms treat their suppliers shabbily, regularly violating the terms of the contract. For example, a contract may call for 30 or 60 days to pay yet payment comes in regularly at 120 days. If the tier 2 firm complains, the tier 1 firm can label them “unreliable” and encourage the tier 0 firm to drop them from the approved vendor list.
- iv. The tier 1 firm will blame their suppliers for anything that goes wrong, regardless of the actual source of the problem.

This testimony suggests an industry in which tiers 2 and 3 have little bargaining power, relative to tier 1, and yearn for more.

*Is there collusion among tier 1 firms?*

For the most part it was implicit in the conversations that tier 1 suppliers compete with each other non-cooperatively for business from the tier 0 firm, and likewise in higher tiers of the chain. While this was the dominant model described in the interviews, there were exceptions.

One respondent suggested that there may be different norms of behavior and social and business network structures in Asia and elsewhere, relative to the U.S. business model. This respondent believed that there are no trade secrets in China, and that the manufacturers his company uses regularly get together and compare prices. They know what everybody else is getting and what things cost (figure 3). Another respondent said that in his industry the tier 1 firms’ leaders all knew each other because they shared a common history together (elite schools, etc.), and that there may be some collusion among them. Both of these respondents noted the advantages of cultivating another supplier outside the perceived collusive set as a hedge against this. However, these were exceptions rather than the rule, at least in these interviews. The standard model of a multi-tier supply chain with negotiations taking place between adjacent tiers only, and firms in a tier in competition with each other for business, was the most common one.

**5. The tier 0 firm chooses a tier 1 supplier for the product. A single tier 1 supplier is usually selected (except for commodity inputs, when more than one supplier may be active).**

After quotes are returned the tier 0 firm chooses a tier 1 supplier based on a balanced scorecard of considerations. Most of the professionals interviewed said the tier 0 firm chooses one tier 1 supplier to work with for each product. Exceptions were for generic, relatively unsophisticated products or substitutable commodities, when more than one supplier may be used (and competition is predominantly on price). However, for even modestly complex products most respondents said that a single source was selected. The reasons for this include:

- a) Avoid duplicating the overhead of setting up a supply relationship.

- b) Higher volumes usually beget lower prices, and can more readily exceed break-evens (to quote one respondent, “If you take a low quantity and divide it 3 ways nobody is interested”), so giving all volume to one supplier makes sense.
- c) Exact duplication of tooling is difficult so contracting with a single tier 1 guarantees product consistency.
- d) Shipping full container loads lowers costs, and one supplier is better for shipping full containers.

There is also a desire to keep multiple potential tier 1 suppliers viable. A common approach to combining the advantages of sole sourcing with the desire to keep multiple suppliers in business is known as “parallel sourcing.” One supplier is used for each specific product, but several different suppliers are supported by the product portfolio. That is, product A may go to supplier #1 but product B to supplier #2 so that more than one tier 1 supplier is kept viable. The tier 0 firm may also have separate chains for different geographic regions. For example, there can be one chain (and tier 1 supplier) in Asia and another in North America or Europe. In each chain there is a single tier 1 supplier, but globally multiple tier 1’s are active in parallel. This has many of the advantages of sole-sourcing, but also provides a hedge in case of disruption (by transferring production in an emergency).

There was one exception mentioned to the sole supplier scenario for non-commodities. One respondent said he consciously tries to do “what if?” scenarios and hedge his bets, especially for sensitive inputs. If a supplier loses his/her warehouse and this would be catastrophic to the firm, the respondent believes they should have assessed that risk and dual-sourced the part to hedge their bets. For this firm, the decision to sole source or use multiple suppliers is based on risk management considerations. They try to have back up plans for all sensitive parts. Most of the other respondents, however, indicated sole-sourcing in tier 1 as the dominant model. As we move up the chain further from the market and more toward commodities, sole-sourcing eventually gives way to multiple sourcing of substitutable inputs.

## **6. Continued post-quote-and-selection negotiations**

If the RFQ quotes align with expectations (most common for familiar products and suppliers) then a winning supplier is selected based on the balanced scorecard. There will often be a second round of negotiations between these two firms over cost and price, sometimes with cooperative efforts to get cost out of the product. The supplier will sometimes build samples to validate both the functionality of the product and their own cost estimates. If the tier 0 firm finds the sample does not meet specs, or the selected supplier finds that costs or complications exceed expectations, another round of discussions may take place to resolve the issues. This is natural and an expected part of the process. One tier 1 supplier reported that “winning” the contract was just the beginning, and that another round of intense and often brutal negotiations then took place, with the objective of reducing costs as much as possible. At this point changing suppliers is a last resort and attempts are made to resolve any differences cooperatively. However, this does not prevent the tier 0 firm from holding up the threat of reconsidering other bids



if negotiations do not go well. In all cases the supply negotiations are not a simple price quote, but an iterative process.

*What happens when quotes do not align with expectations?*

Sometimes the quotes do not align with expectations. These tend to be cases dealing with novel technologies and genuinely new products and components, for which information was much less complete to begin with. This can affect everything. The tier 0 firm will look at the quotes and do an internal assessment, and may decide it is a deal-breaker and not launch the product. They may also rethink quantities, or re-assess costs. Interestingly the latter is the first impulse; the testimony focused a lot more on cost reductions than quantity adjustments. That is, the tier 0 firm tries to figure out what the cost has to go down to and works with the suppliers to see if that target can be reached.

In this reconciliation process some respondents suggested that all potential tier 1 suppliers are given a chance to lower their costs and bids. But, more commonly it was implied that a single supplier was chosen based on the bids received and the balanced scorecard, and that the follow-on discussions took place with that one supplier. This was to avoid imposing the time and expense involved in the negotiations on multiple firms when only one will get the contract. The nature of the interaction is to look at all the cost drivers for the product and work together to make a business out of it. Can they change a material? Change features? One example in the testimony was a success story where unless 20% was taken out of the costs they were not going to market. But, they worked together on the supplier's operations to remove steps and streamline things and got the 20 % out!

As noted above, at least one respondent stated that these sorts of intense post-bid negotiations took place because the tier 0 firms ask for unrealistically low costs. This reflected either (a) a bargaining tactic or (b) true ignorance of the real cost structure. Also see section II.1.

This same situation can play out between tiers 1 and 2. If the tier 0 firm asks for cost targets that are unrealistically low, and the tier 1 goes to tier 2 with that information, then tier 2's will respond high and tier 1 likewise.

## **7. After launch, unexpected events can re-open negotiations.**

The stated custom is one of starting supply chain negotiations with quantity estimates based on market forecasts, and suppliers estimated their costs based on that forecast. Since demand forecasts can be wrong, there will inevitably be occasions where actual demand does not match the forecast. What then?

If actual demand exceeds forecast the tier 0 firm will make profits exceeding expectations unless there is a capacity issue. But the tier 0 firm is almost always willing to pay expedite or overtime costs and everybody is happy making money. Most of the responses to this question discussed remediation when demand falls short of forecasts.

If there are fixed costs involved in setting up systems for the forecast volumes, or pre-build inventories, these costs will not be recouped if actual volumes fall short of target. Fixed costs are sunk and not recoverable. Some of the components in the pre-build inventories may be usable in other products so all of the inventory investment may not be lost. But, unique mechanical and electrical parts would be lost and recognized as obsolete.

In addition to demand volume surprises, other post-launch surprises include things like a commodity price spike that affects suppliers' costs, or a factory burning down disrupting supply. We will label these three types of surprises "volume risk," "input price risk" and "catastrophic events." We discuss some supply chain responses to each, in turn.

### *Volume risk*

With some contracts price does not really adjust, within reason, when demand is more or less than anticipated. Under these contracts the suppliers inherit the risk. Presumably, they understand this and the price of risk is included in their bid price. Other contracts feature a price schedule at different volumes, which shares the risk between the buyer and supplier. Other respondents said they re-open discussions on a case-by-case basis. In these the difference between incumbent and new suppliers was often mentioned. A new supplier does not yet know if the relationship will last, and will be reluctant to absorb costs now on the promise that they will be made whole later. In these cases remediation must take place within the current contract. Possibilities include some relief on cost take-downs (e.g. costs should decrease 2% per quarter by contract) to give suppliers some margin back.

For familiar and often-used suppliers, with sufficient mutual trust, there is the potential for risk smoothing across different contracts. Suppliers believe they will still get their margins in the long run. One respondent said that although their products may have a product life of 2 to 5 years, there can be feature changes every 6 months or so, and these renegotiations are a good place to address past grievances and perhaps make up some money. One respondent noted specifically that between addressing a perceived inequity immediately or living with it until the next round of negotiations, that the latter was more frequent, and that things even out in the long run. This was a recurrent theme, as most respondents suggested that good companies strive to build and maintain partnerships. This is not utopia, and at the end of the day somebody will have to eat some money. But, supply partners try to rally appropriately when things happen out of anybody's control. In contrast, negotiating in an atmosphere of distrust inherits all manner of overhead expenses and litigation risk that everybody wants to avoid.

### *Input price risk*

If there is an unexpected input price spike the supplier will face higher than expected costs. Some firms try to anticipate their exposure and pre-plan for this with contingency contracts. These go by various names, including "formula contracts" or "materials

escalators.” For example, if a tier 0 firm knows their total chain costs are vulnerable to changes in the price for commodity X, they may negotiate a formula contract that starts with the known price for the commodity ( $P_x$ ) and specifies a transfer price of  $P_x + m$  where  $m$  is the supplier’s other costs + margin. Then, as  $P_x$  changes so does the transfer price, and the supplier’s margin remains constant. This removes risk from the supplier. These sorts of contingency contracts with automatic pass-throughs of commodity price fluctuations are selectively written for key inputs that make up a large percentage of cost. For inputs that are a small percentage of cost, these contracts are less common.

Some suppliers may prefer a fixed price contract, in which case they inherit the risk of commodity price fluctuations. Such suppliers likely believe they understand the commodity markets better than their buyers do.

Absent a formula contract or a deliberate embrace of input price risk, a supplier facing increased costs may ask for some relief. These are handled on a case-by-case basis. Again, these issues can be handled within the context of the immediate contract or spread over multiple contracts.

### *Catastrophic events*

Catastrophic events include things like warehouses burning down, strikes, wars or natural disasters closing key port cities or destroying production facilities. Most respondents did not mention specific strategies for anticipating and planning for these events. Rather, the most common response was to handle them on a case-by-case basis. This likely reflected a rational cost/benefit calculation. Many of these events are either difficult to anticipate or very low probability, or both. So, investing time and energy in planning for them may not be rational in an expected value sense.

As mentioned above, one respondent did say they try to have plans for sensitive inputs. To repeat, this respondent said they try to assess the risk of various events (e.g. a supplier loses his/her warehouse) and dual-source (assuming they can) if an event would be catastrophic. For this company, the decision to sole source or use multiple suppliers is based on that type of hedge. Also, repeating another theme, sole-sourcing in multiple separate geographic regions combines the advantages of sole-sourcing with a natural hedge. If the chain in region A is disrupted, the one in region B can be used to fill in on an emergency basis until region A recovers.

However, most respondents said they handled crises on a case-by-case basis, and some highlighted the non-contractual, trusting aspects of supply relationships. One respondent said that if suppliers have trouble, everybody cooperates to try to recover. In one case a supplier told him they had to close in one month. He was able to pay more for increased production for the final month to fill inventories, which then sustained him while they sought out and validated a new supplier, which can take 10 – 11 months. In another example, a natural disaster shut down a key steel plant and caused a world-wide shortage, but everybody was able to rally to keep going, burning off inventory, etc.

In general, there seems to be unwritten flexibility in the relationships and firms try to work together to resolve issues. Of course, it is still business and at the end of the day somebody may have to take a profit hit. But the desire to maintain a productive long term relationship, and to act cooperatively toward that goal, figured heavily in the testimony of these respondents and in their ability to respond to catastrophe.

### **III. Questions raised by this process**

The above describes the process of setting up a supply chain, as reflected in the testimony of the professionals interviewed. Some additional questions were asked of the interviewees, related to issues of visibility, bargaining power and process improvements. These are documented in this section.

#### **1. Why wouldn't a tier 0 firm wish to maintain a lot of visibility upstream?**

Most of the tier 0 respondents interviewed said they stay in close contact with and monitor their key tier 1 suppliers, but have much more limited visibility upstream. One firm stated flatly that it is unlikely that they will go past their suppliers to look at their suppliers' suppliers. Why? Most of the tier 0 firms interviewed were high profile firms with a lot of brand equity, and at least some of their upstream suppliers are not household names. So, the tier 0 firm stands to lose a lot more from poor quality or behaviors than the upstream suppliers, creating an incentive mismatch. Especially after recent news reports of lower quality substitutes being used upstream in some supply chains, with disastrous consequences, wouldn't monitoring the upstream firms make sense?

Also, many tier 0 firms assess the financial stability of their key tier 1 suppliers, but a tier 2 or 3 firm going out of business can be just as disruptive. Given the dependence of the enterprises on whole-chain performance, why would a tier 0 firm not strive to maintain whole-chain visibility?

First, it is not true that upstream visibility is entirely absent. Some upstream integrity is maintained by the approved vendor list (AVL) for tier 2 firms and some firms also take explicit steps to monitor upstream sources for key components. The AVL can extend beyond tier 1. A significant effort might be expended to vet a higher tier supplier, and once they are on the AVL they can be used. Periodic monitoring updates and assesses the list. So, while upstream information regarding the immediate transfer prices and other conditions of the current contract is absent, some information about upstream firm viability, processes and conduct is in place.

Also, sometimes the tier 0 firm deliberately reaches upstream and works closely with a higher tier supplier for important parts that are central to the product (see figure 2). One respondent said his firm operates using a mixed model where they deal with the direct supplier, in tier 1, but also with higher tier suppliers of some of key, unique components. But, it costs time and resources to keep their visibility upstream so they only do that for differentiating components and key technologies. Another firm gave similar testimony, segmented by the importance of the market. In their commercial sector, where their

brand equity is at stake, they would monitor upstream suppliers of key components but exert less effort for more standard inputs.

However, it remains true that for most respondents the selection and management of tier 2 and 3 suppliers is left to the tier 1 partner, and the tier 0 firm has little visibility into those upstream processes. Why? Possibilities include:

*Tier 1 is better at managing tier 2*

In some cases, the upstream suppliers are simply better at navigating their local markets (where most low cost tier 2 and 3 suppliers will be located) than the tier 0 firm is. Several respondents mentioned specifically that their tier 1 suppliers were better at navigating the Chinese market, so it was better to leave that in their hands.

*The decision not to monitor is a rational risk/return trade off*

It is costly to maintain upstream visibility so firms only do that for differentiating components and key technologies. For other items they let the tier 1 firm handle it. Firms carefully decide where they want to invest in upstream visibility, based on a cost/benefit calculation. It is no secret that the tier 0 firm can get burned by leaving the higher tier supply management to tier 1. One respondent described a situation where a higher tier supplier made bad parts leading to a massive recall. So, there is some risk that everybody recognizes. But, especially in longer chains, trying to continuously monitor complete whole-chain performance would be infeasible or prohibitively expensive. Some things have to be managed in a more decentralized fashion. This is related to the next point.

*Tier 0 trusts tier 1, and so on*

Many respondents mentioned trust and relationships as the key to avoiding the overhead expense of full supply chain monitoring. Ideally, the tier 0 firm knows how their tier 1 suppliers do business, and believe that the suppliers in turn value the relationship and want to maintain it. So, they trust their tier 1 suppliers are contracting with quality tier 2 firms and behaving appropriately. New suppliers might be different, and this contributes to the preference for working with incumbent suppliers.

*This strategy will not last*

This strategy of closely working with tier 1, but allowing tier 1 to manage tier 2, etc. may run in cycles. One firm said they used to get involved three and more tiers deep, but now believe that if the appropriate systems are in place the tier 1 suppliers should be able to manage tier 2, and they let them. That is, they are backing away from being involved deeply in sub-tiers. Another respondent offered a similar story. After a recent scarcity everybody thought they had to be strategic about securing supply from distant tiers, but as supply became more ample they got tired of the overhead expense of that effort and backed off. The cycle could move back if another crisis raises awareness of the risks involved in a hands-off strategy.

**2. In supply chain negotiations, what are the sources of bargaining power, and who gets extraordinary rents?**

Respondents were asked about sources of bargaining power and extraordinary rents in supply chains. The most common responses are summarized below. One respondent, however, noted a possible bias in the question as it pertains to sourcing out of China. This respondent said that in China there is not a clear logic to who has to make money in a supply chain. For example, the government owns a lot of facilities, and some operate at a loss. This would not happen in a for-profit company. But in China, with a large government stake in many operations, which firms make money is fungible and not necessarily traceable to competitive logic.

However, most respondents answered these questions from a more familiar competitive perspective. Four things emerged from this testimony, all of which reinforce natural intuition:

- a) Multiple competing firms have less power than a monopoly
- b) Suppliers can make more money by obscuring their true costs
- c) Profit bottlenecks may only appear over time
- d) Firms can make speculative profits

The managerial implications are as follows:

- a) Monopolists anywhere in the supply chain will enjoy robust rents. Cultivating a competitor to bid against the monopolist will reduce these rents
- b) Increasing one's cost knowledge is beneficial in negotiations
- c) Be careful that your sourcing strategy is not creating monopolies-to-be
- d) More work is required on risk management in supply chains

The following offers more details on each of these:

*Multiple firms in a tier have less power than monopolies*

This reinforces the intuitive notion that the more competitors a firm has the less bargaining power it has. So, monopolies are more powerful than firms with several competitors in their tier. This was the most often mentioned or implied response to this question. Sometimes the responses were cast in terms of what makes a firm a monopolist, and that is being uniquely capable of delivering something that the buyer values (e.g. a patented technology). Several times it was mentioned that "unique" items command a higher markup.

As noted above, even after a tier 1 supplier has been selected and the post-selection negotiations begin the tier 0 firm will explicitly invoke the competition, and the potential to take their business elsewhere ("Listen we can take this out to bid again"). This is essentially threatening to put the supplier back into a multi-competitor context. Also, the desire to maintain more than one viable tier 1 source (for example through parallel sourcing, see section II.5) stems from the desire to avoid monopolists in any tier beyond tier 0. If for any reason there are other monopolists in the chain (providing "unique" inputs), those firms will extract higher rents. One respondent noted that sometimes a tier

2 or 3 supplier can be a monopolist if that supplier makes a unique input, and such companies make good margins. Another respondent qualified that observation. He noted that suppliers of specialty products will generally make more money than commodity suppliers, but measuring this is complicated because specialty inputs may be the result of high R&D expenditures that are amortized over many different products. So, what is the real cost of that input? Such firms will get their margins, but maybe over several contracts in aggregate.

Clearly, if a monopolist in some tier in the chain extracts a lot of money one way to reduce that effect is to develop a competitor in that tier. For new features, there may be alternative technologies elsewhere that accomplish the same thing. One respondent described an example where they originally sourced a feature at about \$3 to \$5 per unit, but by finding an alternative technology for it (on another continent) and developing that supplier they reduced this to about \$1 per unit. Thus, one response to monopoly profits being extracted elsewhere in the chain is to broaden the supply base in that tier.

*Suppliers can make more money by obscuring their true costs from the tier 0 monopoly*  
There were multiple examples of incomplete information being profitably exploited by suppliers. One respondent told the story of a 5% tax on some exports to the US that was naturally included in the price quote from the supplier. Then the government rebated the tax to suppliers in their category, but the supplier did not reveal this. The company found out by other means, and then asked for a price break because they knew the true costs had just gone down. As this respondent noted, “Once one supplier granted us that clawback, the others fell into line and did it also.”

One respondent said that 10 years ago it was very common to not know where the real margins were. For example, for a while they were focusing on commodity prices when they did not realize their contract manufacturers had 25 % margins! They assumed that their suppliers were “low cost,” but did not really look into their cost structure. They are better at that now, and have a better sense for what things “should” cost and whenever something does not feel right they go look at it closely.

One anecdote that combines information asymmetries with the effects of competition is as follows. One respondent told the author about a supplier who they believed was quoting very high costs, yet the supplier swore they made no money on the units in question. The tier 0 firm asked to be let in so they we can help save money (which they would share, a classic cost reduction story with gain sharing). The supplier would not let them in. Eventually the tier 0 firm got the price down by finding an alternate supplier and putting the two in competition. Later, they found out that the first supplier did not want them inside their firm because they did not want to reveal some contracts they had with other buyers, and other confidentiality issues.

Another respondent said that sometimes with smaller volume products or working with a new source, they may not initially understand the cost structure but there are two ways the costs can come down. (a) They we can work with the supplier on how to produce the

product (and take cost out), or (b) broaden the supply base. This speaks to two ways of increasing bargaining power: better information or more supplier competition.

*Profit bottlenecks may only appear over time*

One respondent observed that profit bottlenecks may only appear over time. For example, the PC's in the 80's used chip sets and an operating system (DOS) that were newly generated but the margins for these inputs were not extraordinary relative to total chain profits. But, down the road a lot of excess rent went to the operating system and the chips (Microsoft and Intel extracted a lot of profits from the chains). This argues for a far-sighted approach to the make/buy decision. Be careful what development efforts you outsource, because you may be creating a future monopoly elsewhere in the supply chain. In today's markets, this consideration may apply to advanced complex engineered products that still require the development of key technologies.

*Firms can make speculative profits*

Without a formula contract a supplier can, sometimes, win big with a commodity price drop. That is, by signing a fixed price contract in the context of volatile input markets, they can both win big and lose big as the input markets fluctuate. This is de facto speculation, and suppliers can either manage this or leave it to chance.

**3. Where do firms invest in process improvements to bring down overall supply costs?**

The testimony was clear that working with suppliers to get costs out is standard procedure. This arose in the context of cooperating with suppliers on design issues, in response to receiving bids out of line with expectations, and as a natural stage of the process after a supplier has been selected.

Sometimes tier 0 firms looked at processes in other than tier 1 suppliers. One respondent said they look for parts that are high % of the total cost of sales, and work with those firms to reduce costs (wherever they reside in the supply chain), believing that to be the best return on their investment.

Several respondents said or implied that they sometimes invest to develop a competitor. This is a natural response to the perception that some supplier is getting unfair rents. One respondent said their costs decline every year and they consistently expect significant % cost reductions. So, they work to bring down costs, and this can be either through working with a current supplier or bringing in a "disruptive force" (a competing supplier).

Also, to repeat a theme mentioned above, putting increasing cost pressure on suppliers can result in consolidation which increases supplier power. So, in response, tier 0 firms might choose to cultivate competing suppliers as a disruptive force and the cycle starts anew.

**IV. Appendix: Some additional information and observations**



### *1. How does a firm get on the AVL?*

The “approved vendor list” (AVL) is the list of suppliers who have passed the hurdles necessary to be part of the supply chain. The due diligence performed by a buying firm to vet a new potential supplier for inclusion on the AVL can include inspections of plant and data to be certain the supplier is financially sound, has capable processes and capacity, has appropriate quality systems in place and can comply with any other buyer-specific constraints. Such constraints may include process or safety regulations for either workers or products that the supplier must conform to, which often go beyond simply conforming to local laws. For example, a supplier may be required to have documented safety and quality systems in place designed to prevent contaminations or unsafe ingredients, and/or to conform to restrictions on the use of child or prison labor, and otherwise maintain designated standards for working conditions. This is especially true when sourcing from countries without US-style worker protections. Also, in some cases there are legal requirements regarding who the suppliers can be (for example to comply with restrictions to prevent the export of potentially sensitive military technology).

When new suppliers are added to the established pool, they are eased in gradually (if possible) to avoid unpleasant surprises on major products. At least some of the testimony suggests that tier 0 firms and those on the AVL have a sense of where they can try out new suppliers (when they can take a risk to see if somebody can join the family). For example, trying out a new firm is less risky with lower performance, low margin products for a commodity market. Then, if the new supplier does well they may mature to a key supplier for higher end products. So, there is a family succession, or relationship, culture that defines who companies are willing to work with for different types of products. However, overall the firms interviewed said that there is a steady-state supply base that can already do 80% to 90% of what the tier 0 firm needs done.

An exception is chains for complex, highly engineered products where novel technologies are required. Past examples include personal computers of the 1980’s which needed new chips and operating systems. Current examples include advanced aircraft or hybrid vehicles which require novel composite aero-structures or battery technologies. The effort required to vet suppliers in these instances will take longer and be more expensive. The process might also contain additional stages. For example, it might start with an RFI (Request for Information) which is not really pricing-oriented but is a description of who the suppliers are and what they can do. This helps decide who the right people are to invite to the party. By considering a balance of capabilities, culture and geography the list of potential suppliers might be reduced to 3 to 5, and they will ask for a formal bid from these. Sometimes after the first round of bidding the tier 0 firm chooses two suppliers to be “short-listed” and these two are very serious candidates for the contract. Then the buyer will make plant tours, discuss sample contracts, and in general thoroughly vet the short-listed candidates. Finally, a decision is made.

Some tier 0 firms have different AVLs for different types of products. For example, they may have a set of strategic suppliers who can share design and engineering work. These are characterized by a long-term relationship and a lot of information sharing. Another

set may be acceptable for less central and strategic products, and these suppliers may be thoroughly vetted for supply but not design work. Then there may be commodity suppliers that are used for high volume commodity products, and these are considered substitutable and get less attention. So, the tier 0 firm has different suppliers on their AVL for different types of products, and pay each appropriately. But, it is always tempting for a “routine” supplier to move up to the “higher margin” value-adding activities like design or small lot production. An additional advantage of a trusting supply relationship is that a supplier may be content to play a particular role in the procurement portfolio for the tier 0 firm, if they believe the tier 0 firm will reward them for playing this necessary role.

## *2. Exotic contracting*

In addition to the range of contracts mentioned, including

- a) Straight unit price contracts
- b) Quantity guarantees
- c) Tiered pricing at different quantity levels
- d) Formula pricing with automatic commodity price escalators
- e) Mandated cost reductions over time

some more exotic forms were mentioned. One of these was to counter one of the games that tier 1 firms can play (see section II.4.c).

Recall that tier 0 firms may sometimes negotiate good prices from a higher tier supplier, who delivers product directly to the tier 1 assembler. The tier 1 assembler, however, may purchase more than required at the reduced price and use the surplus to serve other contracts (sometimes for the tier 0 firm’s competitors). So, the tier 0 firm has used its clout to help its competitors. One contractual remedy is illustrated in figure 4. The tier 2’ firm makes a part and delivers it to the tier 1 assembler, which the tier 1 firm uses in the products it supplies to tier 0. The part costs tier 2’ \$1 per unit to make, and tier 2’ sells to tier 1 for \$1.20 per unit. Tier 0 can give volumes to tier 2’ across several products, and uses this to negotiate a discounted price of \$1.10 each. But, tier 2’ still sells to tier 1 for \$1.20 per unit. Tiers 0 and 2’ agree that tier 2’ will send a rebate to tier 0 of \$.10 per unit for every one of their parts used in the finished product. Tier 0 does this to avoid a price drop from tier 2’ to tier 1 that tier 1 can exploit to benefit other buyers. In particular, tier 0 does not want its competitors to get a good price as a result of its efforts.

## *3. Supply chains and intellectual property*

Suppliers who manufacture or assemble proprietary technology can leak intellectual property. This was not covered in any detail in these interviews, but one respondent described a firm that purchased CNC machines for a key part of their design and coded them, but then subcontracted the actual production to a tier 1 supplier. That is, there is a supply chain strategy that strives to keep a total design secret by putting pieces into buckets that do not know what the other buckets are doing.

## *4. Bargaining power of the tier 0 firm*

Most of the discussions implicitly inferred a fair amount of bargaining power for the tier 0 firm. Some of this would flow from the new product context if the product is sufficiently distinctive that the tier 0 firm is, at least temporarily, a monopolist in its market. Other possible sources of bargaining power for the tier 0 firm include:

- i) The firm's brand: If people know you are a player, and what you say matters, then in decisions of consequence you are listened to.
- ii) The firm's market knowledge: Having a better understanding of customer behavior and desires than suppliers, the tier 0 firm benefits from some information asymmetry.
- ii) The firm's scale: If suppliers have economies of scale they will prefer dealing with a buyer who will demand higher volumes.

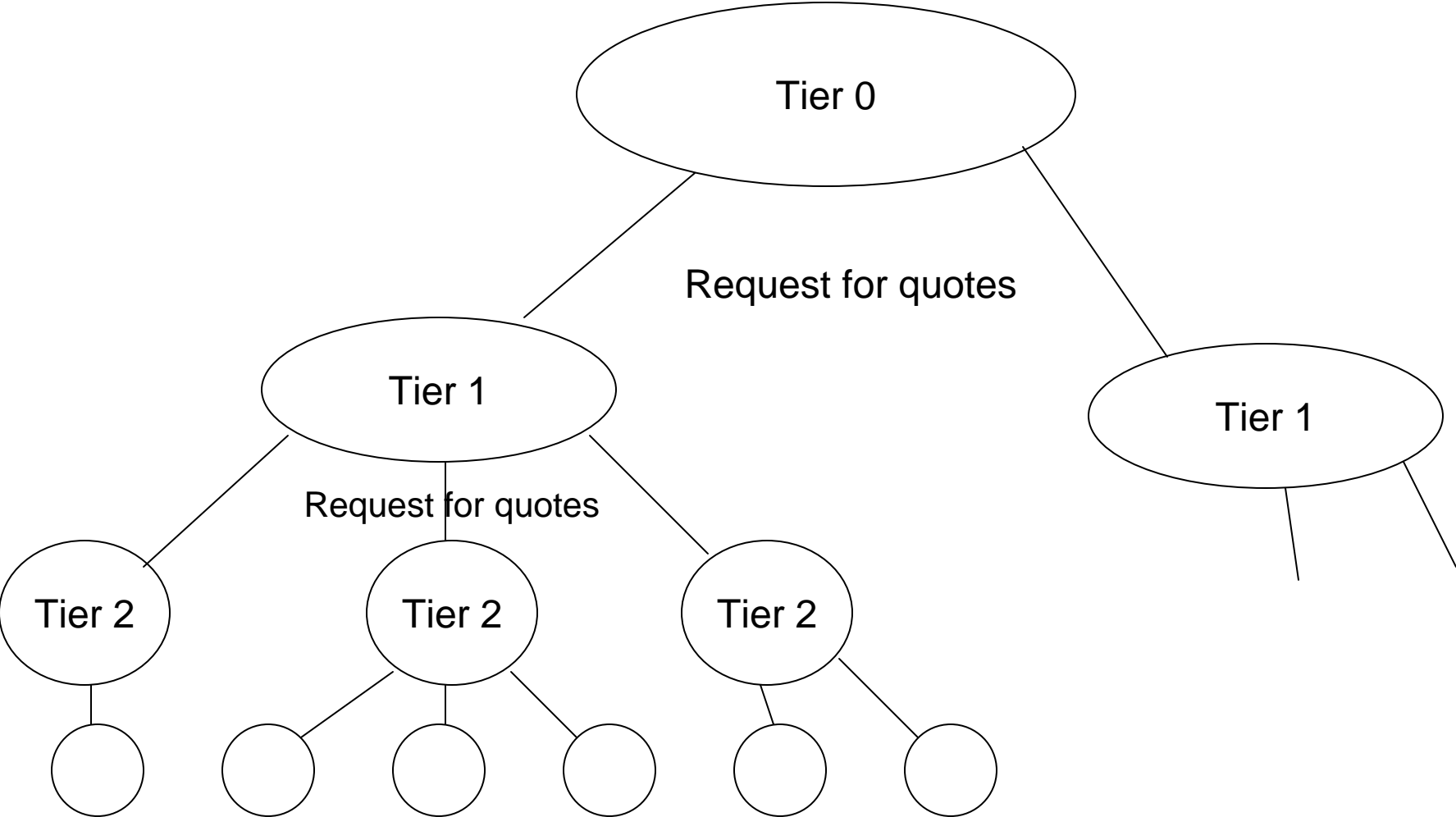
##### *5. Some interesting quotes*

When summarizing practices in supply chains:

“In fact, there is not really a science to this, but there is habit.”

“Anything you can imagine probably takes place somewhere”

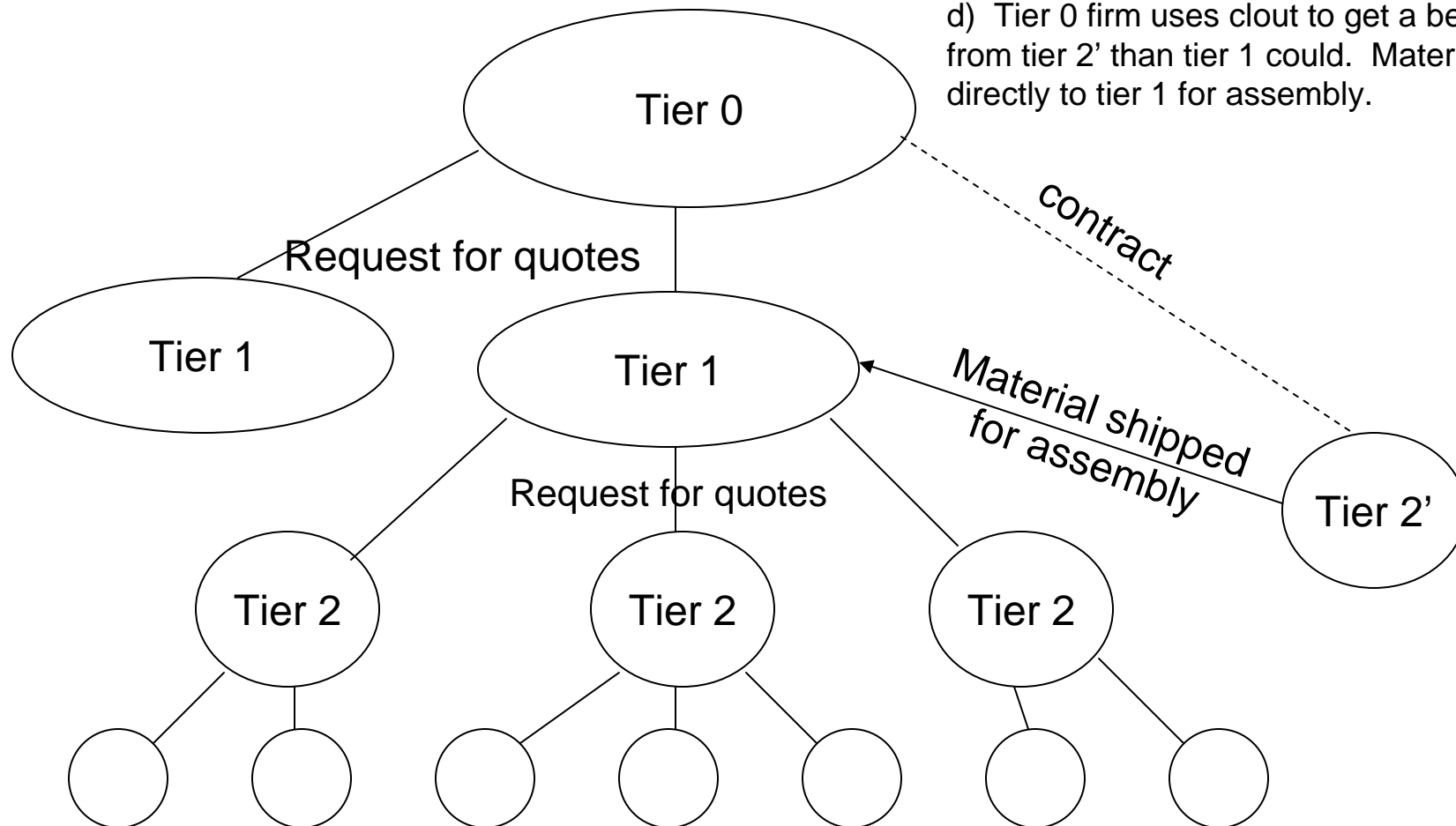
**Figure 1: Standard supply chain**



**Figure 2: Tier 0 bypasses tier 1 to negotiate sensitive parts, or leverages clout for better prices**

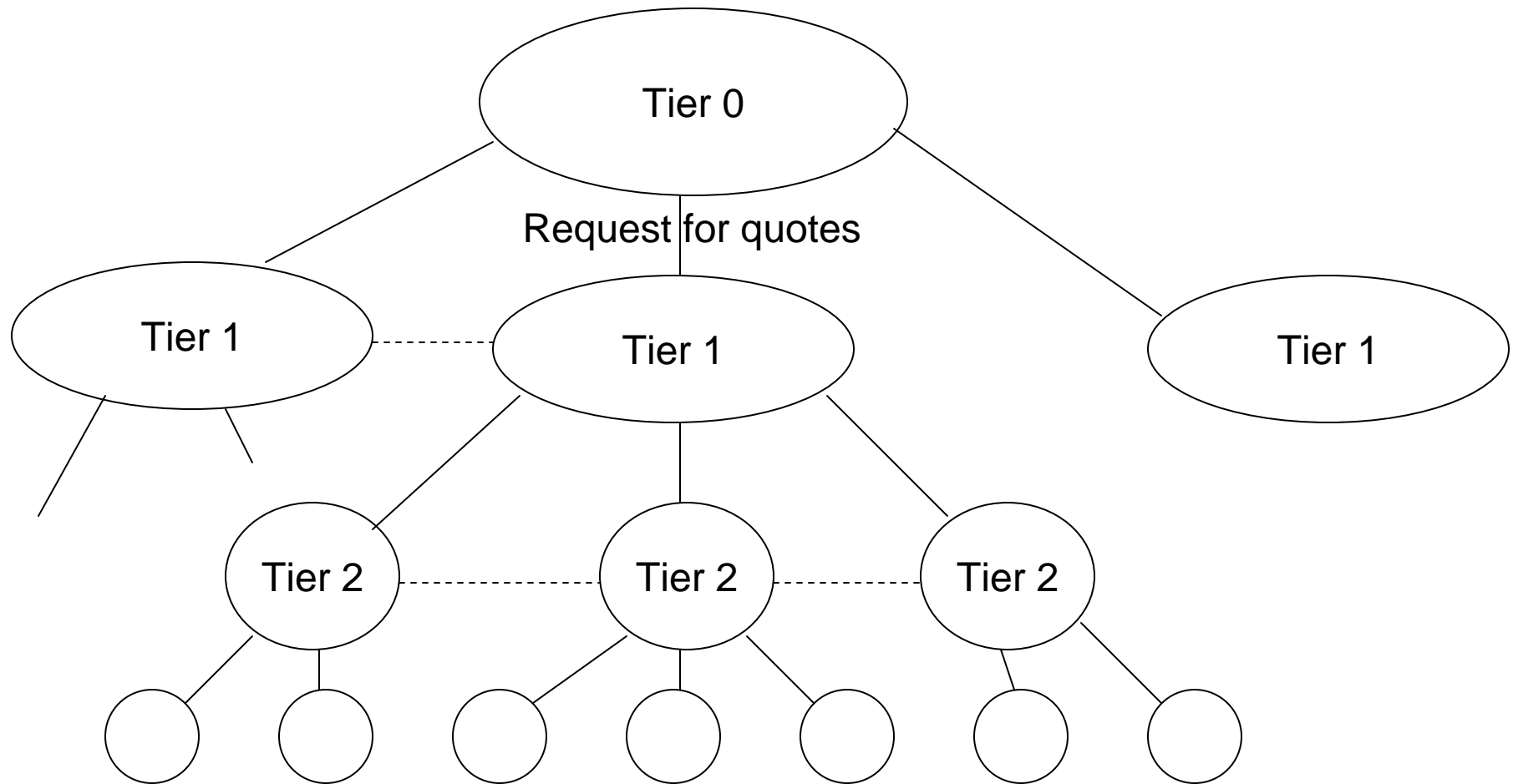
Variations on this theme:

- a) Tier 2' is a monopolist and the only source for a key strategic input to tier 0's product.
- b) Tier 2' supplies a strategic input, and tier 0 wants control over specs and prices.
- c) Tier 2' supplies a strategic input, and tier 0 wants control over specs, but does not negotiate price (tiers 1 and 2' do that)
- d) Tier 0 firm uses clout to get a better price from tier 2' than tier 1 could. Material shipped directly to tier 1 for assembly.



**Figure 3: Potential collusion within a tier**

———— Supply relation  
----- Information exchange



**Figure 4: Tier 0 negotiates favorable price with tier 2' firm, but the tier 1 firm cannot exploit the resulting lower cost supply to serve other clients**

