

The internet and the 'stickiness' of prices

By Sam Wylie

Prices in many markets cannot change quickly. Internet commerce is making prices more flexible and creating massive amounts of value in the process, but there is still a long way to go and much to play for.

At the heart of the value creation in many internet enterprises is increased flexibility in prices. Why does making prices more flexible create value? -- because markets in which prices cannot change as quickly as supply and demand changes are economically inefficient. Innovations that enhance price flexibility make the market more efficient. The increased efficiency represents value, and whoever can reduce the frictions that prevent prices from adjusting to demand and supply changes, can have a part of that value.

A variety of internet enterprises are making prices less sticky (more flexible). From online auctions in business to business (B2B) and retail markets, to catalog sellers who adjust their 'overstock' prices daily, to websites where buyers state the price at which they will buy, prices are becoming more dynamic. These enterprises are adding value in several dimensions: they reduce administration and search costs for their users; they supply useful industry information; they reduce information asymmetry; and of course bring buyers and sellers together. But crucially, they are also harnessing the internet's strength in collecting and disseminating information to make prices respond more quickly to supply and demand shifts.

This aspect of the expansion of the internet into every corner of commerce is tremendously important but much overlooked. The inefficiencies caused by inflexible prices are huge in many markets and the value released by freeing prices to move with supply and demand is commensurately large. The good news is that in most markets the potential gains from increased price flexibility are still up for grabs.

The *Paradigm* article <'sticky prices'> explains how inefficiency arises from sticky prices. This companion article looks at three crucial questions. How does the internet affect the stickiness of prices? What types of markets will the internet impact in terms of price flexibility? Who will get the value released by increased efficiency?

Jumping ahead somewhat, note that the natural market process of matching supply and demand involves a continuous cycle of information collection and dissemination.

1. Prices change to reflect change in supply or demand.
2. Buyers and sellers then adjust their decisions in light of the new prices.
3. The decisions of individual buyers and sellers aggregate into changes in total supply and demand.

4. Back to step 1.

The internet speeds up the information cycle because it changes the cost structure of collecting and disseminating information. That makes prices more flexible. Note also that the internet is impacting a separate form of price flexibility -- the ability to charge different customers different prices. That subject will be discussed in another issue of *Paradigm*.

Why prices are sticky?

Before we look at the three questions we need to think a bit about what causes price stickiness. We will ignore technical explanations of price stickiness such as demand curve kinks from repeat buying, or discrete price jumps, such as occur in stock prices, or markets that clear only intermittently, such as the markets for rookie athletes. Also, be aware that the importance of the following explanations varies a great deal from market to market.

Physical, inventory and information costs

If the physical cost of setting new prices and communicating that information to buyers is high, then demand and supply will have to get out of balance by a long way before producers can justify incurring the cost of a change in price. Prices are therefore sticky. For instance, catalog sellers may want to reduce price to clear inventory, but the cost of distributing catalogs is significant. In contrast, the cost of changing prices on the equivalent website is nearly zero.

Markets for products that are perishable, such as airline seats and fresh fruit, should exhibit highly flexible prices. That is true also of markets where risks of holding inventories are high relative to margins, such as the NASDAQ or London stock markets.

Then there are information costs. Think of a hotel in which room prices adjust after each new booking. The price should be adjusted to reflect systematic changes in demand, not random fluctuations. But separating the two is difficult. It takes time for a trend to be revealed in the sales data and so price changes lag behind changes in demand. Any firm that holds inventory faces this problem. Prices changes may also lag demand changes simply because it takes time for demand information to reach a supplier. For LL Bean and other catalog sellers, there is a lag if the sale is transmitted by mail. For suppliers of LL Bean the problem is magnified. To summarize these three effects, the information cycle is slower if the physical cost of changing prices is high or if demand information aggregates slowly, and the information cycle is faster if the cost to producers of being left with inappropriate inventory is high.

Asymmetric information

At least as important as these three effects are differences in the information held by buyers and sellers. In some markets a problem arises because either buyers or sellers have better information about the level of total demand or supply. In many such cases price stickiness is a tool for solving that **asymmetric information** problem. Think again of a hotel. If prices were completely

flexible, then prices rise as the hotel becomes more fully booked. However, there is information asymmetry between buyer and seller because the seller knows the current occupancy level and the buyer does not. How does a customer know that truly only a few rooms remain and therefore a high price is justified? If room prices only change slowly, from week to week say rather than hour to hour, then the information advantage of the seller cannot be used against the buyer. So the information asymmetry favors slow changes in prices. Instead of prices and quantity varying, only quantity varies over short time horizons. Of course you can book a room a long way in advance but that is just another manifestation of price stickiness (price is fixed through time even when supply and demand change).

A separate problem is that buyers will not allow themselves to become locked into a sale. Rather than going to a restaurant and then negotiating a price, after it has been revealed that the customer is hungry, buyers will simply not go to restaurants where prices fluctuate rapidly with demand. Moreover, where repeat use is required to determine quality because products are heterogeneous, buyers will demand the protection of sticky prices. Otherwise they will not start on the sampling process.

The internet helps reduce information asymmetry in three ways. One, the cost to the buyer of acquiring information about total supply is reduced, thereby reducing the information advantage of the seller. Two, the buyer can check out restaurant prices before leaving home, thereby avoiding **lock-in**. Three, the buyer can take the priceline.com approach and offer to buy from any vendor at a price the buyer specifies. In the last case the buyer has the informational advantage because the buyer's true valuation of the product is not revealed. The internet changes the level of information asymmetry, in the direction of increased price flexibility. For an example of buyers having an informational advantage over sellers consider labor negotiations.

Risk sharing and real options

Price stickiness can also be caused by risk sharing. If sellers commit to changing prices only slowly then they are committing to absorbing the risks of excess supply or excess demand. For economic efficiency we want any particular risk to be born by the party who can take that risk at least cost. In transactions between firms and households the risk tolerant party will usually be the firm because the firm's shareholders hold a portfolio of stocks and can accommodate cashflow fluctuations that even out across many stocks. This effect partially explains why wages are so sticky.

Consider now the **real option** effect. A seller that offers a product for sale at a particular price, is granting an option to all potential buyers to purchase the product at that price. If the price can vary a great deal then the buyer will have to choose one of three actions: reject the product outright; buy now; or delay the decision until later when the price may have changed. If there is some uncertainty about whether the price will change, and if choosing to wait resolves some uncertainty about how the price will change, then the option to delay the decision is valuable and

buyers will need a better deal before giving up that option by making a purchase. In this framework it is in the seller's interest to reduce the incentive to delay the purchase. The seller can do that by having a reputation of keeping prices fixed. In options parlance we would say that the option to delay (not purchase now) is more valuable when the price is more variable. That is essentially why retailers keep prices fixed except for special events which are called 'sales'. Of course 'sales' are also a form of price discrimination.

Bounded rationality

A final reason for price stickiness is that the efficiency gains from price flexibility are only realized if buyers and sellers adjust their decision on the basis of new prices. But we have only a limited amount of time and brain power to devote to decisions about resource allocation.

Economists call that human limitation 'bounded rationality'. Slow moving prices reduce the problem of bounded rationality because decisions have to be made less often. Consumers may prefer to pay a little more not to have to recalculate twice a day whether it is optimal to take the bus instead of the subway. It is also the case that when buyers are forced to reconsider their situation because of a price change, they are more likely to search for a better price among competing suppliers. Changing prices slowly helps to minimize the amount of price searching that buyers undertake.

Examples

Hanover parking meters

Imagine that the Town of Hanover decides to allow the price of metered parking spaces to fluctuate from hour to hour. The town buys new meters that can sense whether the parking space is filled and have wireless communication with Town Hall. The town adjusts prices from hour to hour on the basis of its experience of how demand changes throughout the day and also the current demand for parking. The town makes all its information including the pricing formula available on its website.

Why is value created here? There is an increase in **allocation efficiency**. The parking spaces now go to those drivers who have the highest valuation. Others with lower valuations miss out now whereas before they might have gotten a space by chance, but they benefit from the town having more revenue that is not provided by them. Moreover, prices fall when demand is low.

Parking space time is a perishable good, so it would have always had a flexible price were it not for the previously high cost of changing price. The internet solves that problem. It also solves the problems of measuring demand and then getting new prices to customers (most new cars will have wireless internet access within two years). It therefore speeds up the information cycle. By making all its information available, the town solves any asymmetric information problem. The internet provides the added bonus of drivers with wireless connections being able to easily find empty spaces or even reserve a space -- but that is not related to price flexibility.

That leaves the bounded rationality problem. Is the parking meter price too small a deal to even be bothered with? Probably not, if you don't have to search for the needed information and in any case maybe you have some software that just decides for you on the basis of your past decisions.

B2B

B2B sites are emerging in seemingly every industry. They are adding value by enhancing competition between suppliers, and by providing non-price information on industry developments such as regulation and product development. However, for many industries the greatest increases in value will come about by increased flexibility in prices causing more efficient allocation of resources to their most high value use.

The B2B sites speed up the information cycle in markets by getting new price information to buyers and sellers more quickly and then aggregating the resulting changes in demand.

Who gets the value?

Which markets have potential?

In which markets can internet innovations release the most value by enhancing price flexibility? There are two things to consider. Firstly, is the root cause of price stickiness an information cost that the internet can reduce? Can the information cycle be accelerated by an internet application? Can information asymmetry be eliminated? These questions are not trivial. It could be that price stickiness derives from something else that internet innovation cannot change, such as government regulation that protects vested interests.

Secondly, are either the demand or supply curves highly elastic (flat)? If so, then changes in supply and demand are resolved principally by changes in quantity, rather than changes in price. If not, and if either demand or supply or both are inelastic, then price changes are important and increased price flexibility will have a large effect upon market efficiency.

Markets that do not meet these two tests may still be fertile places for internet investment, but increased price flexibility will not be a driver of value creation.

Who gets the value?

If value is created by reducing price stickiness, then how is it divided between the players in the market? The division between buyers and sellers will depend upon the relative elasticity of demand and supply. A steeper (more inelastic) demand curve leads to more of the released value accruing to buyers. High demand elasticity arises if there are few substitutes for the product. If a market that buyers are locked into becomes more efficient then they reap the benefit. Likewise inelastic supply implies that the production cannot be readily scaled up or down and so existing suppliers benefit when market efficiency is enhanced.

But what of information intermediaries that are neither buyers nor sellers, such as the creators of many B2B websites? How much of the value increase can they claim? Here the issue is **barriers to entry**. If the market intermediary can erect a barrier to entry by other intermediaries who would claim a share of the profits from intermediation, then they should be able to claim a large share of the total value created by more flexible prices. [Network externalities] may be just such a barrier. In many cases the value to any one buyer or seller of being part of the network of users of the B2B site increases with each new buyer or seller who joins. In that case the market will tip in the direction of a single dominant site. Other intermediaries will find it very difficult to create new sites and substantial value will accrue to the dominant site.