<u>**Working Paper No 16/10**</u>

Recessions Across Industries:
A Survey

By

Lasse B. Lien

CRISIS, RESTRUCTURING AND GROWTH
This report is one of a series of papers and reports published by the Institute for Research in Economics and Business Administration (SNF) as part of its research programme "Crisis, Restructuring and Growth". The aim of the programme is to map the causes of the crisis and the subsequent real economic downturn, and to identify and analyze the consequences for restructuring needs and ability as well as the consequences for the long-term economic growth in Norway and other western countries. The programme is part of a major initiative by the NHH environment and is conducted in collaboration with the Norwegian Ministry of Trade and Industry and the Research Council of Norway.

Recessions Across Industries: A Survey

Lasse B. Lien[1]

Abstract

This paper surveys existing knowledge about how and why industries differ with respect to the impact of recessions and credit crunches. While this question is of obvious relevance in today's business environment the relevant knowledge is scattered across several literatures, including macroeconomics, finance, industrial organization and strategic management. We summarize and integrate this knowledge. Our approach is first to examine what determines the cyclicality of demand in an industry, or more precisely, the sensitivity of *industry* demand to negative shocks in *aggregate* demand. We then move on to examine how the supply side responds to these shocks, in particular whether the response is primarily in the form of reduced output or reduced margins. Finally, we examine implications for industry productivity, both in the short and the longer run.

---

[1] Department of Strategy and Management, Norwegian School of Economics and Business Administration, Breiviksveien 40, 5035 Bergen, Norway. Email: Lasse.Lien@nhh.no, Telephone: +47 55 95 97 26.

1. Introduction

Recessions are events that happen periodically in all market economies. Often, but not always, reductions in aggregate demand are accompanied by unusual conditions in financial markets, where the availability of credit and equity capital is dramatically reduced while access to internal finance in the form of retained profit is also below normal. Such episodes have a broad negative impact throughout the economy, but nevertheless, it is also the case that the size and nature of the impact differs significantly across industries. The demand for pharmaceuticals is quite insensitive to recessions, while the opposite holds for the demand for architects. One important question, then, is why demand in some industries is more sensitive to aggregate business cycles than in others. Next, a given reduction in demand will in some industries lead to a larger change in margins than output, while in other industries the opposite will happen. In oil and gas the number of barrels produced will not change much, but the margins per barrel will. Conversely, in many software markets the tendency will be that margins stay unchanged while volume bears the brunt of the impact.[2] Our second main question, then, is what causes an industry to respond in one way rather than the other. Finally, we discuss how recessions impact productivity, which is a major determinant of how quickly an industry will recover from a recession. Unfortunately, this last topic will reflect the fact that the state of knowledge is much poorer here, particularly with respect to the long run consequences, than on the two first questions.

Before we turn to the substance it is interesting to note that research on variation in how industries respond to recessions and credit crunches is almost a byproduct. It is a byproduct because very few have shown any interest in the topic per se, and most of what we know has been created by researchers that were primarily interested in something else. Much of the knowledge has been created by macroeconomists that are essentially interested in aggregate, economy-wide effects, but have generated knowledge about industry variation in order to understand aggregate effects better. Industrial organization (IO) economists have traditionally been more interested in cross-sectional phenomena related to oligopolistic games with different structural characteristics, and rarely done the kind of long run panel studies

---

[2] Profitability may very well decline sharply even if margins per unit increase since volume reductions may make fixed costs impossible to cover.

needed to observe industries going in and out of recessions. Nevertheless, important insights come from IO. Financial economists have also made important contributions, but again this has been because they are interested in understanding something else, specifically the causes and consequences of capital structure decisions and imperfections in capital markets - not because they are genuinely interested in the topic per se. Finally, one might have expected that the strategy literature would have a lot to say on this topic. Surprisingly, the strategy literature is almost completely silent on the topic of recessions and business cycles. One possible reason is that some highly influential studies have found a very small (average) year effect in decompositions of profitability variations (e.g. McGahan and Porter, 1997; 1999; 2002). Also, the strategy literature has had its major period of growth after the early 1990s, an unusually stable period with only mild recessions. At any rate, the scattered and indirect nature of our knowledge seems to make a summary and stocktaking worthwhile.

Finally, it is also important to point out that this paper is (or tries to be) agnostic on the origins of business cycles. We take the existence of shocks to aggregate demand as exogenously given, and remain neutral in the battle between Keynesians of various stripes, Real Business Cycle Theorists, and others engaged in the quest to explain the fundamental causes of recessions. Our agenda is the differences in consequences across industries.

2. Demand Cyclicality

Even the most casual observer of the business cycle will easily observe differences in the cyclicality of demand across different industries, and also realize that the size of a negative demand shock will be of fundamental importance for the short term consequences a given industry will experience. So what causes demand cyclicality to vary?

Durable vs. nondurable goods

The strongest finding on this question is that demand for durable goods is far more cyclical than the demand for nondurable goods. Estimates indicate that value added in durable goods industries is two to three times as cyclical as nondurable goods (Mitchell, 1951; Lucas, 1977; Bernanke, 1983; Petersen and Strongin, 1996). There are several reasons for this. A fundamental one has to do with stocks and flows. Buyers can be seen as possessing a stock of

durable goods. If adverse conditions make buyers want to reduce their stock by just a small percentage, this can translate into large reductions in the percentage of current demand. Assume that a durable goods industry, say PC-producers, supplies customers that hold a stock of 100 PCs. Each year 20 PCs are replaced as they break down or become obsolete. These 20 new PCs will then represent the annual production of the PC-industry. Assume now that the customers want to reduce their stock of PCs by 10%, perhaps because of a 10 % reduction in demand and employment in their own markets. This means 10 units less will be demanded, which constitutes 50% of the annual PC-demand. So a 10% reduction in the desired stock leads to a 50% reduction in current demand.[3]

A related issue is the fact that the purchase of a durable good is on average easier to postpone than a nondurable good. Accounting or dental services can normally not be postponed by very much, while the purchase of new furniture or upgrading a PC can. Also, since investments in durable goods can be postponed, buyers can benefit from waiting to receive more information about how the economy develops. This option value increases during downturns (Bernanke, 1983), making demand even more subject to inter-temporal substitution.

A final reason is that demand for durable goods is strongly linked to conditions in financial markets. Since buyers consume durable products over several periods, financial markets are important for their ability to spread the cost over time. In recessions access to external finance from banks and investors is often severely limited or involves increased cost. This restricts the opportunities to spread costs over time, and makes buyers depend more on internal finance (retained profit). Unfortunately, recessions are also periods with unusually low profit levels, so the availability of internal finance is also restricted. In short, demand for durable goods becomes depressed by buyers' access to finance.

Competition from low cost substitutes

Going into a recession buyers will on average want to reduce spending. One result of this is that they become more willing to switch to low cost substitutes. For example, it has been demonstrated that recessions drive up the market share of private labels, while a boom does

---

[3] Obviously the PC-industry could cut prices and thereby limit the desired reduction in the stock of PCs, but this would also hurt the PC industry. We shall return to the price vs. output issue in section 3.

the same for branded goods (Quelch and Harding, 1996; Lamey, Deleersnyder, Dekimpe & Steenkamp, 2007).

Industries differ with respect to the challenges they face from substitutes, and may face competition both from more expensive substitutes and from cheaper ones. The point here is that a recession will inflate the threat from the cheaper ones, as buyers' disposable income and willingness to pay for quality drops. So, all else equal, the closer and cheaper the substitutes - the larger the negative shift in demand. To illustrate; bottled water faces competition from tap water. Tap water is (by and large) a close and cheap substitute. The pressure from this low cost alternative will be stronger during recessions than booms. As a result, demand in the bottled water industry becomes more cyclical than the market for other non-alcoholic beverages (i.e. those that are not faced with an equally close and cheap substitute). Note also that some industries may receive a positive demand effect from substitution if they *are* the cheaper substitute. If this effect is strong enough, we say that a product or service is an "inferior good", which means that demand increases as income falls. If enough people switch from eating steaks to eating hamburgers during a recession, then hamburgers will be an inferior good.

High growth late in a boom means large contraction early in recession

If an industry grows fast during the latter stages of a boom this might indicate that a large portion of demand receives a marginally sufficient level of utility in the best of times. I.e. many customers were nudged into the market on the strength of the unusually good times late in the boom. Unfortunately, this means that those marginal customers will probably be quick to leave the market again when times become unusually bleak (Okun, 1981; Bils, 1987, 1989; Field and Pagoulatos, 1997). The demand for Spa-weekends and personal trainers illustrates this. Late in the boom there was a substantial inflow of marginal customers to those markets, but those customers were predictably quick to exit again when the recession set in.

A somewhat paradoxical effect of the current and the previous point is that in many industries the demand that disappears first is likely to be the demand from those customers that are only marginally better off by being in the market, which are also the ones most likely to shop around and compare prices. What this suggests is that during the recessionary period, that is, after the marginal customers have exited - the industry as a whole and each firm within it might face less elastic demand than during a boom (Stiglitz, 1984). If so, this reduces the

incentives to cut margins since the volume gain from doing so will be small. This is probably one reason for the finding of countercyclical margins in many industries (higher margins per unit in recessions than during booms). We shall return to this point below.

Ripple Effects

Ripple effects simply refers to the fact that in business to business markets, your own industry might become cyclical even if it does not have any of the properties mentioned above, but is supplying an industry that does. Put differently, if your customers face cyclical demand, so will you. One reason why architects face cyclical demand, is because they supply services to an industry that faces cyclical demand; namely real estate developers.

Note that these ripple effects will be reduced if the industry (or industries) you are supplying has incentives to reduce margins and maintain output high, and worse if it has the incentive to respond by maintaining margins and let output fall.[4] We now turn to those conditions that determine the likelihood of either.

3. The Supply Side Response

How will an industry respond to a given negative shift in demand? A crucial question here is to what extent it will tend to counter the demand shift by lowering prices and margins, or whether it will tend to maintain (or even increase margins) and accept large reductions in output. The question of how elastic supply and margins are to changes in demand is of course not only relevant during recessions, but an important issue during booms and more normal times, too. Many conditions and mechanisms will generally affect how industry output and margins are determined. For the moment, however, we shall limit ourselves to those mechanisms that have been confirmed, empirically, as important for understanding industry responses during recessions.

The proportion of fixed and variable costs

---

[4] This is why many macro-economists, most notably Keynes, put a lot of blame on rigid prices and wages for the tendency of recessionary impulses to spread out through the economy.

When fixed costs make up a significant share of total cost, firms will be happy to take any contribution margin they can towards covering those fixed costs. As long as the margin is positive, a firm is likely to be better off by having high output than by having low output. The competition among firms to maintain high output will then tend to drive margins down as demand weakens. When variable costs are a small fraction of total costs, prices can fall a lot before margins turn negative even for the least efficient firm in the industry. On the other hand, the more prices are bid down, the more customers will demand. This means that during a recession, fixed costs industries will - all else equal - reduce output less than other industries, simply because price reductions will counteract the effects of the original negative demand shift. In other words; the higher the share of fixed cost, the more margin erosion and the less output reduction (Petersen and Strongin, 1996). Shipping can serve as an example of a high fixed cost industry, and the reasoning above is an important reason why shipping rates can and do fall deeply during recessions. Only after extreme rate drops will capacity be moored.

Conversely, if an industry has a cost structure of mainly variable costs, it will only take a small reduction in prices before the least efficient firms will not be able to cover their variable cost, and will stop producing. This implies the opposite, larger changes in volume and smaller changes in margin.

Labor Hoarding

Labor Hoarding means a tendency to keep employees during periods where there is not enough work. There are at least two reasons why firms might want to do this. One is that labor hoarding during bad times can stimulate the willingness of employees to make firm specific investments. Firm specific investments are, of course, less attractive in the eyes of an employee the higher the probability of being laid off. The ability to induce such investments can increase the efficiency of the firm in the long run, even if it is costly during a recession. The other reason is simply that the firm wants to avoid future costs related to search, hiring, and training of new employees (Becker, 1962; Oi, 1962; Rosen, 1966). In short, the incentive to hoard labor is driven by the need for firm specific investments by employees, and for employee specific investments by the firm. Either way, labor hoarding will essentially mean that costs become more fixed. This brings us back to the discussion of fixed cost in the

previous paragraph, where we concluded that higher cost fixity implies less output reduction and more margin cutting. This holds for labor hoarding too (Bernanke and Parkinson, 1991).

Which industries will be most prone to labor hoarding? This will obviously depend on the need to incur firm specific training costs and the costs associated with search, hiring and firing. R&D personnel may serve as an example. It is likely that R&D staff must incur firm specific investments in knowledge that matches the particular R&D needs of their employer. It is also likely that it takes quite some time for R&D personnel to become highly productive, and that it takes ongoing investment in training to stay productive. Hence, the firm will make specific investments in the employees, too. Finally, given specialized needs, the costs of search and hiring may be substantial. This means that R&D intensive industries may be prone to hoard labor - R&D labor specifically. More generally, labor economists have found that (in the manufacturing sector) nonproduction labor requires more firm specific training than production labor, and a stronger tendency to hoard nonproduction labor - though both categories may be subject to hoarding (Parsons, 1986). This means that the larger the ratio of nonproduction to production labor in an industry, the more labor hoarding one will observe (Rotemberg and Summers, 1990). Another indication that adjustment of employment is costly is a low level of turnover (in all phases of the cycle).

Industry concentration

The more concentrated an industry is, the more likely it is that it displays margins that are countercyclical, i.e. margins go up when demand is low, and down when demand is high (Rotemberg and Woodford, 1992; Martins and Scarpetta, 1999; Marchetti, 2002). This will imply larger changes in output than if margins were procyclical. The reason for this is usually taken to be the following: Concentrated industries are more likely to have collusive pricing. When demand is high, the temptation to undercut the collusive price is high, because there is a lot of demand to be won. This means that margins will be lower in periods of high demand, either to soften the temptation to undercut, or because there will be more undercutting going on. In periods of low demand, on the other hand, there is less demand to capture by undercutting, so margins can rise (Rotemberg and Saloner, 1986). Note also the earlier point that a recession may systematically wipe out the most elastic portion of demand, which further contributes towards reducing the volume gains from a price reduction (Okun, 1981; Stiglitz, 1984; Field and Pagoulatos, 1997). Finally, the threat from entry is also known to be

much lower during a recession. This increases the scope for margin increases without having to worry about entry.

A technical point about countercyclical margins is that increasing margins does not have to mean that nominal prices are raised. It suffices that cost reductions and falling input prices are less than fully passed on to customers. Also, increasing margins is no guarantee for attractive levels of profitability, since it depresses output. The aggregate margin of the industry may very well fall, even if the average margin per unit goes up.

In sum, the more concentrated an industry is, the less margins will tend to be lowered in a recession. The more countercyclical the margins, the more procyclical the output (all else equal).

Product differentiation

Product differentiation means that firms have a degree of market power over their customers. This can occur because buyers have heterogeneous preferences and firms are located differently in a space of product characteristics (Hotelling 1929; Salop 1979), or because buyers incur switching costs once they have started using a particular product (Klemperer, 1987, 1995). Either way, product differentiation means that each firm faces less elastic demand. Less elastic demand implies that the volume response from price and margin reductions will be smaller, and hence less tempting, while the opportunity to extract more value from loyal customers will be higher and more tempting.

If, as discussed earlier, there are more customers with elastic demand in the market during a boom than during a recession, then margins are more likely to be countercyclical. To illustrate, consider a situation where buyers incur switching costs. In a boom many new customers enter the market. These new customers are not yet locked into a relationship with any particular supplier, and will accordingly represent quite elastic demand. This gives firms an incentive to lower prices and margins during booms to invest in market share building since market share is cheaper in such periods. In recessionary periods on the other hand, there is less demand from new customers. Demand is in other words more inelastic, and firms shift emphasis from market share building towards value extraction from buyers locked in by switching costs (Beggs and Klemperer 1992, Klemperer, 1995). The empirical implication of product differentiation is then quite similar to that of concentration; the more differentiated the products, the less margins will tend to be lowered in a recession (countercyclical margins

more likely). Also, the more countercyclical margins are, the more procyclical output will be (all else equal). The software industry (or industries) may serve as an example of an industry with considerable learning based switching costs. According to the reasoning here, a recession will not lead to much price cutting on software.

Finance

Industries differ in their reliance on external versus internal finance. Some industries rely heavily on banks for credit (external), while others are able to finance all or most of their investments by retained profit (internal). During a recession the ability to obtain external finance tends to become more restricted for at least two reasons. One is that the lending capacity of banks may be reduced due to (fear of) mounting losses and reserve requirements and/or because of a tightening of monetary policy (the bank channel). Another is that a downturn in the economy may reduce the value of firms' collateral (the balance sheet channel). The latter means that even banks that are unconstrained will want to cut back on their lending (Bernanke and Gertler 1989, 1990).

Firms and industries that depend heavily on external finance will then face a dual challenge. Access to external finance is reduced at the same time as internal finance in the form of profit and positive cash flow is unusually low. The expected result is reduced investment and a sharper decline in output growth. Braun and Larrain (2005) examine a number of manufacturing industries in 100 countries, over a period of 40 years. They find a strong link between an industry's dependence on external finance and the negative shock to output growth during recessions (see Campello and Fluck (2006) for a concurring investigation on the firm level). Others examine the effect on pricing and margins. For example, Chevalier and Scharfstein (1996) and Campello (2003) predict (and find) that externally financed firms will invest less in market share building than unconstrained firms, and are more likely to boost margins during recessions. At the industry level, the implication is that dependence on external finance makes margins more likely to be countercyclical. When prices are strategic complements, one firm's decision to raise its margins creates more room for other firms to raise their margins, and the cost of margin hikes in terms of market share losses for constrained firms will be reduced, thereby contributing to countercyclical margins. Campello (2003) shows that margins are indeed more countercyclical in high-debt industries.

Finally, access to external finance during a recession is also likely to be more restricted when an industry has many small firms, and when assets have low liquidation value. The reason for this is the same as with high debt. Banks and other lenders display a "*flight to quality*" when recession sets in. Quality in this setting means borrowers with a strong balance sheet, with asses that can be liquidated easily, and where information asymmetry problems are not too large relative to the transaction size. The latter is usually taken to create particular problems for smaller firms, since transactions are usually too small to bear large investments in screening and monitoring (Bernanke, Gertler and Gilchrist, 1996).

4. Productivity Consequences

We now turn to the productivity consequences of recessions, and how these vary across industries. The productivity consequences can be sorted into short- and long run effects. A general observation is that while we know quite a bit about the short term effects, there is little consensus regarding the long run effects.

Short run effects

It is well documented that short term productivity growth is pro-cyclical. It rises in booms and falls in recessions (Hultgren & Green, 1960; Hall, 1988, 1990; Basu, 1996). The primary cause of this is that recessions lead to reduced capacity utilization (of labor and capital) (Bils & Cho, 1994; Burnside, Eichenbaum & Rebelo, 1995). The size of this effect in a particular industry will depend on the degree of excess capacity created, and its duration. To understand this we must revert mainly to the same variables we discussed above.

The first and most fundamental factor is of course the size of the negative shift in demand. All else equal a larger negative shift means more excess capacity and consequently a bigger short term drop in capacity utilization. With respect to the size of the demand shift, we refer to the demand drivers discussed in section 2 above. As we recall, important factors were durables vs. nondurables, competition from low cost substitutes, inflow of elastic demand in the preceding boom, and ripple effects. Also, incentives to maintain high (or even raise) margins will tend to depress output and thus capacity utilization, which brings us to the mechanisms discusses in section 3 above. Recall that industry concentration and product

differentiation make margins more countercyclical and output more pro-cyclical, and will accordingly result in larger negative effects on productivity in the short run. Another factor is labor hoarding, which means retaining underutilized labor. This will almost by definition lead to reduced labor productivity in the short run, which is consistent with the evidence (Burnside, Eichenbaum & Rebelo, 1993; Sbordone, 1997). As we shall see later, some claim that labor hoarding may be positively tied to long term productivity growth because the hoarded labor switch from producing output to making productivity improvements during a recession. For now, we conclude that the more an industry hoards labor, the more short term labor productivity will fall.

How long will a state of low capacity utilization last? To eliminate the initial problem demand must either grow or capacity must be reduced (or some combination of the two). The development of demand is notoriously difficult to make general statements about, but industries with highly cyclical demand will tend to grow more rapidly than others going out of a recession. However, these industries also grow from a lower base, since they tend to lose more demand going into a recession. It is not possible to say what the net effect of this will be. Also, and somewhat paradoxically, positive expectations about demand growth may reduce the speed of capacity reductions, as firms - and possibly capital providers- decide to ride out the storm instead of making capacity adjustments. Capacity reductions and exit bring us over to the long run consequences for productivity.

Long Run Effects

There is no agreement about the long run productivity consequences of recessions. Some believe that recessions are more or less pure waste (Keynes, 1936; Dickens, 1982), and others believe that recessions are crucial tools for long term productivity growth (Schumpeter, 1939; Aghion and Saint-Paul, 1996). In spite of considerable amounts of empirical work, there is no agreement even about the aggregate effect of recession, and much less on how the long run effect varies across industries (Aghion, Howitt, Brant-Collett and García-Peñalosa (1998, Ch. 8)). One important determinant of productivity is exit. There are two different sets of arguments related to exit. One is how fast exit reduces the problems of low capacity utilization discussed in the previous section. The other is related to selection, i.e. whether low productivity firms are the ones exiting. Below we focus on each of these in turn.

The speed of capacity adjustment will depend on the exit conditions within an industry. Exit can occur by firms going out of business, by surviving firms consolidating their own capacity, or by capacity reducing mergers and acquisitions. The presence of *sunk cost* will work to slow down all three types of exit. Sunk cost is the difference between the value of assets in their current and best alternative use. If sunk costs are large, the profitability level needed to induce exit is lowered (Eaton and Lipsey, 1980). Put differently; sunk cost implies that it takes bigger losses to shut down capacity - and spells of low capacity utilization can therefore persist longer. Shipyards are typically quite costly to convert to other uses. This slows down yard closings during recessions (but also openings during booms). *Industry concentration* may speed up capacity exit. Removing excess capacity, either by merger or otherwise, creates a benefit for the entire industry. The more concentrated the industry, the larger the firm's own share of the benefits from cutting will be. This means that there is a potential free rider problem with capacity reduction that diminishes with concentration. *Differentiation* may have a similar effect, but driven by the tendency of each firm to cater to its own clientele. Hence, capacity reduction in one niche mainly benefits the firms in that niche. This may also reduce the free rider problem of capacity reductions. In the opposite direction for firms in both kinds of markets (concentrated or differentiated) is the tendency for firms to have comfortable margins to begin with, and be under less competitive pressure to take any drastic action. The net effect of this is uncertain.

Yet another factor is *finance*. The bigger the problems with access to external finance (cf. the discussion above), the quicker the exit process will be. As discussed earlier, small firms, firms with high debt, firms making losses, and firms with assets that have low liquidation value are especially vulnerable to the "flight to quality" phenomenon. Quick exit by such firms reduces the longevity of productivity losses due to low capacity utilization. A different matter is whether the selection process works well under these conditions.

The selection argument is that an industry will tend to come out of a recession with a smaller and more productive population of firms than it had before. If recessions systematically wipe out the least productive firms, this will be the case. There is indeed considerable evidence that low productivity firms are particularly likely to exit during a recession (Caballero and Hammour, 1993, 1994; Geroski and Gregg, 1997). This effect may be at least partially offset by the fact that creation of new firms is also much lower during recession. In evolutionary language this means that there are fewer mutations and the

likelihood of finding a successful one is reduced. In terms of productivity the analogy is that a reduction in the creation of new firms with new methods - reduces the likelihood of finding successful, productivity enhancing innovations. It is also relevant that the selection process is myopic in the sense that it works on current performance and not future prospects. Some of the low productivity firms that are wiped out in a recession may be firms with good ideas that were in transition to become high productivity firms. If such firms lose the battle for survival against firms with higher current but lower potential productivity, then long run productivity growth will suffer.

On a related note, it is uncertain how the selection process is influenced by frozen credit markets. When banks are in the "flight to quality" mode, they may be less willing to fund promising young firms with high growth, high debt and high productivity, and instead ensure the survival of large, low growth, low debt, low productivity firms. In fact, Nishimura, Nakajima and Kiyota (2005) found a severe breakdown in the selection process during the Japanese banking crisis in 1996-97. In about half of the industries they studied - and in total for their sample - the exiting firms were more productive on average than the surviving firms. In the period before and after the banking crisis the selection process did promote productivity, but not during it.

An important argument for a positive productivity effect is the opportunity cost or pit stop model (Hall, 1991; Davis and Haltiwanger, 1990; Aghion and Saint-Paul, 1998). Unlike selection models which strictly speaking do not require each firm to improve, the pit stop model focuses on improvements within firms. What this model says is that some productivity improvement activities will disrupt ordinary production. In a boom, when capacity utilization is high, the opportunity costs of making such improvements are high. When capacity utilization is low, the opportunity costs are low, i.e. in recessions. This means that recessions are periods when productivity improvement activities boom. If so, recessions are crucial for future productivity growth. A related variant is called the vintage capital model, which emphasizes that during recessions old and outdated technology is scrapped at a faster rate than normal, which means that more efficient capital and technology will be used afterwards (see Greenwood and Jovanovic (1998) for a review). Empirical support for these ideas has been found by Gali and Hammour (1991), Saint-Paul (1993), and Menezes (2005).

Critics of the pit stop model claim that it should predict countercyclical productivity, while in reality it is well known that productivity is pro-cyclical in the short run (REF). The counterargument to this is that productivity improvements may take time to bring to fruition, which does seem plausible. Others have countered that the pit stop model exaggerates the flexibility firms have in converting labor from producing output to undertake productivity improvements, that recessions destroy scale- and learning by doing advantages (Arrow, 1962; Stadler, 1990), and last but not least to the well established fact that R&D investments are pro-cyclical (Patrick and Lloyd Ellis, 2009). Pro-cyclical R&D indicates that recessions impede future productivity growth by shrinking R&D input.

As stated earlier, empirical research has not been able to settle the argument about whether recessions are good or bad for long term productivity. One reason is that it is quite challenging econometrically to track the long term consequences of recessions, so there is a lot of debate about the validity and interpretation of the evidence that does exist. As one critic acidly summarized this literature: "some stories, few facts". The research on long term productivity effects is mostly conducted by macroeconomists. As mentioned in the introduction macroeconomists are primarily interested in aggregate effects, and when they have not reached agreement about sign and nature of the aggregate effects of recessions, it is perhaps not surprising that they have invested limited attention in understanding cross industry variation in those effects. The preceding discussion reflects the weak state of knowledge on this issue.

5. Knowledge Gaps

There is no shortage of knowledge gaps in the area surveyed here. Let me conclude by drawing attention to three of them.

The first one may be brief. Obviously the confusion over the long run productivity effects is an example of a glaring knowledge gap. As noted in the previous section, there are models and mechanisms predicting positive long run effects - and others predicting exactly the opposite. Presumably there is some truth in all of them, but what is needed from a

managerial perspective is an understanding of the conditions that lead one or the other to dominate in specific situations, and not which one is dominant in the aggregate.

A second major embarrassment is the bias in the empirical data underlying this literature. Virtually all the existing empirical evidence comes from the manufacturing sector. Given the shift towards service industries in the western world this bias is highly regrettable. It may, of course, be the case that variation across service industries is explained by the same variables that explain variation across manufacturing industries, but very little is known about this. Certainly, it is by no means satisfactory to base such a view on mere assumption. There may also be important differences within the service sector, such as between high and low skill service industries, those exposed to international competition and those that are not, etc. In short, we need more data on how service industries are (differentially) affected by recessions and credit crunches.

The third major gap is associated with *interactions* between the variables we have discussed in the preceding pages. What we have done is essentially to make an inventory of some important *main effects*, but there is little systematic knowledge about how these variables interact. The reason for this is presumably that such a large proportion of the studies is either primarily interested in the aggregate effects (i.e. macroeconomics), or on a specific subset of effects - such as capital structure (i.e. finance). Neither motivation is ideal for making progress on interaction effects, and it is my belief that serious progress cannot be expected to result as a byproduct from researchers primarily interested in something else (though this has served us reasonably well in terms of discovering main effects). It will probably take a full frontal attack by researchers interested in understanding and predicting variation in industry responses to recessions. Hopefully, the current recession will stimulate this interest.

REFERENCES

Aghion P, Howitt P, Brant-Collett M, García-Peñalosa C. 1998. *Endogenous growth theory*. MIT Press: Cambridge, Mass.

Aghion P, Saint-Paul G. 1991. On the Virtue of Bad Times: An Analysis of the Interaction Between Fluctuations and Productivity Growth. In *CEPR Discussion Paper*. London.

Arrow KJ. 1962. The Economic Implications of Learning by Doing. *The Review of Economic Studies* **29**(3): 155-173.

Basu S. 1996. Procyclical productivity: Increasing returns or cyclical utilization? *Quarterly Journal of Economics* **111**(3): 719-751.

Becker G. 1962. Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy* **70**: 9-49.

Beggs A, Klemperer P. 1992. Multiperiod Competition with Switching Costs. *Econometrica* **60**(3): 651-666.

Bernanke B, Gertler M. 1989. Agency Costs, Net Worth, and Business Fluctuations. *American Economic Review* **79**(1): 14-31.

Bernanke B, Gertler M. 1990. Financial Fragility and Economic Performance. *Quarterly Journal of Economics* **105**(1): 87-114.

Bernanke B, Gertler M, Gilchrist S. 1996. The financial accelerator and the flight to quality. *Review of Economics and Statistics* **78**(1): 1-15.

Bernanke BS. 1983. Irreversibility, Uncertainty and Cyclical Investment. *Quarterly Journal of Economics* **98**(1): 85-106.

Bernanke BS, Parkinson ML. 1991. Procyclical Labor Productivity and Competing Theories of the Business Cycle – Some Evidence from Interwar United States Manufacturing Industries. *Journal of Political Economy* **99**(3): 439-459.

Bils M. 1987. The Cyclical Behavior of Marginal Cost and Price. *American Economic Review* **77**(5): 838-855.

Bils M. 1989. Pricing in a Customer Market. *Quarterly Journal of Economics* **104**(4): 699-718.

Bils M, Cho JO. 1994. Cyclical Factor Utilization. *Journal of Monetary Economics* **33**(2): 319-354.

Braun M, Larrain B. 2005. Finance and the business cycle: International, inter-industry evidence. *Journal of Finance* **60**(3): 1097-1128.

Burnside C, Eichenbaum M, Rebelo S. 1993. Labor Hoarding and the Business Cycle. *Journal of Political Economy* **101**(2): 245-273.

Burnside C, Eichenbaum M, Rebelo S. 1995. Capital Utilization and Returns to Scale. *NBER Macroeconomics Annual* **10**(ArticleType: primary_article / Full publication date: 1995 / Copyright Â© 1995 The University of Chicago Press): 67-110.

Caballero RJ, Hammour ML. 1994. The Cleansing Effect of Recessions. *The American Economic Review* **84**(5): 1350-1368.

Caballero RJ, Hammour ML. 1996. On the Timing and Efficiency of Creative Destruction. *The Quarterly Journal of Economics* **111**(3): 805-852.

Campello M. 2003. Capital structure and product markets interactions: evidence from business cycles. *Journal of Financial Economics* **68**(3): 353-378.

Chevalier JA, Scharfstein DS. 1996. Capital-market imperfections and countercyclical markups: Theory and evidence. *American Economic Review* **86**(4): 703-725.

Davis SJ, Haltiwanger J. 1990. Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications. *NBER Macroeconomics Annual* **5**(ArticleType: primary_article / Full publication date: 1990 / Copyright Â© 1990 The University of Chicago Press): 123-168.

Dickens WT. 1982. The Productivity Crisis – Secular or Cyclical? *Economics Letters* **9**(1): 37-42.

Eaton BC, Lipsey RG. 1980. Exit Barriers are Entry Barriers – The Durability of Capital as a Barrier to Entry. *Bell Journal of Economics* **11**(2): 721-729.

Field MK, Pagoulatos E. 1997. The Cyclical Behavior of Price Elasticity of Demand. *Southern Economic Journal* **64**(1): 118-129.

Francois P, Lloyd-Ellis H. 2009. Schumpeterian Cycles with Pro-Cyclical R&D. *Review of Economic Dynamics* **12**(4): 567-591.

Gali, J. & M. L. Hammour. 1991. Long- Run Effects of Business Cycles. Mimeo. *Columbia University Graduate School of Business*.

Geroski PA, Gregg P. 1997. *Coping with recession: UK company performance in adversity*. Cambridge University Press: Cambridge.

Greenwood J, Jovanovic B. 1998. Accounting for Growth. In *New Developments in Productivity Analysis.* Hulten CR, Dean ER, Harper JH (eds.), Chicago University Press: Chicago, Ill.

Hall RE. 1988. The Relation Between Price and Marginal Cost in United States Industry. *Journal of Political Economy* **96**(5): 921-947.

Hall RE. 1990. Kinked Adjustment Costs and Aggregate Dynamics – A Comment. *Nber Macroeconomics Annual* **5**: 292-294.

Hall RE. 1991. Recessions as Reorganizations. Paper presented at the NBER Macro Annual Conference.

Hotelling H. 1929. Stability in Competition. *Economic Journal* **39**: 41-57.

Hulten CR, Dean E, Harper MJ, Conference on Research in Income and Wealth. 2001. *New developments in productivity analysis*. University of Chicago Press: Chicago.

Hultgren T, Green DD. 1960. *Changes in labor cost during cycles in production and business*. National Bureau of Economic Research: [New York].

Keynes JM. 1936. *The general theory of employment, interest and money*. Macmillan and Co. Ltd.: London.

Klemperer P. 1987. Markets with Consumer Switching Costs. *Quarterly Journal of Economics* **102**(2): 375-394.

Klemperer P. 1995. Competition When Consumers Have Switching Costs – An Overview with Applications to Industrial Organization, Macroeconomics and International Trade. *Review of Economic Studies* **62**(4): 515-539.

Lamey L, Deleersnyder B, Dekimpe MG, Steenkamp J. 2007. How business cycles contribute to private-label success: Evidence from the United States and Europe. *Journal of Marketing* **71**(1): 1-15.

Lucas RE. 1977. Understanding Business Cycles. *Carnegie-Rochester Conference Series on Public Policy* **5**: 7-29.

Marchetti DJ. 2002. Markups and the business cycle: Evidence from Italian manufacturing branches. *Open Economies Review* **13**(1): 87-103.

Martins OM, Scarpetta S. 1999. The Levels and Cyclical Behavior of Mark-ups Accross Countries and Market Structures. In *OECD Economics Department Working Papers.* OECD Publishing.

McGahan AM, Porter ME. 1997. How much does industry matter, really? *Strategic Management Journal* **18**: 15-30.

McGahan AM, Porter ME. 1999. The persistence of shocks to profitability. *Review of Economics and Statistics* **81**(1): 143-153.

McGahan AM, Porter ME. 2002. What do we know about variance in accounting profitability? *Management Science* **48**(7): 834-851.

Menezes AG. (2005) Demand shocks and productivity growth. *Portuguese Economic Journal,* **4**(1):

Mitchell WC. 1951. *What Happens During Business Cycles*? National Bureau of Economic Research: Cambridge, MA.

Nishimura KG, Nakajima T, Kiyota K. 2005. Does the natural selection mechanism still work in severe recessions? Examination of the Japanese economy in the 1990s. *Journal of Economic Behavior & Organization* **58**(1): 53-78.

Oi W. 1962. Labor as a Quasi-Fixed Factor. *Journal of Political Economy* **70**: 538-555.

Okun AM, Brookings Institution. 1981. *Prices and quantities: a macroeconomic analysis*. Brookings Institution: Washington, D.C.

Parsons DO. 1986. The Employment Relationship: Job Attachment, Work Effort and the Nature of Contracts. In *Handbook of Labor Economics.* Ashenfelter O, Layard R (eds.), Elsevier: New York.

Patrick F, Lloyd-Ellis H. 2009. Schumpeterian cycles with pro-cyclical R&D. *Review of Economic Dynamics* **12**(4): 567-591.

Petersen B, Strongin S. 1996. Why are some industries more cyclical than others? *Journal of Business & Economic Statistics* **14**(2): 189-198.

Quelch JA, Harding D. 1996. Brands versus private labels: Fighting to win. *Harvard Business Review* **74**(1): 99-&.

Rosen S. 1966. Short-Run Employment Variation on Class I Railroads in the U.S., 1947-1963, University of Chicago.

Rotemberg JJ, Saloner G. 1986. A Supergame-Theoretic Model of Price Wars During Booms. *American Economic Review* **76**(3): 390-407.

Rotemberg JJ, Summers LH. 1990. Inflexible Prices and Procyclical productivity. *Quarterly Journal of Economics* **105**(4): 851-874.

Rotemberg JJ, Woodford M. 1992. Oligopolistic Pricing and the effects of Aggregate Demand on Economic Activity. *Journal of Political Economy* **100**(6): 1153-1207.

Saint-Paul, G. (1993) On the Political Economy of Labor Market Flexibility. *NBER Macroeconomics Annual,* **8,** 151-187.

Salop SC. 1979. Monopolistic Competition With Outside Goods. *Bell Journal of Economics* **10**(1): 141-156.

Sbordone AM. 1997. Interpreting the procyclical productivity of manufacturing sectors: External effects or labor hoarding? *Journal of Money Credit and Banking* **29**(1): 26-45.

Schumpeter JA. 1939. *Business cycles: a theoretical, historical, and statistical analysis of the capitalist process* (1st ed.). McGraw-Hill Book Company, inc.: New York; London.

Stadler GW. 1990. Business Cycle Models with Endogenous Technology. *The American Economic Review* **80**(4): 763-778.

Stiglitz JE. 1984. Price Rigidities and market-Structure. *American Economic Review* **74**(2): 350-355.

PUBLICATIONS WITHIN SNF'S RESEARCH PROGRAMME
"CRISIS, RESTRUCTURING AND GROWTH"

2010-

I. Almås	*Crisis, restructuring and growth: A macroeconomic perspective*
G. Doppelhofer	SNF Report No 05/10
J. C. Haatvedt	
J. T. Klovland	
K. Molnar	
Ø. Thøgersen	

L. B. Lien   *Recessions across industries: A survey*
SNF Working Paper No 16/10

K. G. Nyborg   *Liquidity, ideas and the financial crisis*
P. Östberg   SNF Working Paper No 17/10