The Retail Revolution and Food-Price Mismeasurement

Leonard I. Nakamura*

In December 1995, the U.S. Senate Finance Committee’s Commission to Review the Consumer Price Index issued its final report. This report stated that the U.S. Consumer Price Index (CPI) was an upwardly biased measure of the cost of living that most likely exaggerated inflation by 1.1 percentage points a year. Exaggerating inflation means that we underestimate the purchasing power of our money and thus reduce gains in output when we measure them in inflation-adjusted dollars. The report attempted primarily to estimate the current and future bias of the CPI; it did not discuss the historical bias nor whether the bias had increased. This article presents evidence that the upward bias in measures of U.S. inflation worsened in the late 1970s. A rising bias would support the argument that the slowdown in growth of U.S. inflation-adjusted output and labor productivity reported since the mid-1970s is an artifact of mismeasurement.1

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1Labor productivity is the average amount of inflation-adjusted output produced by an hour of work. For further discussion of productivity measures and the productivity slowdown, see “Is the U.S. Economy Really Growing Too Slowly? Maybe We’re Measuring Growth Wrong,” Business Review, March/April 1997.
Nobel laureate economist Robert Solow has said of this slowdown, “We see computers everywhere but in the statistics.” This so-called Solow paradox draws its power from the observation that not only is there no apparent pickup in productivity growth from the widespread adoption of personal computers that began in the late 1970s, but, instead, our official statistics report a drastic slowdown. I argue here that one of the impacts of the new electronic technology has been a retail revolution that has made price measurement more difficult. Our failure to see faster growth from computerization is thus a side effect of the confrontation between an outmoded statistical system and a rapidly changing economy.

In particular, the implementation of new technologies—scanners, universal product codes, and electronic cash registers—that began in the late 1970s has enhanced the ability of producers and retailers to charge a variety of different prices for identical or similar products. Deregulation of the U.S. economy has removed restrictions on competition, also enhancing the ability of sellers to change prices and increase their product offerings. One such act was the repeal of so-called fair trade laws—these laws, despite their name, tended to prevent retail discounting. As these changes took hold, the methodology underlying the U.S. Consumer Price Index (CPI) was revised substantially. The methodological change was intended to reduce the upward bias in inflation measurement, but, in practice, it exaggerated the bias as price dispersion accelerated.

Food prices provide an illuminating case study of the measurement problems created by price dispersion. Food is historically the most basic product in any economy, and its inflation rate has long been documented. The American economic historian’s bible, Historical Statistics of the United States, Colonial Times to 1970, records wholesale and retail food prices going back to the 18th century. When the U.S. Department of Labor’s Bureau of Labor Statistics (BLS) first began collecting monthly data on retail prices after World War I, it began with a set of 30 food articles and investigated monthly price changes going back to 1890. While much of the discussion of the mismeasurement of inflation has centered on the introduction of new goods (see my article, “Measuring Inflation in a High-Tech Age”), two recent studies, by Marshall Reinsdorf (1993) of the BLS and by James MacDonald (1995) of the U.S. Department of Agriculture, suggest that, since the late 1970s, the Consumer Price Index has substantially overestimated inflation in food. (See It Isn’t Just An Eating Disorder.)

THE RETAIL REVOLUTION

Retailing in the United States has been revolutionized over the past two decades. The use of scanners, for example, began slowly but picked up rapidly in the 1980s (Table 1). Scanners read the bar codes on products for the cash registers, which translate the codes into product descriptions and prices and then tally them

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2Levy et al. (1997) examined a sample of four large supermarket chains with the modern technology and showed that the cost of changing prices was 52 cents per product price change. At a chain located in a state in which retailers are required to place a price on each individual item, the cost averages $1.33 per product price change. They went on to show that the four chains whose cost is lower change prices far more frequently.

3Two laws, the 1937 Miller-Tydings Resale Price Maintenance Act and the 1952 McGuire Act, made it possible for a small retailer to sign an agreement with a manufacturer that would then prevent all retailers in that state from offering discounts on the manufacturer’s products. Since 1976 such so-called fair trade agreements have been illegal.

4This article is based primarily on Nakamura (1998), which discusses empirical evidence on retail food prices and the underlying economic theory of price measurement when price dispersion occurs.
It Isn't Just An Eating Disorder

The biases for food discussed in the article are also found in the CPI for airfares, college tuition, gasoline prices, hotel rates, and prices for department store merchandise. Airfares are a particularly good example of the joint impact of deregulation and computerization. In 1978, there was only one round-trip coach fare on most routes, as fares were regulated by the Civil Aeronautics Board. At present, by contrast, dozens of different fares are available with a variety of restrictions on every route, and the fare structure changes by the minute.

Between 1978 and 1996, the average price paid per mile by passengers grew at an annual rate of 2.7 percent (Table). The CPI-U for airfares grew at an annual rate of 8.3 percent, a difference of 5.6 percentage points. If we use the CPI for airfares to deflate airline revenues from passenger travel, we find that “real” airline passenger travel fell from 1978 to 1996. But, in fact, passenger miles on airlines more than doubled.

How can such a substantial gap have been sustained for so long? The reason is the dispersion of fares. Full fares for unrestricted travel have risen at an average annual rate of 9 percent, and the CPI for airfares has basically tracked the full fare. The average restricted (discount) fare has increased only 2 percent a year. The average domestic unrestricted fare is now about three times the average restricted fare. But only 7 percent of passenger miles are flown at full fare. By contrast, in 1978, virtually all travel on scheduled airlines was at full fare.

College tuition shows a bias because colleges offer reductions in tuition to a large proportion of students—this is, of course, straightforward price discrimination on the basis of ability to pay. Tuition data collected by the National Association of College and University Business Officers show that, not counting scholarship discounts, private school tuition for their members rose 6.6 percent annually from the school year 1990-91 to 1995-96, but only 4.3 percent annually over the same period if you include the discounts.

<table>
<thead>
<tr>
<th>Airfares</th>
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<tr>
<td></td>
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<tr>
<td>CPI, annual average 1982-84=100</td>
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<tr>
<td>23.7</td>
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<tr>
<td>yield, cents per passenger-mile</td>
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<td>full fare</td>
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<tr>
<td>average</td>
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<td>restricted</td>
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</table>

Sources: BLS and Air Transport Association
for the customer and the store. If the store is part of a chain, the scanners permit the store’s daily sales to be cumulated for relay to the chain’s centralized computer, the electronic data warehouse. The electronic data warehouse supplies detailed, item-by-item data on sales and store inventory to managers, buyers, and suppliers. These tools have made it possible for retailers to change prices rapidly; prices that previously were printed on items or stamped on by hand could instead be attached to the shelf. This system eliminated much of the work of stock clerks and substantially reduced the cost of changing prices. Changing prices of products on a weekly basis became a core practice in grocery stores. Equally important, stores became more adept at tracking inventory and measuring the profitability of individual products. Retailers’ increased use of technology, in turn, gave added momentum to a move toward larger stores offering greater quality, variety, and convenience.

Conventional supermarkets accounted for 73 percent of supermarket sales in 1980. But they lost their market dominance and, by 1994, accounted for only 28 percent of sales. They were replaced by two types of establishments: superstores (supermarkets that include bakeries, butchers, delicatessens, pharmacies, and other formerly separate units), whose share of sales rose from 22 percent in 1980 to a dominant 57 percent in 1994; and warehouses (large discount supermarkets), whose share rose from 5 percent to 15 percent over the same period. The total floor space of grocery stores rose nearly 40 percent between 1977 and 1992, and hours of operation increased: the average chain supermarket was open 131 hours a week in 1994—nearly 19 hours a day! The average number of different items stocked, which had increased 20 percent from 1970 to 1980, rose 75 percent from 1980 to 1990. New product introductions also accelerated dramatically (Table 2). And while retailers were able to reduce the number of clerks stocking shelves, they

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5 Conventional supermarkets are large self-service stores that offer a complete line of grocery items but lack the full-service departments found in superstores, yet they provide more variety and service than discount warehouses.

6 These new product introductions are predominantly brand extensions, such as new soup or cereal varieties.

### TABLE 1
Supermarket Scanner Usage Grew Rapidly in the 1980s, with Chain Stores Taking the Lead (Percent)

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<tbody>
<tr>
<td>Chain Stores</td>
<td>26%</td>
<td>38%</td>
<td>80%</td>
<td>95%</td>
</tr>
<tr>
<td>Independent</td>
<td>18%</td>
<td>22%</td>
<td>61%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Source: Progressive Grocer, various issues.

### TABLE 2
Variety at the Average Supermarket Accelerated as New Technology Was Deployed

<table>
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</thead>
<tbody>
<tr>
<td>Items per Store</td>
<td>7,800</td>
<td>9,400</td>
<td>16,500</td>
<td>19,612</td>
</tr>
<tr>
<td>New Products</td>
<td>1,365</td>
<td>2,689</td>
<td>13,244</td>
<td>20,076</td>
</tr>
</tbody>
</table>

creased the number of checkout clerks and cash registers. In short, supermarkets offered dramatically more services to their customers—more space, more variety, longer hours, and faster checkouts.

These larger stores typically set up shop in suburban areas, where relatively low land prices made opening new stores less costly and competition stiffer. Much of this competition did not take the straightforward form of uniformly lower prices. Instead, supermarkets increasingly offered weekly specials, with fliers going out to neighborhood shoppers. Manufacturers increased their issuance of cents-off coupons, and supermarkets sweetened these coupons by doubling them. And while manufacturers promoted brand-name products with national ad campaigns, supermarkets increasingly offered in-house brands at discount prices.

On its surface, this price dispersion seems irrational or tyrannical. After all, it forces us to spend more time shopping—looking for coupons, mailing in rebate coupons, searching the shelves to compare prices, and going from store to store to “cherry pick” the bargains.

If price dispersion were merely a cost imposed on customers, it would not be a successful retail strategy. Customers would shun supermarkets that adopted the new technology and embrace stores that stayed with the old. But the reverse has happened.

Chain stores adopted the new technology more rapidly than independent stores did, and at the same time, the shift away from independent ownership of supermarkets to chain ownership accelerated. The sales share of independents declined 4 percentage points, from 42 percent to 38 percent, in the 20 years from 1954 to 1974. In the 20-year period in which scanners were adopted, 1974 to 1994, the sales share of independents slid 12 more percentage points—three times as much.

So why is price dispersion such a prevalent phenomenon? How does it benefit consumers and the retailers that adopt it?

### The Efficiency of Price Dispersion.

The increase in living standards that made many Americans dissatisfied with bright yellow mustard, canned peas, and gelatin desserts has led to a desire for a vast variety of food products. Different shoppers want different characteristics from their stores, and in particular, some customers value low prices more while other customers place greater importance on variety and quality. Price dispersion then becomes a strategy the retailer can employ to satisfy a diverse clientele.

Mr. Retiree will drive 15 extra miles to stock up on tuna fish or toilet paper if the price is right. Ms. Superwoman is always having to change her schedule at the last minute and wants to put a gourmet meal on the table with nearly no shopping or cooking time. Price isn’t the issue; time is. Mr. Xgen wants food with style but has no money to spare. Ms. Maven tries out new foods and passes the news on to her relatives and neighbors. By shrewdly juggling prices, the store manager can deliver low prices on basics to Mr. Retiree, a broad selection of fresh and frozen dishes with a high markup to Ms. Superwoman, hip new foods at low prices to Mr. Xgen, and a wide variety of new foods to Ms. Maven at relatively high prices.

Mr. Retiree would shop at the store with the lowest prices regardless of variety or service. So the superstore makes sure that at least once every two months each basic item on Mr. Retiree’s shopping list goes on sale for a week, at the lowest price in the area. And the extra checkout clerks the store provides to shorten

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7This section argues that price dispersion, under the pressure of competition, is efficient. The argument is that grocery store owners—as far as possible—use Ramsey pricing to get consumers with different price elasticities to pay different shares of the fixed costs associated with variety and convenience. A nice theoretical discussion of this is Bliss (1988); empirical support is provided by Betancourt and Malanoski (1995).
Ms. Superwoman’s waiting time at the cash register gives Mr. Retiree a reason to prefer the superstore when prices are equal. Mr. Xgen trolls the gourmet aisles for discounts; he helps the store manager keep inventories of fancy foods—especially perishables—under control. This is particularly important because new and fancy foods are subject to fads—often led by Ms. Maven and joined by Ms. Superwoman.

Of course, Ms. Maven and Ms. Superwoman would prefer to pay lower prices, but they aren’t willing to wait for discounts. Nevertheless, they often do benefit from discounts—but less than more patient shoppers do. Mr. Retiree and Mr. Xgen would prefer not to have to spend so much time shopping, but they demand low prices. And they are beneficiaries of the more cordial service and large variety that the wealthier customers demand.

Price dispersion enables store managers to satisfy all these types of customers—to the extent possible. And electronics makes price dispersion feasible by lowering the cost of changing prices and providing an abundance of information on the success of different pricing strategies. When markets are highly competitive, stores succeed by satisfying their customers.

The Customer Is Always Right, but the Price Inspectors May Be Wrong. Unfortunately, our official price-measurement system is not well adapted to a world in which prices change frequently. Suppose the typical store that sold Diet Pop for $3 a 12-pack last year now sells it for $2 for three days a month and $4 for 27 days a month. Has the price fallen to $2 or gone up to $4? The Bureau of Labor Statistics’ price inspectors will find the price $2 one-tenth of the time and $4 nine-tenths of the time, for an average price of $3.80. But the store is likely to sell much more per day at the $2 price than at the $4 price, as shoppers learn to stock up at the lower price. If the store sells the same total number of 12-packs at the lower price in three days as it does at the higher price in 27 days, the average price, weighted by sales, is $3.00—the price consumers pay, on average, hasn’t changed.

How would this price dispersion affect our measures of output and productivity? Suppose 1 billion 12-packs of Diet Pop are made and sold each year. The first year it took 10,000 workers to produce and sell that much soda, and the second year it took 9000 workers, so that productivity rose 11 percent (from 100,000 12-packs per worker to 111,000). In both years, $3 billion is spent on Diet Pop. But the price inspectors, on average, report a price increase from $3 to $3.80 a 12-pack. Using this price information, it appears as if the second year’s $3 billion expenditure on Diet Pop represents only 790 million 12-packs ($3 billion divided by $3.80 per 12-pack) even though consumers are buying as much as ever. In this case, measured productivity will show a fall of about 11 percent, that is, a decrease from 100,000 12-packs per worker to 89,000 (= 790 million divided by 9000 workers), instead of a rise of 11 percent.

To tell whether our official measures have been significantly affected in this way, we need to check what alternative methods tell us about prices being paid. One possibility is supermarket tape data. These data show how much the stores surveyed sold of each product and the prices at which each was sold. Another possibility is to compare wholesale prices, the prices supermarkets pay. These prices may be less subject to the price dispersion that occurs at the retail level.

8Broadly speaking, within the U.S. federal statistical system, the Bureau of Labor Statistics, part of the Department of Labor, collects price data while nominal expenditure data are collected by the Department of Commerce. The Department of Commerce’s Bureau of Economic Analysis is responsible for constructing measures of real output for the national income accounts, for the most part deflating the nominal expenditure data by the Bureau of Labor Statistics’ price indexes.
EVIDENCE OF FOOD-PRICE MISMEASUREMENT

Recent studies by two U.S. government economists suggest that food-price inflation in the U.S. CPI has been overstated between 1.5 and 2 percentage points a year.

Marshall Reinsdorf’s 1993 study compared the CPI for food with an alternative food-price measure, the series on average food prices, also compiled by the Bureau of Labor Statistics. This average price (AP) series does not differentiate as the CPI does between generics and brand names and between types of stores. In particular, if consumers switch from full-price stores to discount outlets, or from name brands to house brands or generic products, this switch will show up in the AP as a decline in average price but will not affect the comparable CPI series.

The AP series is what economists have collected historically and, except for a break from 1978 to 1980, is available going back to 1890 for nine foods. Before 1978, the CPI series and the AP series showed no systematic tendency to diverge. Reinsdorf showed that from 1980 to 1990, these series for comparable products diverge by roughly 2 percentage points a year, with the CPI series rising faster than the AP series. And the same divergence continued through 1995 (Nakamura, 1998).

The advantage of the CPI method is supposed to be that the items for which it collects prices and the outlets where they are sold are held fixed. But if consumers change where they shop or what they buy, the CPI can give a misleading impression of what is happening to the prices they pay. If quality is rising (as the apparent improvement in freshness, availability, and variety of fresh fruits and vegetables would suggest), average prices should be rising more rapidly than the CPI. After all, if quality is rising and consumers are, on average, shifting toward better goods that are costlier to produce, this should cause the average price across all goods to rise faster than the price of a typical good of fixed quality. Instead, the opposite is happening: the CPI reports that prices of fixed-quality goods are rising faster, a contradiction that suggests that the CPI is gravely overstating inflation.

In Reinsdorf’s studies, 16 of the 52 food items covered by the average price series are fresh fruits and vegetables. The evidence indicates that much of the discrepancy, at least for fresh fruits and vegetables, is caused by problems associated with price variability and price dispersion. Fresh fruits and vegetables are seasonal products, and their prices rise and fall dramatically from month to month, if the item is available at all. Moreover, their perishability can cause prices to vary dramatically across stores. The formulas that the BLS introduced in 1978 were apparently very vulnerable to these fluctuations and provided upwardly biased measures because of them. But the problems are not confined to fresh fruits and vegetables.

James MacDonald, an economist with the Department of Agriculture, showed similar discrepancies for nonperishable food products in a 1995 study that compared CPI data with supermarket checkout (scanner) data for 1989-94. MacDonald used A.C. Nielsen Company data that report the quantity sold nationwide in a given month for a particular item, as well as the total dollar sales for the item. The advantage of Nielsen data is that they report the quantities sold at different prices, while the BLS’s price inspectors report only the particular price they observe, not the amount sold at that price.

MacDonald did two analyses. The first used data from 1988-91 for those items for which the BLS product categories and the A.C. Nielsen product categories closely corresponded. For each of these 14 groups, the CPI inflation measures were consistently higher; the average gap...
was 1.4 percentage points a year. The second comparison used a wider array of classes of nonperishable products, comparing annual price changes for the leading brand in each of 323 product classes between April 1988 and April 1993 with the BLS price indexes for these product classes. The CPI for these products grew at an annual rate of 3.7 percent per year, compared with 1.9 percent for the Nielsen items—the CPI showed an upward bias of 1.8 percentage points a year. This finding shows that the bias is not confined to seasonal products.

In another study, Reinsdorf (1994) noted that the CPI for food could be compared to the BLS’s Producer Price Index (PPI) for the same category (called consumer foods). In this comparison, it again appears that although before 1978 the CPI and the PPI for food showed no systematic tendency to diverge, after 1978 the CPI for food has grown nearly 1.5 percentage points a year faster.

OUTPUT MEASUREMENT

An important use of price data is to permit us to compare real expenditures over time: real expenditures are said to rise if the dollars spent rise faster than the prices of the items purchased. If the CPI is upwardly biased in measuring food inflation, using it to deflate nominal expenditures on food will produce underestimates of growth in real expenditures. One test of the accuracy of the CPI is to compare nominal measures deflated using the CPI with direct measures of quantity. If CPI-deflated output grows more slowly than a pure measure of quantity, we have strong evidence that the CPI is biased.11

The U.S. Department of Agriculture computes implicit quantities of U.S. food consumption by weight by adding up U.S. production, imports from abroad, and carryover inventory from the previous year, and subtracting exports, processing and nonfood uses, and final end-of-year inventory. These measures are called disappearance estimates. Over the period 1978 to 1988, disappearance data imply that per capita consumption of fresh fruits and vegetables measured in pounds rose 25 percent, or 2.3 percent a year (MacDonald). But deflating U.S. domestic expenditures on fresh fruits and vegetables by the CPI measures for these categories implies that consumption of fresh vegetables declined 1.2 percent a year and consumption of fresh fruits declined 0.2 percent a year. Thus, when compared with measures based on disappearance data, the CPI-based measures underestimate growth in consumption of fresh fruits and vegetables by over 2 percent a year. This discrepancy is a strong argument that the CPI overstated food-price inflation during this period.

Another way to measure output is to ask, what is the contribution of different actors along the distribution chain? Consumption is, after all, the result of the net contributions of farms, factories, wholesalers, truck drivers, and retailers in adding value to the product until the consumer can purchase it. To measure the net value-added of food retailers, we can measure the real output of farms, factories, and wholesalers in producing goods that food retailers buy and subtract that contribution from the real sales of the food retailers. But our official statistics, again, give a distorted view.

Deflating food-store sales for 1992 by the CPI for food gives a measure of the real value of food products and retail services delivered to

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10The Consumer Price Index measures prices paid by urban consumers to retailers, while the Producer Price Index measures prices received by producers (such as farmers or manufacturers).

11This assumes that the quality of a unit of output was constant or increased over the period, which seems reasonable.
consumers. Similarly, using the PPI for consumer foods to deflate food stores’1992 purchases of goods gives a measure of the real value of products that farms and manufacturers delivered to food stores. The difference between these two measures should be real retail services added by the food stores: the economic contribution of supermarkets as implied by our official statistics (Table 3). What we see is that, since 1977, the purchased input of supermarkets in real terms has risen 1.3 percent a year faster than the supermarkets’ sales. In effect, the statistics argue that supermarkets are decreasing their contribution to real output, using more inputs and somehow wasting much of the increase. When we use this so-called double-deflation methodology to estimate the real contribution of supermarket output, we find that food-store output has been declining at an annual rate of 7.7 percent. This seems unreasonable. As I have shown, the services provided by food stores have been increasing along a variety of dimensions. In other words, our CPI statistics overstated inflation and understated output growth in this industry.14

The empirical studies we have been discussing provide further evidence that the CPI mismeasured food-price inflation after 1978. Moreover, Reinsdorf (1994) showed that the average price and PPI data are consistent with the CPI data until 1978. Did the revision to the BLS’s methodology for the CPI in 1978 — done to correct upward biases — actually exacerbate them? We now turn to this crucial revision.

**TABLE 3**

The CPI Implies Unrealistic Declines in Services Provided By Food Stores

<table>
<thead>
<tr>
<th>PPI, Consumer Foods</th>
<th>CPI, Food-at-Home</th>
<th>Real Sales of Food Stores</th>
<th>Real Wholesale Purchases of Goods for Resale by Food Stores</th>
<th>Double-Deflation Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977-92</td>
<td>3.5 %</td>
<td>4.9 %</td>
<td>0.9 %</td>
<td>2.2 %</td>
</tr>
</tbody>
</table>


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12 The CPI revision was phased in beginning at the end of 1977.

13 The “double-deflation” method deflates the revenues of food stores by the CPI to obtain the total real output received by consumers. It then uses the PPI to deflate the total input received by the food stores from producers to obtain a measure of the total real input of the producers. The difference is the implied real value-added by the retailer. Without going into all the details of the calculations, when revenues are deflated at a faster rate than costs, as here, the difference declines at a very fast rate.

14 Another possibility is that the PPI for consumer foods understates inflation. But the other evidence I have presented suggests the CPI is at fault. In either case, mismeasurement is occurring — and has worsened since the late 1970s.
tistical framework constructed during an earlier period, when prices were far less flexible than they are now. Ironically, recommendations—made in 1960 and finally implemented in 1978—to improve the price statistics appear to have backfired.

The Pre-1978 CPI Method and the Quality Issue. Until 1978, BLS price inspectors around the country priced products specified by BLS headquarters in Washington. For example, all inspectors would be asked to price “whole milk, in glass bottles, quarts, delivered” or “bacon, hand sliced, best quality.” These pricing categories were necessarily broad, as price inspectors had to be able to find the product in each of the dozens of urban markets they covered. Even so, items within the categories were often hard to find. Indeed, by 1978, home-delivered milk and hand-sliced bacon had both long ceased to be dominant retail items. As a result, price inspectors might have found themselves forced to price a commodity that had become unimportant in total sales and whose price movements had become idiosyncratic.

The breadth of the category definitions meant that improvements in quality might occur without being picked up. One obvious example is the pasteurization of milk in the early part of the 20th century. Another is the improvements in cars that took place in the 1950s. If a new model Chevrolet came standard with a more powerful engine and larger seating capacity or, less obviously, a superior braking system or smoother clutch, was the price increase associated with the introduction entirely inflation—or should some of it be counted as quality improvement?

A government-mandated review of the statistics in 1960 recommended that the quality problem be partially solved by focusing on narrower product definitions, developed locally by price inspectors, and by systematically replacing products to update the sample. This recommendation was implemented in 1978.

The 1978 CPI Revision. Under the revisions, price inspectors were empowered to determine which products they would track. The price inspectors were given broad product categories, such as flour and prepared flour mixes, and a store location based on a nationwide survey called the Consumer Point of Purchase Survey. For example, the inspector might be told to collect prices at the Price Chain supermarket at the corner of Broad and Vine in Philadelphia. Then the price inspector, with the help of store personnel, would choose several popular items within the product category and, using scientific sampling, pick one, say, Grandma Nakamura’s chocolate fudge cake mix. Each month for the next five years, the price inspector would record the price of that particular item at that particular store (unless the store stopped carrying that item or closed). This procedure improved the odds that the quality of the good being priced was indeed unchanged. This solution, which was widely discussed and approved in the 1970s when it was introduced, does not appear to have worked well in practice, partly because of price dispersion.

Prices have diverged into (a) the brand name’s “list” or full price at the traditional supermarket; (b) the “sale” price of the brand name; (c) the price of the generic equivalent or alternative “discount” brands; and (d) the price at the discount supermarket. The highest of these prices is the first, and the gaps have widened over time, but the narrow product definitions focus on the first price. To the extent that sales have shifted away from the brand name at full price at the traditional supermarket, the CPI inflation rate is going to be biased upward relative to the average price consumers pay.

Every five years, the Consumer Point of Purchase Survey data are used to refresh the sample and new product-store combinations are substituted. This substitution assumes that the old good at the old location and the new one at the new location offer the same quality per dollar, so that any difference in price between them does not represent inflation. In fact, the new
product-store combination may have replaced the old precisely because it offered superior value, but this added value is ignored. If the old good was a particular brand and size of toothpaste sold at $3, and the new good was precisely the same brand and size but sold at $2 at the new, more efficient outlet that replaced the old outlet, none of the decline in price is recorded. The CPI treats the decline in price as a decline in quality—the lower price is taken to mean that the inconvenience of buying the toothpaste at the new store costs the consumer $1 per purchase.\footnote{Moulton (1996) argues that the bias resulting from shifts to “warehouse” stores is small, since, as pointed out above, the share of purchases at such stores has increased only 10 percentage points. But the shift to superstores has also resulted in bias, and purchases at these stores have increased 35 percentage points.}

The Bureau of Labor Statistics Continues to Revise Its Methodology. The BLS has identified and acted on one problem caused by price dispersion, so-called formula bias. Suppose, when the sample is refreshed, the new product chosen is Diet Pop at each of two similar supermarkets. At one store, Diet Pop is on sale at a discount when the survey is taken: $2 a 12-pack. At the other, Diet Pop is offered at the regular price: $4 a 12-pack. At each store, let us say, the priced item represents a beverage category that has $200,000 in annual sales. The store with the discounted price apparently sells 100,000 12-packs, while the store with the non-discounted price apparently sells only 50,000 12-packs; the result is that Diet Pop at the store that is temporarily discounting it is given a greater weight in calculating the Consumer Price Index. This procedure would be sensible if these were permanent price differences between the two stores, reflecting higher costs at one location.

But suppose there is no real difference between the two stores. Next month, Diet Pop at the first store reverts to the regular price while the second store discounts it. In calculating the inflation rate of Diet Pop, the store that had the lower price when the weights were determined is given more weight. So instead of the two changes canceling out, the net effect is an increase in inflation. This is formula bias, and it results from the fact that price differences need not reflect cost differences and may reflect price dispersion instead.

In January 1995, the Bureau of Labor Statistics revised its methods for introducing products into the CPI for food with a technique called seasoning. The idea behind seasoning is to construct the quantity weights for a newly introduced or substituted product using a price that is months old. This sharply reduces the chance that a good with an unusually low current price is given too high a weight. This change corrects much of the problem for fresh fruits and vegetables and has reduced the upward bias in the CPI for food by roughly one-half of a percentage point, leaving about 1 to 1.5 percentage points of upward bias.

How do we know that food-price mismeasurement continues? An important clue comes from the use of the CPI to deflate U.S. personal consumption expenditures for food. According to the Bureau of Economic Analysis, the real consumption of food (including at restaurants) remained almost unchanged between 1994, when real food consumption was $688 billion, to the third quarter of 1997, when it was $689 billion. It is extremely unlikely that, with population growing and income and employment rising, Americans were not increasing their total food consumption at all. This is strong evidence that the CPI for food is still significantly overestimating food-price inflation.

CONCLUSION

The new technology of retailing has decreased firms’ cost of changing their prices. As a result, price dispersion has increasingly become the norm for products—the price paid for a product varies across stores, brands, days of
the week, and customers. One consequence of this change has been that measuring the price paid for a product has become increasingly difficult.

Alternative data sources are available for checking the validity of CPI price measures. But the chronically underfunded U.S. statistical agencies are, by and large, limited to using a single, imperfect methodology for price measurement. This methodology led to dramatic overstatement of food-price inflation during a period in which inflation was public enemy number one. Although steps have been taken to improve the accuracy of the Consumer Price Index, and more are in progress, the continuing rapid changes in retailing technology—including the Internet—suggest that U.S. statistics will continue to lag behind the marketplace.

REFERENCES


In the U.S. economy, workers change jobs, and firms create and eliminate jobs, in an almost constant flow. This process of restructuring occurs even more intensely during recessions. The economic costs of recessions are significant: many workers lose their jobs and not as much output is produced. The pain of recessions, though, can be accompanied by activity that helps prepare the economy for further expansion. During recessions, firms can eliminate low-productivity jobs, reorganize plants, and regroup their organization charts. In the words of economist Joseph Schumpeter, recessions can be times when “creative destruction” occurs. Consequently, what happens during recessions—and the response of policymakers to those events—can have implications for long-term economic growth.

In this article we will explore in some detail what happens to jobs and workers over the business cycle. The pace of restructuring seems

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to be high in recessions for two reasons. First, adverse economic events may affect firms in different ways, leading to large movements of workers across firms and industries. Second, firms may find recessions an opportune time to restructure, since the cost of doing so is lower than it is during expansions: workers can be retrained and machines upgraded since more of their time is idle.

We’ll also look at some of the questions restructuring raises for policymakers: Can policies designed to promote growth lead to too much restructuring? What about stabilization policies designed to boost the economy’s production during recessions and throttle it back during expansions? Might these policies delay productivity-enhancing restructuring to the extent that long-term growth is adversely affected?

**DATA ON RESTRUCTURING ACTIVITY**

The U.S. economy is characterized by a large and continual movement of workers into and out of employment and unemployment. Over the course of a typical business cycle, unemployment rises during recessions and falls during expansions (Figure 1). The Bureau of Labor Statistics classifies unemployed workers in several ways. In the figure, we count job losers and leavers as those who lost or quit a job or who...
completed a temporary job. Alternatively, an unemployed worker may have just entered the labor force and begun looking for work (new entrants and re-entrants). Since the early 1970s, job losers have considerably outnumbered new entrants and re-entrants. On average, someone who becomes unemployed stays so for approximately three months, but this duration varies over the business cycle, rising during recessions and falling during expansions (Figure 2).

While these figures give us information about the numbers of workers who are unemployed, we would really like to know about the flow of workers into and out of unemployment. Further, if we want to characterize turnover in the labor market, we need to look at flows into and out of employment as well. This overall turnover is related to restructuring in the economy: if firms are continually restructuring to improve their profitability and if workers are improving their prospects by acquiring new skills, there will be large flows of workers into and out of employment and unemployment. These flows are associated with the creation of new jobs and the destruction of existing jobs. Job creation and destruction come about as existing firms expand or contract, as new firms are formed, and as existing firms die. This creation and destruction activity is driven by the actions of both firms and workers: a firm may

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**FIGURE 2**

**Average Duration of Unemployment**

(January 1968 - September 1997)

Data source: Bureau of Labor Statistics
hire workers because of higher demand for its products or because some of its workers quit to search for new jobs or to leave the labor force.¹

The average monthly flow of workers among the categories of employed, unemployed, and not in the labor force is quite large (Figure 3).² For example, according to data compiled by Olivier Blanchard and Peter Diamond, from 1968 to 1986 an average of 1.2 million workers per month moved from employment to unemployment, while 1.6 million workers moved from unemployment to employment. Similarly large flows occurred between the employed and those who are not in the labor force. The fact that more workers moved into employment than moved out means that the number of people working rose over time.

Data on gross flows are much more difficult to collect than data on unemployment and its duration. As a result, the data on gross job flows are currently available only up to 1986. The extent to which the patterns observed between 1968 and 1986 continued to hold after that period is an open question. The 1990s have been a time of high turnover as well: many firms have restructured and downsized. Overall, the evidence points to a labor market that is very dynamic: lots of turnover as workers shift between employment, unemployment, and not in the labor force.

¹We can distinguish between gross and net job creation and destruction. For example, whenever a worker is separated from a job, that job can be considered destroyed, and it contributes to the gross job-destruction count. What is often measured, though, is a net job creation and destruction count that compares numbers of jobs at two points in time. Thus, if a worker is separated from a job and the job is filled a short time later, there may be no measured change in net job creation and destruction even though gross job creation and destruction have changed. In the text, when we refer to job creation and destruction, we mean net job creation and net job destruction.

²The Bureau of Labor Statistics’ survey counts individuals as “not in the labor force” if they did not work during the survey week and were not counted as unemployed. A worker is unemployed if he did not work during the survey week, was available for work, and searched for a job sometime during the previous four weeks.
Restructuring During Recessions: A Silver Lining in the Cloud?  
Keith Sill

Employment is procyclical: it rises during expansions and falls during recessions. The fall in employment during recessions can come about in two ways: the normal flow of workers moving from not employed (unemployed or not in the labor force) to employed decreases, and the flow of workers moving from employed to not employed increases. However, if we focus first on the flows between employed and unemployed (later, we’ll talk about those not in the labor force), we find that, during recessions, the movement of workers from employed to unemployed rises, but the movement from unemployed to employed rises as well (Figure 4).

Why does this second movement occur? The increase in unemployment during recessions can benefit firms wishing to hire workers, since they now have a larger pool of applicants from which to choose. As the pool of unemployed workers increases, the cost to firms of searching for a good match between jobs and workers may fall because firms can more easily match workers’ skills with available jobs. Consequently, the number of workers hired goes up. Even during recessions, the labor market remains quite active and not all firms are firing or laying off workers (Figure 4).

Furthermore, during recessions, some workers not in the labor force are enticed to re-enter and begin searching for jobs, perhaps because

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**FIGURE 4**  
Monthly Flows Between Employment and Unemployment  
(January 1968 - December 1981)

second-income earners in households enter the labor market when primary-income earners lose their jobs (Figure 5). On balance, a good deal of job-searching activity by both workers and firms occurs during economic downturns.

**Job Flows in the Manufacturing Sector.** Some detail on job flows in manufacturing can be obtained by looking at a data set compiled by economists Steven Davis, John Haltiwanger, and Scott Schuh. They collected plant-level data on job flows for the U.S. manufacturing sector using data from the U.S. Bureau of the Census. They defined *job creation* as employment gains summed over all plants that expand employment or start up over a selected interval, such as a quarter or a year, and *job destruction* as employment losses summed over all plants that reduce employment or shut down over a selected interval. The net employment gain, which measures the overall addition to or subtraction from manufacturing employment, is the difference between job creation and job destruction.\(^3\) *Job reallocation* is defined as the sum

\[^3\]The annual data in the book by Davis, Haltiwanger, and Schuh measure changes in the job count at plants from March of one year to March of the next. Thus, if a worker is laid off and then rehired at the same plant within the March-to-March period, he would not be counted in the job creation or destruction numbers.
of job creation and job destruction and represents the amount of job reshuffling across plants.

Like the overall economy, the manufacturing sector undergoes a large amount of job reallocation (see Table). In an average year, a little over 19 percent of manufacturing jobs are either created (9 percent) or destroyed (10 percent). The negative number for average net employment growth reflects the fact that manufacturing employment has been declining since the early 1970s as more workers have been hired to provide services and fewer have been hired to produce manufactured goods. In fact, the job creation rate peaked in 1984 when it hit a little over 13 percent. The job destruction rate hit a high of 16.5 percent in 1975, the same year in which the job creation rate plummeted to its lowest level, about 6 percent. On a year-to-year basis, job destruction is about 50 percent more volatile than job creation, that is, the destruction rate shows much wider yearly swings than the creation rate (Table).

If we associate job reallocation with firm or plant restructuring, the data suggest that the U.S. manufacturing sector experiences a great deal of ongoing restructuring as firms attempt to improve productivity and profitability and as workers search for better employment matches. One might suspect though that much of the job destruction and job creation activity represents temporary firing and hiring by firms in response to changing demand and may not correspond very closely to restructuring activity. Can the data help us sort this out?

Davis, Haltiwanger, and Schuh have also compiled statistics on the permanence of jobs created and destroyed. They found that 70 percent of jobs created in a given year are still filled one year later, and 54 percent remain filled two years later. Some 82 percent of jobs destroyed in a given year remain so one year later and nearly 74 percent two years later. These numbers suggest that job destruction and creation are quite persistent in the manufacturing sector and most likely reflect some fundamental reorganizing activity at the plant level.

**Job Flows and the Business Cycle.** Now that

#### TABLE

**Annual Flows as a Percentage of Employment in Manufacturing 1972-1988**

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Volatility*</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Creation</td>
<td>9.1</td>
<td>2.1</td>
<td>6.2</td>
<td>13.3</td>
</tr>
<tr>
<td>Job Destruction</td>
<td>10.3</td>
<td>3.1</td>
<td>6.1</td>
<td>16.5</td>
</tr>
<tr>
<td>Net Employment Growth</td>
<td>-1.1</td>
<td>4.8</td>
<td>-10.0</td>
<td>5.7</td>
</tr>
<tr>
<td>Job Reallocation</td>
<td>19.4</td>
<td>2.1</td>
<td>16.7</td>
<td>23.9</td>
</tr>
</tbody>
</table>

Source: Author’s calculations based on the job flow data from Davis, Haltiwanger, and Schuh.

* Volatility is measured by standard deviation, which is the square root of the variance. Variance is the average sum of squared deviations from the mean.
we have some idea about the magnitude of the average flows in manufacturing jobs, we can look at how job flows vary over the business cycle. Job creation tends to fall in recessions and job destruction tends to rise, but the movement in job destruction is much greater (Figure 6). As confirmed by the numbers in the table, job destruction is much more volatile than job creation, a pattern suggested as well by the flows between employment and unemployment for the entire economy (see Figure 4).

During economic downturns, firms tend to slow the rate at which new jobs are brought on line and increase the rate at which jobs are terminated. For example, from 1972 to 1988, for all manufacturing plants combined, the quarterly job creation rate during recessions is about 1 percentage point lower than during expansions, while the job destruction rate rises a little over 2 percentage points in recessions. Over the business cycle, the rates of job creation and destruction demonstrate an asymmetry: job destruction varies much more than job creation. This asymmetry holds up when plants are broken down by age, size, and average wages paid, but tends to be more pronounced for older, larger, higher-wage plants.

These observations indicate a significant difference in plants’ responses to economic events. The high rates of job creation and destruction over the business cycle suggest that a lot of restructuring activity goes on in both recessions

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**FIGURE 6**

Quarterly Job Creation and Destruction
Manufacturing Sector

Data source: Davis, Haltiwanger, and Schuh, 1996.
but expansions. Even during recessions, the job creation rate remains fairly high. Davis, Haltiwanger, and Schuh summarize some of the evidence related to business cycles by noting that “job flow dynamics in good times are dominated by the creation and destruction of jobs among relatively young and small plants. These younger and smaller plants are, like young workers, trying to determine whether and where they fit into the marketplace. During recessions, older and larger plants experience sharply higher job destruction rates, so their contribution to the process of job and worker reallocation rises. This time of intense job destruction by older and larger plants coincides with the rise in layoff unemployment, especially among prime-age workers.”

Recall that job reallocation is defined as the sum of job destruction and job creation and is a measure of the flow of jobs across plants. Another way of measuring job flow activity is excess job reallocation. This measures the amount of job creation and destruction that occurs beyond the amount required to account for the increase or decrease in total manufacturing employment. For example, in 1984 manufacturing employment grew 5.7 percent. The growth in employment could have been accommodated by a job creation rate of 5.7 percent and a job destruction rate of zero, which would mean excess job reallocation was zero. But, in fact, job creation was over 13 percent in 1984 and job destruction was about 7.5 percent, so excess reallocation was a bit over 15 percent.

Thus, many more jobs were created and destroyed than the minimum amount required to account for the growth in employment. While excess job reallocation is generally higher during expansions, a significant amount occurs during recessions: on a quarterly basis, the average rate of excess job reallocation for all manufacturing plants is 9.2 percent in recessions and 10.2 percent in expansions. This compares to a quarterly average job reallocation rate for all manufacturing plants of about 12 percent in recessions and 10.6 percent in expansions. The bottom line is that a lot of job-flow activity occurs during both recessions and expansions.

THEORIES OF RESTRUCTURING

One common view of firms’ behavior during recessions holds that recessions are caused by negative economic shocks that affect most firms at about the same time. Furthermore, this view suggests that most firms respond to a bad economic shock in a similar fashion: they reduce production and employment, which results in an economywide recession. However, the observation that a lot of job reallocation occurs during recessions means this view can be refined to reflect the different ways that firms respond to shocks.

The facts about job and worker flows have led to several theories about business cycles and resource reallocation. Here, we discuss two of the more prominent theories.

The first view highlights the role of allocative shocks to the economy as a potential driving force in the overall business cycle. When these shocks hit, resources must be reallocated across

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5Davis, Haltiwanger, and Schuh, p.146.

6Excess job reallocation is measured as job reallocation (the sum of job creation and destruction) less the absolute value of the net change in employment.

7Specifically, job reallocation was 20.9 percent in 1984 — the sum of a job creation rate of 13.3 percent and a job destruction rate of 7.6 percent. So excess reallocation was 20.9 percent - 5.7 percent = 15.2 percent.

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8An economic shock is an unexpected event, good or bad, that affects the operation of the economy.

9Allocative shocks are unexpected events that affect the closeness of the match between the economy’s existing resources and its desired use of those resources. For example, a drought in the Midwest could lead to significant resource reallocation in the agricultural industry and its suppliers.
firms and industries, and a recession may result as part of the transition. Individual firms are also subjected to a type of allocative shock, ones that are unique to their enterprise. These firm-specific shocks also lead to a reallocation of resources. In the manufacturing sector, firm-specific shocks play a significant role in the overall movement of jobs and workers. A sectoral shock, one that affects a specific industry, is another type of allocative shock. For example, a strike in the coal industry affects coal suppliers and users as well as the firms and workers who supply products to the industry.

The second view pinpoints aggregate shocks, such as a fall in aggregate demand, as the primary driver of the business cycle. These shocks affect many industries and firms simultaneously. Firms then take advantage of these periods of low demand to reorganize their production because the cost of doing so in terms of forgone profits is less than it would be in expansions.

Both of these views stress the fact that firms are not all alike and that the economy has imperfections that lead to large flows among workers and jobs over the business cycle.

Allocative Shocks and the Business Cycle. A prime example of an allocative shock is a large, unexpected change in the price of oil. Since World War II, there has been a close relationship between oil-price shocks and recessions in the U.S. economy. In fact, James Hamilton has documented that an oil-price shock preceded all but one of the postwar U.S. recessions. Steve Davis, Prakash Loungani, and Ramamohan Mahidhara found that oil-price shocks were a major factor in postwar regional unemployment cycles in the United States. Oil-price shocks may cause major economic fluctuations by upsetting the closeness of the match between desired and actual amounts of labor and capital inputs used to produce goods and services, that is, the workers employed at a firm and the physical plant, machinery, and equipment used in production.

For example, consider the transportation industry and the oil-price shocks of the early 1970s. After the rise in oil prices, demand shifted toward more fuel-efficient means of transportation and away from the inefficient products then offered by the industry. This shift caused a great deal of upheaval in the U.S. automobile industry as consumers switched to small cars, which were not then widely offered by domestic producers.

In other words, the industry specialized in the production of a good for which demand had suddenly dropped. The automobile industry went through a long and wrenching process of redesigning cars, retooling plants, and retraining workers in an effort to meet the new demands of consumers. At the peak of the business cycle in 1973, just before the oil-price shocks helped drive the economy into recession, employment in the production of motor vehicles and equipment was 973,000 workers. By the next business cycle peak in 1980, employment in this sector had fallen to 852,000, and by the 1990 cyclical peak, employment had dropped even further to 826,000 workers. From 1973 through 1980, the average quarterly rate of job reallocation in automobile manufacturing was about 16 percent.

Similarly, many households and firms switched from oil to other products, such as coal and natural gas, to produce heat and other forms of energy. This led to disruption in the distribution pattern of energy resources and required investment in, and installation of, new capital equipment, such as furnaces and pipelines.

Other examples of allocative shocks include cutbacks in defense spending by the U.S. government; weather events, such as hurricanes; significant changes in industry regulation, such as allowing banks to branch into other states; and the invention of new technologies, such as personal computers. In each of these cases, the shock initially affects a narrow sector of the economy — an industry or a location, for ex-
ample. As a result, the shock alters the match between desired and actual labor and capital inputs used to produce goods and services.

The large flows of jobs and workers that occur over the business cycle suggest that the economy is continuously buffeted by allocative shocks. It is an open question how much these allocative shocks contribute to economywide recessions and expansions. Various studies come to different conclusions on the issue: some find that allocative shocks may account for as much as 40 to 60 percent of the variability of output and unemployment, while others find that aggregate shocks explain almost all of the variability. Allocative shocks most likely play a significant role in the restructuring activity that occurs within firms and industries, but a consensus has not yet emerged on how important a role they play in causing recessions and expansions.

Aggregate Shocks and Restructuring Activity. Theories that attribute a prominent role to aggregate shocks as the driving force behind business cycles argue that recessions and expansions are caused by an event common to all participants in the economy. This argument implies that a single economic shock accounts for the similar movements in production and employment across different sectors of the economy over time. This view does not rule out allocative shocks as a significant factor in the restructuring that occurs in the economy, but says only that aggregate shocks play a much larger role in generating recessions and expansions. Aggregate shocks may interact with allocative shocks to produce complicated flows of workers and jobs across firms and industries.

If aggregate shocks cause recessions and expansions, how do we account for the intensity of restructuring activity during recessions? Suppose a firm finds itself in an economywide recession caused by a falloff in aggregate demand. The firm can either use its capital and labor to produce output or reorganize its capital and labor in an effort to improve productivity. The firm has the option to forgo current production and instead expend resources to restructure, taking advantage of new management methods or new technologies that will eventually improve efficiency and profitability. In a recession, the profits forgone by the firm if it devotes more resources to restructuring and less to producing goods are low compared to what they would be in an expansion. In an expansion, demand for the firm’s output is high, sales are brisk, and profitability is up. The firm has less incentive to reduce its production activity and devote resources to productivity-enhancing restructuring.

Another side of restructuring activity is that it may be advantageous to scrap old machinery, equipment, and plants. Outdated equipment is likely to be the least profitable for a firm and so becomes a larger drain on profitability in periods of economic downturn. Scrapping older equipment and shutting down outdated plants would entail a significant amount of job destruction.

What about job creation? The data show that the rate of job creation does not decline much during recessions, which suggests that some firms continue to add jobs and workers. These new jobs and workers are likely to be more productive for firms than jobs and workers associated with its older technology and equipment.

10There is a fairly large literature on the contribution of sectoral and aggregate shocks to the cyclical variability of economic aggregates. A few of the most recent studies are those by Russell Cooper and John Haltiwanger; Lael Brainard and David Cutler; and Olivier Blanchard and Peter Diamond (1989).

11The following discussion draws on research presented in the articles by Ricardo Caballero and Mohamad Hammour; Philippe Aghion and Gilles Saint-Paul; Robert Hall; Gilles Saint-Paul; Charles Bean; and Davis, Haltiwanger, and Schuh.
If it is more costly to add new workers and jobs at a faster rate — say, because of training and capital installation costs — firms will have an incentive to keep job creation somewhat smooth. If firms stopped adding new workers during recessions, it would be very costly for them to “catch up” during the next expansion. Thus, more of the downsizing activity may involve eliminating the most unproductive jobs and plants. In this view, job creation would be smoother than job destruction over the business cycle.

This theory has implications for economic growth and the cyclical behavior of productivity. Suppose firms find it less expensive to pay the costs of restructuring during recessions and then reap the benefits of a more efficient organization in the future. Higher productivity can translate to faster growth for the firm and, by extension, for the economy. These productivity-improving activities by firms may take the form of devoting resources to retraining their workers or to reorganizing the existing pattern of production to become more efficient. These types of activities are difficult to measure. If firms shift more workers to these hard-to-measure activities and away from directly producing output, measured output falls more than measured labor input, and, hence, measured productivity falls. In this view, measured productivity is procyclical (increasing when economywide output rises), which is indeed what we see in the data for the U.S. economy.

Several criticisms can be levied against the view that firms restructure during recessions primarily because the cost of doing so is lower. Most of the investment measured by the government and used to compute gross domestic product, such as spending on capital goods, is procyclical. So why is some productivity-improving investment countercyclical (increasing when economywide output falls) rather than procyclical like other investment? Some of the restructuring activity that occurs during recessions may be in a form that is hard to pick up in standard measures such as those used to compute gross domestic product. Furthermore, productivity-improving investments with long-term benefits, such as retraining workers, are more likely to be countercyclical, since firms are more willing to wait until the next expansion to benefit from them. That is, the firm knows that the benefits from the investment will still be in place when the expansion starts and demand picks up.

Financing constraints may play a role here as well. Some firms have difficulty borrowing to finance new investment, particularly during economic downturns. For these firms, cash-intensive investment activities, which are easier to measure, are likely to be procyclical: the firm will be able to undertake them only when sales are brisk and cash inflows are high. On the other hand, productivity-improving investments that involve the redistribution of existing resources are less likely to be subject to these finance constraints, since they are not as cash-intensive. Thus, firms might find it advantageous to undertake these investments when output and cash flow are low.

Another criticism of the theory is that firms may have a greater incentive to introduce new technologies and innovations in booms, when demand and profits are high. When profits are high, firms can more quickly recover the costs of innovation. Furthermore, many firms innovating in a boom heighten the boom, which, in turn, promotes even more innovation. In addition, when output is high and firms are developing new technologies, other firms may learn about new innovations from observing their competitors. These observers can then introduce some of these innovations into their own production process. So, there are reasons to believe that a lot of procyclical restructuring activity may occur. This procyclical activity may

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12 Labor productivity can be measured as output divided by worker input.
be much more important than reorganization investment that is countercyclical.

Other Evidence on Restructuring Activity During Recessions. The data on job creation and destruction provide some evidence in favor of the view that a good deal of restructuring activity occurs during economic downturns. This restructuring can be driven by aggregate shocks, allocative shocks, or a combination of the two. No matter the source of the shocks, the restructuring-during-recessions theory implies that productivity may respond favorably to economic slumps. If firms undertake their productivity-enhancing activities during recessions rather than booms, overall productivity for the economy should rise in response to this investment.

Several studies have found that adverse shocks to the economy can lead to higher productivity or that there is a slight positive correlation between unemployment and productivity growth. However, the statistical evidence in support of the theory is modest at best. Isolating the effects consistent only with the restructuring-during-recessions view is difficult. For example, the data may include the effect that, during recessions, some firms may be closer to bankruptcy and therefore forced to reorganize. Or perhaps recessions seem to lead to higher productivity because they affect low-skill workers more adversely than high-skill workers.

The evidence is not conclusive for the restructuring-during-recessions view, but it is not inconsistent with that view either. Most likely, some of the restructuring undertaken during recessions is voluntary, and some is an involuntary response to financial distress. Does the nature of the restructuring matter? If firms that are not financially distressed during recessions undertake voluntary restructuring, restructuring will be more widespread, and economic policies may change the incentives to invest in productivity-improving reorganization.

POLICY IMPLICATIONS

The large amount of job creation and destruction that occurs over the business cycle suggests that not all firms respond in the same way to economic shocks, whether allocative or aggregate. Much of this job reallocation seems to be associated with restructuring activity at these firms. What are the implications of these observations for economic policymakers?

Consider targeted industrial policies, such as those designed to promote growth in a specific sector of the economy. If a common set of identifiable circumstances or factors is holding back all firms in a sector, policies that offer regulatory and tax relief, government subsidies, or protection from foreign competition would be more likely to spur growth.

However, Davis, Haltiwanger, and Schuh argue that, for the data on manufacturing plants, job flows within sectors dominate job flows across sectors of the economy. This holds true whether sectors are defined by industry, geographic region, plant size, or plant age, suggesting that firm-specific shocks play a major role in the job reallocation that occurs over time. If sectoral shocks were most important, flows across sectors would dominate for at least some sectoral breakdowns. But if, indeed, firm-specific shocks drive a large part of job reallocation and firm restructuring, targeted industrial policies will be of limited use because they are designed to modify factors common to all firms within a sector. Thus, designing an effective targeted industrial policy is likely to be very difficult.

13See the articles by Bean; Saint-Paul; and Caballero.

14That is, plants are first classified by sectors. Excess job reallocation is then broken down into a component caused by shifts in employment within a particular sector and a component caused by shifts in employment across different sectors.
Now, let’s consider a different set of policies, such as minimum wages, job protection, and generous sick leave and unemployment benefits. These policies can hinder the reallocation of workers between firms and work activities by raising firms’ costs of hiring and firing workers or by changing workers’ incentives to search for employment opportunities. Such policies, in an effort to provide greater security for workers, could slow a firm’s restructuring process because they hinder its flexibility to alter its workforce. On the other hand, the total economic cost of such policies is unknown. Unrestricted competition in the labor market may not generate an efficient amount of restructuring because of factors such as imperfect information and inefficient wage-setting arrangements.

Generous worker benefits are more common in Europe than in the United States and may be a contributor to the persistently high unemployment rates in Europe. Firms will be more reluctant to create permanent jobs when the cost of doing so is higher. An extreme case is Spain: there, a permanent employee who is fired may receive generous compensation equal to 45 days’ pay times the number of years the worker was with the company. Spanish firms have responded by creating few permanent positions and, instead, offer temporary contracts that carry less job protection. About 30 percent of Spanish workers are covered by these temporary contracts. Almost 50 percent of workers under 24 years of age are unemployed. In addition, generous worker benefits in Spain have led to a sharp distinction between “insiders,” who have jobs, and “outsiders,” who do not, and has led to low aggregate job creation.

A prominent hypothesis is that the United States has created many more jobs than Europe over the last 30 years because U.S. labor markets are more flexible. However, the story is more complicated than that. Job reallocation rates in the largest European countries (Germany, France, Italy, and the United Kingdom) are not that different from those in the United States, so, by that measure, European labor markets are nearly as flexible as U.S. labor markets.\(^{15}\) A major reason the United States has created more jobs since the 1960s is that the supply of labor went up more in the United States than it did in Europe, largely because of women entering the U.S. labor force in great numbers. These additional workers were then successfully absorbed into the workforce as evidenced by the relative decline in the U.S. unemployment rate. Looking at data across countries does not reveal a significant relationship between job reallocation and unemployment rates. However, more of the unemployed in countries with low rates of job reallocation do seem to have long spells of unemployment.

The restructuring of jobs over the business cycle also has implications for government stabilization policies. Stabilization policies are actions that attempt to use monetary and fiscal policy to smooth out recessions and expansions, keeping economic growth on an even keel. Our overview on the theory and evidence of restructuring over the business cycle raises several questions. Do stabilization policies delay economic restructuring and possibly alter the long-term prospects for economic growth? If stabilization policies delay restructuring, do they merely put off a more severe day of reckoning? Is the pace of economic restructuring efficient, or are there policies that can improve efficiency?

Economists are just beginning to address these questions, so definite answers are not yet available. But recent research points to some possibilities.\(^{16}\) Suppose an expansionary policy aims to boost economic growth either to help the economy out of a recession or to boost the

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\(^{15}\)See the article by Dale Mortensen and Christopher Pissarides.

\(^{16}\)See the 1994 article by Caballero and Hammour and the one by Alwyn Young.
economy’s long-run growth prospects. The policy might take the form of incentives, such as an investment tax credit, that encourage firms to undertake investment in new technologies. Another policy, such as lowering the corporate income tax, may provide production incentives that encourage firms to produce more output. On the surface, these policies seem to be the same, but they differ in an important way. Creation incentives (those that encourage investment in new technologies) have a direct impact on a firm’s decision to invest and lead to more intense hiring in the labor market as firms put new capital in place. Increased hiring activity can then help buttress wages. Production incentives (such as a cut in the corporate income tax) affect investment decisions as well, but they also encourage firms to keep older production technologies in place longer: the cost associated with using an older technology rather than scrapping it in favor of a new, more productive technology is effectively lowered.

Creation incentives have an ambiguous effect on unemployment: their effect depends on the degree to which destruction of old technologies and jobs offsets the positive impact that investment in new technologies has on employment. Production subsidies lower unemployment but lead to greater use of old equipment. Both policies can potentially increase employment and production in the economy, but could they be taken to excess? If creation incentives are too strong, the economy may undertake too much restructuring at too fast a pace and too high a cost. If production incentives are too strong, we can imagine a case where the adoption of new technologies is slowed by a reluctance to retire old machinery and equipment, which ultimately may have negative consequences for economic growth.

The empirical evidence on this issue is slight, especially concerning stabilization policies. A study by Alwyn Young looks at the long-run growth experiences of Singapore and Hong Kong and identifies a potential cost of excessive restructuring. In the post-World War II period, these economies have grown at about the same rate, but they have invested at very different rates. The Singapore government put policies in place that boosted investment as a share of GDP from about 10 percent in 1960 to more than 40 percent in 1984. Over the same period, investment relative to GDP hovered around 20 percent for Hong Kong, which had a much less activist government.

Despite the much more massive investment, Singapore did not grow any faster, on average, than Hong Kong over the postwar period. In fact, Young shows that all of Singapore’s per capita real GDP growth came about through the accumulation of more capital and not through increased technological progress. Hong Kong had significant technological progress over the same period and so was able to achieve the same amount of growth with much less investment. The people of Hong Kong appear to be better off. Hong Kong’s ratio of consumption to GDP hovered around 70 percent over the period 1970 to 1992, while real GDP grew an average of about 6.3 percent per year. In Singapore, the ratio of consumption to GDP has fallen from 73 percent in 1970 to 53 percent in 1992, while real GDP growth averaged about 6.9 percent. So, at least as of 1992, the people of Singapore were not seeing the benefits of rapid growth in terms of consumption when compared with the people of Hong Kong.17

Young concludes that the Singapore government’s policies to encourage investment in new technologies and production were too strong and have led to a too rapid pace of restructuring, thereby adversely affecting productivity. He hypothesizes that the pace of restruc-

17 Although Singapore has a high rate of saving, it has a low return on capital. Young’s analysis implies that Singapore’s real return on capital had fallen to about 10 percent by the late 1980s. In contrast, the real return on capital in Hong Kong remained above 20 percent over 1960-86.
turing is so fast that workers do not have enough time to learn to work effectively with new technologies and new capital in an industry. Before workers learn to use existing resources, those resources are shifted to a new industry or the existing technology is replaced by a next-generation technology. Thus, Singapore may have encouraged too much investment.

CONCLUSION

The U.S. economy is characterized by large flows of workers into and out of unemployment and by the shifting of jobs between firms. These flows suggest that firms are continuously restructuring their production activities and that this restructuring is particularly intense during recessions. The intensity of restructuring observed during recessions may be due to allocative shocks that affect different firms and industries in different ways, leading to a large flow of workers between jobs and firms. This job flow activity could be severe enough to show up as an economywide recession. Although there are no firm estimates, some research suggests that as much as 40 to 60 percent of the variability of output might be due to allocative shocks. Alternatively, it may be that aggregate demand shocks are the primary causes of recessions and that firms take the opportunity provided by recessions to reorganize production because the cost, in terms of forgone profits, is lower in recessions.

The large amount of restructuring that occurs during recessions carries policy implications. Designing effective targeted industrial policies to help specific sectors may be difficult, since the evidence suggests that most restructuring occurs in response to firm-specific shocks. Policies that hinder the restructuring process are likely to have an adverse effect on employment and economic growth in the long run. On the other hand, policymakers must guard against promoting too much restructuring at too fast a pace and too high a cost, which can adversely affect productivity.

REFERENCES


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