

**Schumpeterian Labor Economics:
The Labor Pains (and Labor Gains) from
Creative Destruction**

Short running title: Schumpeter Labor

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Brief Abstract

The innovative new products from creative destruction benefit the consumer, but the benefits to the consumer must be weighed against the costs to labor in terms of technological unemployment. The first section examines the magnitude and duration of unemployment from creative destruction. The second section examines whether the new jobs created are generally better or worse (in terms of worker satisfaction and other criteria), than the old jobs destroyed. The third section examines the actions of workers and the policies of government, that would reduce the costs, and increase the benefits, to workers of the process of creative destruction.

Extended Abstract

The current research is a part of a broader research program (Diamond 2006, 2007, 2009) in which I argue that the process of creative destruction has not received sufficient emphasis in research, or encouragement in policy.

The process of creative destruction is increasingly viewed (e.g., Aghion 2002, Baumol 2002, Caballero 2008, DeLong and Summers 2001) as a source of economic growth. The primary obstacle to policies accelerating the process is the belief that the benefits of creative destruction may not sufficiently outweigh the costs in terms of labor market disruptions.

The current paper has three broad parts. The first evaluates the types and magnitude of effects on labor that arise from the process of creative destruction. In

evaluating the effects, I first document that the job creation from creative destruction is of equal magnitude to the job destruction (e.g., see Cox and Alm 1992), but is under-reported because of costs and incentives faced by business journalists and government data collectors (e.g., see Murmann, 2003, p. 205).

The second part of the paper examines whether, on average, the quality of the new jobs created, is higher than the quality of those destroyed, in terms, for instance, of requiring more reasoning and creativity, and involving less routine (see Cox and Alm 2003), and less physical danger.

The third part of the paper presents the policies that can be taken by the government, and the actions that can be taken by workers, to reduce the costs of any dislocations that might result from creative destruction.

Recent developments in the labor market, especially related to the internet, have reduced the costs to workers (see Daniel Pink 2001). I discuss government policies that also have reduced, or could reduce, the costs to workers of changes from creative destruction. Progress in dampening the volatility of business-cycles, and especially of reducing the risks of a severe depression, reduces the costs to workers. Policies, more generally, that reduce the unemployment rate also lower workers' costs. These would include lower taxes, less labor market regulation, and lower health-care costs.

I also examine the role of government in providing the rules and infrastructure for an open and efficient capital market (e.g., see Rajan and Zingales 2003). Improving education is one more way that government can play a role, so that workers

'learn how to learn' and hence become more resilient to changes in the labor market. Policies that improve workers' ability to cope with temporary job loss, would also be beneficial. Included here would be policies that strengthen the family, and strengthen workers' ability to save.

More briefly, I finally discuss actions that workers can take to increase their own resilience to changes that result from creative destruction. These would include thoughtful decisions about investing in general human capital, and investing in continuing education.

JEL codes: J6 – Mobility, Unemployment, and Vacancies

Key words: technology, growth, productivity, Schumpeter

1. Introduction

The process of creative destruction is increasingly being recognized both by theorists (e.g, Aghion, Baumol 2002) and by empirical and policy-oriented economists (e.g, Baily 2001, DeLong and Summers 2001, Easterly 2002), as providing essential insights on how capitalism succeeds in producing economic growth. I argue elsewhere (Diamond 2006) that a growing body of evidence indicates that these economists are correct.

The current paper is part of broader project in which I argue that academics and practitioners have under-appreciated and made too little use of Schumpeter's process of creative destruction in understanding capitalism, as reflected in their research, teaching and public policy advice. In an early part of the project, I highlight the historical and potential future benefits to consumers from the innovations that are produced through creative destruction. I show that a growing number of academics (and practitioners) at least sometimes recognize this. But I also argue that economists still base almost all of their research on what Schumpeter identified as the standard textbook price competition model of capitalism.

If growth is the upside to creative destruction, government economists (Alan Greenspan 2003),¹ congressmen (Barney Frank 2007) and policy analysts (Thomas Friedman 2005), have identified labor market uncertainty as the major downside to creative destruction.² Richard Nelson (2004) has argued that the process of creative destruction has major implications for labor economics, but that these implications have been understudied, due partly to the historical accident that most of those with an

interest in Schumpeter have had backgrounds in the areas of industrial organization or economic development.³ In this paper I propose to contribute to the remedying of this neglect.

Beyond this first introductory section, the main body of the paper is divided into three main sections. Section 2 is about the severity of job loss due to creative destruction. Section 3 is about the relative quality of the old jobs destroyed, and the new jobs created. And section 4 is about what individuals and government can do (or refrain from doing) to ease labor's pain from creative destruction. In my section 5 conclusion, I provide an example of how labor markets that are open can, at their best, provide great benefits both for consumers and for workers.

2. How Much Unemployment from Creative Destruction? (How Long Until a New Job, and How High-Paying and “Good” Is New Job?)

To learn whether, on balance, workers suffer greatly from creative destruction, we need to learn the costs to workers from creative destruction, and the benefits to workers from creative destruction, and then we need to evaluate the net effects. In this section, I begin by facing the costs head-on, the most discussed of which is the loss of employment from creative destruction.⁴

It is not hard to understand why it is commonly believed that the level of job loss due to creative destruction is severe. One reason is partly due to Schumpeter himself. The Great Depression is the most severe episode of economy-wide job loss, in terms of levels of unemployment, duration of unemployment, and suffering from the unemployment. In more than one location, Schumpeter discussed depressions in general, and the Great Depression in particular. The short version of Schumpeter's own position, was that the Great Depression was just a particularly severe case of the inevitable contraction that results when resources must be re-allocated after a wave of innovations. But in his fuller and more subtle analyses of the Depression, Schumpeter argued that poor policy decisions had made the Depression worse than it had to have been.⁵

And since Schumpeter's death, the evidence has grown implicating bad policy. While some economists⁶ believe that there is still more to learn about what made the Great Depression so deep, and so long-lasting, it still is true that many economists believe that we have learned enough to be able to propose policies that would greatly reduce the severity and length of any future depression.⁷ In particular, we know enough to avoid the main cause of the severity of the Great Depression, the contraction of the money supply; and we know enough to avoid the massive tariffs that made the severity even more severe.⁸

So if creative destruction is not responsible for the pains to labor from a Great Depression, what is the worst pain that creative destruction might cause? In Schumpeter's full account of business cycles, he argued that innovations come in

waves, and that the economy absorbs and adjusts to those waves through a process that causes the ordinary business cycle. On the Schumpeterian account, the effects of these innovation-induced reallocations, though not as severe as the labor pains of a Great Depression, can still be substantial.

But here too, we believe that we know more than Schumpeter did. Many of those who are generally sympathetic to creative destruction, doubt that innovations regularly are bunched in waves (e.g., see Mansfield 1983). If innovations do not occur in waves, then the process of reallocation would be on-going, and may be less likely to result in economy-wide dislocation.

Even so, with creative destruction, jobs are lost. The popular impression is that this problem is severe. Several questions are relevant. How many jobs are lost? How long does it take for those who lose their jobs to find others? And what is the pay of the new jobs versus the old jobs?

Much of the recent literature⁹ on job creation has occurred in the context of a major empirical research effort by Davis, Haltiwanger, and Schuh (1996). They make use of Census data on manufacturing firms in the United States. One of their main findings is simply the large volume of new jobs created---this finding all the more dramatic since the book is limited to the manufacturing sector, which has not been the major growth sector for jobs in recent decades. Figure 1 reproduces from Siems (2006) some data showing the secular growth in jobs in the United States economy. One important conclusion from the figure is that in the 26 years ' data reported, over 43 million more jobs were created in the U.S. than were destroyed. Another important

conclusion is that there is no evidence of a secular increase in the rate of unemployment.

The worst fears about the effects of creative destruction were that the process would result in a permanent loss of jobs, and hence a secular rise in the rate of unemployment. (As illustrated, e.g., by Jeremy Rifkin's fears about loss of jobs from the spread of computers.) The evidence shows that the worst fears are groundless.

Burgess et al find that worker churning between jobs represents 70% of worker flows in the non-manufacturing sector (2000, p. 497). The authors attribute worker churning to the process of searching and matching between workers and jobs. Presumably, almost all unemployment related to creative destruction would take the form of the destruction of old jobs. If so, then the unemployment that occurs when jobs are preserved, could not be attributed to creative destruction. If our reasoning is sound, then this implies that **at most** 30% of unemployment in the non-manufacturing sector is due to creative destruction, and **at most** 54% of unemployment in the manufacturing sector is due to creative destruction. Most emphasis should be given to the 30% upper bound, since the percent of labor in the manufacturing sector has been declining since at least 1950, and in 2004 was less than 15% (Brauer 2004, p. 3).

Of those 65% of workers who have found full-time jobs in the next period after a full-time job loss, the average salary is 13% less than the salary of their earlier job (Farber 2005, p. 25).¹⁰ For older workers, larger salary declines are usually reported. For instance, Jacobson et al (1993) find for high-tenure workers, 50 years old or younger, that three years after losing their jobs, they earn an average of 25% less than

they did while employed. The sample in the study only included workers who accepted a new job within 12 months or less of losing the old job (p. 708). One of their key findings is that “. . . , losses are larger in settings where unions . . . are likely to be prevalent.” (p. 706; ellipses added) If unions raise wages above their market value, then it is no surprise (and perhaps not as concerning?) when subsequent jobs provide lower pay. Perhaps the appropriate public and policy attitude toward such workers is congratulations for their earlier job where they earned more than the market value of their productivity, rather than sympathy for their later job where they earned only the market value of their productivity.

The worst case for creative destruction is if all older worker job loss is due to obsolescence of older worker technology-specific human capital (see Neal 1995). But older workers lose their jobs, and suffer lower subsequent salaries for other reasons too. For example, they may be working for a less efficient firm, and then lose their job when their firm goes under.

Another reason might be that, through inattentive or timid or insufficiently incentivized management, workers previously had received raises that were not justified by productivity---so when there is a push to cut costs, they are obvious candidates.¹¹ Leonhardt (2007) for example, discusses how senior Circuit City sales workers over time received salary increases not justified by increases in productivity, with the result that for high tenure workers there often was an increasing gap between compensation and value of current productivity. When this happens, we would expect to observe lower mobility, higher probability of layoffs, and lower salaries in new jobs. Hirsch et

al (2000, p. 416) for example, have noted that: “If firms structure compensation to correspond more closely with current productivity, older workers’ mobility should increase.”

It would be useful to have a clearer decomposition of the causes of job loss among older workers. Among causes that have been mentioned in past research, would be: search and matching, trade (a.k.a. globalization, or outsourcing), downturns (a.k.a. recessions, business cycles), and restructuring (see Burgess et al, p. 473; and Labonte 2004, pp. 5-13). Of these reasons for job loss, loss due to creative destruction would be included as a component of the “restructuring” reason. After clarifying the causes of job loss, it would also be useful to try to trace any differences in later outcomes, for workers who lost their jobs for different causes.

For men in their 50s, two years after losing a job, 61% are employed (Chan and Stevens 2001, p. 485). But note that this does not imply that the remaining 39% are unemployed (seeking work without success). As Chan and Stevens emphasize (pp. 485-486) workers age 50 and older, will be weighing the costs and benefits of continued work against the costs and benefits of retirement.

Older workers who lose their jobs may conclude that it is a good time to transition to retirement, especially if they have no dependent children, and if they have pension, retirement savings, equity in a home, or an employed spouse. So for those who truly are unemployed, we cannot conclude that they could not find any work, only that they cannot find work that they are willing to accept, given the pay, location, and other characteristics of the available jobs.

In the discussion so far, and in most of what is to follow, we treat creative destruction as if it is applied to products, and this is the most natural and common interpretation. But Schumpeter himself noted that creative destruction could occur in processes too. So we might briefly ask what the effects on labor would be of process innovation. Blanchflower and Burgess (1998) examined data on process innovation in Britain and Australia, and concluded (p. 130) that in both countries a firm's adoption of process innovations was associated with an increase in the number of jobs at the firm three years later. The authors present this result without much interpretation, suggesting in the end that "the Luddites were wrong" (p. 132). In my view, their finding does not necessarily constitute evidence against the generalization that almost all technologies have turned out to be labor-saving. My hypothesis would be that the process innovations in the study lower the labor used per unit of output, but also lower the costs of producing a unit, and hence lower the price. With lower price, there is greater quantity demanded. And at least in the cases examined by Blanchflower and Burgess, the job-increasing effect of the greater quantity demanded, dominates the labor-saving effect of the new technology. The net effect is job growth.

Various aspects of the process of creative destruction operate (or could operate) in a way that dampen or mitigate negative labor market outcomes. For example, many major innovations through creative destruction, take many years, or even a few decades, to fully unwind. If it takes many years for the horse and buggy to be replaced by the automobile, for example, then the reduction in the number of workers employed

as buggy-whip makers, can occur at least partly by older buggy-whip makers retiring, and new workers choosing other jobs.

And often many of those who work in an industry that is being leapfrogged by a new industry, will be doing work that is needed in either industry. The horse and buggy industry required workers to make wheels, and upholstery, and to do accounting. The automobile industry also required workers to make wheels, and upholstery, and to do accounting.

And even where new technologies require workers to learn new skills, the transition to a new product from creative destruction, need not imply large-scale job loss. Job loss due to technological leapfrogging may be less severe (or less necessary) than is often believed. Collins, in *Good to Great* (2001), makes the case that the kind of workers that a successful firm needs are not mainly those with high levels of technical knowledge, but rather those with certain important character traits---traits like discipline, perseverance, a hard-work ethic, and the like. He emphasizes Nucor, as an example. If Nucor had wanted/needed technical skills, it would have located nearer to metropolitan areas. But it located in rural areas in order to tap into the work-ethic of farmers.

Perhaps the pace of creative destruction has quickened, as is often asserted. But there are counter forces at work too. The media tend to report new innovations once they have matured into major forces. They do not report on the great businesses until it is obvious to all that they have become great---they miss the time period when they are **becoming** great. Using an analogy from Collins (2001, p. 168), they capture the

chicken cracking through the egg, but they miss the earlier development that was going on inside the egg.

Collins points out that the process that preceded the maturation may have taken many years. (One of his examples was again the Nucor steel company.) This would be especially true to the extent that Clayton Christensen's disruptive innovations are common (Christensen 2000; Christensen and Raynor 2003).

For a sample of 46 major product innovations, Gort and Klepper found that on average it took 37 years from when the product was introduced until it had been fully diffused (1982, p. 641). To the extent that such long-term developments are visible, or could be made visible through a more effective business media, workers would have a longer time to make adjustments in occupational choice and human capital investment, to minimize the pain from creative destruction transitions.

The persistence of demand for the old technology in niche applications is another feature of creative destruction that dampens the effect on jobs of the introduction of new leapfrogging technologies. For instance, although the automobile leapfrogged the horse and buggy, there is still some recreational demand for horse and buggies, and so, still some demand for buggy whips. And although vacuum tubes have leapfrogged transistors, there still is a niche demand (for use in guitar amplifiers) for vacuum tubes (see: Kramer, 2006).

One unexpected form of human capital investment, in the context of creative destruction, may be job hopping. Virginia Postrel (2005) has made the case that in Silicon Valley frequent job changes may benefit both workers and firms.¹² The worker

benefits by acquiring a greater diversity of human capital, and possibly achieving a better match between the job and the worker's preferences. Firms benefit by the infusion of new ideas and skills. Notice that this example refutes the common belief that low unemployment corresponds to long job tenure. When there is frequent job-hopping, there can be both low unemployment, and short job tenure.

If the job loss effects of creative destruction are less severe than is commonly thought and can be mitigated in a variety of ways, then we may wonder why the impression of severity is so common. The widely-held impression of the severity of job-loss from creative destruction is probably due, in part, to biased sources of information. We tend to over-emphasize the results of job destruction, because it is in the interests of the news media to over-report the jobs destroyed, relative to the jobs created (see Falvey 1999; Murmann 2003).¹³

Observers as diverse as Leo Strauss (1952) and Michael Crichton (2004), point out that in evaluating evidence and arguments, we are well-advised to learn if the writer has any special interest in spinning the results in a particular direction. (Just as medical researchers are now required to admit any associations they have with drug companies; and "experts" giving advice on CNBC are required to report the stocks that they own.)

The effects of costs and incentives may be more subtle. In *The World is Flat*, Thomas Friedman points out that it takes more digging (read 'higher costs') for a newspaper reporter to find the new jobs created by free trade, than it takes to find the jobs lost from free trade. (Friedman praises his hometown Minneapolis newspaper for producing one such article.¹⁴)

It is easy to understand how this might happen. Frank Knight, and others, have pointed out that labor market outcomes are a combination of merit and other factors¹⁵ (including obsolescence from technological advance, and outsourcing from free-market globalization). Our self-esteem is enhanced if we emphasize the role of merit when we succeed, and emphasize the “other factors” when we fail. Those who obtain new jobs that only exist because there is technological progress or globalization, are usually not going to join lobbying organizations, or labor unions, to lobby for laissez faire economic policies. But those who lose their old jobs because of technological progress or globalization, are very likely to join lobbying organizations, or labor unions, or political campaigns, to lobby for protection against technological progress and free-trade. So when a reporter prepares to write an article on the job effects of technological progress and free trade, many people and organizations are primed to present her with negative examples on a silver platter. But no one has the same motivation to present her with the positive examples. She is likely to be equally rewarded for reporting either sort of example, but old jobs lost are much cheaper to learn about than new jobs found. So if reporting is a job (rather than a mission to find the truth), she will report more examples of old jobs lost. But that does not mean that there are more old jobs lost than new jobs gained.

We may also expect that, like reporters, academics would over-estimate both the extent of job loss, and, when job loss occurs, the harm from job loss. This might happen if academics extrapolate from their own situation. The U.S. academic’s situation is akin to that of workers in Europe. High job security results in a high rate of

unemployment and a long average duration of unemployment. So the academic, based on her own experience, is apt to imagine the consequences of job loss as greater than they usually are for the non-academic population.

3. The Characteristics of New Jobs

In this section of the paper, I argue that, in general, the new jobs created by creative destruction are ‘better’ jobs than the old jobs that are destroyed.

Adam Smith, in a well-known passage,¹⁶ laid out many of the characteristics of jobs that result in the jobs receiving higher or lower pay. One might plausibly assert that the passage is the foundation of the modern theory of “compensating differentials.” In a less-well-known passage,¹⁷ Smith elaborated on how some sorts of occupations have had effects on the intelligence of workers who have “torpor” induced by monotonous jobs.¹⁸ In doing so, he was one of the first economists to discuss how non-wage job characteristics of jobs may benefit or harm workers.

Modern accounts that distinguish job qualities have sometimes anchored their discussion in the work of Abraham Maslow (1954), specifically in his hierarchy of human needs. (Other versions of a hierarchy of values view can be found in Menger and Engel.¹⁹) The idea is that we have basic desires for goods like food, clothing and shelter. But after those are satisfied we seek to satisfy higher level needs, like fulfillment, meaning, control, and creativity. Daniel Pink in his *Free Agent Nation* (2001) has argued that as we feel increasingly secure in the basic needs, we give more

attention to these higher job characteristics. He extends the argument in his *A Whole New Mind* (2006) and *Drive* (2009). And many others have written along the same lines (e.g., Michael Lewis 2000, Tom Peters 2003, Richard Florida 2002).

Evidence that jobs are improving according to criteria like the Maslow hierarchy, can be classified as either historical or more recent. First, I briefly discuss some of the historical evidence.

In the early period of the industrial revolution, that first created the process of creative destruction, Nassau Senior observed that the factory system had improved the conditions of labor. He described the new conditions of labor as “. . . the comparatively light labor which is exerted in the warm and airy halls of a well-regulated factory” (1928, p. 309).

If we broadly and historically compare early and new occupations under capitalism, a case can be made that in many ways the characteristics of the new occupations are better than the characteristics of the older occupations. One way to see this is to peruse Figure 2 which has been reproduced from an article by Cox and Alm (1992) on labor market churn.

Other important evidence can be found in an important and well-known paper by Paul David (1990) on how the introduction of the dynamo into American industry enabled great increases in productivity, including most notably the horizontal production process of the assembly line. In part of his discussion, David compares the vertical structure of the pre-dynamo factory, with the horizontal structure of the post-

dynamo factory. He notes that the leapfrog in production methods enabled by the dynamo, resulted in significant improvements in the job characteristics of labor:

Factory designs adapted to the unit drive system also brought improvements in working conditions and safety. Lighter, cleaner workshops were made possible by the introduction of skylights, where formerly overhead transmission apparatus had been mounted; and also by the elimination of the myriad strands of rotating belting that previously swirled dust and grease through the factory atmosphere, and, where unenclosed within safety screening, threatened to maim or kill workers who became caught up in them. (David, p. 359)

There has been improvement along other dimensions as well. Many of us would probably agree with Alan Greenspan (2003) when he suggests “that the vast majority of us would prefer to work in a less stressful, less competitive, environment.” Yet a *New York Times* feature article comparing life now with life a couple of generations ago, mentions that earlier occupations had significant stresses of their own:

. . . stressful occupations added to the burden on the body.

People would work until they died or were so disabled that they could not continue, Dr. Fogel said. “In 1890, nearly everyone died on the job, and if they lived long enough not to die on the job, the average age of retirement was 85,” he said. Now the average age is 62.

A century ago, most people were farmers, laborers or artisans who were exposed constantly to dust and fumes, Dr. Costa said. “I think there is just this long-term scarring.” (Kolata, p. 19)

A skeptic might object that “stress” is being used in two different senses. The stress 100 years ago was mainly physical, while the stress now is mainly psychological.

But even if we limited ourselves to psychological stress, we still might ask if Greenspan conceded too much in implying that creative destruction increases such stress. Is it obvious that psychological stress is greater in a regime where creative destruction is in full play, as compared to a regime without creative destruction? If so, then how do we explain the most notorious case of job stress of recent times---the recurring cases of government postal employees “going postal” by killing fellow postal workers? Surely the post office is about as insulated from creative destruction as any organization in the United States could be. Another example might be academia, which likewise has been insulated from the forces of creative destruction. Yet the high level of stress in academe is well-documented (e.g., Gmelch 1993; Thorsen 1996).

Some of the recent evidence of improving characteristics of jobs is more systematic. Cox and Alm in the 2003 *Dallas Fed Annual Report* (p. 20), and in the (May 13, 2004) Op-Ed pages of the *New York Times* have presented highly suggestive tabular evidence that the cognitive characteristics of the new jobs are almost always at a higher and more satisfying level, than those of the old jobs. The two versions of the Cox and Alm tables, are reproduced as Figure 3 and Figure 4 near the end of this paper. Most of the basic data in the figures are the same, but are presented differently. One key difference is that the years of comparison are stated as 1992 and 2002 in the 2003 figure²⁰, and as 1994 and 2004 in the 2004 figure. After obtaining the data from the Bureau of Labor Statistics, it appears that the dates provided in the 2003 version are

correct.²¹ The key result of the Cox and Alm tables is that jobs created through creative destruction are generally better jobs than the jobs destroyed through creative destruction.

At about the same time as the 2003 Cox and Alm report, Autor, Levy and Murnane (2003) published a paper that similarly reported a general growth in the number of higher-skill jobs and a general reduction in the number of lower-skill jobs, but arguing more strongly that the recent changing characteristics of jobs are due primarily to the growing importance of the computer in the workplace. The findings of the paper were further elaborated, popularized and applied, in *The New Division of Labor* (2004) book by Levy and Murnane.

Figures 5, 6, and 7 are from an excerpt (2004a) of the Levy and Murnane book (2004b). Figure 5 shows the rising and falling shares of seven broad occupational categories between 1969 and 1999. In general the shares of jobs in higher-skilled categories have been rising, while the shares of jobs in lower-skilled categories have been falling. Figure 6 may be even more revealing in that it shows the growth in jobs associated with higher skills, such as ‘expert thinking’ and ‘complex communication’; as well as the corresponding fall in jobs associated with lower skills, such as ‘non-routine manual’ and ‘routine cognitive.’ Figure 7 is intended to show, for the more recent 1980-1998 period, that these changes were substantially driven by increased computer use.

The robustness of the conclusions about computerization generally increasing the level of job-tasks, could be questioned on a couple of grounds. Alan Krueger

(1993, p. 33) found that workers who used computers earned 10-15 percent higher wages, compared to similar workers not using computers, which was taken as evidence of the productivity of computers, when combined with high skill workers. DiNardo and Pischke (1997) replicated Krueger's study, except that they substituted pencils for computers, and obtained similar results, thus casting doubt on the original Krueger study. But the Krueger results have been defended. Valletta and MacDonald (2004, p. 3) have pointed out that there is much additional evidence of the productivity of computers when combined with skilled workers. They do not mention specific studies, but they could have cited the papers by Bresnahan, Brynjolfsson and Hitt (2002) and by Bartel, Ichniowski and Shaw (2007). Another, perhaps more direct, response to the DiNardo and Pischke critique, is Spitz-Oener (2008) who has found, with more recent data, that the pencil effect on wages has disappeared, but the computer effect continues.

Other researchers have found results broadly complementary to those of Autor, Levy and Murnane. Most notably, Spitz-Oener (2006) has found similar results, using data from West Germany. Chin, Juhn and Thompson (2006) also found similar results for an earlier technological innovation, the steam engine, using data from the merchant shipping industry. Although they found that demand increased for highly skilled labor, they also found that demand increased for low-skilled engine room operatives, at the expense of middle-skilled able-bodied seamen.

This latter effect, of an increased demand for lowest-skilled workers, was not as strongly evident in the Autor et al results, but has been found using data from Great Britain in studies by Manning (2004) and by Goos and Manning (2007). Manning

(2004, p. 581) adds the qualification that the increased demand for low-skilled workers “is increasingly dependent on physical proximity to the more-skilled and may also be vulnerable in the long-run to further technological developments.” One example may be the masseuse who recently retired as a multi-millionaire after receiving stock options for massaging Google engineers (Hafner 2007).

An issue of continuing interest, deserving further research, is the extent to which the computer (and apparently the steam engine) are typical in their effects on labor, of other important innovations resulting from the process of creative destruction. Some have suggested, for example, that some of the early machines of the industrial revolution replaced skilled artisans with unskilled factory workers. This suggestion is disputed by Rosenberg and Birdsell (1986 173-174) who claim that the new factory workers were not mainly former craftsmen, but were mainly former agricultural workers who had previously been living precarious lives on the edge of subsistence.

The improvement in work conditions through the process of creative destruction, is reinforced by the findings of Daniel Pink in his *Free Agent Nation* (2001). Pink considers the growing portion of the work force who do not have “jobs” as usually conceived, but who work for themselves, and contract with individual clients. Good data on the extent of free agency are hard to find, but Pink shows evidence that the category is growing.²² He divides free agents into three types: entrepreneurs, self-employed independent contractors, and temps. Except for the temps, persons in the other two categories report high levels of pay, and especially high levels of job satisfaction.

One part of the free agent nation are the entrepreneurs. Many other scholars and analysts have commented on the challenges faced, and the satisfactions experienced, by those in this important group. It is not surprising that the satisfactions are more readily available to workers in entrepreneurial firms than to workers in governments, or in bureaucratic large corporations (see almost any Dilbert cartoon). For example, the early generation of Microsoft employees often praise Microsoft's early years for having an entrepreneurial culture, and mention the bureaucratization of Microsoft, as one reason for leaving the company (Tsang 1999). Similar sentiments were used to describe those attracted to Jim Clark's enterprises (such as Silicon Graphics, and Netscape) in Michael Lewis's account.

Although Jim Clark's risky innovative kind of entrepreneurship may not have broad appeal, the free agent kind of entrepreneurship may become attractive to many.²³ Potential entrepreneurs hear about the high 'failure' rates of entrepreneurial ventures, but do not realize that in such studies "failure" usually means "exit" and that the firm can exit a business for many reasons. E.g., restaurants close because the proprietors retire, or because they get tired of running a restaurant, or because they have an idea for how to run an even better restaurant. None of these reasons implies that the restaurant was losing money.

A second part of the free agent nation consists of the self-employed independent contractors. Back in 1988 Catherine Hakim suggested (p. 421) that: "Self-employment is one of the Cinderellas of labour market research, only recently invited to the ball." To continue the analogy, in more recent years self-employment may have made it to the

ball, but is still waiting to be whisked onto the dance floor. Daniel Pink (2001, pp. 29-30) complained about how difficult it was to obtain good data on self-employed workers. Karoly and Zissimopoulos (2004, p. 42) suggest that a growing percent of the self-employed are legally incorporating themselves, presumably for tax and liability purposes. But the government data collectors do not count such individuals as self-employed, missing as much as one-third of the actual self-employed workers (p. 42). Bureau of Labor Statistics data for 2002 (Karoly and Zissimopoulos, p. 26), indicate that 7.1 percent of all workers were officially “self-employed.” But if we are actually missing one third of the actual self-employed workers, then that would imply that it would be more accurate to report that 10.65% of all workers are self-employed.

In several respects, self-employment may be a better option for workers than many have supposed. For example, most are not self-employed because it is their only option after the loss of a job. Most of the self-employed voluntarily leave employment in order to choose self-employment as an alternative expected to be better (Dennis 1996, p. 660; Kirchoff 1996, p. 641; Polivka 1996, p. 59). And on two key dimensions, pay and job satisfaction, self-employment does in fact usually turn out to be better. Although the results are somewhat mixed, several studies show that for men, the average pay of the self-employed exceeds the average pay of the employed (Farlie 2005, pp. 45-46; Kunda et al 2002, p. 252; Taylor 1996, p. 260). Several studies also report evidence that on average, self-employed workers are more satisfied with their jobs than are employed workers (Ajayi-obe and Parker 2005, p. 506; Blanchflower and Oswald 1998; Clark 1997; Hakim 1988; Kawaguchi 2004; Taylor 1996, p. 261) It

also appears that Pink's anecdotal evidence that the self-employed tend to organize into networks for mutual advice is supported by broader data (Kunda et al 2002, p. 257). Ayaji-obe and Parker (2005) report that on average the self-employed work more hours than the employed. They suggest, however, that the longer hours may not be a negative, if “. . . the self-employed enjoy a nonpecuniary benefit from the work itself (e.g., independence) . . .” (p. 511).

Another characteristic of the labor market that workers care about is inequality. (How much we actually do care about it, whether we should care about it, and whether it is built in to us to care about it, continue to be the subject of substantial debate.)²⁴ Whether the process of creative destruction increases inequality, is not totally clear. The process of creative destruction creates wealth associated with new innovations (though not as much as might have been thought, if Nordhaus is right that only small profits are needed to make it work²⁵), but also destroys old wealth associated with old products that are made obsolete. Also, inequality of wealth under creative destruction is less likely to reflect inequality of inheritance, and more likely to reflect inequality of economic contribution. These considerations suggest that creative destruction may decrease inequality, or at least create an inequality that is based more on merit and achievement, and less on inheritance and rent-seeking.

In addition, there is the famous silk stockings quote from Schumpeter that claims that usually the effect of new innovations is to bring the poor consumer a kind of product that previously could only be consumed by the rich. (Only the rich could afford silk stockings, but nylon stockings were available to all.²⁶) Initially, the

automobile was seen as a leapfrogging invention, that substantially increased the inequality in society. But later, the automobile was widely available (see: Kim and Mauborgne 2005, p. 193).²⁷ The pattern is the common one that we are now seeing with flat screen TVs, that initially the innovation is expensive and only purchased by the rich; but that very quickly the price falls to the point that a much broader group of consumers are purchasing it.

Sometimes policy discussions seem to focus mainly on income inequality. But to the extent that inequality is viewed as a “bad” it is presumably the inequality of utility that matters. And the inequality of utility is probably less than the inequality of income for three reasons.

The first follows from what has sometimes been called “The Law of Diminishing Marginal Utility of Income.” For example, the utility received from owning a \$60,000 car is not apt to be twice the utility received from a \$30,000 car. The second reason is that some differences in income are due to compensating differentials. A plumber may be paid more than a modestly successful novelist, but if novel writing is more satisfying and pleasant than plumbing, their utility levels may be more equal than their income levels. The third reason is that a person highly productive at generating utility from leisure activities may choose to devote less time to income-generating work.

So, it is unclear both the extent to which income inequality increases due to the process of creative destruction, and the extent to which income inequality is undesirable. (But if income inequality is a problem, and if creative destruction

increases income inequality, it may be partly reassuring that any worker unhappiness with greater inequality does not seem to result in lower workplace productivity (Charness and Kuhn 2007).)

In Thomas Friedman's *The World is Flat* (2005), he emphasizes that one manifestation of the flattening that would be beneficial to labor, is that hierarchies are being reduced in the work place. Thus creative destruction may result in greater inequality in incomes. But it may result in less inequality in terms of work place status.

Another alleged characteristic of work in a regime characterized by creative destruction is that there is apt to be too much of it; meaning that work time is alleged to grow and leisure time is alleged to diminish (see, e.g., Schor 1991). Postrel (2006) has provided an answer to this concern, summarizing and interpreting Aguiar and Hurst (2007). It turns out that we are not working more hours, but that activities that we used to do without being paid, are now more likely to be done for pay, so that it only **appears** that we are working more hours. When measured correctly, average leisure has actually increased by over five hours a week from 1967 to 2003.

In the first section of this paper I argued that the threat to job security from unemployment caused by creative destruction is not as severe as is frequently thought. In this section I argued that the new jobs created by creative destruction have characteristics that matter to workers, most clearly that on average the new jobs involve higher levels of skills and activities.

We need to remember that job security is only one value, and it is not necessarily the most important value for workers. Inglehart has accumulated

considerable worldwide survey evidence (e.g., Inglehart and Welzel 2005, p. 288) that reported satisfaction with one's life depends substantially on having a sense of control over one's life. The skills that increase a sense of control are the same higher skills increasingly demanded for the new jobs created by creative destruction. Besides security, we want challenges, feeling we are making a difference, a sense of control, and a sense that we will be rewarded if we do well. The new jobs created by creative destruction are likely to be better along all these dimensions, and so should increase worker satisfaction.

4. Individual Actions, or Government Policies, That Can Reduce the Labor Pains

One response to worries about job loss from creative destruction, might be termed the 'courage and resilience' answer. Yes, losing a job is painful, but the gains are great, and it is noble to display courage, strength, perseverance, and a long-term perspective. (If Shackleton could lead his men across Antarctic in physically horrendous conditions, shouldn't you be ashamed of worrying about a little labor market uncertainty?)²⁸ And reasonable scholars, such as Deirdre McCloskey (2006), have made reasonable arguments that courage, strength, and perseverance are admirable virtues (though McCloskey does not consider them the **most** admirable virtues). Todd Buchholz (2004, pp. 177-179) is another who argues persuasively that Americans used to have more backbone, and that we would be better people, and better

off, if we had more backbone again. (Perhaps the change in attitude is partly a result of generational differences in life experiences. For example, maybe those who grew up in the Great Depression often over-valued the permanence of a job, as a result of their experience.)

And sometimes some of us take risks, either because something about the risks thrills us, or because we believe that some important projects or values make the risks worth taking. It is paradoxical that in the spring of 2006, while some young French citizens were in the streets protesting the alleged “precariousness” of a labor market under Villepin’s proposed mild labor market reforms (Smith 2006), other young French citizens were seeking ever-more extreme ways to rapidly descend mountain slopes (Vinton 2006).

So a case could be made for courage and resilience. But most people are not going to be friendly to an argument to toughen themselves up—at least not unless you can convince them that it is in the service of some noble BHAG (Big Hairy Audacious Goal).²⁹

Fortunately, there is a more palatable alternative to the “courage and resilience” argument. It is usually possible for those in the workforce to take actions that can substantially reduce the pain from the destructive side of creative destruction.

Stanley and Danko (1996) have argued that most workers have it within their power to achieve significantly higher levels of financial security. The methods are not surprising. Primarily, the “secret” is frugality. This does not mean a life of stoic self-denial. One can live quite comfortably, with many material and psychic pleasures, but

do it frugally. But to be frugal, you do need to forego some of the pleasures of conspicuous consumption and expensive tastes. But isn't it in the end more satisfying and noble to pursue other pleasures anyway, such as the pleasures of pursuing meaningful projects, and of expanding the human capital of oneself and others?

There are a variety of ways to live frugally. You can forego new wardrobes every year or two. You can buy from discount and "club" stores. You can buy big-ticket items (e.g., cars) used rather than new. You can buy a somewhat more modest home, with a mortgage that you could afford to continue to pay during a period of lower earnings. Stanley and Danko provide many examples that those who live below, rather than above, their current means, achieve a level of savings that gives them a peace of mind, even in a changing environment.

They also show, that at similar income levels, entrepreneurs are more likely than professionals to adopt habits of frugality, and to achieve correspondingly high levels of personal wealth and financial security. This is a significant finding, since entrepreneurs have chosen an occupation that makes them among the most vulnerable to the obsolescence that arises from creative destruction.

Human Capital Investment

If parents anticipate that their children will live in an environment where creative destruction is common, they can give advice and make choices that will help their children acquire the human capital that will most help them in a changing environment. Pink (2001) and Peters (2003) each have chapters on education where

they point out that the current Dewey-inspired educational systems are designed to turn children into obedient, static, organization men and women. Other forms of education are more likely to aid and abet budding entrepreneurs and free agents. Pink suggests that home-schooling is one constructive alternative. I believe that some versions of Montessori education provide another.³⁰ Montessori education provides children with the opportunity to constructively make choices, and develop the skills and confidence that will allow them to better function as free agents. Resiliently educated children will as adults be better able to bounce-back from job-loss; and the bounce-back will be faster, and higher.

Other, currently unforeseen, educational innovations may also provide better opportunities for student growth toward resiliency, and the achievement of higher Maslovian needs. So, more generally, at the policy level, it would be desirable for government to encourage faster innovation in education by adopting Milton Friedman's voucher plan to expand the range of parental choice in education (1962, pp. 89).

At higher levels of education, Gary Becker has argued (1975, p. 190) for liberal education as a means to acquire the general human capital that consists of 'learning how to learn.' General human capital is useful in a wide variety of jobs and hence will be less likely to rapidly and unpredictably depreciate during episodes of creative destruction.

Some workers may nonetheless be unable or unwilling to follow Becker's advice, and may find that most of their work-related human capital is job specific. To facilitate the retooling of job specific human capital during episodes of creative

destruction, Alan Greenspan has advocated an expanded role for community colleges. Also aiding worker retooling, are the growing offerings of within-company courses, and also the growing array of online learning tools.

Clayton Christensen has argued that entrepreneurs of disruptive innovations should be patient for growth, but impatient for profits. The improvement in the disruptive innovations that allows them eventually to replace the incumbent products, usually is a gradual one, that can take many years. So, one implication of Christensen's analysis (Christensen 2000; Christensen and Raynor 2003) is that many episodes of creative destruction, generally will unfold in 'fullness of time.' That may seem unfortunate if you are anxious to speed progress. But, it has a positive aspect, in that it increases the time that workers have to adjust their skills, or their career plans, to the emerging new technology. The longer the transition time, the more that it will be possible for the jobs that disappear, to do so through attrition (e.g., retirement) rather than through firings. That is, when we see figures in sources like Cox and Alm (1992 and 2003) on number of jobs lost, it would be wrong to assume that all, or even most, of these jobs lost occurred by the holders of the jobs being laid off or fired.

Another issue that eases the transition, is that it probably is rare for the old technologies to totally disappear. Just as initially there are some niche uses for which the disruptive technology is superior, it may remain true that after the dominance of the disruptive technology, there still may remain niche uses in which the older technology remains superior and in demand. One example might be that vacuum tubes are still in

demand in guitar amplifiers where they are thought to deliver a “richer” sound (see: Kramer 2006).

One unexpected form of human capital investment, in the context of creative destruction, may be job hopping. Virginia Postrel (2005) has made the case that in Silicon Valley frequent job changes may benefit both workers and firms.³¹ The worker benefits by acquiring a greater diversity of human capital, and possibly achieving a better match between the job and the worker’s preferences. The firm benefits by the infusion of new ideas and skills. Notice that this example refutes the common belief that low unemployment corresponds to long job tenure. When there is frequent job-hopping, there can be both low unemployment, and short job tenure.

Private Safety Nets

The family can serve as a form of unemployment insurance (Di Tella and MacCulloch 2002). One member can have a 'safe' standard job, while another can be taking greater risks as a low-level entrepreneur, or as the employee of a fragile start-up. Part time jobs can serve as a safety net, especially during the early start-up period for a free agent entrepreneurial enterprise. A person's own personal savings can also serve as a resource (or safety net) for entrepreneurial activities. Apparently increasing numbers of retirees from standard corporate jobs are ‘following their dreams’ to open entrepreneurial ventures (Pink 2001; Olson 2006). So policies that increase the ability of individuals to save a 'nest egg' would increase their resilience.

Internet

Recent information technology has reduced the costs of finding new jobs and retooling human capital, and hence reduced the costs to workers of the destructive part of creative destruction (e.g., Pink 2001; Brynjolfsson et al 1994). The internet has resulted in faster, and closer matching of workers to jobs, as exemplified, for example, by the online job site, Monster.com (see: Kuhn and Skuterud 2004). The larger the market, the quicker, and better the match between jobs and workers. Monster.com, and other internet job tools, make for quicker and better rebounds, thus reducing the destruction side of creative destruction. The internet may even have enabled a long-term reduction of the steady-state level of unemployment.

More broadly, Pink (2001) has discussed how information technology enables free agents to provide office functions for themselves, that previously would have required an office staff. Brynjolfsson, et al (1994), also provide arguments and evidence that suggest that information technology may have differentially increased the productivity of small work units. And even within large firms, leapfrogging information technology has had the effect of reducing hierarchy within the firm, which would presumably have the effect of moving job characteristics to better locations on the Maslow hierarchy (see: Bresnahan, Brynjolfsson, and Hitt 2002; and Brynjolfsson and Hitt 2000).

So, one of the main ways that the government can reduce labor pains is to avoid policies that delay or discourage like the internet. For example, a plausible case has been made that the government's forcing the baby Bells to allow competitors to

make use of their infrastructure, at nominal charges, delayed and reduced investment in infrastructure by baby Bells, most notably slowing the roll-out of DSL to homeowners. The widely advocated, “net neutrality” regulation would have a similar effect by reducing company incentives to provide valuable, innovative, but infrastructure intensive, services, such as high quality streaming video.

What Else Government Can Do (Or Refrain from Doing)

We tend to think of "finding" another job as the only appealing rebound from a job loss. But through entrepreneurship, a person can "create" their own job. So government policies that benefit the consumer by encouraging entrepreneurship that creates innovative new products, also benefit the worker by creating appealing alternatives to standard employment for corporations. These policies would include reducing government regulations (Klapper et al 2006), and putting limits on punitive tort damages (Stiglitz et al 2002; Buchholz 2004, pp. 119-154).

A less volatile macro-economic environment reduces job market risks, and the risks of entrepreneurship. Until 2008, many economists believed that wise monetary policies from the Federal Reserve seem to have been effective in the last couple of decades, at reducing the volatility of unemployment by reducing the frequency and severity of downturns in the business cycle. (See the several economics journal articles with the phrase “the Great Moderation” in their titles.)

One form of government regulation that reduces job opportunity consists of zoning laws, which often function as a substantial barrier-to-entry. The absence of

zoning laws in Houston, for example, has been related to Houston's appeal as a location of opportunity for entry level entrepreneurs.³² Occupational licensing also creates barriers to entry (Buchholz 2004, pp. 97-117; Kleiner 2000). For one particularly bizarre example, consider the California law saying that hairbraiders need to have a cosmetology license in order to legally braid hair (Postrel 1997).

There is a potential for greater personal financial assets to smooth consumption during periods of unemployment, lowering the downside risks from entrepreneurship and free agency. Bush and Moynihan's personal savings account might be one such policy.³³ Another would be to have lower personal income tax rates.

Lower corporate tax rates would reduce the churn, by reducing firm costs, and allowing more firms to stay out of the red (Buchholz 2004, pp. 92-95).

Several different arguments and types of evidence can be adduced to support the proposition that health care in the United States is inefficiently provided. For example, the United States spends a higher percent of GDP for health care than France and Japan, but has lower life expectancy and higher infant mortality than France and Japan. Other explanations should be explored, but one salient hypothesis would be that the United States health care system is inefficient (see Lahart 2007). One claim sometimes made, is that improvements in health care must come at increasingly higher costs. Christensen et al (2004) provide persuasive arguments and examples to show that this need not be true if we permit the process of disruptive innovation in health care to thrive.

Unions, at their worst, stop the efficient reallocation of labor that is part of the process of creative destruction. One example is the railroad union 'featherbedding' that required a coal shoveler be in every engine, even if the engine was a diesel that did not use coal. Another example, from Schmitz (2005), provides strong evidence that reduction in the power of unions would have increased labor market productivity in the Canadian iron ore industry.

A Bigger Government Safety Net?

Thomas Friedman (2005) identifies the greatest threat to continued Schumpeterian growth to be obstacles to creative destruction due to workers who fear that their skills will be destroyed, and that they will end up with a worse job, or no job at all, or too painful a transition. This threat leads Friedman to advocate a larger safety net for workers, in order to earn worker's buy-in to an unimpeded process of creative destruction. Other advocates of creative destruction who also support a larger safety net, include Gene Sperling (2005a; 2005b) and Robert Reich (2007).

Hayek argued (pp. 122-124; see also pp. 207-208), to the contrary, that the more generous the worker safety net, the more slowly workers will acquire new skills, and move to new jobs, and the more slowly the economy will grow. This is perhaps the main difference between government "safety nets" and the private safety nets that were discussed earlier---the government nets provide workers with incentives to delay taking the steps necessary to transition to new jobs.

Baily (2001) and Feldstein (2003) have argued that countries with bigger safety nets, experience slower economic growth. An informative graph from Baily's study has been reproduced as Figure 8 near the end of this paper. The United States appears as an outlier in this graph which relates worker productivity to average hours of work per week. Baily's explanation was that the United States had a greater openness to creative destruction, which implies that the United States, more than Japan and the nations of "old" Europe, allows jobs to be destroyed. (A related cross-country comparison by Siems (2006) is presented in Figure 9.)

Also supporting the Hayek view is Edward Lazear (2006) who summarized his 1990 paper by saying ". . . I found that job security provisions were instrumental in limiting employment in developed countries." Other researchers have used cross-country comparisons to reach a similar conclusion (Botero et al 2004; Lafontaine and Sivadasan 2007).

Another consideration that should be mentioned is that increased job security for the less competent requires **decreased** upward mobility for the more competent.

In the end, a government safety net may be implemented, either out of a belief in its economic desirability, or out of a belief in its political necessity. It would then be useful to analyze what forms of a safety net would be least costly and most beneficial. The safety net proposal of Thomas Friedman (2005), for example, attempts to preserve the worker's incentive to seek new employment. And Rajan and Zingales (2003, p. 300) note that safety net payments should take the form of lump-sum side payments to workers, rather than the form of subsidies to firms. This would preserve the worker's

incentive to seek new jobs; and would not slow the exit of dinosaur firms, and the growth of “sunrise” firms. This would “. . . prevent the victims of creative destruction from being transformed into human shields for special interests, . . . “ (p. 300).

5. Conclusion

Near the top of every Florence tourist’s ‘to see’ list are Ghiberti’s bronze door panels (Figure 12), and Brunelleschi’s dome (Figure 13). But if there had been a strong government safety net, maybe the dome would not have been built. You see, Ghiberti and Brunelleschi ‘tied’ in a contest to do the doors. Brunelleschi was irate and declined. He retooled (or refocused?) as an architect and got the dome built. The optimism and confidence of the renaissance is evident in their building the base of the “duomo” so large that the space at the top could only be filled by a dome bigger than anyone yet knew how to build.³⁴ You see, they were confident that by the time they got ready to build the dome, somebody would figure out how to do it. A prize of 200 florins was offered for the best plan to build the dome (Fisher 2001, p. 90).

Retooling by Brunelleschi resulted in the best outcome. Ghiberti did the “gates of paradise” and Brunelleschi went on to do the dome. To build the dome, some other previously impressive church was torn down. The Florentines of that time embraced creative destruction, just as today many do in Manhattan (cf. Page’s *The Creative Destruction of Manhattan*) and Las Vegas, but as most Florentines of the present time do not.

Are workers (or need they be) more like Humpty Dumpty, who breaks into a million pieces when he falls? Or are they (or could they be) more like the hard Super Ball³⁵ of my youth, that quickly and strongly bounces back?

Year	Initial claims*	Dec.-to-Dec. net job gains*	End-of-year employment*	End-of-year unemployment rate (percent)	Productivity (index, 1980=100)
1980	5,850	267	90,936	7.2	100
1981	5,419	-52	90,884	8.5	102
1982	7,033	-2,128	88,756	10.8	101
1983	5,294	3,454	92,210	8.3	105
1984	4,484	3,877	96,087	7.3	108
1985	4,702	2,500	98,587	7.0	110
1986	4,529	1,897	100,484	6.6	113
1987	3,897	3,150	103,634	5.7	114
1988	3,704	3,237	106,871	5.3	116
1989	3,950	1,938	108,809	5.4	117
1990	4,616	309	109,118	6.3	119
1991	5,363	-857	108,261	7.3	121
1992	4,905	1,157	109,418	7.4	126
1993	4,117	2,785	112,203	6.5	127
1994	4,076	3,853	116,056	5.5	128
1995	4,298	2,154	118,210	5.6	128
1996	4,223	2,793	121,003	5.4	132
1997	3,858	3,358	124,361	4.7	135
1998	3,810	2,154	127,364	4.4	139
1999	3,563	2,793	130,536	4.0	143
2000	3,590	3,358	132,484	3.9	147
2001	4,869	-1,763	130,721	5.7	150
2002	4,852	-535	130,186	6.0	156
2003	4,823	112	130,298	5.7	163
2004	4,114	2,097	132,395	5.4	168
2005	3,985	1,976	134,371	4.9	172
Total	117,924	43,702			
Avg./month	378	140			

*Establishment survey. Data in thousands. Claims are for unemployment insurance.

SOURCES: Bureau of Labor Statistics. Federal Reserve Board. (Proofed by AMD on 9/26/07.)

Figure 1: “The Churn: Recycling America’s Labor.” Source: Siems 2006, p. 5.

People Employed			
Destruction	Today	Yesterday	
Railroad employees	231,000	2,076,000	1920
Carriage and harness makers	*	109,000	1900
Telegraph operators	8,000	75,000	1920
Boilermakers	*	74,000	1920
Milliners	*	100,000	1910
Cobblers	25,000	102,000	1900
Blacksmiths	*	238,000	1910
Watchmakers	*	101,000	1920
Switchboard operators	213,000	421,000	1970
Farm workers	851,000	11,533,000	1910
Creation			
Airline pilots and mechanics	232,000	0	1900
Medical technicians	1,379,000	0	1910
Engineers	1,846,000	38,000	1900
Computer programmers/operators	1,287,000	*	1960
Fax machine workers	699,000	0	1980
Auto mechanics	864,000	0	1900
Truck, bus and taxi drivers	3,328,000	0	1900
Professional athletes	77,000	*	1920
TV and radio announcers	60,000	*	1930
Electricians/electronic repairers	711,000	51,000	1900
Optometrists	62,000	*	1910
*Less than 5,000			
DATA SOURCE: U.S. Bureau of the Census			

Figure 2: “Creative Destruction Over the Past Century.” Source: Cox & Alm 1992, p. 7.
(Proofed by AMD on 9/26/07.)

	Employment Gains (1992-2002)	Percent Change
People Skills/Emotional Intelligence		
Registered nurse	+512,000	+28
Financial services sales	+248,000	+78
Lawyers	+182,000	+24
Educational and vocational counselors	+48,000	+21
Recreation workers	+35,000	+37
Imagination/Creativity		
Designers	+230,000	+43
Hairstylists and cosmetologists	+146,000	+19
Architects	+60,000	+44
Actors and directors	+59,000	+61
Photographers	+49,000	+38
Analytic Reasoning		
Legal assistants	+159,000	+66
Electronic engineers	+147,000	+28
Medical scientists	+22,000	+33
Metallurgical engineers	-2,000	-8
Computer operators	-367,000	-55
Formulaic Intelligence		
Cost and rate clerks	-16,000	-24
Health records technicians	-36,000	-63
Telephone operators	-98,000	-45
Bookkeepers	-247,000	-13
Secretaries and typists	-1,305,000	-30
Manual Dexterity		
Tool and die makers	-30,000	-23
Lathe operators	-30,000	-49
Typesetters	-34,000	-62
Butchers	-67,000	-23
Sewing machine operators	-347,000	-50
Muscle Power		
Garbage collectors	-2,000	-4
Stevedores	-3,000	-17
Fishing workers	-14,000	-27
Timber cutters	-25,000	-32
Farm workers	-182,000	-20

Figure 3: “Hierarchy of Human Talents” Source: Cox and Alm 2003, p. 20. (Proofed by AMD on 9/26/07.)

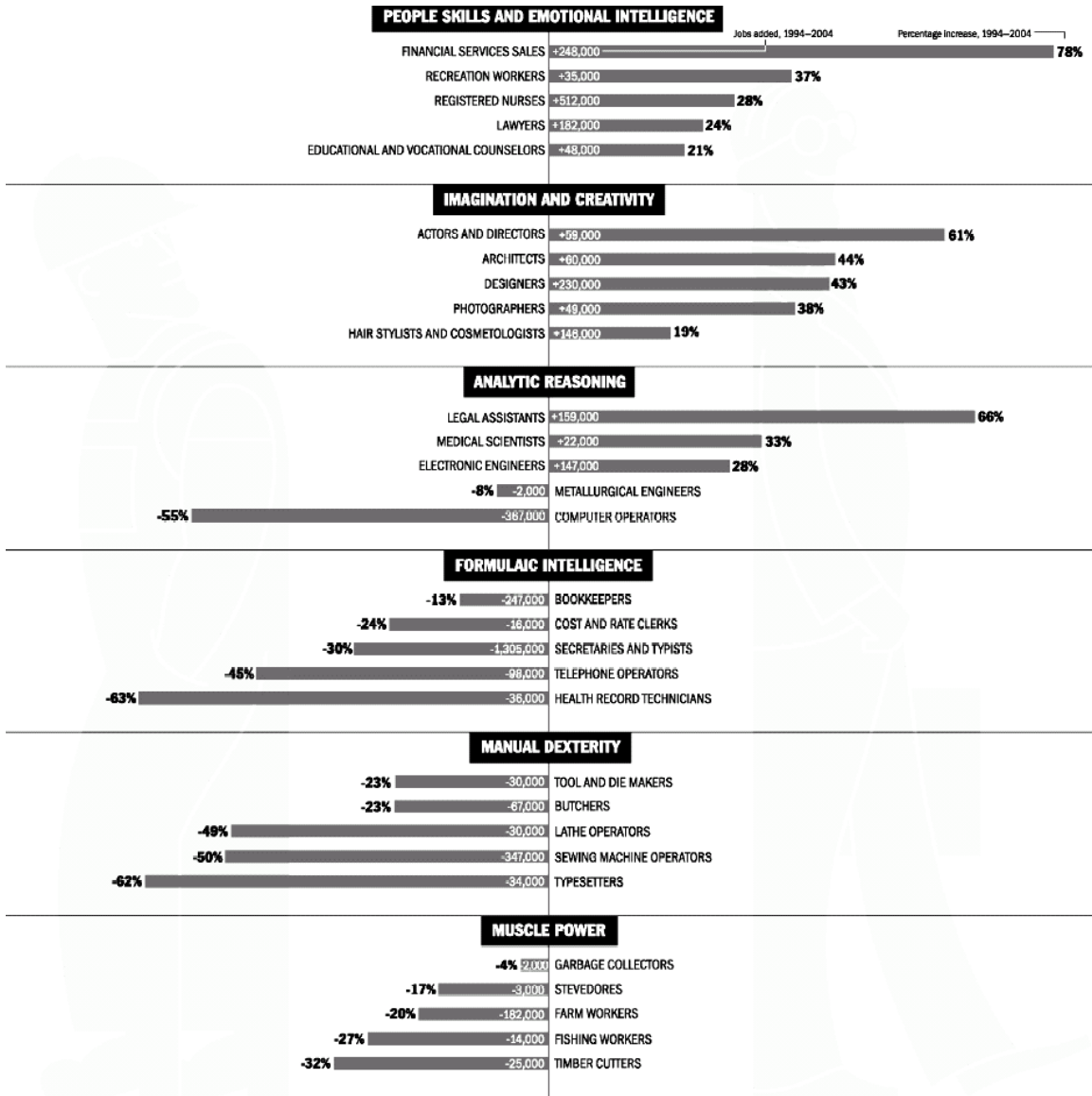


Figure 4: “Hierarchy of Human Talents”---*New York Times* Version. Source: Cox, Alm and Holmes 2004, p. A27.

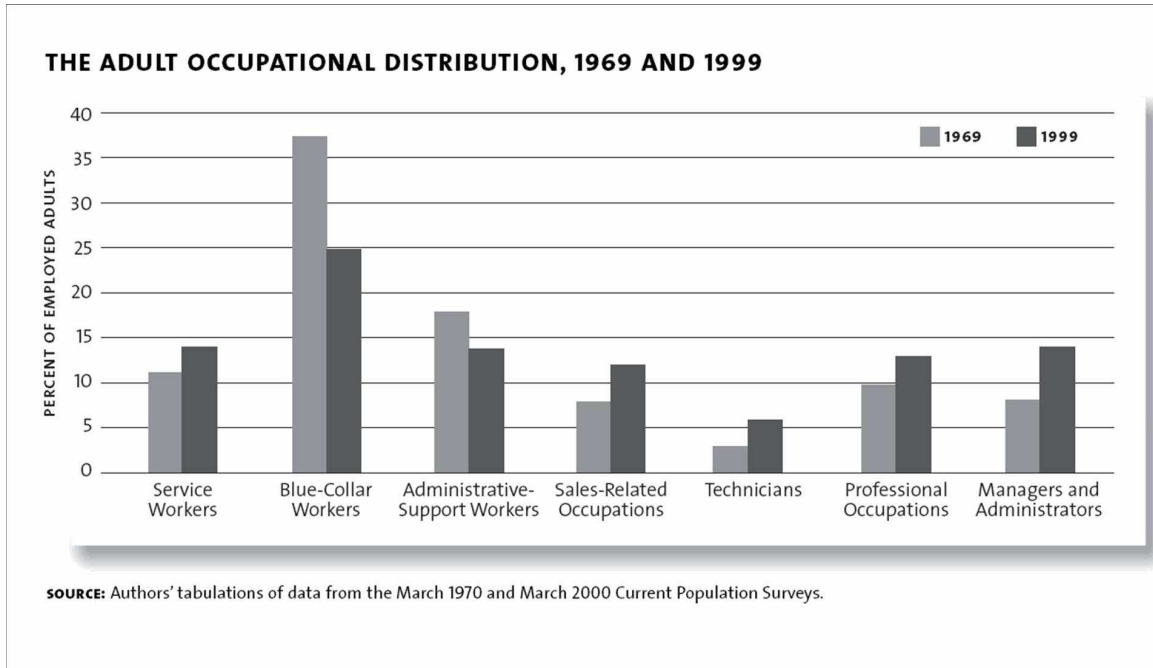
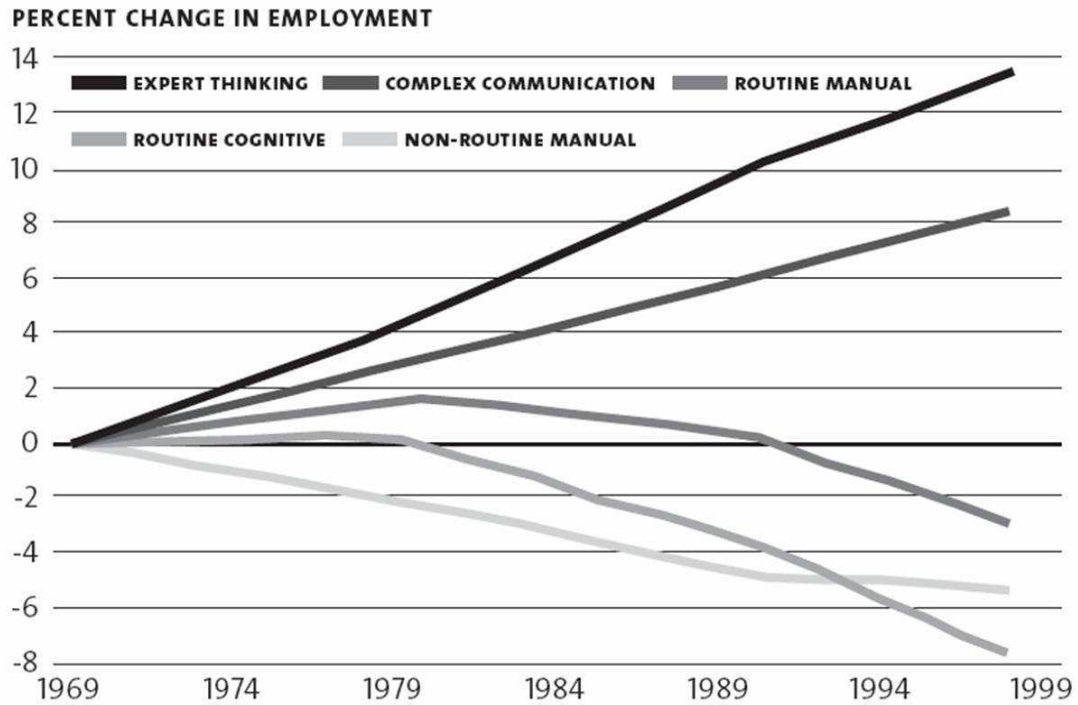


Figure 5: “The Adult Occupational Distribution, 1969 and 1999.” Source: Levy and Murnane 2004a, p. 69.

ECONOMY-WIDE MEASURES OF ROUTINE AND NONROUTINE TASK INPUT: 1969 - 1998



SOURCE: Revised version of figure from David Autor, Frank Levy and Richard J. Murnane, "The Skill Content of Recent Technological Change: An Empirical Exploration," *Quarterly Journal of Economics* 118 (November 2003): 4.

Figure 6: "Economy-Wide Measures of Routine and Nonroutine Task Input: 1969 - 1998."
Source: Levy and Murnane 2004a, p, 74.

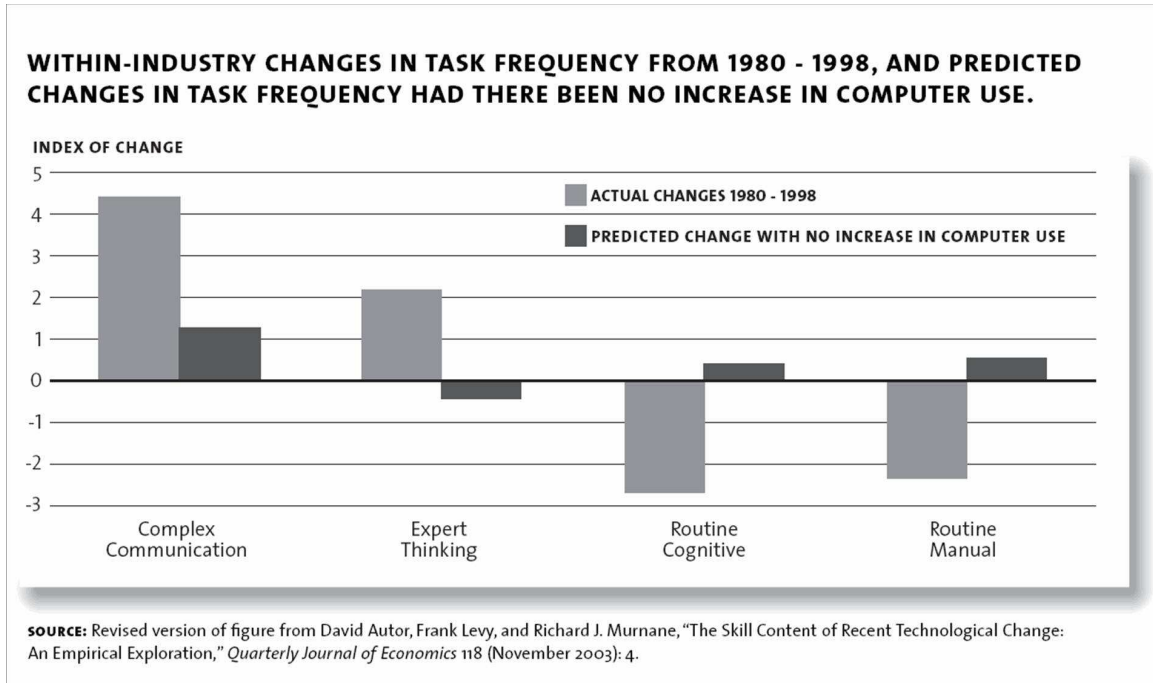
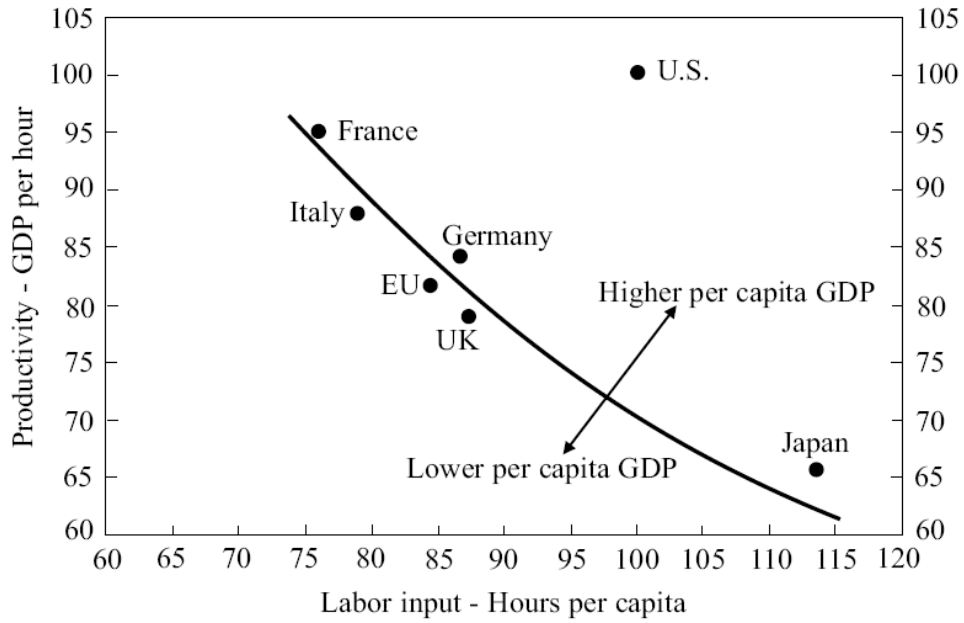


Figure 7: "Within-Industry Changes in Task Frequency from 1980 – 1998, and Predicted Changes in Task Frequency had there Been No Increase in Computer Use." Source: Levy and Murnane 2004a, p. 75.



Source: The Conference Board.

Figure 8: Explaining the Outlier: Openness to Creative Destruction. Quantities in graph are “indexed to US equals 100.” Source: Baily 2001, p. 220.

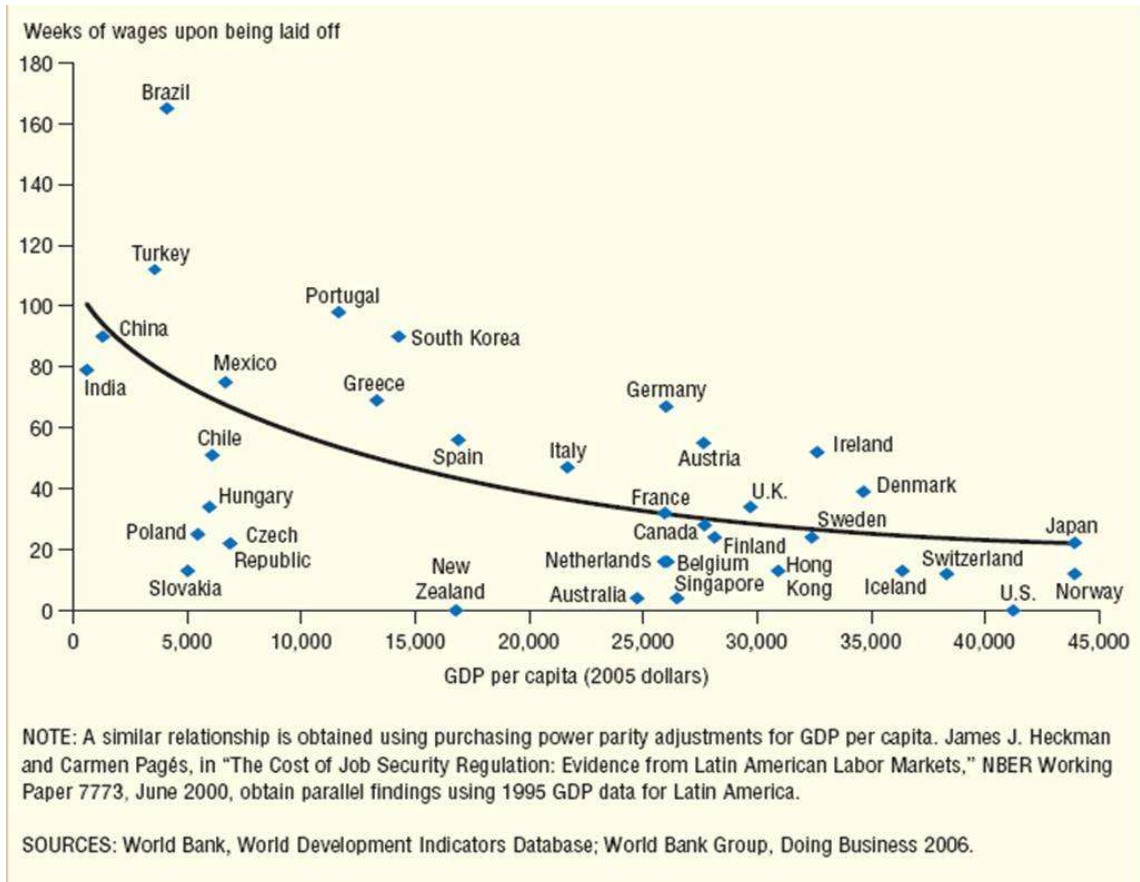


Figure 9: "Job Security and Income Per Capita." Source: Siems 2006, p. 4.

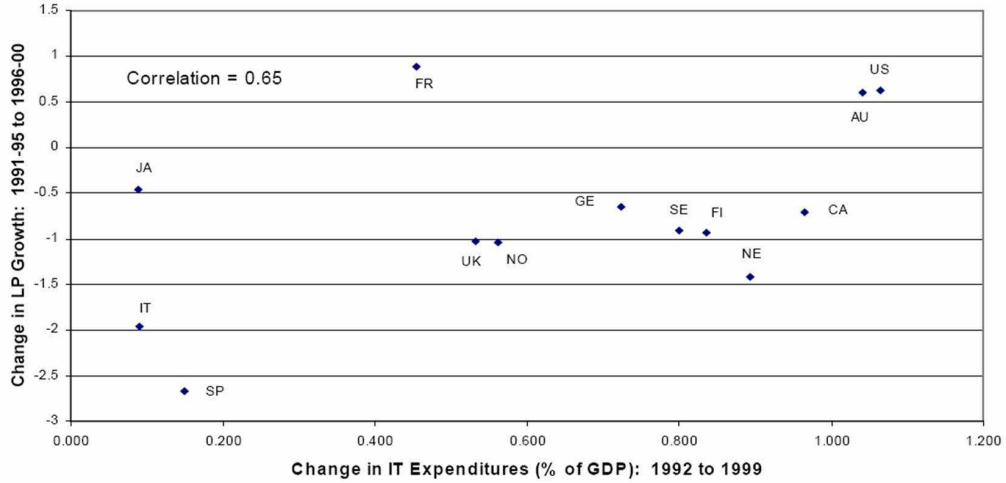


Figure 10: “IT Expenditures and Labor Productivity Growth.” Source: Gust and Marquez 2002, p. 34.



Figure 11: “IT Expenditures and Employment Protection Legislation.” Source: Gust and Marquez 2002, p. 34.



Figure 12: Ghiberti's "gates of paradise." Source:
http://z.about.com/d/arthistory/1/0/1/Q/Ghiberti_Doors_03.jpg



Figure 13: Brunelleschi's dome. Source: <http://knowmark.ca/images/Italy/P5050737.jpg>

Footnotes

* An earlier version was presented to the 13th Conference of the International Schumpeter Society, Aalborg University, Denmark, on June 24, 2010. I received useful comments from Christian Schubert. I am especially grateful for able research assistance from Miaomiao Yu. I also received some useful assistance from Brent Erickson and Chan H. Cho. For information on the data used in Cox and Alm's marvelous tables on the hierarchy of occupations, I am grateful to Julia K. Carter, of the Dallas Fed. For the unpublished time series data on occupations, I am grateful to Stephanie White of the Division of Labor Force Statistics, Bureau of Labor Statistics. Earlier versions of the paper were presented at the annual meetings of the Association of Private Enterprise Education (APEE), in Cancun, Mexico, in April 2007, and at the annual meetings of the Southern Economic Association in New Orleans, in November 2007. At the APEE meetings, I received useful comments from David Macpherson and Will Wilkinson. I also received a useful reference from Tim Taylor.

¹ "I do not doubt that the vast majority of us would prefer to work in a less stressful, less competitive environment. Yet, in our roles as consumers, we seem to relentlessly seek the low product prices and high quality that are prominent features of our current frenetic economic structure." (Greenspan 2003)

² At the American Economic Association meetings in January 2007 I presented a paper (Diamond 2009) arguing the that one of the main reasons most of the economics profession had not integrated creative destruction into the mainstream of what we research, teach and advise, is that we have not found good ways to mathematically model the main parts of the theory. At the end of my presentation, someone in the

audience got up and said I was wrong. He claimed the main reason that economists reject creative destruction is the destructive labor market effects. I still think that I was mainly right, but the questioner had a point, and his point would have been stronger if he had been referring to why policy makers, voters, and the educated public have not embraced policies encouraging creative destruction.

³ Richard Nelson, at the end of his keynote address to the 2004 International Schumpeter Society meetings in Milan, was asked his view of the implications of Schumpeter's theories for labor economics. He responded that Schumpeter's theories had important implications for labor economics, but that this was a much neglected topic, because of the historical accident that most of those with an interest in Schumpeter had backgrounds in industrial organization, and related areas. One might counter Nelson by noting the existence of the small, but growing, pure theory literature in which highly aggregated models are devised, with some Schumpeterian features, in order to explain some stylized facts about the macro labor market (e.g., Aghion 2002; Caballero and Hammour 1996; Francois and Lloyd-Ellis 2005; Mortensen and Pissarides 1998; Şener 2000; and Şener 2001). For policy purposes, papers that are more empirical, and less aggregated, are generally more relevant (see Diamond 2009). Since my goal in the book is mainly the analysis and improvement of institutions and policies, I do not give much attention to this purely theoretical and highly aggregated branch of Schumpeterian labor economics.

⁴ A pithy way of expressing this main cost of creative destruction to labor has been expressed: "The proper role of a healthily functioning economy is to destroy jobs and

put labor to use elsewhere. Despite this truth, layoffs and firings will always sting, as if the invisible hand of enterprise has slapped workers in the face.” Management guru Tom Peters, and others on the web, have attributed this passage to Schumpeter himself, but it was actually penned by Michael W. Cox in his “Schumpeter in His Own Words” article (p. 7).

⁵ In a brief article asking what we can learn from depressions, Schumpeter begins (1989, p. 113) by suggesting that depressions are an inevitable part of the process of creative destruction. But then (p. 114), he contrasts past, ordinary depressions, with the, then current, Great Depression, which he labels a “catastrophe.” He attributes the severity of the Great Depression mainly to misguided government policies.

⁶ For example, while I was a graduate student at Chicago, I remember Robert Lucas giving a packed seminar on the Great Depression, in which he said that we had yet to find a good theory adequate to explain what happened. I also remember him saying that in the absence of such a theory, the best way to learn about the Great Depression was to read a good history, such as Murray Rothbard’s *America’s Great Depression*.

⁷ See, e.g., the Brady Commission Report (“Report of the Presidential Task Force on Market Mechanisms.”)

⁸ This can be counted as one of Milton Friedman's important contributions (see, e.g., Friedman and Schwartz 1963.)

⁹ E.g., Burgess, Lane and Stevens 2000; Groshen and Potter 2004. For a survey of some of the recent work in this literature, see: Davis, Faberman, and Haltiwanger 2006.

¹⁰ Some of those who reference Farber on this (e.g., Sperling 2005; Committee 2007, p. 2; *NYT* article) report that the new salary is 17% less than the old salary. But this is arguably too high. Farber measures the earnings growth of ‘similar’ workers who did not lose their jobs and then supposes that the fired workers would have been earning the same higher earnings, if they had not lost their jobs. But isn’t it likely that on average those who lose their jobs are **not** similar to those who kept them? If firms are indeed efficiently profit-maximizing (as economists usually assume) wouldn’t they first lay off the less productive? To the extent this is so, Farber’s 17% overestimates the harm experienced by the fired workers.

¹¹ E.g., Orey 2007. Also: “Like a lot of companies, Circuit City sets ‘pay ranges’ for its various jobs. Once associates reach the top of the range, they are not supposed to get further raises -- beyond the basic cost-of-living increases that also push up the pay range -- unless they are promoted.

But Circuit City's store managers found it hard to stick to the policy. When they were divvying up the yearly pool of raise money, they would often increase the pay of all workers who had done a good job, even those at the range's ceiling, said Bill Cimino, Circuit City's chief spokesman. It just seemed like the decent thing to do.

‘‘It's hard to say no,’’ Mr. Cimino told me. ‘‘It's only 3 or 4 percent.’’

Eventually, though, the company's executives decided they couldn't afford decency for decency's sake.” (Leonhardt 2007)

¹² Postrel bases her discussion largely on Fallick et al (2006).

¹³ “The media have a tendency to cover massive layoffs and firm failures but rarely mention when firms hire a large number of people or when a surprisingly large number of new firms are being formed in particular months. From an evolutionary point of view, firm bankruptcies are undesirable only if they are not brought about by other firms that provide better products and services. Joseph Schumpeter's (1942) characterization of capitalism as a *process of creative destruction* underlines the evolutionary view that better economic structures can only be achieved by allowing underperforming entities to be replaced by organizations that can make better use of their resources.” (Murmann, p. 225; italics in original)

¹⁴ “It is so easy to demonize free markets—and the freedom to outsource and offshore—because it is so much easier to see people being laid off than being hired. But occasionally a newspaper tries to dig deep into the tissue. My hometown paper, the Minneapolis *Star Tribune*, did just that.” (Thomas Friedman 2005, p. 235) A nice example follows, from the *Star Tribune*, but it is too long to reproduce here.

¹⁵ For example, Knight approvingly quoted the following passage that he attributed to Ruskin: “In a community regulated by laws of demand and supply, but protected from open violence, the persons who become rich are, generally speaking, industrious, resolute, proud, covetous, prompt, methodical, sensible, unimaginative, insensitive, and ignorant. The persons who remain poor are the entirely foolish, the entirely wise, the idle, the reckless, the humble, the thoughtful, the dull, the imaginative, the sensitive, the well-informed, the improvident, the irregularly and impulsively wicked,

the clumsy knave, the open thief, the entirely merciful, just, and godly person.”

(Knight 1935, p. 66.)

¹⁶ In the *Wealth* (Vol., 1, Book 1, Ch. 10, pp. 116-117) Smith summarizes in an oft-quoted passage: "The five following are the principal circumstances which, so far as I have been able to observe, make up for a small pecuniary gain in some employments, and counter-balance a great one in others: first, the agreeableness or disagreeableness of the employments themselves; secondly, the easiness and cheapness, or the difficulty and expence (sic) of learning them; thirdly, the constancy or inconstancy of employment in them; fourthly, the small or great trust which must be reposed in those who exercise them; and, fifthly, the probability or improbability of success in them."

¹⁷ I encountered this Smith passage because it was highlighted by Tim Taylor in his lecture on Smith in the "Great Lectures" series (1996).

¹⁸ "In the progress of the division of labour, the employment of the far greater part of those who live by labour, that is, of the great body of the people, comes to be confined to a few very simple operations, frequently to one or two. But the understandings of the greater part of men are necessarily formed by their ordinary employments. The man whose whole life is spent in performing a few simple operations, of which the effects are perhaps always the same, or very nearly the same, has no occasion to exert his understanding or to exercise his invention in finding out expedients for removing difficulties which never occur. He naturally loses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human creature to become. The torpor of his mind renders him not only incapable of relishing or bearing

a part in any rational conversation, but of conceiving any generous, noble, or tender sentiment, and consequently of forming any just judgment concerning many even of the ordinary duties of private life. Of the great and extensive interests of his country he is altogether incapable of judging, and unless very particular pains have been taken to render him otherwise, he is equally incapable of defending his country in war. The uniformity of his stationary life naturally corrupts the courage of his mind, and makes him regard with abhorrence the irregular, uncertain, and adventurous life of a soldier. It corrupts even the activity of his body, and renders him incapable of exerting his strength with vigour and perseverance in any other employment than that to which he has been bred. His dexterity at his own particular trade seems, in this manner, to be acquired at the expence of his intellectual, social, and martial virtues. But in every improved and civilized society this is the state into which the labouring poor, that is, the great body of the people, must necessarily fall, unless government takes some pains to prevent it.” (Smith, Vol. 2, Book 5, Ch. 1, pp. 781-782.)

¹⁹ On Engel, see Chai and Moneta 2010.

²⁰ The source of the data in the Fed Report version is listed simply as “BLS” (p. 24).

²¹ Julia K. Carter worked on the research for the 2003 study, but apparently not for the brief 2004 version. When I emailed her asking about the discrepancy in dates, she agreed with my suggestion that the dates provided in the *New York Times* version must be mistaken. (I appreciate Julia K. Carter’s willingness to respond to email questions.)

²² But Pink’s claim is disputed, for example, in Autor 2001, pp. 36-37.

²³ I use “innovative entrepreneurship” in place of Marc Casson’s “high-level entrepreneurship” and “free agent entrepreneurship” in place of his “low-level entrepreneurship.” I do this because “low-level” has a pejorative implication that is not deserved.

²⁴ But Alesina, Di Tella, and MacCulloch (2004) present evidence that Americans care less about equality than do Europeans. For a useful discussion, and review of the literature, on the extent to which equality affects happiness, see Wilkinson 2007. Reynolds (2007) gives some plausible reasons for believing that the growth in income inequality in the United States is less than is commonly believed.

²⁵ Nordhaus estimates a very low rate of Schumpeterian profits. However, in PowerPoint slides of a commentary on the as yet unpublished paper, Robert Gordon suggests (2002) that Nordhaus’s estimates are dependent on an arbitrary parameter choice. As a result, Gordon thinks the actual rate of Schumpeterian profits could be much larger.

²⁶ “Queen Elizabeth owned silk stockings. The capitalist achievement does not typically consist in providing more silk stockings for queens but in bringing them within the reach of factory girls in return for steadily decreasing amounts of effort.” (Schumpeter 1950, p. 67.) (See also: Adam Smith, Vol. 1, Intro., p. 11)

²⁷ “The autos of the time were a luxurious novelty. One model even offered electric curlers in the back seat for on-the-go primping. They were unreliable and expensive, costing around \$1,500, twice the average annual family income. And they were enormously unpopular. Anti-car activists tore up roads, ringed parked cars with barbed

wire, and organized boycotts of car-driving businessmen and politicians. Public resentment of the automobile was so great that even future president Woodrow Wilson weighed in, saying, "Nothing has spread socialistic feeling more than the automobile . . . a picture of the arrogance of wealth." *Literary Digest* suggested, "The ordinary 'horseless carriage' is at present a luxury for the wealthy; and although its price will probably fall in the future, it will never, of course, come into as common use as the bicycle."” (Kim and Mauborgne 2005, p. 193)

²⁸ See, for example, Morrell and Capparell’s *Shackleton's Way: Leadership Lessons from the Great Antarctic Explorer*.

²⁹ As far as I am aware, the concept of a “BHAG” was first introduced, and elaborated, in Collins and Porras’s business classic, *Built to Last* (1994).

³⁰ Jeffrey Bezos (Amazon) and Sergey Brin (Google) are two prominent information technology entrepreneurs who participated in Montessori education as children. (See: Hoff 1998; and Malseed 2007)

³¹ Postrel bases her discussion largely on research by Fallick et al (2006).

³² “Like other Americans, immigrants often dramatically improve their quality of life and economic prospects by moving out to less dense, faster growing areas. They can also take advantage of more business-friendly government. Perhaps the most extreme case is Houston, a low-cost, low-tax haven where immigrant entrepreneurship has exploded in recent decades. Much of this has taken place in the city itself. Looser regulations and a lack of zoning lower land and rental costs, providing opportunities to build businesses and acquire property.” (Klotkin 2005, A16)

³³ “Mr. Moynihan has long advocated the creation of personal investment accounts.”
(Stevenson 2001).

³⁴ “Think of the confidence of the age: The Duomo was built with a hole awaiting a dome in its roof. This was before the technology to span it with a dome was available. No matter. They knew that someone soon could handle the challenge...and the local architect Brunelleschi did. The cathedral’s claim to artistic fame is Brunelleschi’s magnificent dome---the first Renaissance dome and the model for domes to follow.”
(Steves 2003, p. 266; ellipsis in original; another useful source on Ghiberti and Brunelleschi is King 2000, e.g., pp. 19-20)

³⁵ “The Super Ball has an amazingly high coefficient of restitution. Dropped from shoulder level, Super Ball snapped nearly all the way back; thrown down, it could leap over a three-story building.” Source: http://en.wikipedia.org/wiki/Super_Ball
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