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PSST: Patterns of Sustainable Specialization and Trade

Arnold Kling

Abstract

This essay offers an alternative way to look at macroeconomics. The current standard approach uses aggregate supply and aggregate demand (AS-AD). I call the alternative approach "patterns of sustainable specialization and trade" (PSST). The PSST approach combines many old and new strands in economics. It suggests that the economy is a highly complex system that is constantly adapting to new circumstances, especially opportunities created by technological innovation. We can view employment fluctuations as a reflection of the difficulty that markets sometimes have in making the necessary adjustments, so that for a period of time some workers have extremely low marginal revenue product and as a result become unemployed.

Author Notes: Arnold Kling is an independent scholar who lives in Silver Spring, Maryland. The ideas in this paper emerged in a series of conversations in online media, mostly blogs. I would like to thank Tyler Cowen for suggesting that perhaps a recession is a market analog to the socialist calculation problem and Garrett Jones for pointing out that many modern workers produce organizational capital rather than widgets. I have received helpful comments from Cowen, Jones, Alex Tabarrok, and numerous commentators in the economics blogosphere.

Introduction

This essay re-examines macroeconomics from the perspective of a paradigm that I call Patterns of Sustainable Specialization and Trade (PSST). This approach has a number of features that differ from the standard paradigm of aggregate supply and demand (AS-AD). These are summarized in the following table.

AS-AD	PSST
Labor demand is derived from an aggregate production function, and labor supply is derived from aggregate inter-temporal substitution	Occupational heterogeneity makes it inappropriate to speak of aggregate labor supply and demand
An important concept is potential GDP.	Production and trade undergo constant reconfiguration, so that potential GDP is not meaningful.
There is a sharp distinction between economic growth (a supply side phenomenon) and employment fluctuations (a demand side phenomenon)	Both economic growth and employment fluctuations reflect the process of reconfiguration
The economy can be characterized by a set of equations, the solution for which represents equilibrium	The economy is too complex to be represented by equations
Production techniques are taken as given, and known	Production techniques must be discovered by entrepreneurs using a trial and error process
Nominal rigidities are important sources of friction	The focus is on real costs of moving resources from declining to expanding sectors, including the cost of discovering where and how to expand

To illustrate the PSST approach, let us use Ricardo’s classic example of comparative advantage. Suppose that England is just about to open up trade with Portugal. Before opening up trade, England supplies its own wine and its own cloth. Once trade is allowed, England will import wine and export cloth. Our focus will be on the adjustment process, which can follow three scenarios: an exuberant scenario (E); a displacement scenario (D), or a Goldilocks scenario (G).

Under E, resources are transferred too quickly to the cloth sector. Investors get ahead of themselves, the value of shares in cloth-making firms rises to unsustainable levels, and too much capacity is built in the cloth sector. Meanwhile, the wine sector does not yet begin to contract.

Under D, the wine sector sees the writing on the wall. Employers recognize that with competition from Portuguese wine, the marginal revenue product of workers in English wine will be extremely low. Consequently, wine makers lay off workers in anticipation of a flood of cheap imports. Meanwhile, the cloth sector expands slowly and cautiously. The net effect is to reduce overall employment.

Under G, the expansion of the cloth sector and the contraction of the wine sector are synchronized. Workers shift readily from wine to cloth.

There is nothing mutually exclusive about E and D. Both could take place. Imagine what happens if E takes place first and is followed by D. That would mean that just as the premature bubble in cloth is popping, the wine industry is downsizing. That would create a strong downturn.

Economists tend to take it for granted that G will take place, at least in the long run. However, it is fairly unlikely. What are the chances that workers who are no longer needed in the wine sector can be profitably employed making cloth?

More likely, only a small increase in employment in the cloth sector will be needed to produce the additional cloth needed for export. Most of the unemployed wine workers will not have a high marginal revenue product in either industry. Instead, they will either find employment in newly-created industries or exit the labor force altogether. Those who exit the labor force will be replaced by—pardon the expression—a new vintage of workers, who are better suited to the freshly-created industries. Until these new industries are discovered and the work force adjustments have been made, scenario D may persist.

The likelihood that new industries must be discovered in order to restore full employment is what distinguishes the unemployment of the PSST model from textbook structural unemployment. If the problem were that English wine workers needed to be retrained to work in cloth, then we would observe excess demand for labor and/or rising wages in the cloth industry along with an excess supply of labor in the wine industry. Instead, under PSST the problem is not simply one of changing the balance of workers between existing industries. The more difficult problem is to discover and establish new patterns of specialization and trade that employ the workers displaced from the wine industry.

Of course, new opportunities for international exchange are not the only events that can trigger a change in the patterns of production and trade. The ongoing process of innovation, sometimes punctuated by major technological change, is an important source of market ferment.

In the AS-AD approach, structural unemployment goes on in the background. Structural change is happening all the time, but it takes place gradually, so that structural unemployment is relatively low and relatively constant. It may not seem like a plausible source for what we call cyclical fluctuations in employment, particularly high levels of unemployment such as those the U.S. has experienced recently or during the Great Depression.

One point of PSST is to raise the possibility that structural unemployment indeed could be a significant factor in periods of high unemployment, under scenario D. This would be the case if there is an asymmetry between the rate at which jobs become uneconomical and the rate at which new patterns of trade are established.

From the textbook perspective, in which the jobs for the unemployed already exist, the evidence for structural unemployment would consist of job losses that are concentrated in just a few sectors of the economy, along with high job vacancy rates in other sectors. If instead we observe broad-based unemployment and few sectors with high vacancy, the AS-AD approach would claim this as evidence of deficient aggregate demand.

From a PSST perspective, it is possible to have broad-based structural unemployment. The key empirical issue is the relationship between permanent and temporary job loss. To the extent that the jobs that are lost during a recession are the jobs that are restored during a recovery, we would have to concede that the problem was aggregate demand. On the other hand, if the pattern of employment after the recovery is almost totally different from the pattern that existed prior to the downturn, then we would argue that the fluctuation in employment was a reflection of structural change. The economy needed to be reconfigured.

If the jobs that are created as full employment is restored are not the same as those that were destroyed during a downturn, then the AS-AD model somewhat mis-characterizes the nature of employment fluctuations. Standard AS-AD stories, such as sticky nominal wages, are oversimplifications. If conventional monetary and fiscal expansions work, it would have to be through mechanisms other than overcoming nominal rigidities.

The rest of this essay proceeds as follows. First, I argue that the economy is more complex than is suggested by modeling it as a system of equations, including a given production function. Because the AS-AD paradigm treats the production technology as known, this approach leads one to think only in terms of wage and price rigidities as barriers to full employment. Instead, PSST focuses on real adjustment costs. To reconfigure the economy, time and resources are used in undertaking entrepreneurial experiments as well as in shifting capital and labor across firms and industry sectors.

Next, I use the Great Depression to illustrate the difference in perspective between AS-AD and PSST. Economic historian Alexander Field has found that

there was a large increase in total factor productivity (TFP) during the Great Depression. The AS-AD approach, which he employs, treats this as a phenomenon entirely distinct from the increase in unemployment that took place. With the PSST approach, we look for links between the rise in output per hour and the increase in the unemployment of resources. We may wish to revive the hypothesis of technological unemployment, which, though popular in the 1930s, was rejected by both classical and Keynesian economists.

I do not wish to characterize PSST as a brand-new macroeconomic theory. It has plenty of antecedents. Nor do I envision any test based solely on broad aggregate data that would decisively reject AS-AD in favor of PSST, or vice-versa. More fine-grained time-series cross-section analysis of the structure of the economy would be needed.

In my view, the AS-AD approach closes off too many avenues of research. The heterogeneity of labor and product markets is swept under the rug of the “representative agent.” Too much is made of non-market-clearing money wages and not enough is made of real sources of adjustment costs. The phenomenon of technological unemployment, much debated in the 1930s,¹ is overlooked. Discontinuities and out-of-equilibrium adjustment are usually ignored, because infinitesimal changes in the neighborhood of equilibrium are more tractable mathematically.

I see PSST as a way of opening up macroeconomic research to various lines of thought, some old and some more recent. In the final section of this paper, I briefly list some of the macroeconomic literature that relates to PSST.

A Rubik’s Cube with Disturbances

Economists often represent the economy as a set of equations. General equilibrium is in turn represented as a solution to these equations. The search for general equilibrium in mathematical terms is the search for a price vector that sets excess demands equal to zero.

I wish to point out that a system of equations is only a metaphor. The actual economy consists of businesses and households. They engage in consumption, production, and trade. They grope for ways to achieve their ends, sometimes using formal plans, often using trial-and-error.

I think that a better metaphor, although still just a metaphor, would be to think of the overall economy as a Rubik’s Cube with disturbances. It may help to think of the cube as being far larger than the 3x3 or 4x4 cubes usually sold. Perhaps a cube where each side is 10x10, or larger.

¹ See Bix (2000).

Imagine a player working to solve this Rubik's Cube, except that at frequent intervals a demon creates "disturbances" by taking away the cube, giving it a few twists, and returning it to the player, effectively posing a new problem. The disturbances take place at such frequent intervals that the player never manipulates the cube to the point where it is completely solved. When there is a sufficiently long interval of time during which the disturbances are small, the player may come close to solving the cube. This corresponds to what we would call a period of high employment. On the other hand, right after a large disturbance, the player may be far away from a solution. We can think of such a period as a slump.

A fully solved Rubik's Cube represents the ideal of general equilibrium. However, because of the phenomenon of disturbances, we never observe this general equilibrium.² Instead, the cube is constantly being reconfigured. The player, who represents the market mechanism, is always working on the problem, rotating the cube, perhaps manipulating it closer to the ideal, perhaps not. The demon, which represents developments not under the control of market participants, also acts on the cube.

I want to emphasize that the Rubik's Cube with disturbances is not just a metaphor for job matching. The job matching problem usually assumes a fixed set of well-defined jobs. Instead, part of the problem of solving the Rubik's Cube is to define new jobs as part of ongoing economic ferment and evolution.³

² As an aside, when a Rubik's cube is one rotation away from being solved, it obeys a sort of Walras' Law. That is, when there is an excess of the white color on the blue side, there is an excess of the blue color on the white side. However, this holds only when the cube is one rotation away from being solved. It does not hold in general. In my opinion, this is also the case for trying to use Walras' Law to say something about macroeconomics and general equilibrium. That is, only in the unrealistic case where the economy is close to the ideal of general equilibrium does Walras' Law have significance. Far from general equilibrium, it ceases to matter.

I make this point about the irrelevance of Walras' Law because otherwise it can trap the unwary. You might come to believe that a recession must consist of an excess demand for money. Similarly, you might come to believe that only in a monetary economy can you have unemployment, and that if workers received wages in the form of output there would be full employment. I think that most students who try to think about macroeconomics fall into such traps sooner or later. I know I have.

³ Keep in mind that the academic job market is not a representative example of the economy at large. Job matching might be a good description of the employment process for new assistant professors. It is not such a good description of the process by which occupations like "telephone operator" or "gas station attendant" became obsolete and occupations like "web designer" and "social media marketing manager" emerged. In academia, the new job descriptions are in the area of administration and support, not in the teaching hierarchy. Most colleges and universities, if they were listed along with American businesses, would be in the 99th percentile for longevity. Almost all other industries are less stable.

The Changing Pattern of Comparative Advantage

The twists and rotations of the economy's Rubik's Cube are a search for new forms of comparative advantage. However, in a modern economy, comparative advantage is subtle and complex. When a friend's daughter's first job was in "social media marketing," neither my friend nor I had any idea what this meant. Yet, apparently, this was her comparative advantage, and certainly the business importance of Facebook and Twitter is much in the news these days, however difficult this may be for people my age to grasp.

Businesses ask their employees to develop organizational capital.⁴ Organizational capital consists of processes and capabilities, including marketing channels, supply chain improvements, management reporting systems, internal controls, human resource management, training systems, and so on. The process of creating organizational capital is often undertaken by *ad hoc* teams of workers playing roles that are fleshed out on the fly. Once the capabilities are in place, workers are needed for maintenance and implementation. However, in today's American economy, routine work is always a target for automation or outsourcing to low-wage developing countries. A well-defined job is a job at risk.

The constant rearrangements and investments in organizational capital within firms are mirrored by equally pervasive reconfigurations of the relationships among firms. Many market innovations are embedded in new firms, who sell services to established enterprises or are swallowed whole via acquisition.

Although Schumpeter's term "creative destruction" captures some of this ferment, economists too often speak as if this were simply a matter of replacing old, inefficient businesses with new firms. Instead, innovations disrupt entire business ecosystems. For example, the ability to store and distribute music in digital form has affected more than just the stores that no longer are needed to sell physical recordings. The entire industry is in turmoil. Newspapers are another example, facing competition from web sites that specialize in sports, business, or other niches as well as from sites that skim away the business of classified advertising.

One difference between the AS-AD paradigm and PSST is that in the AS-AD paradigm most of the adjustment barriers take the form of wage and price rigidities, while with PSST the emphasis is on real adjustment costs. We know that there are real costs that must be undertaken in order to discover new opportunities, reconfigure business relationships,⁵ and train and hire new workers.

⁴ I am indebted to Garrett Jones for suggesting this term in a famous Twitter post.

⁵ One example of an adjustment cost is the cost of reaching the scale needed to exploit network effects. For example, consider the "chicken and egg" problem that a computing device cannot achieve market penetration without software applications, but software developers will not

We also know that embedding these adjustment costs into a mathematical model is difficult. I would feel better if I had a solution to the problem of incorporating a variety of adjustment costs in a mathematical model, but of course I do not. However, that is not an excuse for ignoring real adjustment costs.

A simple story may help to illustrate the difference. Suppose that there are four chefs arranged as two partnerships, operating restaurants. The four chefs are Bao, Esteban, Leroy, and Marcel. At first, Bao and Leroy are partners, serving curried baked beans. Esteban and Marcel also are partners, offering Pupusas in wine-mushroom sauce. Both restaurants do poorly, and they have to shut down. This is not because of sticky menu prices; it is because Vietnamese-Texas cuisine and Mexican-French cuisine are not such good ideas. The real adjustment that needs to take place is for Bao and Marcel to realize that they should combine forces, and for Esteban and Leroy to do the same. Once they figure out that French-Vietnamese and Tex-Mex are winning combinations, the economy can get back to full employment. There are real adjustment costs to discovering this way of organizing production. Note also that this is not job-matching in the conventional sense that jobs exist and the problem is to get the right people to fill them. The problem here is to discover that Tex-Mex is more popular than Mex-French.

The focus on real adjustment costs offers a different perspective on economic shocks. For example, the March 2011 earthquake and tsunami in Japan would be treated in the AS-AD paradigm as an adverse supply shock for Japan but a favorable demand shock in the rest of the world. The PSST paradigm suggests that the natural disaster, by disrupting trade patterns, is adverse for all countries that trade heavily with Japan. Similarly, in the AS-AD paradigm, a sudden drop in oil prices is a favorable demand shock. Using PSST, we would consider that a sudden drop in oil prices can disrupt patterns of trade just as a sudden increase may do so.

Persistent Patterns

The economy is never in a position of stable equilibrium. However, the market establishes many patterns that are somewhat persistent. A product is invented, a supply chain is developed, and production and distribution take place through the same channels for several years, or in some cases for decades.

The production process can be highly roundabout and complex, such as the process that ends with a consumer purchasing a smart phone, for which the activities involved include design, sourcing, reaching agreements with suppliers, assembly, marketing, distribution, and customer support. The patterns of

want to create applications until they know that a device will achieve market penetration.

specialization involved are more complicated by several orders of magnitude than those extolled by Adam Smith in this famous description of a pin factory.

These patterns of specialization and trade are constantly being tweaked. Firms try out new products and processes. Inter-firm relationships shift. Even entire sectors of the economy can be affected by changes in opportunities available.

Patterns of specialization and trade must remain profitable in order to be maintained. The requirement for profitability is what I mean by “sustainable” in the phrase “patterns of sustainable specialization and trade.”

We presume that patterns of trade are getting better over time. We expect this to happen, because we expect profitable patterns to persist, unless they are replaced by more profitable patterns. However, there is nothing that guarantees that patterns will always get better in the short run. Instead, good patterns might break down, and worse patterns could emerge for a time. In terms of the traditional metaphor of equations, when an economy is not in general equilibrium, the process of adjustment is not guaranteed to lead to improvement at each step. In terms of the Rubik’s Cube metaphor, not every rotation of the cube serves to better align the colors.

A standard measure of economic performance is GDP per capita, or GDP per working-age adult. We can decompose this into (GDP per hour worked) times (hours worked per adult). In the AS-AD framework, we typically associate changes in GDP per hour worked with changes in supply, and we associate hours worked per adult with changes in demand. In practice, we make the dichotomy stand out more clearly by using “cyclically-adjusted” productivity and by using “trend-adjusted” hours worked.

Using the PSST framework, we would not attempt to separate supply from demand. If GDP per adult is higher in period A than in period B, then we would simply say that the organization of production was better in period A than in period B. Whether output per hour worked is higher or hours worked per adult is higher, the market has done a better job of organizing production.

Over long periods of time, there has been a downward trend in hours worked per adult. A measure of economic well-being should account for this. In principle, we should add the value of planned leisure to the value of GDP. On the other hand, unplanned leisure, due to involuntary unemployment, should not be added to GDP.

Household production, such as do-it-yourself cleaning, cooking, and gardening work, is not counted in GDP. I think that is correct. I believe that we are better off than households where people grew their own food, sewed their own clothes, and so forth.

The modern economy rewards specialization and comparative advantage far more than do-it-yourself work. Household production is so inefficient relative

to market exchange that I would count it at best as part of planned leisure (when people garden because they enjoy it) and at worst as a symptom of poorly-organized production (when people tinker around the house because they cannot find suitable market work.)

Market exchange is a means for translating specialized work skills into general consumption. Economists who want to illustrate the benefits of international trade will point out how America can grow cars. We grow wheat, put the wheat onto ships, send the ships to Japan, and the ships come back with cars.⁶

In a sense, we obtain all of our goods and services this way. That is, we load our narrow, specialized production abilities onto the ship of the market, and back to us come all sorts of goods and services that we could not produce ourselves. As an individual, I hardly know how to make anything that I consume. However, by engaging in a narrow range of activities that reflect my comparative advantage, and then trading in the market, I am able to enjoy a cornucopia of goods and services.

In other words, all production is roundabout production. As individuals, we specialize narrowly. However, in a roundabout way, our work activities yield a dizzying array of consumption opportunities.

Roundabout production is associated with the Austrian theory of capital. However, in this instance, as in many others, there is little difference between augmenting labor with capital on the one hand and augmenting labor through trade on the other. In either case, people indirectly obtain the goods that they wish to consume by producing something else. People take unplanned leisure when they are not offered attractive opportunities to engage in roundabout production through the medium of the market. If there were a central planner at work, we would say that the planner is wasting resources and doing a sub-optimal job of organizing production. In a market economy, the decentralized actions of entrepreneurs are similarly falling short of optimal utilization of resources when many people are taking unplanned leisure.

This is not merely a problem of sticky wages operating within an aggregate production function. In PSST, there is no aggregate production function from which a well-defined marginal product of labor can be derived. Even within a given firm, the value that a worker adds may be impossible to calculate with precision. Remember that many workers are contributing to organizational capabilities, not producing widgets. Worker value is also highly dependent on context. Workers and firms are heterogeneous and specialized, with the amount of value added depending more on the overall pattern of trade and comparative advantage than on any measure of the absolute level of output.

In summary, let me emphasize the following points:

⁶ See Friedman (1996), p. 286, for example.

1. The organization of the market economy has become steadily more complex over time. People spend less time on household production and instead spend more time on market work or planned leisure.

2. Production has become more roundabout. Fewer people are engaged in hands-on labor. Instead, many workers are developing or maintaining organizational capabilities, such as product design, supply chain management, marketing, internal controls, and human resource management. For these workers, marginal product is not well defined.

3. Specialization has increased. As a result, the value that workers add depends on context and can change discontinuously when patterns of production shift.

4. When technology changes, the adjustments that are required are wide-ranging. The electric motor, the internal combustion engine, and the Internet are examples of technologies that stimulated wholesale re-organization of production processes.

5. The economy is constantly undergoing restructuring. Rather than moving back and forth along a production function, most changes in employment reflect shifting patterns of specialization and trade.

The Great Depression

The experience of U.S. railroads during the Depression provides some support for the silver lining hypothesis, the view that the recession may sometimes provide a longer-term boost to the growth of potential output...Even with some silver lining effect, however, we must still conclude that the growth of potential output would likely be higher in the presence of a smoother path of capital accumulation--that is, without either the boom or the bust. We cannot comfort unemployed workers with the thought that their sacrifices pave the way for a better tomorrow.⁷

Thus does Alexander Field conclude his monumental work, *A Great Leap Forward: 1930s Depression and U.S. Economic Growth*. An important thesis of the book is that potential output growth in the United States between 1929 and 1941 was relatively strong. This contrasts sharply with actual economic performance, in which output fell swiftly in the 1930s as unemployment soared. It is indeed counterintuitive that potential output increased during the Depression, given the decline in investment and capital worker that took place.

Using standard growth accounting, Field finds that the period 1929-1941 was characterized by the largest Solow residual (equivalently, growth in Total

⁷ Field (2011), p. 311.

Factor Productivity, or TFP) of any comparable period in this century. Since it is measured as a residual, TFP is almost by definition the unexplained determinant of output. We are left to speculate on what this determinant really is. Of course, Solow famously speculated that technical change contributed to the residual, and Field follows in this tradition. Field also suggests that earlier innovations, such as the electric motor in factories and the internal combustion engine in transportation, continued to affect TFP growth in the 1930s through their impact on what he calls “the organization of production.”

According to Field, the organization of production was improved both within and across firms. The electric motor allowed the factory to change from a multistory building dependent on a single large motor to a horizontally laid out plant with many different motors. The transition to these more efficient factories had begun in earlier decades, but it was completed in the 1930s. The internal combustion engine allowed trucks to complement railroads, making the latter more efficient and improving overall transportation. Again, this transition had begun in earlier decades, but it accelerated in the 1930s and continued beyond that period.

Field interprets his results in terms of the AS-AD paradigm. That is, the growth in TFP was a supply phenomenon, and the rise in unemployment represents a shortfall in aggregate demand. Instead, I want to suggest that the concept of “organization of production” can be applied to cyclical behavior as well as potential output. We can look at markets as searching for patterns of sustainable specialization and trade (PSST). This search process can be made more difficult by major technological change. Thinking in terms of PSST, we would *not* say that the organization of production improved during the 1930s. Something clearly went awry with the organization of production in that period. We need to understand why so many workers withdrew from or were jettisoned by the market trading system, and we need to understand what relationship, if any, there is between these dislocations and technological innovation.

For mainstream economists, including Field, we could have had the high TFP growth without the Great Depression, and we could have had a Great Depression without high TFP growth. From the PSST perspective, it is more appropriate to think about both the Great Depression and high TFP growth as manifestations of the same phenomenon: a reconfiguration of the patterns of specialization and trade in response to cumulative innovation.

Technological Unemployment

In the 1920s and especially in the 1930s, the issue of technological unemployment was widely debated. Of course, it had been debated for over a century, as the tenets of classical economics were worked out.

A new, efficient technology increases potential output while changing the pattern of comparative advantage. In theory, if adjustment is complete and instantaneous, full employment is restored, and average real incomes are increased, although there can be distributional effects that adversely affect some subset of the labor force. However, in the real world, adjustment costs matter.

In the 1930s, jobs in a variety of industries were lost to mechanization. When full employment was restored after the second World War, these jobs did not come back. Instead, new jobs had been created that were oriented around suburbia: in construction, wholesale distribution, and retail trade. The workers who filled these jobs in 1950 were largely of a different vintage than the workers who lost their jobs in 1930.

Another point worth noting about technological unemployment in the 1930s is that the jobs that disappeared were not necessarily mourned in later years. Bix (2000) lists a number of examples of occupations that were decimated by mechanization after 1930, including cigar rolling, cotton picking, and industrial glass blowing (for bottles and light bulbs). By 1950, no one was longing for such jobs.

Technological Unemployment and the Cycle

As noted earlier, economists tend to assume that structural unemployment is small and relatively constant. Implicitly, we assume that Goldilocks adjustment takes place, with employment gains in expanding sectors balancing the losses in contracting sectors. The PSST perspective is that this need not be the case.

Katherine Abraham and Lawrence Katz (1986) argued that if sectoral shifts cause aggregate unemployment, then we should see job vacancies rise during recessions. However, vacancies do not in fact display this behavior. In my view, the failure of vacancies to rise could simply reflect the fact that the firms and industries that will ultimately provide jobs do not exist at the time that unemployment arises.

There may be an asymmetry between the rate at which new industries expand and the rate at which old industries decline, with the latter taking place more suddenly. When technological progress generates new jobs, the change is relatively gradual. With the advent of the automobile, it took a few decades for employment opportunities to develop and expand at gas stations and other complementary industries.

On the other hand, industry-wide reductions in employment can take place quickly. During the 1970s, gasoline filling stations went from full-service (gasoline pumped by attendants) to self-service (you pumped your own gas, and

then you paid) nearly over night.⁸ Except in a few states that outlawed self-service, it seemed that within a few years the job of fuel pump jockey disappeared. It is conceivable but highly unlikely that the marginal revenue product of attendants suddenly changed so much.

I suspect that adjustment costs play a big role. In particular, I would emphasize the fixed costs associated with defining a job, hiring a worker to fill the job, and training the worker to perform the job. These fixed costs make firms hesitate to hire additional workers and hesitant to fire existing workers. If the environment that a firm faces is mostly mean-reverting, then it is rational to tolerate short-term fluctuations in profit rather than adjust completely to every shift in market conditions.

It may take a while for firms to reach the conclusion that a decline in the value of their workers is permanent rather than temporary. Once they reach such a conclusion the resulting adjustment may be sudden and large, rather than gradual and small.

It is interesting that many obsolete factories were shut down in the 1930s while newer factories expanded. Did the *relative* profitability of new and existing factories change in the 1930s? Or was there some sort of bandwagon effect, in which once an unprofitable firm saw that other unprofitable firms were shutting down, the firm would view this as a signal that it was faced with a secular decline in prospects, rather than a temporary deviation?

Another possible explanation for rapid worker displacement might be that financial stringency forces severe belt-tightening. Perhaps when profits are high, the productive contributions of workers are not scrutinized too closely. However, when profits fall, firms search for every possible way to economize on labor. Credit conditions also could play a role. Perhaps when credit is tight, firms pay extra attention to trying to hold down labor costs. These sorts of explanations would tend to overlap with AS-AD models.

The basic explanation for cyclical unemployment in the PSST perspective is that there are situations in which innovation reduces labor demand in old industries more rapidly than it leads to creation of new industries. Jobs are destroyed in industries where the pace of productivity growth exceeds the growth in demand. Jobs elsewhere are created by a process of trial and error, in which entrepreneurs attempt to invent new businesses and new industries. These two processes are not necessarily synchronized.

⁸ Mitchell (1980) writes: "In 1975 when the data first appeared, only 15% of the gasoline sold in the United States was sold on a self-service basis. In 1976 this rose to 30% and in 1977 to 40%." His explanation is that various regulations imposed after the oil embargo encouraged consumers to search for gasoline rather than go to the same filling station repeatedly. This shopping behavior broke what he terms the implicit contract in which the car owner received "free" services in exchange for regular patronage.

The late 1920s might have seen the economy in mode E, in which there was exuberance in the industries that seemed likely to gain in the long run, such as electric utilities and radio. Just as the bubble popped in those industries, other sectors were jettisoning workers as productivity gains outstripped demand in agriculture and some manufacturing industries, resulting in the high unemployment of the 1930s. It took the reconfiguration of the economy around suburbia that took place after the second World War to create the jobs needed to restore full employment.

Recent experience may be similar. The economy may have been in mode E during the late stages of the Internet bubble of the 1990s. Once that bubble popped, the economy switched to mode D, with the technologically threatened industries cutting back faster than newer industries can develop and expand. The weak employment performance since 2000, with unusually high levels of long-term unemployment and permanent job loss, is consistent with this description. The 2008 financial crisis may have been the definitive signal to firms that restructuring could not be postponed any longer.

PSST and Other Macroeconomic Approaches

PSST is not a brand new theory of macroeconomics. I see it as incorporating a number of existing ideas. In fact, relating PSST to the literature in macroeconomics would require an encyclopedic effort. Instead, I want to mention just a few strands to which PSST can be compared, in order to help clarify how it relates to other work.

Like Austrian economics, PSST emphasizes roundabout production. However, I do not think of the business cycle as consisting of production becoming “more” roundabout during an artificial boom and “less” roundabout after a bubble pops. Instead, production is constantly becoming roundabout in different ways. Any new configuration of specialization and trade can be as disruptive as a change in the length of the cycle of production.

PSST also shares with Austrian economics a view that entrepreneurs play an explicit role in the adjustment of the economy by reallocating resources as circumstances change. However, this process is much more than merely shifting inputs and outputs around in response to price signals. Entrepreneurs have to discover new ways to organize production, not only within firms but among firms. They need to experiment with different goods, services, production processes, organizational forms, supply chains, and other business arrangements. The collective actions of entrepreneurs are what substitutes for a central planner in the economy. Just as a central planner would be baffled by the complexity of today’s economy, the neural network of entrepreneurs can sometimes find itself baffled,

unable to provide all potential workers with opportunities that are better than unplanned leisure.

The idea of roundabout production as used in this paper is related to what some contemporary economists call complexity modeling. For example, Hidalgo and Hausmann (2009) argue that economic development is associated with a country's production and trade taking place in an increasingly complex network.

One example of real adjustment costs in the literature is the job-matching model. Diamond (1982), Mortensen (1970), and Pissarides (1985) have famously examined this. Job matching is certainly an aspect of economic adjustment, but I think that it understates the problem that entrepreneurs must solve. Filling an existing, well-defined job is only part of the challenge. Entrepreneurs have to invent entirely new goods, services, production processes, and business organizations in order to create PSST.

One challenge for the PSST approach is to describe an asynchrony between the creation of new industries and the destruction of old industries. There have been attempts to address this at both a theoretical and empirical level.

The idea that unemployment is high when the economy is undergoing sectoral adjustment has a long history. It includes David Lilien (1982), criticized by Abraham and Katz (1986) but supported by Guo (2007), who looked at the correlation between dispersion of stock market returns and unemployment.

Another attempt to link structural unemployment with cyclical unemployment was made by Fischer Black (1995), who built an approach based on the Capital Asset Pricing Model. In that framework, news about the future can affect the economy today. So, for example, news that a particular industry is going to be obsolete in the future may affect those who have financial and human capital assets in that industry today, even before the emergence of the new industry that will displace the incumbent. Greenwood and Jovanovic (1999) argued that the information technology revolution had this effect on stock prices in the 1970s. There is much related literature, including Beaudry and Portier (2003) as well as Chen, Kannan, Loungani, and Trehan (2011).

Another possible reason that structural change may lead to layoffs in a declining industry before an expansion takes place in an expanding industry is the option value of waiting to invest. This has been described by McDonald and Siegel (1987) as well as Dixit (1989).

There is a longstanding controversy about whether Keynes meant to describe unemployment as a phenomenon of equilibrium or disequilibrium. I prefer the disequilibrium tradition, which I associate with Clower (1965) and Leijonhufvud (1973). In Clower's model, an increase in structural unemployment would cause consumption to decline, which would reintroduce aggregate demand into the PSST approach. Leijonhufvud's "corridor" theory suggests that we might observe Goldilocks patterns of adjustment when innovation is modest and

continuous, but we might suffer large employment fluctuations in the wake of rapid change.

This can also be tied into the large literature in general equilibrium theory on the problem of adjustment in the absence of a general Walrasian auctioneer. Again, even that problem, complex as it is, strikes me as an oversimplification, because it takes production possibilities as given, so that the only challenge facing entrepreneurs is resource allocation. I believe that the discovery of new production possibilities is the most difficult and important task that entrepreneurs are expected to perform in the economy.

Finally, the idea that an economic shock might generate exuberance or displacement is borrowed from Kindleberger (2005, originally 1978). His thinking on manias, panics, and crashes seems to increase in relevance with each decade.

Conclusion

The PSST approach treats the economy as more complex than the AS-AD approach. It also raises the possibility that a large fraction of unemployment fluctuations could be due to structural changes. This view opens up many avenues for research and for policy analysis.

For research, perhaps the most interesting issue would be determining the extent to which the job structure changes over the course of a recession and recovery. The PSST model suggests that we might observe a faster rate of labor market restructuring during a recession/recovery than during a period such as the Great Moderation. It also predicts that most of the jobs lost during a sharp recession will not come back during the recovery, and that instead the recovery will produce very different patterns of employment. Perhaps the recently-developed data series on job openings and labor turnover (JOLTS) can be exploited to study whether during a recovery the job structure changes or reverts to some previous norm.

In contrast, the AS-AD model predicts a tight relationship between unit labor cost and employment. When unit labor cost is high, employment is low, and vice-versa. It would be interesting to see how well this fits a time-series cross-section of data on employment by industry.

For policy, PSST suggests that one might be less confident in aggregate demand policies. I would worry that generic increases in deficits or monetary growth might not provide the solution for workers who have been displaced by innovation. Instead, wage subsidies or other labor market policies might be more likely to achieve success.

References

- Abraham, Katherine and Lawrence Katz (1986). "Cyclical Unemployment: Sectoral Shifts or Aggregate Disturbances?" *Journal of Political Economy* 94:3 (June), 507-522.
- Beaudry, Paul and Frank Portier (2003), "Stock Prices, News, and Economic Fluctuations," CEPR *Discussion Paper* No. 3844.
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=410601
- Bix, Amy Sue (2000). *Inventing Ourselves Out of Jobs? America's Debate over Technological Unemployment 1929-1981*. Baltimore, Md.: Johns Hopkins University Press.
- Black, Fischer (1995). *Exploring General Equilibrium*. Cambridge, Mass.: MIT Press.
- Chen, Jinzhu, Prakash Kannan, Prakash Loungani, and Bharat Trehan (2011), "New Evidence on Cyclical and Structural Sources of Unemployment," paper prepared for a conference on long-term unemployment, held at the University of Wisconsin, Madison.
- Clower, Robert (1965), "The Keynesian Counter-Revolution: A Theoretical Appraisal," in F.H. Hahn and F.P.R. Brechling (eds.), *The Theory of Interest Rates*. N.Y.: MacMillan.
- Diamond, Peter (1982), "Aggregate Demand Management in Search Equilibrium," *Journal of Political Economy*, 90
- Dixit, Avinash (1989), "Entry and Exit Decisions under Uncertainty," *Journal of Political Economy* 97:3 (June), 620-638.
- Field, Alexander, (2011). *A Great Leap Forward: 1930s Depression and U.S. Economic Growth*. New Haven: Yale University Press.
- Friedman, David (1996). *Hidden Order: The Economics of Everyday Life*. N.Y.: Harper Business.
- Guo, Hui (2007), "Stock Market Dispersion and Unemployment," St. Louis Federal Reserve Bank *Economic Synopses* No. 5.
<http://research.stlouisfed.org/publications/es/07/ES0705.pdf>

- Greenwood, J. and B. Jovanovic (1999), "The Information-Technology Revolution and the Stock Market," *American Economic Review* (Papers and Proceedings), 89(2) (May), pp. 116-22.
- Hidalgo, Cesar A. and Ricardo Hausmann (2009). "The Building Blocks of Economic Complexity," PNAS 106:26, June 30.
http://www.chidalgo.com/Papers/HidalgoHausmann_PNAS_2009_PaperAndSM.pdf
- Kindleberger, Charles P. (2005; first edition 1978). *Manias, Panics, and Crashes*. NY: Wiley
- Leijonhufvud, Axel (1973), "Effective Demand Failures," *The Swedish Journal of Economics* 75:1 (March), pp. 27-48.
- McDonald, Robert and Daniel Siegel (1986), "The Value of Waiting to Invest," *Quarterly Journal of Economics* 101:4, 707-727.
- Mitchell, Edward J. (1980), "Change in Gasoline Marketing: an Interpretation," University of Michigan Working Paper No. 211.
- Mortensen, Dale (1970), "A Theory of Wage and Employment Dynamics," in Edmund S Phelps, ed., *Microeconomic Foundations of Employment and Inflation Theory*, Macmillan.
- Pissarides, Christopher (1985), "Short-Run Equilibrium Dynamics of Unemployment, Vacancies, and Real Wages," *American Economic Review*, 75.