

Human Capital and Its Structure

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Abstract

The Austrian school is unique for emphasizing an economy's capital structure. This paper explores the capital-based approach to macroeconomics, with its focus on capital as a structure and the heterogeneity of both physical and human capital. What might this approach teach us about how government interventions might distort market price signals, disrupt intertemporal coordination, and lead to malinvestments in human capital? By extending the Austrian theory in this manner, I sketch a theoretical foundation that future scholars can build on to contribute to some of the most pertinent questions in labor economics and macroeconomics.

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“Nothing is more certain than that, the degree of economic progress of mankind will still, in future epochs, be commensurate with the degree of progress of human knowledge.”

—Carl Menger ([1871] 1981, p. 76)

“Finally, the productive structure as a whole, encompassing the capital structure (narrowly understood) and the institutional structure (including the financial structure), must also be seen to include the value of human capital. In fact the human capital structure is arguably the most essential (and the most difficult to

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replicate) ingredient of the entire productive structure. Human knowledge has value. It is an asset. The human capital structure is, however, indescribably complex and unfathomable.”

—Peter Lewin (1999, p. 215)

I. Introduction

Economists dating back to Adam Smith have discussed the parallels between the entrepreneur’s decision to invest in physical capital and an individual’s decision to invest in education and other productivity-enhancing skills, or human capital (Kiker 1966). Yet explicit discussion of human capital only moved to the mainstream of the profession in the mid-twentieth century, with the pioneering work of Gary Becker, T. W. Shultz, and Jacob Mincer. In labor economics, human capital theory has been used to explain what factors influence an individual’s (and firm’s) decision to invest in labor-augmenting skills such as education and job training. It has also been used in growth economics to explain why some nations experience more rapid economic growth than others.¹

In this paper, I discuss how insights from Austrian capital theory can be extended to *human* capital to explain not only growth but also *cyclical* phenomena. In particular, I argue that viewing human capital not as a homogeneous stock but as a heterogeneous structure helps to explain how central bank credit expansion and various labor and education policies can distort market price signals, disrupt the coordination of human capital investments with underlying market conditions, and lead to a cluster of malinvestments in human capital, with adverse effects on postrecession recovery and economic growth. It may also offer insights into some of the most pertinent questions in macroeconomics, such as the growing prevalence of “jobless recoveries” (Bernanke 2003; Schweitzer 2003; Aronowitz 2005) and the perceived skills gap and underemployment problems that many economists fear are stunting growth (Faberman and Mazumder 2012; Fadda and Tridico 2013; Mutikani 2016).

II. Human Capital in the History of Economic Thought

Generally speaking, human capital refers to investments that workers

¹ For discussion of how human capital theory has impacted labor economics, see Mincer (1974), Becker (1994), and Goldin (2016). For discussion on the connection between human capital and growth, see Romer (1986); Lucas (1988); Barro (1991); Mankiw, Romer, and Weil (1992); Benhabib and Spiegel (1994); Hall and Jones (1999); Mokyr (2004); and Romer (2012).

or firms make in any skills (through education or job training, for example) that might enhance their productivity (Becker 1962, p. 9). In quantitative terms, we can think of the value of a person's human capital as the present value of the higher expected future stream of income they can reap from the higher output they can produce thanks to these investments. Thus, human capital can be estimated much in the same way that the value of a piece of physical capital can be as the present discounted value of its future productivity.

Although the term "human capital" wasn't formally employed until the turn of the twentieth century with the work of Irving Fisher (1897) and A. C. Pigou (1928), the concept has a long tradition in economic thought (Kiker 1966). Classical economists ranging from Adam Smith, Jean Baptiste Say, and J. S. Mill to Walter Bagehot, Henry Sidgwick, Jeremy Bentham, and Frederick List all noted the close parallels between investments in physical and human skills. Smith ([1776] 2008, p. II.I.17) famously included the "acquired and useful abilities" of workers in his four categories of a nation's fixed capital.² The "improved dexterity" of workers, he concluded, "may be considered in the same light as a machine . . . which facilitates and abridges labour." Others, such as J. R. McCulloch, Nassau Senior, Leon Walras, and Irving Fisher, went even further to argue that there was little practical need to distinguish human and physical capital; both were vital components of a nation's capital stock (Kiker 1966, pp. 485–87). Overall, although these writers recognized the differences between human and physical capital—most notably, that human capital is inalienable and so cannot be bought and sold separately from the person who possesses it—most agreed that useful analogies could be drawn between the two. As Alfred Marshall ([1890] 1920, p. 468) argued in his landmark textbook, "The most valuable of all capital is that invested in human beings."

By the twentieth century, most economists scoffed at equating individuals with physical commodities (Schultz 1961). This dismissive attitude was most prevalent in the burgeoning field of labor economics led by institutionalist scholars such as Richard T. Ely and John R. Commons. These early labor economists dismissed many core aspects of neoclassical theory, including the marginal

² Smith was among the first to describe the investment approach to human capital that was later made famous by Becker, Mincer, Schultz, and others. He wrote ([1776] 2008, p. II.I.17) that the "acquisition of such talents, by the maintenance of the acquirer during his education, study, or apprenticeship always costs a real expence, which is a capital fixed and realized, as it were, in his person."

productivity theories of wage determination and the neoclassical theory of the firm; they instead focused their scholarly attention on advocating for labor reforms along progressive lines (White 2016, pp. 10–12). So, although some advances in the neoclassical theory of labor and wage determination were made during this period by William Hutt, John R. Hicks, Paul H. Douglas, A. C. Pigou, and others, these advances were relegated to the background of the field (White 2012).

The topic of human capital experienced a renaissance in the mid-twentieth century with the work of Gary Becker, T. W. Schultz, Jacob Mincer, and George Stigler.³ As Becker (1962, pp. 9–10) pointed out, although ample work had been done up to that point in estimating the economic return to various types of *physical* assets, there had been “few, if any, attempts to treat the process of investing in people from a general viewpoint or to work out a broad set of empirical implications.” Applying rational choice theory to explain individuals’ decisions to invest in their “human capital,” Becker argued, provided a much more “unified explanation of a wide range of empirical phenomena” such as the time structure of earnings, the migration patterns of skilled vs. unskilled labor, and the optimal time workers should invest in training, education, and job search.

In the years since this revival, research on human capital has concentrated heavily on two areas within the economics literature. The first has been in the more microeconomic realms of labor economics and industrial organization. Following the work of Becker, Schultz, and Mincer, economists have continued to analyze what factors influence an individual’s (or firm’s) decision to invest in their human capital as a means of production. The second has been in the more macroeconomic realm of growth economics. Over the past few decades, more economists have argued that a nation’s human capital is a key ingredient for explaining why some nations enjoy higher labor productivity rates and hence more sustained economic growth than others.⁴

Despite its continuing relevance in these two areas, the topic of human capital has remained conspicuously absent from the modern literature on business cycles. With the disappearance of capital theory

³ For examples, see Becker (1958, 1962), Mincer (1958), Stigler (1961), and Schultz (1961).

⁴ For examples, see Romer (1986); Lucas (1988); Barro (1991); Barro and Lee (1993); Mankiw, Romer, and Weil (1992); Benhabib and Spiegel (1994); Hall and Jones (1999); Mokyr (2004); and Romer (2012).

from macroeconomics following the Keynesian revolution, economists have paid little attention to how investments in human capital interact with and complement an economy's physical capital structure, and how the two might be thrown into disarray during the business cycle. Standard models conceive of human capital in one-dimensional terms.⁵ Such an approach neglects the dispersed nature of knowledge in society and the importance of capital's heterogeneity.⁶ When instead we view human capital as a *structure*, not a simple aggregate, we can better appreciate how monetary and fiscal disturbances can distort market price signals and can cause entrepreneurs to malinvest in certain types of human (and physical) capital.

III. Human Capital and Its Structure

Before the Keynesian revolution, Austrian scholars from Carl Menger and Eugen von Böhm-Bawerk to Ludwig von Mises and F. A. Hayek made vital contributions to economic thought. They made efforts to erect from the micro-level principles of purposive human action and simple price theory a macro-level theory of how intertemporal coordination leads to sustained growth and what factors might disrupt it. Their emphasis on intertemporal coordination placed the economy's "time structure of production," or capital structure, at the heart of their macroeconomic analysis.⁷

A. Austrian Capital Theory and Capital-Based Macroeconomics

In this capital-based approach, savings play a pivotal role; they make possible not only the accumulation of more capital, but also the use of more "roundabout" and capital-intensive production processes with longer time to build and payback periods that ultimately yield greater output per unit of factor input (Böhm-Bawerk 1959). From

⁵ For example, Mankiw, Romer, and Weil (1992) make aggregate output, Y , a function of human capital, H , as well as of the Solow model's traditional inputs of physical capital, K , and labor, L .

⁶ Schultz (1972, p. 4) once remarked: "Because of the ambiguities that burden capital theory, we do well to bypass it, and rely on a theory of investment and the rates of return to investment opportunities." Accordingly, human capital theory deliberately avoided issues from the Knight-Hayek debate about what is gained and lost by treating capital as homogeneous rather than heterogeneous, and production as instantaneous rather than time-consuming (White 2016, pp. 2–3).

⁷ For this reason, Garrison (2001) describes the Austrian approach as "capital-based macroeconomics." He contrasts this to the Keynesian "labor-based" and monetarist "money-based" approaches.

an Austrian perspective, capital or “higher order” goods (defined as an economy’s nonlabor means of production⁸) occupy a critical role in the capitalist economy because they are the means through which advanced material production takes place (Menger [1871] 1981). The enhanced productivity of these more roundabout production methods—made possible by the public’s prior savings and the movement toward a greater division of capital that it promotes—lies at the heart of the Austrian theory of sustainable growth (Garrison 2001; Manish and Powell 2014).

The greater steady-state output of these more time- and capital-intensive production methods, however, comes at a cost in addition to longer waiting—namely, the higher risk of embarking on projects that might turn out to be inconsistent with future consumer preferences. The immense difficulty of predicting a future that is, as Lachmann put it, “unknowable but not unimaginable,” led Austrians to stress two main ideas.

First, Austrians strongly emphasized the role that money prices play in enabling entrepreneurs—the market’s driving force—to engage in rational economic calculation (Mises [1949] 1996). In a world characterized by dispersed knowledge and Knightian uncertainty, market prices serve as indispensable “aids to the human mind” (Mises [1912] 1981, p. 62). They allow entrepreneurs to economize on the knowledge required to efficiently allocate capital to its highest valued use by cheaply relaying only the most vital information about the relative scarcity of inputs and demand for various outputs (Hayek 1945).

The most important of these relative prices is the interest rate. Interest rates play a central role in the Austrian story because they reflect consumers’ time preferences—that is, they equate at the margin consumers’ willingness to delay their consumption with an investment’s marginal productivity. The interest rate signals to investors how “roundabout” of projects they can embark on. When the market rate of interest equals the equilibrium or “natural rate,” intertemporal coordination is achieved, and the economy enjoys

⁸ Over the years, Austrian scholars have offered numerous definitions of capital. Böhm-Bawerk defined capital as the economy’s *produced* means of production. Hayek defined it as the *nonpermanent* means of production. Rothbard defined it as the *reproducible* means of production. Lachmann defined it as the heterogeneous stock of material resources used as inputs in the production process. When I use the term “capital,” I will rely on Garrison’s definition of capital as the *nonlabor* means of production.

sustainable growth. If the two rates are driven apart, say by policy disturbances, the economy's capital structure is unsustainable.

Second, Austrians uniquely emphasized how capital is physically and functionally heterogeneous (Garrison 2001, pp. 7–9).⁹ With time-consuming production, capital goods in the form of goods-in-process and durable equipment at the “early stages” of a production process (e.g., crude oil stocks and drilling rigs) are often not interchangeable with capital goods at later stages (e.g., gasoline stocks and refineries). For this reason, capital should not be modeled as a homogenous stock that can be reallocated without cost to other projects, as most mainstream models show. Moreover, in a world characterized by disequilibrium, entrepreneurs are bound to have divergent (and often contradictory) expectations of the future, so the subjective values they assign to these capital inputs will inevitably vary.¹⁰ There is therefore no way to “aggregate up” in dollar terms the diverse array of capital goods in an economy into a single measure or index, K .¹¹ For this reason, Austrians stress that capital should be seen as a *structure* of heterogeneous inputs, each with multiple albeit limited uses, rather than as an aggregate stock that can be objectively measured.¹²

⁹ Unlike land and labor, which to some degree can be conceptually compared and aggregated in terms of acres and persons, respectively (leaving aside the theoretical problems with assuming that these units are of homogenous value, as discussed later), capital comes in many different physical forms. It thus has “no natural measure” (Lachmann [1956] 2011, p. 12). It is also possible that the same capital good—a forklift, for instance—can be used in a variety of ways based on the entrepreneur's subjective plans. For this reason, Austrians also stress that capital is “heterogeneous in use” (Lachmann [1956] 2011, p. 2).

¹⁰ Lachmann ([1956] 2011, p. xv) elaborates on this point: “The generic concept of capital . . . has no measurable counterpart among material objects; it reflects the entrepreneurial appraisals of such objects.” He goes on to explain the ramifications of this insight in a world of disequilibrium: “In equilibrium where, by definition, all values are consistent with each other, the use of money value as a unit of measurement is not necessarily an illegitimate procedure. But in disequilibrium where no such consistency exists, it cannot be applied” (p. 2).

¹¹ Hayek (1941, p. 6) stressed this in his critique of Keynes: “But all the essential differences between these [units of capital] were obscured by the general endeavor to subsume them under one comprehensive definition of the stock of capital. The fact that this stock of capital is not an amorphous mass but possesses a definite structure, that it is organized in a definite way, and that its composition of essentially different items is much more important than its aggregate ‘quantity,’ was systematically disregarded.”

¹² As Lewin (2012) explains: “The productive capital of the economy is not simply an amorphous ‘stock’ of generalized production power; it is an intricate structure of

The Austrian capital-based approach illuminates which factors lead to sustainable growth and which forces may spark the boom-bust cycle. Because the capital structure is composed of an array of heterogeneous items with limited substitutability, price signals—particularly, interest-rate signals—play an indispensable role in guiding entrepreneurs’ decisions about what combinations of capital goods and labor they should employ to produce output in the most economical way possible.¹³ The main policy implication of this analysis is to caution that distortions in the structure of intertemporal relative prices—for example, when central banks hold interest rates below Wicksellian natural rates—can lure entrepreneurs into unsustainable investment projects, leading to boom followed by bust.

In the years since the Keynesian revolution, macroeconomics has strayed from these Wicksellian approaches that emphasize intertemporal coordination between the plans of consumers and investors (Leijonhufvud 1981, 2009; Hayek 1989). It has instead relied on models that emphasize the circular flow of income and treat real income as the product of an instantaneous aggregate production function composed of aggregate capital and labor inputs. Fortunately for Austrian scholars, these models’ failure to predict or explain the Great Recession has led economists to reexamine these overlooked theories and see how they might be extended to explain unresolved questions regarding the length and severity of modern recessions, and in particular why labor markets tend to take so long to return to full employment.

B. Human Capital as a Structure

Over the years, Austrians have argued that the increasing specialization of labor brought about by the greater division of capital in the economy has elevated the importance of human capital in explaining what factors cause economic growth (Bellante 1983; Lewin 1999; Boettke and Luther 2012).¹⁴ Where opinion has diverged is on

specific interrelated complementary [parts]. For Austrians, there is no ‘capital stock.’ Any attempt to aggregate the multitude of diverse capital items . . . into a single number is bound to result in a meaningless outcome: a number devoid of significance.”

¹³ Lachmann saw the essence of entrepreneurship as the choice among various types of capital combinations: “As long as we disregard the heterogeneity of capital,” he wrote, “the true function of the entrepreneur must also remain hidden” (Lachmann [1956] 2011, p. 16).

¹⁴ Boettke and Luther (2012, p. 14) argue that “increasing specification over time has placed human capital on or near equal footing as physical capital. Hence,

the question of whether human capital should be included in the economy's capital structure.¹⁵ Some contend that since human capital is inalienable—that is, it cannot be bought and sold separately from its possessor, and hence its price is difficult if not impossible to extract—the term “capital” should not be broadened to include human or social capital, or any nonmarketable assets (Klein 2014). Others argue that although it is true that human capital cannot be marketed and priced as easily as physical capital, individuals and firms do in fact try to estimate the expected costs and benefits of their investments in human capital—that is, like owners of physical capital, they behave *ex ante* as if they can access such prices even though they will only be able to gauge the success of these decisions *ex post* via real or psychic returns to their investments. So despite important differences between human and physical capital, and even though economic agents might not be able to access explicit market prices for the former, there are nevertheless enough parallels between the two to include human capital as a distinct yet critical element of an economy's capital structure.

This paper adopts the latter viewpoint. One need not argue that physical and human capital are equivalent in every way to contend that key similarities make the two ripe for comparison. Like physical capital, human capital is dimensionally heterogeneous in that it lacks a natural unit of measurement since various investments in training and education cannot easily be summed (as is often done when human capital is approximated by total years of education). Like a particular physical capital good, a particular investment in human capital (say, earning a PhD in economics) can be used in many different ways, but is not perfectly substitutable with other human capital owned by other agents; pieces of human capital must fit into the economy's structure of production plans rather than just be added to a homogenous stock of generalized skills. And as with investments in

entrepreneurs making malinvestments in human capital—in much the same way as physical capital—might be more relevant today” to explaining business cycles.

¹⁵ On the one hand, Lewin (2009) takes a broader approach to understanding capital as anything, material or not, that adds value over time to the production process. He argues that “a ‘proper’ understanding of capital suggests that human capital is a logical component of the capital structure of the economy.” Klein, on the other hand, takes a more narrow approach to understanding capital. He writes: “Knowledge is not, strictly speaking, capital, because it is not traded in markets and does not have a rental or purchase price. What markets trade and price is labor services, and it is impossible to decompose the payments to labor (wages) into separate ‘effort’ and ‘rental return on human capital’ components” (Klein 2014).

physical capital, individuals' decisions to invest in particular sorts of human capital depend on the relative prices they face, including market interest rates on the cost side and relative wages on the returns side. When prices accurately reflect underlying consumer and employer preferences, investments in human capital will tend to be well chosen, with randomly distributed errors. When extra-market forces such as central bank credit policies and government interventions into labor markets distort the relevant prices, however, a cluster of malinvestments may occur in particular types of human capital.

C. Understanding Optimal and Malinvestments in Human Capital

By extending these insights from Austrian capital theory to examine investments in human capital, we see several things. For the human capital structure of an economy to be consistent with optimal growth (i.e., ensuring it is operating along the preferred path on its sustainable intertemporal production possibilities frontier), wages must be allowed to signal the relative demand for certain types of knowledge and labor skills. Also, interest rates (especially on things like student loans) must accurately coordinate the time preferences of lenders with the transformation opportunities of borrowers so that workers are not misled into over- or underinvesting in specific types of human capital. When these conditions are met, the economy achieves full employment and an optimal distribution of employment.¹⁶ The structure of investments in human capital in the economy is consistent with (or “fits” into) employers' demands, and the labor force's skills are perfectly aligned with the economy's physical capital structure. This situation has no systemic under- or malemployment.¹⁷

Mainstream economists might find little to disagree with in the preceding analysis. Most agree that prices are crucial in

¹⁶Mises ([1949] 1996, p. 598) distinguishes “catallactic unemployment” (i.e., frictional unemployment), which is an unavoidable market phenomenon, from “institutional unemployment,” which results largely from nonmarket forces such as minimum wage laws. Although the sum of these two is called the “natural rate” of unemployment, only the former is truly natural. A third category is cyclical unemployment, which can occur, for instance, in the wake of the Austrian boom-bust cycle. In the case of *optimal* employment discussed above, there is catallactic unemployment, but no institutional or cyclical unemployment.

¹⁷ “Underemployment” or “malemployment” refers to the mismatch between the skills that workers invest in and possess and the skills that employers actually demand. For more, see Fogg and Harrington (2011).

communicating information, and that labor-market interventions such as minimum wage laws often have perverse effects on employment. Although these points might be tacitly recognized, many of the core Austrian insights outlined here are nevertheless incompatible with the methodology employed by many labor and macroeconomists. For instance, both Stigler's optimal search model and Becker's human capital model assume a perfectly competitive world of symmetrical and complete information. In this world, knowledge is a standardized product that is equally available to everyone, and agents have equilibrium-consistent beliefs about the underlying functional relationships so that they know with certainty how additional search time and each incremental investment in human capital will pay off in terms of employment and higher wages. In short, there is no room for Knightian uncertainty, genuine discovery, or any recognition of the heterogeneity of labor and capital (Boettke and Luther 2012, pp. 21–22).

These assumptions break down in the disequilibrium world depicted by Austrians (Kirzner 1963, 1973; Lachmann [1956] 2011; Lewin 1999). In this world, Knightian uncertainty is an unavoidable fact of life, knowledge is dispersed and costly to acquire, agents have different and often contradictory expectations of the future, and both labor and capital are heterogeneous. In a world of human capital heterogeneity, agents face a difficult task: they must estimate not just the return to their investment in order to choose *how much* education to acquire, but also the returns to investments in various types of human capital in order to choose *which specific type* of education to acquire. In a world of heterogeneous human capital investment possibilities, each worker becomes not just a simple maximizer but, as Michel Foucault (2008, p. 226) once expressed it, an “entrepreneur of himself.” In such a world, equilibrium remains a mirage. However, there will emerge a tendency toward equilibrium (understood as a greater consistency of plans) insofar as entrepreneurs on both sides of the labor market successfully align their plans according to price signals. As the returns to various types of human capital change, they induce employers to revise their hiring decisions to attract workers with more highly valued skills; they also induce employees to revise the types of human capital they might invest in.

Boettke and Luther (2012, pp. 23–28) outline a market-process approach to labor markets that combines these Austrian insights with the evolutionary search theory put forward by Alchian (1969). The model can be broken down into two sides: employees and employer.

On the employee side of the market, “entrepreneurial workers must make strategic human capital investments in order to be compatible with the future plans of entrepreneurial producer” (Alchian 1969, pp. 24–25). Alertness to profit opportunities encourages workers to invest in specific types of human capital that earn higher rates of return.¹⁸ Workers who acquire more valued types of human capital earn higher salaries, and these above-normal returns (assuming an equal cost of acquisition) draw other workers to invest in these types of human capital.

Employers engage in a similar trial-and-error process to find workers who possess the types of human capital that best fit their existing production plans. Just as with physical capital, recognizing the heterogeneity of human capital is essential for employers. As Mises (1949, p. 590) noted: “What is bought on the labor market is not ‘labor in general,’ but definite specific labor suitable to render definite services” (Mises 1949, p. 594). To succeed, employers must therefore rely on market prices and profit-and-loss signals to determine what skills their workers should possess to best complement their existing physical capital structure.

Although errors are inevitable, this feedback process tends to promote a more efficient dovetailing of plans between entrepreneurs on both sides of the labor market. However, a critical element of this Austrian market-process approach is that this coordination is only possible if the market discovery process is allowed to operate freely. If governments interfere with the price system by enacting wage controls or subsidies or penalties on certain human capital investments, and if central banks engage in cheap credit policies that distort interest rates, the information conveyed by these relative price signals is diluted, and large-scale coordination problems can arise.

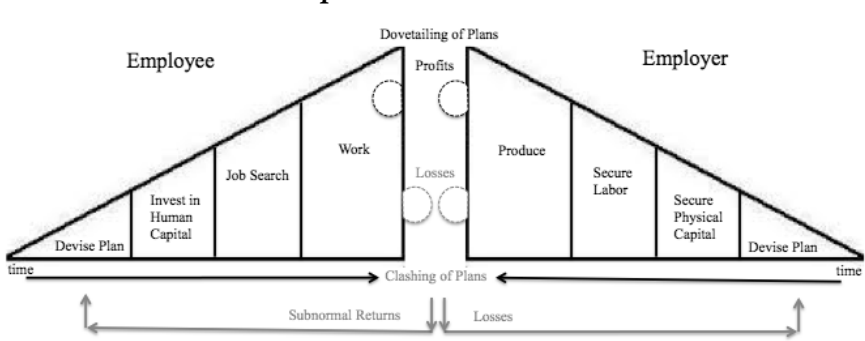
Figure 1 depicts these investments in human capital and the coordination game that occurs between employers and workers. On the employee side, workers devise plans and decide what types of human capital they should acquire before embarking on their job search. On the employer side, capitalists devise their production plans and then secure the physical capital and labor that they need to produce. If the mix of human capital that workers acquire dovetails with the skills that employers seek, the human capital structure “fits

¹⁸ A student at Stanford, for instance, might be tempted to switch from microelectric engineering (a field that is experiencing flagging demand) into software engineering (a burgeoning field) to increase their chances at receiving a high-paying job in Silicon Valley.

into” the firm’s production structure like compatible puzzle pieces, as indicated by the black dotted lines, and the economy’s human capital structure is sustainable.

If not, plans between workers and employers clash, as the dotted red lines indicate, and the economy’s human capital structure is unsustainable. In this case, workers who are experiencing subnormal returns to their human capital investments (in the form of unemployment, underemployment, or malemployment) must return to the start, revising their plans and reinvesting in new skills that employers seek. Though their human capital is not entirely lost or “liquidated” in the way many physical capital goods are during the bust, it still takes time for workers to retool their skills and find new employment. This phenomenon helps explain why unemployment persists for so long during the bust.

Figure 1. Entrepreneurial Market-Process Approach to Labor-Market and Human-Capital Investments



Source: Adapted from Boettke and Luther (2012, pp. 24–25).

If we view the economy’s investments in human capital as a structure that evolves through the actions of entrepreneurs on both sides of the labor market in response to relative prices, we get a better microfoundational approach to understanding labor-market discoordination. Specifically, the Austrian view properly emphasizes the connection between prices and production in labor markets. Prices guide investments in human capital as well as physical capital. When the integrity of these prices is impaired, employers and employees will not only invest in the wrong amounts of human capital, but perhaps more importantly, they will invest in the wrong mix of skills. The structure of human capital in the economy will not be consistent with the set of production methods that would best meet consumers’ demands.

The key contribution of this Austrian approach to labor and human capital theory is that macro- and labor economists should focus less on the symptoms of the problem that contribute to cyclical unemployment and more on the underlying problems of *structural* unemployment, underemployment, and malemployment, which worsen the business cycle and dampen long-term growth.¹⁹ When central banks hold interest rates artificially low for substantial periods, longer-duration production methods appear more profitable. Firms that invest heavily in these early stages of production bid up wages and raise the return to human capital investments in these sectors. If workers base their education and other human capital investments on these distorted price signals in the labor market, they will be misled into attaining skills that are specific to a sector that will soon stop hiring.²⁰ When the artificial boom turns to bust, the unemployment rate inevitably rises. However, contrary to the view that recessions are due merely to shortfalls in aggregate demand, the core forces driving this unemployment are not only cyclical but *structural*.²¹ Employers, misled by false interest-rate signals, restructure their capital and invest in the earliest (and latest) stages of production; employees, misled by the higher rates of return in these sectors, malinvest in human capital skills that are directly suited for these jobs.²² Ultimately, both physical and human capital must be reallocated toward other sectors. The need for a transition away from the prior structural misallocation helps to account for why it takes so

¹⁹ Garrison (2001, pp. 63–67) discusses the perverse effects that the boom-bust cycle described by the Austrian theory has on wages and the relative demand for labor across the economy's stages of production.

²⁰ As Hayek (1979, p. 25) notes, in the boom these false price signals cause "discrepancies between the distribution of the demand among the different goods and services and the allocation of labor."

²¹ Boettke and Luther (2012, pp. 41–43) distinguish between vertical and horizontal changes in employment. Vertical changes refer to changes in aggregate (i.e., cyclical) employment that occur during the business cycle. This is what mainstream economists tend to focus on. Horizontal changes refer to the *structural misallocation* of labor that occurs between early and later stages of production. Although Austrians recognize vertical changes, they are more apt to stress the danger of horizontal changes.

²² Garrison (2001, p. 64) splits the effect on labor markets into two parts. In the later stages of production, the *derived demand effect* dominates, so that the rise in consumer spending compels employers to hire more workers and bid up their wages. In the earlier stages, the *time-discount effect* dominates. Since labor is valued at a discount, the reduction in the interest rate during the boom lessens this discount and increases the value of labor in these sectors.

long for workers with the wrong skills to find appropriate new jobs, sometimes by retraining. This point is overlooked by analysis that attributes the rise and duration of unemployment simply to a decline in aggregate demand (Bernanke 2003; Schweitzer 2003; Aronowitz 2005).

The Austrian perspective, with its emphasis on the specificity of the physical and human capital structure of an economy and the time-intensive nature of these investments, may also be able to contribute to two of the biggest puzzles in macroeconomics. First, in terms of business cycles, it paints a much clearer picture of the “jobless recovery”—that is, why labor-market recovery tends to lag so far behind the recovery of total spending. For Austrians, full employment takes so long to be reestablished because so much of the unemployment in the aftermath of an unsustainable investment boom involves a structural mismatch of human capital. This view has clear implications for public policy: any effort to raise total employment that impedes human capital restructuring will impede recovery and prolong the structural mismatch that is the root problem.²³

Second, the Austrian perspective on the structural nature of investments in human capital may also shed light on issues relating to economic growth, such as what factors contribute to the “skills mismatch” that many developed nations are experiencing with the sharp rise in measured under- or malemployment rates (Fogg and Harrington 2011; Faberman and Mazumder 2012; Mutikani 2016). For Austrians, widespread discoordination between the skills that job seekers are investing in and the skills that employers demand suggests that nonmarket forces might be at work. In particular, economists should look for policies that might be distorting market price signals and thereby encouraging workers to invest in inappropriate types of human capital. Are subsidies to higher education (in particular, government-subsidized student loans) or to certain types of job-training programs, for instance, distorting market price signals and inducing workers to invest in the wrong types of human capital?

²³ As Lewin (2012) notes, the idea that the solution to high unemployment is simply for the government to stimulate total investment spending “ignores the heterogeneity and structural nature of both capital and labor (human capital).” He concludes: “The [latest] enduring recession is basically structural in nature. It is the bust of a credit-induced boom-bust cycle, augmented by far-reaching production-distorting regulations.”

Analysis incorporating human capital heterogeneity may help to resolve such puzzles.

IV. Conclusion

In this paper, I have attempted to show how a capital-based approach to macroeconomics, with its focus on the capital structure of an economy, can be extended to improve our understanding of labor markets and, in particular, human capital markets. I have identified a few implications for scholars and policymakers. From a theoretical standpoint, viewing human capital as a structure rather than as a homogeneous stock has much to offer. Perhaps the most important application pertains to improving our understanding of investments in skilled labor in the business cycle. Because human capital is heterogeneous, and because price signals play a critical role in driving individuals and firms to invest in specific types of human capital, any policy that interferes with the price system's ability to communicate accurate information will prevent human capital markets from achieving an optimal (and sustainable) match of skills to employment. After a recession, market prices need to adjust and malinvested human capital needs to be reallocated. Although a more detailed empirical analysis of these implications is beyond the scope of this paper, the analysis here points to opportunities for future scholars to improve our understanding of human capital. In particular, studying the heterogeneity of human capital and the conditions for human-capital malinvestment provides a route for joining macroeconomics and endogenous growth theory in the spirit of Garrison (2001). The physical and human capital structures of an economy involve complex coordination that can only be sustained when prices are allowed to convey accurate information to employees and employers (Wagner [2010] 2013).

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