THE ECONOMICS OF EDUFACTURING: HISTORICAL ROOTS OF THE BIFURCATION OF AMERICAN HIGHER EDUCATION

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ABSTRACT

This paper is an analysis of the development of edufacturing, which is defined to be the application of manufacturing methods to education. In particular, the genesis of edufacturing in higher education is outlined in the context of public funding and the attendant emphasis on educational processes over academic content. Efforts to model universities as firms are summarized and critiqued, and the present state of affairs with the bifurcation of higher education into two tiers is linked to relatively recent public initiatives to reform education at all levels. **JEL Classifications:** B25, H52, I23

INTRODUCTION

With his 1918 polemic, *The Higher Learning in America: A Memorandum on the Conduct of Universities by Business Men*, the father of the Institutionalist School of economics, Thorstein Veblen, began a debate that has continued for a hundred years. Veblen, more influenced by the French Socialists than by Karl Marx, characterized modern universities as having been corrupted by Capitalism. To Veblen, and to many educational commentators today, education is too important to be relegated to Capitalism. Unfortunately, many of the problems perceived as coming from *Capitalist* influences on education are largely due to the application of *manufacturing methods* to education. This confusion between Capitalism and manufacturing is at the root of the problem.

Of course, manufacturing and capitalism are not synonymous. Communist states have been known to engage in manufacturing while some capitalist enterprises have been concerned entirely with the provision of services instead of easily-measured goods. Standardized products, production recipes, and interchangeable parts that so many writers have linked to capitalism are common in manufacturing industries and may have nothing to do with the price system, financial institutions, or modern marketing methods. To help separate the two distinct phenomena of manufacturing and market mechanisms, this paper defines the application of manufacturing methods to education as *edufacturing*.

Manufacturing in universities is not new, as will be shown below. In his heterodox

1962 work, *The Community of Scholars*, Paul Goodman quoted leading university administrators including Jacques Barzun and Harold Taylor in arriving at his summary statement:

> …these factory-like and businesslike ways are inevitable under the modern conditions with which administrations must cope. (p. 240)

Bauerlein (2009) documented the well-known tendency for faculty research in the humanities to conform to carefully specified recipes. Greene, Kisida, and Mills (2010) have noted *dis*economies of scale in higher education in spite of technological progress. These examples are all couched within manufacturing practices and terminology.

The roots of edufacturing will be explored in a brief history, followed by evidence of peculiarities of educational production processes. Then, an explication follows of some old economic controversies whose origins predate Veblen, particularly the Cambridge Capital Controversy and the Human Capital debate, that may be of use in modeling the industry in which the modern educational factory operates.

A BRIEF HISTORY

A complete history of edufacturing is beyond the scope of this paper. The subject is perhaps most efficiently addressed in terms of two different threads of literature that later intertwine. The first thread is the modern scientific management movement. The second thread is the evolution of public funding mechanisms for higher education.

Thread One: Scientific Management and Manufacturing

The study of modern manufacturing methods in industry is generally acknowledged to have had its genesis in the efforts of Frederick W. Taylor, the generally-accepted "father of scientific management" (Taylor, 1967; Wren, 1994, pp. 103-106).

It is important to note that at the time when both Taylor and Veblen wrote, American industries were almost exclusively manufacturing entities. Textiles, weapons, and fuels were explicitly manufactured. The only significant exceptions were transportation and communication, but even these two "service" industries were possible only with heavy equipment and machinery manufacturing, so that every large American industry until 1920 had manufacturing at its core (see Wren, 1994, pp. 83-93).

During the same period, the iconoclastic Veblen noted that the evolution of the modern corporation had led to a remarkable change in commercial (i.e. manufacturing) enterprises. Increased specialization and complexity caused a division between "those who designed and administered the industrial processes from those others who designed and managed the commercial transactions and took care of the financial end (Veblen, 1983, originally published in 1921).

> This division between business management and industrial management has continued to go forward, at a continually accelerated rate, because the special training and experience required for any passably efficient organization and

> direction of these industrial processes has continually grown more exacting, calling for special knowledge and abilities on the part of those who have this work to do and requiring their undivided interest and their undivided attention to the work in hand (p. 77).

He continued to contrast the *content* people in firms with the *process* masters as follows:

> These specialists in technological knowledge, abilities, interest, and experience, who have increasingly come into the case in this way – inventors, designers, chemists, mineralogists, soil experts, crop specialists, production managers and engineers of many kinds and denominations – have continued to be employees of the captains of industry, that is to say, of the captains of finance, whose work it has been to commercialize the knowledge and abilities of the industrial experts and turn them to account for their own profit.

Veblen concluded this argument by stating that

> The result has been a somewhat distrustful blindfold choice of processes and personnel and a consequent enforced incompetence in the management of industry, a curtailment of output below the needs of the community, below the productive capacity of the industrial system, and below what an intelligent control of production would have been made commercially profitable (p. 78).

"Taylorism," or the systematic approach to recording movement and process in order to standardize and optimize operations for maximum efficiency, had been almost immediately applied to public schools in America in many of the larger school districts (Callahan, 1962, pp. 46-52). In his 1918 work, Veblen completed the links between his views on manufacturing and higher education. In doing so, he was merely applying the existing trends in elementary and secondary education to colleges and universities. According to Goldin and Katz (1999a), by 1910 "the era of the division of labor in higher education had (already) arrived (p. 40)." Several influences "altered the industrial structure of higher education (Goldin and Katz, 1999b, p. 303). These included

- Specialization of disciplines
- Professionalization of many occupations
- Secularization of higher education
- Ascent of the 'university' form

On the other hand, *standardization* was slower to follow in higher education than it had in the public school systems (Schmoker and Wilson, 1993). As Draper (1907) had observed,

> Happily, the high-school movement in America has proved to be a great disorganizer of (social) classes, as well as a great help to the diffusion of higher learning (p. 36).

Although scientific management had taken public education at primary and secondary levels by storm during the 1920s, some universities balked at wholesale adaptation of manufacturing methods to higher education. The market for higher education was much more stratified than was the "market" for high school, with some institutions having started as land-grant universities and others as private liberal arts colleges, technical institutions, normal schools, and professional schools.

Thread Two: Funding Sources as a Catalyst for Changing Market Structure

After the earlier Morrill Acts of the nineteenth century, the next major foray into direct federal funding of higher education was the G.I. Bill (The Servicemen's Readjustment Act of 1944) and its subsequent amendments (Kerr, 1994; Olson, 1973).[1]

By 1967, The Carnegie Foundation for the Advancement of Teaching had formed The Carnegie Commission on Higher Education "to study and make recommendations regarding the major issues facing U.S. higher education (McCormick and Zhao, 2005, p. 51). Three years later, the Carnegie Commission established five major categories for colleges and universities (with subdivisions):

1. Doctoral Institutions,
2. Comprehensive Institutions,
3. Liberal Arts Institutions,
4. Two-Year Colleges and Institutions, and
5. Professional Schools and Other Specialized Institutions.

Almost immediately, McCormick and Zhao noted, the classification had "a homogenizing influence" since its focus on institutional diversity caused many institutions to seek to "'move up' the classification system for inclusion among 'research-type' institutions" (p. 52). But it should be noted that the effects of the Carnegie classification system coincided with a concerted effort to allocate more federal money to higher education (McCormick, 2007).

The transmission channels for funds from public entities were changing. Instead of primary investigators (content experts) being responsible for how grants were spent, university administrators (process masters) were now accountable to the federal government for how funds were used. Perceived as managers responsible for allocating funds in order to operate manufacturing enterprises with peak efficiency, administrators were monitored through accreditation (the academic equivalent of quality control). This resulted in the very Dominant Differentiated Oligopoly/ Competitive Fringe market structure predicted by Kaysen (1979). Another of this MIT economist's remarkably accurate predications follows:

> In general, those who regulate higher education at the federal level have little or no connection with those who provide support, and the latter are themselves widely dispersed. The intimate connection that exists among research, scholarship, and education is recognized by some of the agencies providing an important part of research funding, but less so by those concerned with student aid…The creation of a Department of Education at the cabinet level, as now proposed, will not change the situation (p. 49).

Veblen's theoretical application of his model of modern business firms to higher education were being verified through practice.

Influential University of California president and longtime Carnegie Commission official Clark Kerr stated flatly that "federal guidance has been crucial in the conversion of American higher education" from "more devoted to liberal learning, moral philosophy, and ethical concerns and codes of behavior" during the nineteenth century to "more devoted to universal access and economic advancement" during the twentieth century. (Kerr, 1994; also Kerr, 1995). This motive of educating the American workforce to more mundane and less critical-thinking oriented tasks was made explicit in a report co-authored by the then-Secretary of Education, Richard Riley (Riley, et. al., 1994).

A widely-distributed report entitled *Efficiency in Liberal Education* was funded by The Macalester Foundation and issued in 1971 by the Carnegie Commission while Kerr was chairman. As might be expected, the report was focused completely on minimizing explicit costs with no mention of value-added or revenue (Bowen and Douglass, 1971). As Dobyns and Crawford-Mason (1991) summarized the idea of using Deming's methods of process over content (p. 221):

> It is the students, not the parents, who are any school's principal customers and, simultaneously, its products and it is, therefore, the students who define the quality of the school. The parents are the educational equivalent of stockholders, and they have a right to insist that their investment be treated well and wisely, but the students must be educated. To achieve that, schools have to adopt the same attitude toward quality that is now being adopted by leading American industries. Quality programs can be used in schools as well and as profitably as they can be in factories, hospitals, and police stations. That is not the newest fanciful pedagogic theory; it is demonstrable fact.

NEOCLASSICAL VERSUS HETERODOX APPROACHES

Writing in 1990, economist Estelle James combined the influences of the standardization and public funding movements into a neoclassical synthesis. She introduced an objective function for institutions of higher learning that considered primarily institutional prestige and faculty satisfaction (James, 1990). Her hypothesized objective function was a reasoned simplification of a somewhat complex process involving recruiting, faculty resources, research funding, teaching loads and other variables that described the mix of diverse influences on mission and sustainability. In short, she posited that an institution of higher learning might reasonably be expected to maximize the following objective function,

W = W [Number of graduate students, Quality of graduate students, Number of undergraduate students, Quality of undergraduate students, Number of faculty, Teaching loads, Research grants, Undesignated donations, Administrative expenditures, Average faculty salary, Faculty support services, and Average class sizes)],

(1)

subject to a break-even budget constraint.

Her approach was a detailed neoclassical model that entailed both revenue and production, presumably for the highly-stratified market structure that dominated American higher education until approximately 1970.

A problem with the neoclassical approach, however, is that data required to test reasonable specifications directly simply do not exist. More important is the misapplication of neoclassical theories of the firm to services firms in general and educational firms in particular. The most important reason, however, why the neoclassical theory of the firm is inappropriate for higher education is because, to date, no one seems to have adequately defined the (a.) products and (b.) inputs of a university.

James' approach considered prestige and satisfaction as the objectives of higher education institutions. But this is not comparable to a firm. Currently, with edufacturing becoming more widespread as the dominant operative model of many universities, it is essential to define just what it is that administrators are trying to do. What are their objectives and how are they to be objectively measured? Is an educated student the "product" of the university? Are faculty members *laborers*? Is the number of degrees awarded an appropriate measure of the product of the university?

HOW UNIVERSITIES ARE DIFFERENT

In the new millennium, most analysts (and boards) have chosen to ignore revenue, instead choosing to focus on cost (Fain, 2009). It seems that what were formerly known as "teaching institutions" have collectively pursued enrollment, presumably to tap into the federal and state funds available to all accredited institutions, including those with faith-based missions. Doti (2004) noted that the standard practice in American higher education has defaulted to the cost-based approach with the result that "universities are losing their ability to effectively price discriminate (p. 369)." This approach has some virtues, including ease of communication of university operations to key stakeholders. Treating all inputs and all outputs as fungible has the benefit of simplicity. On the other hand, a disadvantage is the latent possibility that many schools exhibit operating *in*efficiency, at least regarding explicit costs. Boyd (2004) contains an excellent and meticulously-documented summary of this debate. Furthermore, accountability for public funds through accreditation requires explicit costs that may deter the educational mission of the institution (Burke, 2005).[2]

In those cases in which a school has suffered from few sources of revenue and/or failure to economize on implicit costs, then edufacturing might well do more harm than good. The new American university has public funding for instruction through grants, student loans, and other subsidies. A multi-faceted industry has been reduced to just two: 1. Teaching or 2. Research, and the funding comes primarily from government sources in both cases. New programs are developed based on what competitors are doing (pure imitation/standardization) instead of based on what markets or stakeholders other than what government funders expect. As a result, there is very little private product development. Accreditation is necessary to satisfy those

who hold the purse strings to continue the money flow to institutions. This money flow is essential for "feeding the beast," i.e., sustaining an institution with high degrees of both operating and financial leverage. Higher education is bifurcated into the two categories mentioned immediately above. In this world, even a strong faith-based mission becomes secondary. Following the lead of public institutions, even private teaching institutions have incentives to hire as many adjuncts as possible to get as many students as possible in order to occupy a more advantageous position for accreditation and formula funding. Research institutions have incentives to hire extremely specialized scholars with almost no breadth in their studies in order to occupy a more advantageous position for accreditation and formula funding.

An Alternative Approach to the Higher Education "Production Process"

As an alternative for modeling the production processes of higher education, it may be constructive to reconsider other approaches for modeling the production process vis-à-vis the old Cambridge Capital Controversy.[3] Beginning with Böhm-Bawerk, Austrian capital theory emphasized the *roundaboutness* of production. The idea behind roundaboutness is that labor is involved at every stage of production and that capital (embodiment of labor in physical goods used to make other goods) requires the passage of time. According to Böhm-Bawerk, this passage of time makes the use of labor difficult to trace through stages of production because it is so roundabout (complex). In trying to refute the Austrian approach once-and-for-all, Samuelson (1966) ended up popularizing it, using a model of production later employed by Pasinetti (1969; 1970; 1977). The model he used to describe the Austrian concept of roundaboutness and refute the simple relationship between reswitching and interest rates was applied to the production of champagne (Samuelson, 1966, p. 571).

Many years and much ink were used to address the *reswitching* issue of Austrian capital theory. The idea behind reswitching was that capital to labor ratios may reverse depending on the cost of capital. Fortunately, the controversies surrounding the reswitching issue are largely irrelevant to the validity of the Austrian approach for modeling certain, select, situations. In particular, Samuelson inadvertently provided an apt description of the situation facing many American universities today.

Figure 1 illustrates the story told by Samuelson in the spirit of Pasinetti (and, presumably, Böhm-Bawerk). The production timeline on the left illustrates a process whereby seven units of labor make one unit of brandy in one period. In one additional period, the brandy ferments by itself into one unit of champagne. By contrast, in the production timeline on the right, two units of labor make one unit of grape juice in one period. In one additional period, the one unit of grape juice ferments by itself into one unit of wine. In one additional period, six units of labor must be applied to shake the one unit of wine into one unit of champagne. For both timelines, the single unit of output (champagne) is represented by the long, black-shaded, box above the timeline at the extreme right. In this model, all units of champagne (output) are interchangeable.

Whether or not the model accurately describes the production of champagne, it is applicable to the production processes of American universities, as shown in Figure 2. The production timeline on the left illustrates a four-year institution in which one unit of labor (facilitation rather than instruction, presumably) applied each of the four years produces the *outcome* of a single degree at the end of four years. This seems to

be the ideal for edufacturing in a teaching institution in which a standardized product is produced using a recipe of part-time facilitation so that every student can reasonably expect a degree at the end of four years, regardless of effort. On the right is a possible timeline of production for a research institution in which the student is first subjected to a rather rigorous orientation and then left alone. At the end of the four years (or a different number of periods depending on the diligence of the particular student or difficulty of the academic discipline), a tough examination results in a degree at the end of the four periods.[4]

The assumption of edufacturing that all outputs are fungible is subject to challenge, so the assumption in Samuelson's portrayal of champagne production is more properly viewed as a potentially flawed assumption for the value of academic degrees. Were the products of each perfect substitutes for the other, then eventually there would be only one type of institution instead of two. It is a commonplace that different institutions have different academic reputations and placement rates for graduates. The motivation for matriculating at a research institution with a fine academic reputation is likely that of adding to one's *human capital*. The motivation for demand for the final product drives the derived demand for the inputs used in producing the product, so human capital would also enter the decision on which inputs to hire and how much to pay them. For teaching institutions, on the other hand, graduates compete for pieces of paper that signal the value of their *labor* rather than their human capital.

A Different Take on 'Human Capital'

The classic references on human capital are Becker (1964) and Mincer (1993). Despite earlier references to the term by Pigou (1928) and earlier yet to the concept by Smith (1976, originally published in 1776, pp. 282-283), the term was considered offensive to Marxians (Bowles and Gintis, 1975). In each of its manifestations, "human capital" has been taken to function as a factor of production in midst of the general population. Gibbons and Waldman (2004) came closer to a more job-specific use of the term, but nowhere in the literature does the term "human capital" or even "intellectual capital" seem to have found application as the body of knowledge of the professorial base. Even Abel and Deitz (2012), who applied "human capital" to universities, were applying it to customers and other stakeholders, not professors.

If, indeed, edufacturing has become the order of the day, surely it would eschew human capital in favor of the traditional factors-of-production: labor and physical capital. If this were the case, in their quest for producing intellectual capital, research institutions might be expected to concentrate on highly technical, narrow, Ph.D.s with little breadth. This would be consistent with economies of scale rather than economies of scope. New professors might be expected to know little beyond the bounds of their dissertation topics. Employment of new faculty members in research programs would be limited to a very small, highly specialized, elite club. Interaction between academic disciplines, long the hallmark of liberal arts programs, would be minimized. Scientific revolutions, to use Thomas Kuhn's much-vaunted framework, would be unheard of since little cross-pollination would be possible (Kuhn, 1970, *passim*). Graduates from such programs would "know too much" (be overqualified) to be employable in the other sector that comprised what were known before 1970 as teaching institutions.

On the other hand, the former teaching institutions would forgo research altogether, except in meta-studies that require little formal or advanced training.

Courses in mathematics, economics, statistics, physics, and other more rigorous disciplines would be taught by professors with general doctorates in education or law and specialties in science education, for example. No path-breaking discoveries would be forthcoming or welcome for those employed at such places. Graduates who would teach in higher education would find themselves restricted to institutions like their alma maters, with no hope of breaking into the alternative, research institutions. Their academic capital would be insufficient to allow them to answer routine questions of top students, much less challenge them. Cures for cancer or Pulitzer-winning plays are seldom produced by those with highly-standardized undergraduate credentials.

This segmentation has been apparent for decades to those who would go back-and-forth between teaching at community colleges and four-year institutions. Academic lore holds that the two markets have always been strictly separated and that the credentials valued by two-year colleges as employers are considered inadequate by four-year institutions, and vice-versa. This further reflects the long-standing barriers between college teaching and high school teaching, even though concurrent enrollment courses are held forth by both high schools and colleges as being perfect substitutes for another. The faculty members of each know better.

So, why haven't institutional guardians "right-sized" by focusing on those segments of the market for which they are most advantaged to serve? To a large extent, they did, but public funding requires a significant bureaucratic superstructure to manage. The only way that an institution can cover the overhead of increasing accreditation burdens is to try to achieve economies of scale through additional enrollment. The old teaching institutions did this by building dormitories and athletic facilities to accommodate the record number of traditional college-age students for which they have to collect financial aid in order to remain solvent. But online teaching came along and rescued administrators from forced growth in on-campus enrollment and provided further economies-of-scale, albeit at the opportunity cost of less human capital and the explicit cost of servicing debt-financed expansions of stranded physical capital and financially-unproductive sports complexes. The construction industry has been exceedingly grateful.

CONCLUSION

Given the widespread practice of outsourcing instruction in colleges and universities noted in Schibik and Harrington (2004), it seems that research institutions have self-selected into an area of comparative advantage: research degrees that have the potential to bring in research grant funding.[5] Correspondingly, they have decided to outsource an area of comparative disadvantage: undergraduate teaching. That the new, "lower-tier" institutions have self-selected into an area of comparative advantage: providing standardized degrees that amount to perfectly substitutable pieces of paper in response to subsidies from various governmental agencies, seems inescapable. Correspondingly, they have decided to abandon what they perceive to be an area of comparative disadvantage: mission-based, value-added, teaching in a market of highly-differentiated products. In doing so, they have outsourced the teaching resources that had previously brought them the distinction of high-quality, differentiated instruction. Instead, the lower-tier is focusing on hiring standardized faculty facilitators with terminal degrees outside their areas of instruction in the

interests of explicit efficiency. The idea seems to be to hire inputs that are minimally-qualified on paper in order to satisfy accreditation watchdogs, but pay them on the basis of piece-work. As documented in Veysey's (1965) work, the historical struggle to develop highly-educated, teaching faculty resources to bridge the gaps between specialized segments of the American higher education market would indicate that the redevelopment of appropriate faculty resources will be a very long process.

That portion of the higher education market abandoned by both types of institutions was formerly served by rapidly-disappearing entities such as liberal arts institutions and technical institutes. Rather than several middle-tiers bridging what were formerly two polar cases of a multi-tiered market for higher education (research institutions and homogenous teaching institutions), surviving institutions have chosen to morph into one or the other extremes. Without the bridges between the local community college and the Research I university (which no longer exists), the higher education market is bifurcated with a chasm rivaling that alluded to in the parable of Lazarus and the rich man, with little hope of transport across.

ENDNOTES

1 According to Kerr (1994), the only other major federal government funding of higher education between the Morrill Acts and the G.I. Bills were the direct grants from federal agencies to research institutions arising from World War II.

2 Caplan (2018) has pointed out the uselessness of degrees that virtually repeat the student's public school studies. He lays the blame squarely at the feet of government funding. Certainly, the two are correlated. See also the book review by Leef (2018). According to Caplan, the use of government subsidies has reduced many universities to instruction significantly below that of a master/apprentice system.

3 As mentioned, the debate on whether or not capital or labor was to be considered the predominant factor of production came to be known as "The Cambridge Capital Controversy." This was because the economists who supported the view of Piero Sraffa in the tradition of Böhm-Bawerk, including Pasinetti and Joan Robinson, were affiliated more-or-less with the University of Cambridge in England while the strongest adherents of the neoclassical approach, including Samuelson and Solow, were based at MIT in Cambridge, Massachusetts. The battle between the two Cambridges raged for decades. Samuelson (1966) demonstrated that reswitching, or reversal in capital intensity (roundaboutness) is not a simple function of interest rates as the Austrians had claimed.

Eventually, the controversy died down, but not before alternatives to the Neoclassical Theory of the Firm had emerged. Good introductions to the Austrian capital theory are Lewin (2012; 2017) and Braun, Lewin, and Cachanosky (2016). Good summaries of the Cambridge Capital Controversy are Burmeister (1974; 2000), Brown (1980), and Cohen and Harcourt (2003).

4 Of course, the timing of inputs and outputs may vary between institutions, with the framework able to accommodate a variety of arrangements. An apprenticeship

system, one of the alternatives posed by Caplan (2018), may also be modeled economically in this framework.

One of the many issues neglected in this approach is the timing of payments. This is similar to the old macro debate over Say's Law as to whether or not supply creates its own demand, or instead demand creates its own supply (or some other alternative outcome). The timing of factor payments versus retail sale of the final product matters. If workers are paid in advance, then indeed, supply *may* create its own demand. Say addressed this with his *caveat* that all workers are gainfully employed. On the other hand, if workers are paid only after the product is sold and the employer receives the revenue from sales, then Keynes' warning that insufficient demand may result in an economic contraction takes on added urgency. An economy of teaching institutions in which adjunct faculty members are paid only after the course grades have been submitted may benefit from having faculty pay parked in financial institutions for an extended period. This makes loanable funds available for borrowing and subsequent expansion of physical assets. On the other hand, it postpones the stimulative effect of demand for goods and services, such as food, housing, clothing, and transportation for the part-time professorate.

5 As alluded to earlier, this process involves edufacturing of a different sort than the undergraduate practice that is more visible and widespread.

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FIGURE 1. SAMUELSON'S PRESENTATION OF BÖHM-BAWERK'S ROUNDABOUTNESS MODEL

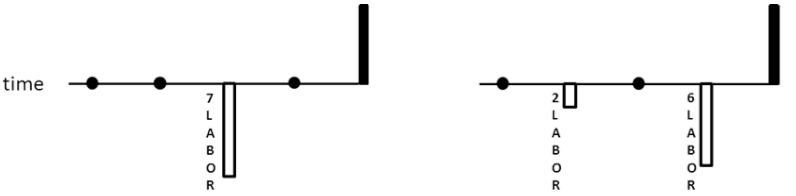

FIGURE 2. BÖHM-BAWERK'S ROUNDABOUTNESS MODEL ADAPTED TO HIGHER EDUCATION