Educational Degree Design: The Economic Rationales

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Abstract

Within the economics of education, degrees are treated as given empirical phenomena. There are neither scientific definitions of degrees nor theories of degree design. The economics of degrees are not well understood. The current paper aims to improve this understanding. It suggests that the economics of information, investment theory's real options approach, and agency and transaction cost theories can help to understand degrees' design features, their inner complexities, and their hierarchical embeddedness. A deeper understanding of the rationales behind degrees allows for new approaches to optimize degrees.

1. Introduction

Formal education is organized via educational degrees. However, despite their high relevance, degrees and their design features are not well understood. Textbooks on the economics of education and those on labor economics do not offer any definitions (Bellmann & Leber, 2019; Borjas, 2020; Cohn, 1979; Ehrenberg, Smith, & Hallock, 2023; Toutkoushian & Paulsen, 2016).

Theory suggests two predominant rationales for investments in education. According to human capital theory (Becker, 1962; Schultz, 1960), acquisition of education improves productivity. Improved productivity then leads to higher earnings in competitive labor markets. According to the signaling approach (Spence, 1973), education serves as a signal of agents' unobservable productivity attributes in labor markets characterized by asymmetric information. Both approaches treat education as a one-dimensional quantity variable that can be obtained in marginal units. However, this perspective diverges from the reality that formal education predominantly assumes the form of degrees, which are discrete, non-marginal aggregations of educational content (Winter, Kistner, & Maffia, 2024).

This paper's aim is to enhance the understanding of the economics of degrees. We outline possible economic reasons for their existence and their design features. We do so by relying on information economics, investment theories, transaction costs, and agency economics.

The paper proceeds as follows. In Section 2, we briefly outline what constitutes a degree. In Section 3, we consider degrees from an economics of information perspective, suggesting high advantages of information aggregation via degrees. In Section 4, we refer to investment theories and show how investment valuation's real options approach can explain degrees' hierarchical structure. In Section 5, we employ agency and transaction cost economics to explain how degrees' design and institutionalization reduce agency problems and transaction costs. Section 6 concludes the paper.

2. Definition of Degrees

Human capital theory (Becker, 1962; Schultz, 1960) as well as the signaling approach (Spence, 1973) explain why people may want to invest in their education. However, both fail to explain the existence of degrees. A comprehensive theory of degrees is completely missing. Degrees' architectures, their inner complexities, as well as their hierarchical embeddedness into a system of degrees of different levels are not well understood. A detailed definition has been suggested only recently (Winter et al., 2024). That definition, based on stylized facts, can be summarized as follows.

The acquisition of a degree necessitates successful completion of a predefined bundle of courses, that is, a curriculum. Within the curriculum, sets of mandatory and voluntary courses may exist. Degrees prescribe a minimum and maximum number of courses to be completed.

Student success is measured via graded examinations. Meeting a minimum grade threshold is imperative for successful course completion. Degrees themselves are graded, with the grade typically calculated as a weighted average of

individual course grades.

Degrees are modular and hierarchically embedded elements within a system of interrelated degrees. Modularity means that complex systems are broken up into discrete, manageable pieces that can only communicate with each other via standardized interfaces (Langlois, 2002). Education mirrors such a modularity approach. School education degrees constitute a shared module, shared by economists, lawyers, and physicians alike. Only later on do students combine their school degree module with complementary modules, that is, specialized degrees in the respective academic fields. Degrees are embedded within a hierarchical degree system. A higher-level degree program can only be entered after earning required lower-level degrees.

Degrees are conferred via institutions. These institutions serve as transaction platforms that bring together the demand for degrees from students with the supply of educational services provided by educators.

Consequently, degrees are defined as educational content bundles, specifically delineated by curricula. They are not attainable in marginal units but are instead granted upon successful examinations across the curriculum. Degrees are embedded into a modular and hierarchical system of degrees of diverse levels.

In what follows, we suggest answers to the question of why degrees are designed in exactly this way.

3. Economics of Information

The economics of information perspective (Stigler, 1961; Stiglitz, 2000) underscores information's pivotal role, the costs associated with its acquisition and verification. Severe problems may arise in incomplete or asymmetrically distributed information's presence (Stiglitz, 2000). Notably, educational choices that students make suffer from incompleteness and information asymmetry.

We suggest that degrees help overcome some of students' major information problems. In Section 3.1, we interpret degrees as expert combinations of knowledge. Empowering experts to make curriculum choices on students' behalf significantly simplifies students' decision processes. In Section 3.2, we argue that degrees are also information transmission devices. Knowledge about degrees and associated earnings of the respective degree holders allows for an estimation of returns from education. This helps students improve their choices and self-select into different educational pathways (Rothschild & Stiglitz, 1976).

3.1 Expert Combinations

A predefined curriculum's successful completion is required to attain a degree (Winter et al., 2024). A predefined curriculum's existence is a mechanism revealing vital information.

Assume a counterfactual situation without degree programs. All courses that would otherwise constitute the degree curriculum would still be offered. Here, each course is offered independently by its respective teachers. In such a scenario, students would need to select a combination of courses from an unstructured and nearly infinite set of individual course offers. Assuming bounded rationality (Simon, 1990), such a set would be impossible to evaluate correctly.

The problem would be exaggerated by the experience good character of education. Experience goods can be evaluated only after their characteristics have been experienced (Nelson, 1970). Evaluation is only feasible ex post, that is, after consumption. In the no-degree scenario, it would therefore be necessary for students to simply study something to evaluate course contents. Selecting single courses as well as course bundles would pose an almost insurmountable decision problem for students in such a scenario. They would be better off if a more well-informed agent makes such choices on their behalf and bundles courses into degrees.

The predominant mechanism in practice is expert choice. Professionals with expertise in fields such as medicine or economics make the course selections for the corresponding degree programs.

Numerous studies illuminate the expert-driven creation of new degree programs in higher education (Angelov, Melnik, & Buur, 2003; Burkhardt-Holm & Chebbi, 2008; Van Dam-Mieras, Lansu, Rieckmann, & Michelsen, 2008). Thus, degrees can be conceptualized as expert-selected knowledge combinations.

Expert selections transform education from experience goods into search goods. Search goods are assessable before consumption (Nelson, 1970). The presence of degrees empowers students to gather sufficient information prior to consumption. For example, they only have to find out what kind of degree is needed to become a lawyer or physician. They do not have to bother about needed knowledge, courses, and the like. Thus, degrees are information transmission devices.

Furthermore, expert combinations enable more efficient exploitation of synergies among courses. Experts can identify

and leverage synergies when designing degree programs. For example, experienced auditors know that knowledge of taxation, accounting, and controlling is necessary to work as an auditor. They will make sure that these topics are covered in the respective degree programs, thereby securing synergies.

For students, determining the precise combination of competencies essential for a particular occupation poses a formidable challenge. Additionally, educational institutions continually redesign their curricula in response to the job market's evolving demands. What students learn in a medical school today differs dramatically from what would have been taught decades earlier (Anderson, 2000; Jones, Higgs, De Angelis, & Prideaux, 2001). While the institutionalized updating process may not be flawless, it is arguably much better than students' isolated choices would be.

In summary, the existence of degrees designed by experts dramatically reduces students' information problems. Degrees contain all relevant knowledge about job requirements and synergies. They are a highly efficient information aggregation device.

3.2 Information Transmission

Returns to education are difficult to quantify (Jensen, 2010). However, the existence of degrees dramatically improves the measurability of returns to education (Manski, 1993).

Graduates' earnings can serve as a proxy for the returns on education represented by those graduates' degrees (Morgan & David, 1963). Degrees indicate education, whereas degree holders' earnings indicate returns to education. Thus, degrees transmit information on the returns to education. For example, a study by Engbom and Moser (2017) reveals that higher-level degrees correlate with significantly higher incomes. Hout (2012) demonstrates that annual earnings increase by approximately 20 percent per educational level.

There are also substantial differences in returns across various disciplines (Altonji, Blom, & Meghir, 2012; Arcidiacono, 2004; Bol & Heisig, 2021). Altonji and Zhong (2021) find that mean earnings in fields like medicine or law significantly surpass those in the humanities. Kirkeboen, Leuven, and Mogstad (2016) highlight that degrees in biology, chemistry, or computer science, as opposed to the humanities, lead to nearly tripled early career earnings.

In a scenario without degrees, the return estimation problem would be arguably greater. For example, studies examining the income effects of years of schooling find that more years of schooling are associated with higher wages (Angrist & Krueger, 1991; Ashenfelter & Krueger, 1994; Bhuller, Mogstad, & Salvanes, 2017; Harmon & Walker, 1995).

However, that kind of information alone is less instructive. If, on the other hand, you observe that your physician has a medicine diploma on her wall and a Porsche in her garage, then you know exactly what to do if you want a Porsche in your own garage. Degrees allow students to become easily knowledgeable about the profitability of different fields of study.

Degrees are thus dual-purpose information transmission devices. They convey knowledge and expertise and provide information on returns of different educational pathways.

4. Investment Economics

The decision to pursue education is an investment decision. Here, we argue that degrees deliver the information needed to make good investment decisions.

In Section 4.1, we will focus on the information needed to evaluate an investment in education. We contend that degrees provide highly valuable information for assessing different educational pathways' risk/return properties.

In Section 4.2, we argue that degrees' modularity and hierarchical organization create so called real options. These real options promote flexibility and adaptability and thus increase the value of an investment in education.

4.1 Expected Returns and Investment Risks

Investments should be appraised based on their risk and return characteristics. There are different approaches to model investment decisions, that is, models of certainty versus models of risk/uncertainty (Knight, 1921; Koutsoyiannis, 1982). To evaluate investment opportunities, investors need information about the size of the necessary investment itself, about expected returns, and about the associated risks (Markowitz, 1952; Von Neumann & Morgenstern, 1953).

Students planning to invest in education share those information needs. Educational investments encompass, for example, tuition fees, other study-related costs, and forgone income (Avery & Turner, 2012). Then, there are two distinct categories of risk linked to an educational investment: the risk of failing to attain the desired level of education and the risk that upon attainment returns may fall short of expectations. Thus, investment in education is

risky, requiring much information (Taylor, 1974).

We posit that degrees supply much of the needed information. Degrees are highly standardized, encompassing course contents and course timetables. This allows for a robust estimation of the time span necessary to achieve the educational objective (Barro & Lee, 1996; Baum, Ma, & Payea, 2013). Opportunity costs and tuition fees, that is, the lion's share of the total investment, can thus be estimated reasonably well.

Next, students have to estimate expected returns, conditional upon degree attainment. As suggested above, the existence of degrees makes these returns more discernible.

Subsequently, students need to assess the risk of non-attainment of their educational goal. The existence of a hierarchical system of interrelated degrees aids in conducting such risk assessments. The high degree of standardization allows for Bayesian inferences to estimate completion risk. The rationale is straightforward: if students from earlier cohorts with a specific high school grade point average (HSGPA) successfully completed a particular degree program, there is a high likelihood that other students with the same HSGPA will also complete it successfully.

Indeed, HSGPA has consistently been found to be a strong predictor of college success (Astin, 1975, 1993; Astin & Oseguera, 2005; Camara & Echternacht, 2000; Geiser & Santelices, 2007; Hoffman & Lowitzki, 2005). School grades' predictive power holds true in European countries as well (Brandstätter & Farthofer, 2002; McManus & Richards, 1986; Melamed, 1992; Rindermann & Oubaid, 1999; Schmidt-Atzert, 2005; Steyer, Yousfi, & Würfel, 2005; Trapmann, Hell, Weigand, & Schuler, 2007; Vollmer, 1984). Using grade-adjusted success rates further improves estimation of success likelihoods.

Besides completion risks, there is also a relevant return risk. Research indicates that wages even within single disciplines can vary considerably, implying a post-graduation risk (Black, Sanders, & Taylor, 2003; Fournier & Koske, 2012; Glocker & Storck, 2014; Simkovic & McIntyre, 2014). However, graduates' wage distributions can be inferred as well. This allows for a sound post-graduation risk evaluation.

Again, the existence of degrees improves the informational basis of students' decisions. By aggregating and revealing information on costs, expected returns, and investment risks, degrees support the decision-making process in educational investments.

4.2 Real Options

In this section, we compare degrees' practiced hierarchical structure with a hypothetical counterfactual regime. Under the current hierarchical structure, degrees of different levels are chosen sequentially, which we term a Sequential-Degree Choice Regime (SDCR). We argue that a SDCR, allowing sequential conditional decisions, is vastly superior compared to the hypothetical One-Degree Choice Regime (ODCR). In an ODCR, the decision regarding whether to pursue a final degree in fields like medicine, law, or economics would need to be made at the age of about six.

Under ODCR, one would calculate discounted cashflows (DCF) from career paths in medicine, law, or carpentry. Then one would direct children to the highest DFC path. That DCF criterion would be appropriate for such one-time decisions.

Compared to ODCR, degree selection under SDCR offers much more flexibility. It allows for the use of information that becomes available only later on. It further allows for adjusting investment decisions during the course of the educational project and for the postponement or cancellation of subsequent investments. When such behavioral options exist, the DCF criterion is no longer adequate. In that case, the real options approach is appropriate.

Real options involve acquiring real assets on potentially favorable terms (Myers, 1977). Valuation of real options goes beyond DCF by incorporating growth option values (Myers, 1977, 1984; Trigeorgis, 1996). DCF often underestimate the importance of timing, uncertainty, and irreversibility (Kerr, 2014) and provide "now or never" valuations (Dixit & Pindyck, 1994) with no room for future adjustments (Trigeorgis, 1995, 1996). On the other hand, the real options approach incorporates new information when it becomes available (Amram & Kulatilaka, 1999), thereby capturing an investment's option value (Trigeorgis, 1995, 1996).

Real options emerge when there is uncertainty, flexibility in timing, and irreversibility in investments (Brady, 2017; Bräutigam, Esche, & Mehler-Bicher, 2003; Dixit & Pindyck, 1994; Hommel & Pritsch, 1999). They come into play when opportunities for flexible adaptations to evolving uncertainties arise (Bräutigam et al., 2003; Hommel & Pritsch, 1999). Flexibility is typically present in sequential investments with timing opportunities (Arnold, 2014; Bromiley & James-Wade, 2003). The real options value derives from the flexibility to either make or delay a

decision when faced with certain circumstances (Arrow & Fisher, 1974; Henry, 1974; Trigeorgis, 1995, 1996). Real options allow for better management of uncertainty, increasing investments' value (Ford & Lander, 2011; Garvin & Ford, 2012; Martínez Ceseña, Mutale, & Rivas-Dávalos, 2013; Tadeu et al., 2016).

Flexibility may be derived from opportunities to switch, defer, alter, and time-to-build options, abandon options, growth options, and multiple interacting options (Trigeorgis, 1995, 1996). Real options valuation is particularly fitting for projects that might allow for future growth, not just relatively fixed cash flows (Amram & Kulatilaka, 1999).

Indeed, investments in education under SDCR exhibit characteristics of such a growth scenario, making the real options approach applicable.

Degrees can be considered illiquid assets (Friedman, 1962) characterized by irreversibility and sunk costs (Hwang, Liao, & Huang, 2013; Jacobs, 2007). The SDCR's modular and hierarchical structure fosters flexibility. Consequently, students can adapt their choices by considering new incoming information about costs and returns (Groot & Oosterbeek, 1992; Hogan & Walker, 2007; Hwang et al., 2013).

Modularity and hierarchical embeddedness within SDCR create real options. Under SDCR, individuals have the option to switch fields, alter their investments, or pursue specialized education. For example, it is only after obtaining a bachelor's degree that students have to decide whether to pursue a master's program. SDCR also reduces uncertainty by providing options to wait, enabling individuals to gather information, gain experience, or reassess their goals before committing to a next step. The hierarchical structure sets the stage for incremental education, informed choices, and adaptability to evolving trends and labor market demands. Thus, SDCR offers significantly more opportunities for adaptation than ODCR does.

Consequently, modularity and the hierarchical structure of degrees create additional value by providing real options.

5. Transaction Costs and Agency Economics

Educational institutions like schools or universities offer degrees. We argue that those institutions are means to reduce transaction and agency costs.

In that view, educational institutions can be seen as one-stop shops where students can access all the services needed to attain a degree. When it is apparent that students need to acquire and learn various types of content anyway, the one-stop shopping concept can lead to diverse advantages.

In Section 5.1, we argue that such institutions reduce transaction costs (Coase, 1937; Williamson, 1975). In Section 5.2, we demonstrate that institutionalization also helps reduce agency costs.

5.1 Transaction Costs

Transaction costs encompass search costs, bargaining costs, and policing costs (Coase, 1937; North, 1984). Reducing these costs can make exchanges more attractive, improving on efficiency.

From that perspective (Coase, 1937, 1972; Commons, 1936; Williamson, 1975, 1985), reduction of transaction costs can be achieved for both students and teachers if they do not have to engage in direct contracting with each other. We argue that trading degrees instead of individual courses substantially simplifies transactions and reduces their number. Schools and universities act as intermediaries that reduce a variety of transaction costs at the same time.

Search and information costs are reduced because students get all the information they need from one source. A student aspiring to become a physician only needs to find an institution offering the appropriate degree. The institution provides all relevant information on courses, content, and so on. Teachers' transaction costs are reduced as well. There is no need to advertise individually, search for students, and select appropriate ones. Institutions, acting as intermediaries, reduce search and information costs on both the students' and the teachers' sides.

By coordinating supply and demand, institutions also allow for the reduction of bargaining costs (Baligh & Richartz, 1964; Coase, 1937; North, 1984; Picot, 1986). When education is offered in the form of degrees, students and teachers do not have to bargain individually over the number of courses, schedules, or the financial conditions of single courses. Contracting is reduced to a take-it-or-leave-it option for both teachers and students, reducing transaction costs considerably.

Institutionalization also leads to a significant reduction in the number of necessary contracts (Baligh & Richartz, 1964; Gümbel, 1985; Picot, 1986). In a counterfactual situation without degrees, students would have to sign one contract with each teacher for each course. If M is the number of students, N is the number of teachers, and K is the number of needed courses per student, N x M x K contracts would have to be signed. With institutionalized degrees,

each student and each teacher signs only one contract with the institution, giving a total of N + M contracts. Enforcement costs are also reduced considerably because institutions ensure contract compliance. If single teachers fail to provide their services, institutions will offer substitutes. Teachers also profit because they do not have to worry about students' abilities to pay or about their entrance qualifications.

To conclude, bundling educational content into degrees and delivering them via institutions reduces transaction costs significantly in numerous ways.

5.2 Agency Economics

Students wanting to be educated face some severe agency problems that arise from selection, incentivization, and monitoring of their teachers.

First, teacher selection tends to be marked by hidden characteristics. Hidden characteristics refer to a situation in which the quality of the exchanged good is not verifiable to buyers ex ante (Akerlof, 1970; Eisenhardt, 1989). The quality of teachers' services is likely not fully observable for prospective students ex ante, leading to a potential adverse selection problem (Lazear, 2003). Teachers may claim higher abilities than they actually have. On top of the hidden characteristics problem, a moral hazard problem might arise as well (Jensen & Meckling, 1976). After contracting, teachers may choose to shirk, that is, they may not always be well incentivized to do their best teaching. Teachers' true efforts might be unobservable (Alchian & Demsetz, 1972; Ross, 1973). Students then might not be able to monitor teachers' actions closely enough.

Now, educational institutions can be interpreted as market intermediaries between teachers and students with respect to hiring decisions. By acting as a "delegated monitor" (Diamond, 1984), intermediaries can mitigate information asymmetries and thus reduce adverse selection's risks (Berger & Gleisner, 2009; Cummins & Doherty, 2006). Information asymmetries can be better reduced if institutions rather than students themselves select teachers.

Students need good teachers. Teacher quality is a highly relevant, and eventually the most important input, needed for successful education (Jürges, Richter, & Schneider, 2005; Hanushek, 2005). In fact, teacher quality has a high impact on student success (Darling-Hammond, 2000; Hattie, 2009; Koedel, Mihaly, & Rockoff, 2015; Marzano, 2003), so hiring high-quality teachers is paramount for students (Loeb, Kalogrides, & Béteille, 2012; Marzano, 2003).

Even though educational institutions do not perform optimally in selecting the best teachers (Ballou, 1996; Harris, Ingle, & Rutledge, 2014; Hinrichs, 2021; Staiger & Rockoff, 2010), they still have major selection advantages over students' selecting capabilities. Institutions can find teachers more efficiently than students themselves through their economies of scale in recruiting and screening (Houseman, Kalleberg, & Erickcek, 2003). They can rely on wide job advertising, streamlined application, and selection processes. Institutions benefit from economies of scale as they hire many teachers over time, gain experience, and improve selection criteria. They also gain advantages from economies of scope because learning to hire math teachers will improve competencies to hire English teachers as well.

The effectiveness of monitoring and supervision can depend on various factors (Alchian & Demsetz, 1972; Harris & Raviv, 1978; Jensen & Meckling, 1976). With repeated interactions, uncertainty's impact tends to decrease, making dysfunctional behavior easier to detect (Holmström, 1979). Repeated interactions enhance the monitoring process, thereby reducing dysfunctional behavior's likelihood (Lambert, 1983; Eisenhardt, 1989). Long-term contracts, as compared to short-term ones, tend to encourage better agent efforts and provide more effective incentives compared to short-term contracts (Holmström, 1979; Lambert, 1983).

Under direct, short-term teacher-student contracting, most contracts would be one-shot contracts. Chances for detection of little teacher effort would be low. In this scenario, teachers' main motivation for long-term performance improvement lies in their reputation, contingent on effective reputation transfer mechanisms' existence. However, it is not warranted to assume the presence of such mechanisms with appropriate strength.

If, on the other hand, educational institutions do all the contracting, monitoring, and incentivizing, performances can be carried out more effectively. Establishing long-term relationships between institutions and teachers improves monitoring quality and enhances visibility of teachers' capabilities. Under long-term contracts, shirking would likely be detected and penalized. In conclusion, contracting by institutions offers the following advantages over individual student-teacher contracting:

(1) Teacher selection: Educational institutions often have more resources and capabilities to select qualified teachers. They can conduct rigorous hiring processes, consider teacher qualifications and experience, and assess teaching performance over time.

(2) Incentives: Institutions can offer long-term contracts to teachers, which may provide better incentives for sustained high-quality teaching. Long-term relationships between teachers and institutions reduce information asymmetry and encourage teachers to invest in their teaching skills.

(3) Monitoring: Institutions can implement systematic evaluation processes to monitor teacher performance. These evaluations can be conducted over an extended period to ensure that teachers consistently meet educational standards.

(4) Standardization: The standardized nature of degrees and curricula can even help maintain a consistent level of education quality across different programs and institutions. This reduces the risk of opportunistic behavior by teachers and ensures that students receive a reliable education.

6. Conclusion

The most influential approaches within the economics of education, that is, human capital theory (Becker, 1962; Schultz, 1960) and the signaling approach (Spence, 1973), cannot and are not intended to explain the existence of degrees and their inner complexities. Degrees are not well understood phenomena. This paper addresses that lack of understanding.

We interpret degrees as discrete bundles of educational content covering a predetermined curriculum of different courses. Degrees cannot be obtained in marginal units. Degrees are modular elements within a hierarchically ordered system of degrees of different levels. Moreover, institutions such as schools and universities offer degrees.

The economics of information viewpoint suggests that students' problem of selecting educational content is mitigated if experts choose appropriate content on students' behalf. Further, the existence of degrees allows students to gather information ex ante, transforming education from an experience good into a search good.

The existence of degrees improves the measurement of returns to education by using degree holders' income as a proxy for educational returns. Degrees reveal information about different educational pathways' profitability, enabling better choices.

Degrees' existence improves information on costs, duration, expected returns, and risks of educational investments. Standardized time frames along with readily available information on tuition fees allow for sufficiently precise cost estimates. The hierarchical ordering and standardization of degrees allow for Bayesian inferences about one's own chances of success. Expected returns and investment risks can be assessed by a closer inspection of wages and wage distributions of degree holders from earlier cohorts.

Modularity and hierarchical organization of degrees promote flexibility and adaptability, thereby creating real options. The emergence of real options increases the value of an investment because they help better manage uncertainty.

Institutionalization of education facilitates transaction costs' reduction in multiple ways. Because institutions offer degrees as bundles of predefined course sets, search costs, bargaining costs, and policing costs are dramatically reduced as compared to individual contracting. Employing institutions as intermediaries between students and teachers significantly reduces the number of contracts.

Institutionalization also offers many advantages from an agency perspective such as improved teacher selection, improved teacher incentives, and improved monitoring.

While we provided one of the first economic characterizations of degrees and their design features, the above arguments and views are not meant to be complete. For example, Winter et al. (2024) suggests that degrees, their design features, and their hierarchical structure could also be understood from a technological viewpoint. They interpreted the hierarchical system of different degree levels as a multi-layer approach resembling that of software architectures. In their view, school degrees might be interpreted as operating systems, whereas higher-level degrees can be interpreted as applications running on the operating system called the school degree. That view and the views offered in our present paper are complementary.

The presumably most important question of an evolving theory of degrees would be to identify possible alternative designs of degrees themselves. The definition offered in Winter et al. (2024) that we also adopted here is based on stylized facts about existing degrees. However, it is unclear whether the design of existing degrees is optimal or at

least good. Maybe there are totally different designs that would be superior to the existing one. Winter et al. (2024) presents the first possible candidate.

Therefore, one caveat with respect to our above analysis is that we analyzed the advantages of degrees compared to a counterfactual world in which no degrees would exist. What we have shown is that having degrees as they are designed right now is preferable over having no degrees at all. That does not rule out that there could be highly superior designs. The definition of degrees used herein might not even cover such designs. We believe that a deeper understanding of such design questions would be a promising field for future research within the economics of education.

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