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The Hidden Economic Costs of Doctoral Training – The Human Capital Impacts of Publication Pressure

Summary

The hidden economic costs of publication pressure in doctoral education are gaining increasing significance in performance-oriented academic systems. Although the goal of publication expectations is to increase scientific productivity and institutional competitiveness, they can also cause significant losses of human capital and pose efficiency risks. This study interprets publication pressure not merely as a psychological or educational issue, but as a structural economic phenomenon affecting the sustainability of doctoral education. This study employs an integrated narrative literature review and examines the economic mechanisms through which publication pressure influences doctoral education. It pays particular attention to the hidden costs associated with decreased productivity, the pressure to maintain workplace presence, prolonged study periods, dropout rates, and the deterioration of doctoral students' mental well-being. The analysis also highlights the economic dimensions of supervisors' workloads and resource allocation within doctoral programs. The study argues that overly performance-oriented evaluation systems may optimize short-term publication outcomes but can simultaneously undermine the system's long-term efficiency and the utilization of human capital. The findings of the study titled " " highlight that the mental strain experienced in doctoral education should be interpreted not only as an individual burden but also as an institutional and economic risk factor.

Keywords: doctoral education; publication pressure; hidden costs; human capital; attendance requirements; system efficiency
JEL-codes: I23; J24; M54

Introduction

Doctoral education serves a dual purpose: on the one hand, it ensures the next generation of scholars by developing independent research competencies; on the other hand, it increasingly operates within a performance-oriented institutional environment that focuses on measurable outputs. In this system, publication output is not merely a tool for scientific communication but becomes the primary indicator of academic advancement (Görög, 2021; Görög & Kása, 2019).

As a result of this process, a structural tension arises between long-term knowledge-building and short-term performance expectations. Doctoral students are forced to produce publishable results early in their training, often at a stage when their research identity and methodological competence have not yet stabilized. This temporal asymmetry increases vulnerability and may also reduce the overall efficiency of the system (Sverdlik et al., 2018; Stubb et al., 2014).

This phenomenon is particularly relevant in a controlling perspective, as it has a direct impact on the relationship between resource utilization and performance optimization. Doctoral training requires significant institutional investment, including funding, supervisory capacity, and infrastructure. If efficiency losses arise as a result of publication pressure—for example, in the form of prolonged training periods, fragmentation of research processes, or increased attrition—the return on investment becomes uncertain (Council of Graduate Schools, 2008; Pusztai et al., 2022).

Furthermore, evaluation systems based on publication output can foster adaptation patterns that are rational at the individual level but have a distorting effect at the systemic level. These include a preference for topics that can be published in the short term, the fragmentation of research results, and the avoidance of innovative but higher-risk research directions. In the long term, these phenomena can adversely affect not only the quality of scientific output but also the sustainability of the academic system (Görög & Kása, 2019).

Consequently, publication pressure cannot be interpreted merely as an individual-level challenge, but as a structural factor that influences the functioning and effectiveness of doctoral education through economic mechanisms.

A significant portion of the international literature focuses on psychological stress, mental health risks, and persistence related to doctoral education (Levecque et al., 2017; Evans et al., 2018), while economic and controlling perspectives—particularly the systemic interpretation of hidden costs and human capital loss—are less frequently addressed in an integrated manner. As a result, the economic consequences of publication pressure often remain implicit in the literature, without being incorporated into institutional decision-making as measurable and evaluable factors.

Reflecting on this gap, this study undertakes to interpret the phenomenon of publication pressure from a controlling and human capital perspective, and to explore the economic mechanisms that transform psychological strain into a cost factor at the institutional level. The contribution of this research lies in interpreting publication pressure not merely as a psychological

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or educational policy problem, but as an economic factor determining the efficiency and sustainability of doctoral education.

The aim of the analysis is to demonstrate how publication pressure manifests itself through human capital loss, reduced productivity, and distortions in the use of institutional resources, as well as how these effects can be integrated into controlling-oriented evaluation systems. Accordingly, the following chapter outlines the methodological framework of the research.

Method

The study is theoretical and analytical in nature, and its methodological framework consists of an integrative, narrative synthesis of the literature. The aim of the research is not primarily empirical data collection or quantitative modeling, but rather to explore what economic and human capital consequences the publication pressure in doctoral education may have at the institutional level.

The approach employed is based on a thematic review of international and domestic literature, which examines the specific characteristics of doctoral education, mental health risks, and the functioning of performance-oriented academic environments (Levecque et al., 2017; Evans et al., 2018; Sverdlik et al., 2018). The literature is supplemented by research on economic and organizational impacts, with particular reference to human capital theory (Gary S. Becker, 1993) and models examining the relationship between workplace stress and productivity (Halbesleben & Buckley, 2004; Bakker & Demerouti, 2017).

In our analysis, we examined the effects of publication pressure within a multidimensional interpretive framework. Accordingly, we interpreted the phenomenon at three interrelated levels:

– *the individual level,* where psychological strain and decreased performance manifest,
– *the organizational level,* where trends in productivity, training time, and attrition can be interpreted,
– *the economic level,* where the loss of human capital and the return on resources become central issues.

An important element of the methodological approach is the integration of an economic perspective, which allows the effects arising from publication pressure to be interpreted as costs. Within this framework, the study distinguishes between direct, indirect, and hidden costs, and structures the economic impact mechanisms of doctoral education along these lines. This approach is consistent with management science models aimed at examining organizational efficiency and resource allocation (Quick & Henderson, 2016).

In the analysis, we paid particular attention to interpreting phenomena that are difficult to measure—especially presenteeism and hidden productivity losses—which constitute significant yet often invisible components of the economic impacts arising in doctoral education (Kinman & Wray, 2018). Including these factors helps ensure that publication pressure is viewed not merely as a qualitative phenomenon, but as a potential economic risk.

A limitation of the chosen methodology is that the study does not rely on primary empirical data; thus, the results are interpretive in nature. At the same time, this is consistent with the research objective, which aims to provide a systemic economic interpretation of publication pressure and to develop an economic framework. The methodological approach thus provides the foundation for the analysis of the economic impact mechanisms presented in the following chapters.

Results

1. Dropout as a loss of human capital

Based on human capital theory, dropping out of doctoral programs can clearly be interpreted as a lost investment. The resources used during the program—including state and institutional funding, the time spent by advisors, and the infrastructure—are not recouped if the student does not earn the degree (Gary S. Becker, 1993; Pusztai et al., 2022).

Based on international and domestic data, the dropout rate for doctoral programs ranges between 40–60%, which is considered exceptionally high among higher education levels (Council of Graduate Schools, 2008; Szigeti, 2020). This phenomenon points to a systemic efficiency problem, as a significant portion of the resources invested in education is not converted into useful scientific or economic output.

From a controlling perspective, dropout rates are not merely a statistical indicator but should be interpreted as a direct cost factor. Resources spent on students who do not earn a degree appear as lost investments, while the system must account for additional costs associated with recruiting and training new students.

2. Decline in productivity and deterioration in efficiency

One of the most significant economic consequences of publication pressure is a decline in productivity, which manifests not necessarily as an immediate drop in performance, but rather as the prolongation of research processes and a deterioration in efficiency. Chronic stress increases the time spent per publication, reduces concentration and cognitive performance, leading to a delayed release of scientific output (Levecque et al., 2017; Evans et al., 2018).

From an economic perspective, this phenomenon results in lower output for the same resource input, which can clearly be interpreted as a decline in efficiency (Taris et al., 2001; van der Heijden et al., 2019). Paradoxically, the pressure to publish may stimulate performance in the short term, but in the long term, it can lead to the fragmentation of the research process and a decline in innovation potential (Görög & Kása, 2019).

3. The cost of presenteeism as a hidden economic cost

In the economic interpretation of doctoral education, the phenomenon of presenteeism is of particular significance; it refers to the formal continuation of work while actual performance declines. Mentally overburdened doctoral students often actively participate in research processes ( ), but due to their exhaustion and stress levels, they are unable to perform at their best (Kinman, 2016; Kinman & Wray, 2018).

Presenteeism is particularly problematic from an economic perspective, as it manifests as a hidden cost: the institution allocates resources to support students, while the actual output falls short of potential performance (Quick & Henderson, 2016). This phenomenon is difficult to measure, yet it results in significant losses in performance and efficiency in the long term.

4. Career dropout and structural succession risk

The effects of publication pressure are not limited to the doctoral training period but also influence the development of aca-

Table 1: Domestic and international data on PhD student attrition and dropout risks

Country/Region	Dropout Rate	Study Period/Method	Main findings	Source
Hungary	~40%	Cohort analysis	Exceptionally high dropout risk in doctoral education	Szigeti (2020)
USA	~30–33%	10-year longitudinal study	Degree completion and dropout are based on different measurement logics	Council of Graduate Schools (2008)
International estimates	40–60%	Variable	Significant institutional and country-level differences	Gardner (2009)
Belgium	Not quantified	Cross-sectional study	Strong relationship between mental strain and intention to leave	Levecque et al. (2017)

Source: compiled by the author based on the cited literature

demic careers after degree completion. Excessive performance expectations and chronic stress can contribute to leaving the academic track, particularly in the early stages of one's career (Sverdlik et al., 2018; Weiss & Vanderford, 2018).

From an economic and institutional perspective, this process poses a structural risk to the supply of new talent. The academic system loses highly qualified professionals in whom it has invested significant resources, while training new entrants is again a costly process (Council of Graduate Schools, 2008).

5. Institutional efficiency and economic rationality

The overall effects of publication pressure indicate that performance evaluation systems used in doctoral education do not always support the efficient use of resources. Incentive mechanisms based on maximizing short-term output can generate efficiency losses in the long term, which manifest as a decline in the quality of human capital and a weakening of the system's sustainability (Siegrist, 1996; McEwen, 1998).

From an economic perspective, this means that publication pressure is not merely a behavioral or psychological phenomenon, but an economic factor that directly influences institutional performance and the return on investment.

Based on the data presented, it can be concluded that the dropout and withdrawal risks observed in doctoral programs are not isolated, country- or institution-specific phenomena, but rather point to a structural problem that is evident at the international level as well. Both domestic and international estimates indicate that doctoral education can be considered a particularly high-risk stage among higher education levels, in terms of both failure to obtain a degree and the prolongation of the duration of studies.

At the same time, the significant variation in international data highlights that the rate of dropout is strongly influenced by the characteristics of the institutional environment, evaluation and publication expectations, as well as the organizational and support structures of doctoral education. Consistent with this, findings related to mental strain and intention to drop out indicate that continued participation in formal education does not necessarily go hand in hand with sustainable performance.

6. The transformation of the motivational structure under the influence of the publication incentive system – within a framework of economic psychology

The dominance of publication expectations in doctoral education is not merely an organizational or performance-measurement issue, but can also be interpreted as a phenomenon of economic psychology. Economic psychology proceeds from the assumption that incentive systems not only regulate behavior but also transform motivational structures, decision-making patterns, and resource allocation preferences.

The publication incentive system in doctoral programs creates a performance architecture that defines research activity as quantifiable output. If publication volume and scientometric indicators become the primary measures of scientific value, students' motivational structure gradually shifts: commitment based on intrinsic interest and autonomy may recede into the background, while the external pressure to conform becomes dominant (Deci & Ryan, 2000).

This transformation is not merely an individual psychological change, but a rational adaptive response to the system's incentive logic.

6.1. The economic-psychological reorganization of motivation

According to economic psychology, individuals' decisions align with the perceived reward structure. If the system rewards quantitative performance, behavioral optimization develops accordingly. Doctoral students' initial orientation—curiosity, professional identity building, in-depth research—can gradually become expectation-dominated if publication becomes the primary measure of value.

An excessive emphasis on external incentives can weaken intrinsic motivation in the long term (Deci & Ryan, 2000). This phenomenon is particularly problematic in creative-intellectual activities such as scientific research, where innovation and quality stem from internal commitment.

6.2. Measurement logic and behavioral distortions

A fundamental principle of economic psychology is that the measurement system shapes behavior. The dominance of scientometric indicators in doctoral education induces adaptive optimization strategies:

– a preference for topics that can be published in the short term,
– fragmentation of projects,
– selecting research directions with lower uncertainty.

These behavioral patterns are rational responses at the individual level, but at the systemic level they can distort resource allocation and reduce innovation potential (Görög & Kása, 2019).

6.3. Effort–reward balance and psychological costs

Siegrist's (1996) effort–reward model is particularly relevant to doctoral education from an economic psychology perspective. A distinctive feature of the publication system is time lag and uncertainty: a significant disparity often arises between the intellectual effort invested and the recognition received.

This imbalance can become a chronic source of stress, contributing to burnout and increased mental health risks

(Halbesleben & Buckley, 2004; Levecque et al., 2017; Evans et al., 2018). Psychological strain thus becomes a cost factor in economic terms as well.

6.4. Human capital devaluation and system efficiency

A lasting transformation of the motivational structure and chronic psychological strain can lead to a deterioration in the quality of human capital. Declining cognitive capacity, diminished creativity, and the increasing risk of career dropout directly affect the return on investment in doctoral education (Council of Graduate Schools, 2008; Pusztai et al., 2022).

From an economic psychology perspective, this means that the short-term output optimization of the publication incentive system may generate a loss of system efficiency in the long term.

6.5. Long-term system-level effects of the publication incentive system

The dominance of the publication incentive system shapes structural adaptation patterns within the academic sphere. The external orientation of the motivational structure, decisions aligned with the measurement logic, and the disproportion between effort and reward collectively generate dynamics that extend beyond the individual level.

Chronic psychological strain and hidden productivity declines can be interpreted as a devaluation of human capital. The sustainability of doctoral education is thus not merely a matter of mental health but also a problem of economic rationality.

The economic-psychological interpretive framework highlights that the design of the incentive structure is, in itself, a matter of system design. A balanced evaluation model that integrates quality considerations does not undermine academic excellence but, in the long term, stabilizes the quality of human capital and the sustainability of the academic system.

7. The economic dimensions of the supervisor's role in doctoral education

When examining the economic and organizational impacts of doctoral education, research typically focuses on student performance, mental health, and dropout rates (Levecque et al., 2017; Evans et al., 2018; Sverdlik et al., 2018). At the same time, the supervisor's perspective—as one of the most important operational mechanisms of doctoral education—is less prominent in economic analyses, even though it plays a key role in the efficient use of resources and the maximization of research output.

In doctoral education, the supervisor is not merely an academic mentor but also a decision-maker in resource allocation, whose activities directly influence research efficiency. This role becomes particularly prominent in the context of increasing performance pressures and publication expectations (Görög, 2021).

7.1. The economic consequences of student psychological stress

There is a strong link between the mental health of doctoral students and their academic performance. Research shows that the prevalence of mental health issues among PhD students is exceptionally high, which results in a significant loss of productivity (Levecque et al., 2017; Evans et al., 2018). The neurobiological effects of stress–particularly chronic stress–impair cognitive performance and decision-making abilities (McEwen, 1998; Sapolsky, 2004).

From an economic perspective, this phenomenon manifests itself in a decline in research output, a deterioration in publication performance, and delays in doctoral training. The phenomenon can also be interpreted within the framework of "presenteeism," which describes losses resulting from reduced performance while present at work (Kinman & Wray, 2018).

Internationally, the economic impact of mental health issues is significant: according to OECD estimates, productivity losses resulting from mental disorders can reach 4% of GDP in developed countries (OECD, 2021). This impact is also evident at the doctoral level, albeit in a more indirect form.

7.2. Direct costs: supervisor time and resource utilization

Supervisor time is one of the most important implicit economic resources in doctoral education. According to management science approaches, time expenditure can be interpreted as a direct cost, and an increase in this cost results in a decrease in efficiency (Quick & Henderson, 2016).

In the case of mentally burdened students:

– consultation time increases,
– more correction cycles are required,
– the publication process slows down.

This leads to an increase in the cost per unit of output. This phenomenon can be compared to research on workplace performance decline, which indicates that stress and burnout have a significant impact on productivity (Halbesleben & Buckley, 2004; Bakker & Demerouti, 2017).

7.3. Indirect costs: academic performance and funding

Indirect costs are the most critical elements of the economic dimension of doctoral education. A decline in student performance leads to reduced publication activity, which has a direct impact on institutional funding and competitiveness (Görög & Kása, 2019).

In modern higher education systems, funding is increasingly performance-based, so a decline in research output results in a loss of revenue (Pusztai et al., 2022). Furthermore, international research highlights that workplace stress and psychosocial risks represent a significant economic burden for organizations (EU-OSHA, 2014).

The literature on workplace psychological harassment (mobbing) also offers relevant parallels: research indicates that prolonged psychological strain entails significant organizational costs, including reduced performance and increased turnover (Einarsen et al., 2020; Nielsen & Einarsen, 2012).

7.4. Dropout rates and transaction costs

One of the most serious economic consequences of doctoral education is attrition. According to a report by the Council of Graduate Schools, a significant proportion of PhD students do not complete their studies, which represents a serious loss of resources (Council of Graduate Schools, 2008).

The costs of dropout:

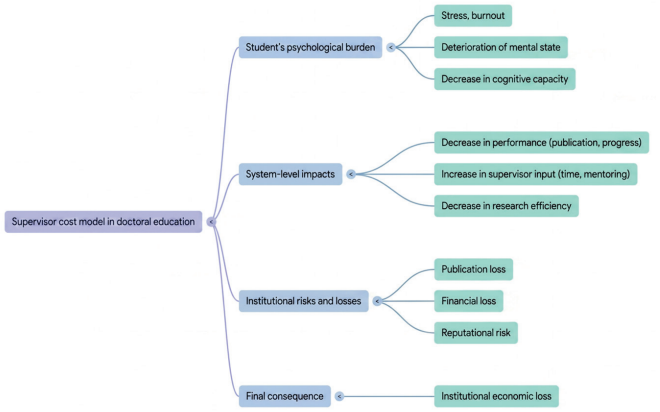
– wasted supervisor time,
– interrupted research projects,
– costs of recruiting new students.

These costs can be interpreted from a human capital perspective, according to which the loss of invested knowledge and competence constitutes an economic loss (Becker, 1993).

7.5. Macroeconomic dimensions and innovation effects

The effectiveness of doctoral education is relevant not only at the institutional level but also at the macroeconomic level. A de-

Table 2: Economic impacts of the cost model for doctoral program supervisors



Source: Compiled by the author based on the cited literature

cline in research output affects innovation capacity and economic competitiveness in the long term.

According to analyses by the World Health Organization and the OECD, the economic losses resulting from mental health problems are significant (WHO, 2022; OECD, 2021). Stress and declining performance in doctoral education may thus indirectly contribute to a slowdown in economic growth.

7.6. Implications for leadership and strategic significance

Recognizing the economic dimension of the supervisor's role requires a new approach to the management of doctoral education. Supporting students' mental health is not merely a matter of well-being but can also be justified on economic grounds.

It is justified for institutions to:

– introduce mental health programs,
– monitoring the workload of advisors,
– Integration of economic indicators.

The table systematizes the relationship between the psychological burden in doctoral programs and supervisor resources, as well as their economic consequences. The model demonstrates how the deterioration of students' mental health leads to institutional economic losses through systemic effects.

Conclusions

Based on the study's findings, it can be concluded that the publication pressure prevalent in doctoral education cannot be interpreted merely as a performance evaluation tool, but rather as a complex structural factor with direct and indirect economic consequences. The "publish or perish" logic aims to increase scientific output; however, based on the mechanisms of action presented, it may also contribute to a decline in the system's efficiency in the long term.

The analysis highlighted that the effects of publication pressure manifest at multiple levels and can be interpreted as interrelated processes. Increased psychological stress leads to a decline in cognitive and functional performance, which manifests itself in the prolongation of research processes, a decline in productivity, and the emergence of presenteeism. Ultimately, these processes lead to a decline in the utilization of human capital and a deterioration in the return on institutional resources.

One of the most significant economic risk factors in doctoral education is dropout, which, based on human capital theory, can clearly be interpreted as a lost investment. High dropout rates indicate that the system is unable to fully utilize the resources invested in training. At the same time, career abandonment and early departure from the academic track generate a structural succession problem, which in the longer term may also affect innovation capacity and scientific competitiveness.

One of the study's most important contributions is that it interprets publication pressure from an economic and human capital perspective, highlighting that psychological strain is not merely an individual-level problem but also a measurable economic factor at the institutional level. The integration of direct, indirect, and hidden costs—particularly presenteeism and reduced productivity—sheds new light on the question of the efficiency of doctoral education.

The economic psychology approach further reinforces this interpretation by demonstrating that the publication incentive system not only regulates behavior but also reshapes motivational structures and resource allocation decisions. The dominance of external performance pressure can weaken intrinsic motivation in the long term, distort research decisions, and contribute to a decline in the quality of human capital.

Based on our findings, it can be concluded that the current, strongly output-oriented evaluation system of doctoral education may optimize publication performance in the short term, but may generate losses in system efficiency in the long term. This insight is particularly important from an economic perspective, as it highlights that current performance measurement practices are not always consistent with the efficient use of resources.

The practical implications of the study can be articulated on multiple levels. At the institutional level, it is warranted to rethink publication expectations and evaluation systems so that they focus not only on quantitative results but also on the quality and sustainability of the research process. In addition, it is necessary to integrate mental health support into the operation of doctoral programs, as well as to introduce " " indicator systems that can capture hidden costs and human capital losses.

Overall, it can be concluded that scientific excellence and economic efficiency are not mutually exclusive goals; however, under the current incentive structures, tensions may arise between them. Rethinking publication pressure does not mean reducing output, but rather organizing it in a more sustainable and efficient manner. Developing a balanced system that simultaneously supports high-quality research, mental well-being, and the efficient use of resources can contribute to the long-term stability of doctoral education and the sustainability of the next generation of scholars.

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