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Marketized Mentality of Scientists in Poland

Abstract: Science undergoes the gradual market-oriented transformation. Our study intends to illustrate how these market logics manifest themselves at the individual level of scientists. By examining the marketized mentality (MM) of scientists in Poland, we confirm that the traditional academic ethos and the marketized mentality are incompatible. Scientists as a group manifest fewer signs of marketized mentality than the general population of Poland. This does not mean that higher MM is uncommon among scientists. Representatives of humanities, agricultural and veterinary sciences, and medical sciences were less willing to adopt MM values than those in social sciences. We found that higher degrees of MM characterized academics whose attitude towards values and norms might be describes as 'opportunistic' and who additionally conduct applied research. This suggests that the lack of academic values might disturb the ability of science to solve problems that are unprofitable such as climate change, economic inequality, migration, and pandemics.

Keywords: marketization of science, ethos of science, academic capitalism, marketized mentality, academics in Poland

Introduction

The marketization of science can be understood as the incorporation of capitalist market logic into the processes of research and the dissemination of its findings (Kulczycki 2023: 47–69). At the individual level, this manifests as a "marketized mentality" (MM), where scientists internalize market-oriented values and role performance repertoire. Within the framework of Institutional Anomie Theory (IAT), MM represents a strong alignment with values and norms associated with the market economy, as well as behaviors guided by cost and benefit logic (Hövermann and Messner 2019a).

Historically, scholars have viewed science as being resilient to market pressures (Koertge 2000; Merton 1973; Panofsky 2010; Weber 1917). Robert K. Merton argued that science operates under a distinct set of norms—communism, universalism, disinterestedness, and organized skepticism (C.U.D.O.S.)—which serve to protect it from external influences (see Anderson et al. 2010; Barber 1952; Stehr 1978: 174–75). Szadkowski (2023: 77) refers to this belief in science's resistance to market forces as "exceptionalism." At its core lies the belief in the "impenetrability of the sector by capital" due to its autonomy, openness, and competition for prestige.

Recent empirical studies challenge this notion of "exceptionalism." While some evidence suggests that productive researchers respond best to non-financial motivators (Lam 2011; Roach and Sauermann 2010; Ryan and Berbegal-Mirabent 2016) and that traditional Mertonian norms continue to guide many scientists, these coexist alongside more market-oriented approaches to scientific practice (Bieliński and Tomczyńska 2019; Macfarlane 2023). This coexistence may reflect a growing prevalence of marketized mentalities among individual researchers.

This study aims to explore the extent to which market values have permeated the scientific community. We pose three research questions: 1) How prevalent is the marketized mentality among scientists in Poland? 2) What characteristics of scientists and scientific institutions foster higher degrees of MM?; and 3) Do scientists who adhere to traditional academic norms exhibit greater resilience to the marketization of science, resulting in lower levels of their MM?

These questions are significant in understanding the evolving dynamics between science and the economy. According to IAT, when economic values dominate, other social institutions lose their ability to effectively regulate individual behavior (Messner and Rosenfeld 1997: 217). In the context of science, MM can lead to questionable research practices, hinder research on unprofitable subjects, such as climate change or migration, and potentially reduce an actual value of scientific production. By examining the socioeconomic and institutional factors that foster MM, we aim to inform science policy and gain deeper insights into how economic pressures reshape the normative foundations of science.

However, to fully grasp the emergence of such mentalities, it is crucial to recognize that the marketization of science is not a natural evolution but a deliberate, state-engineered project involving the creation of quasi-markets and the implementation of New Public Management (NPM) principles. Far from withdrawing, the state actively steers the academic field from a distance, replacing traditional professional autonomy with performance-based accountability and metric-driven competition (Shore and Wright 2015). This structural shift creates a hybrid logic where scientific practice is increasingly subjected to a corporate-like evaluation regime, making the study of values and norms internalized by scientists essential for understanding the subjective impact of these macro-reforms.

Our study draws on a 2016 survey of 801 Polish scientists, conducted shortly after market-oriented reforms were introduced to the Polish science system (see Bieliński and Tomczyńska 2019: 157–159). These reforms emphasized business-academia cooperation in alignment with the "knowledge-based economy" (see Mowery and Sampat 2004) and the "Triple Helix" doctrine (see e.g. Etzkowitz and Leydesdorff 2000). The timing of data collection is particularly significant, as the year 2016 precedes the transformation of the Polish science system that took place after the introduction of the new law, the so-called 2018 "Constitution for Science" reform (see Waligóra and Górski 2022). Consequently, the findings of this study establish an essential baseline for analyzing the Polish scientific community during a period when market-oriented evaluation mechanisms and parametrization were already institutionally embedded yet lacked the highly restrictive and deterministic influence of the current metric-driven regime. Poland's transition toward a neoliberal science policy mirrors broader European trends following its accession to the OECD and EU, as the country aligned its science policies with those of Western Europe

(Dobbins 2017; Kwiek and Szadkowski 2018; Waligóra and Górski 2022). Furthermore, post-communist Central-East European countries, including Poland, have been shown to exhibit a relatively high dominance of economic values over other social institutions (Hövermann, Groß, and Messner 2016). This combination of rapid policy shifts and significant institutional changes makes Poland a valuable case for studying the effects of marketization on the scientific community.

While our analysis focuses on Polish scientists, we believe the MM framework can be applied more broadly. Early studies demonstrate the concept's validity in monitoring consequences of anomic culture (Groß, Hövermann, and Messner 2018; Hövermann et al. 2015; Hövermann, Messner, and Zick 2015). However, we have identified only a handful of studies employing the concept of marketization in relation to science and academics' values (De Jong and Kantimm 2024; S. Y. Kim and Kim 2018; Macfarlane and Cheng 2008; Mendoza et al. 2020; Ylijoki 2003).

The remainder of this article is structured as follows: first, we discuss the theoretical background, including the marketization of science, IAT, MM, and the normative structure of science. Next, we present data and measures of MM and other latent variables. The results section outlines our findings, followed by a discussion on the implications of MM for the integrity of the scientific system.

Institutional Anomie Theory and Marketized Mentality

Institutional Anomie Theory (IAT) provides a valuable framework for understanding how market-oriented values penetrate noneconomic social institutions, shaping individual behavior. Developed within criminology over the past three decades (Hövermann and Messner 2023; Messner and Rosenfeld 2001; Rosenfeld and Messner 2017), IAT posits that economy can undermine the regulative functions of noneconomic social institutions (Messner and Rosenfeld 1997: 217) through mechanisms of penetration of market values into non-economic social institutions, accommodation to demands of the economic social institutions in role conflict situations and devaluation of non-economic social roles (Messner and Rosenfeld 2001: 68–76). Under economy dominated social conditions non-economic social institutions lose their ability to regulate and guide individual's behavior (Messner and Rosenfeld 1997: 217) leading to anomic culture where "technical expediency guides the selection of the means to pursue personal goals regardless of the normative status of means" (Bieliński and Hövermann 2023: 22). Internalizing market values can push scientists toward instrumentalism, potentially leading to research misconduct, the sidelining of urgent yet "unprofitable" topics like climate change or migration, and an uncritical dependence on LLMs for drafting manuscripts and evaluations—a practice that prioritizes metric success over authentic intellectual engagement and rigorous human oversight. These potentially negative consequences in research practices may lead to decline in the actual value of scientific production.

Messner and Rosenfeld identified key market-oriented values—individualism, universalism, and achievement orientation—which they termed "American Dream Values." Individualism reflects the belief that people should rely on their own abilities, viewing others

as competitors in the pursuit of success. Universalism frames material success as both universally attainable and desirable. Achievement orientation encourages individuals to define and pursue goals independently, with success measured by their effectiveness in achieving these goals (Bieliński and Hövermann 2023: 29–30). Money fetishism, another core market-specific value, centers on the belief that material success is the ultimate goal and that the accumulation of economic resources defines an individual's achievements and aspirations (Messner and Rosenfeld 2001: 63).

The IAT has been formulated, operationalized, and tested empirically at a macro level in many studies (see Messner and Rosenfeld 2006). In 2015 Hövermann et al. (Hövermann et al. 2015; Hövermann, Messner, and Zick 2015) proposed the concept of MM as a micro level manifestation of the macro level phenomena that the IAT describes.

Early studies of the MM concept proved its explanatory usefulness in studying social phenomena such as attitudes toward minority groups or deviant behaviors (Groß, Hövermann, and Messner 2018; Hövermann et al. 2015; Hövermann, Messner, and Zick 2015, Hövermann, Groß, and Messner 2016, Hövermann and Messner 2019b, Hövermann and Messner 2019c, Hövermann and Messner 2022). However, most previous attempts to measure the processes described by IAT on an individual level lacked a consistent operationalization. This gap was recently addressed by Bieliński and Hövermann (2023). Building on the previous work of Bieliński (2013), they mapped accommodation and penetration processes, including anomic success and American Dream Values. Their MM model rendered construct validity and to date seems to be the best MM operationalization. It relates directly to the IAT, offering a social-psychological lens to examine how market-specific values (achievement orientation, individualism, universalism, and the fetishism of money) shape individual behavior.

In the field of science, MM is thus both an individual-level indicator of the broader process of marketization of science and a concept that aligns well with observed changes in the ethos of science.

Types of Ethos of Science

The ethos of science, as described by Merton (1973), represents a distinct normative framework that has historically shielded science from external pressures, including market influences (see Anderson et al. 2010; Barber 1952; Stehr 1978: 174–175).

Merton proposed that the norms of communism, universalism, disinterestedness, and organized skepticism guide scientists' behavior (Merton 1973: 270). These norms implied that research findings are the common property of the scientific community, evaluated by impersonal criteria, and driven by objectivity, with a critical approach to claims (Stehr 1978: 174; see also Merton 1973: 276–278). Merton also indicated that the normative structure of science is distinct from its individual level manifestation, i.e. "scientific conscience" or the "scientific mind," which he understood as the degree of internalization of the ethos of science by a particular scientist (Merton 1968: 605).

However, the integration of industrial science, typical of commercial research laboratories, with academic science—as described by John Ziman (1996a, 2002)—poses a chal-

lenge to the traditional ethos of science. The norms of industrial science, summarized as P.L.A.C.E.—proprietary, local, authoritarian, commissioned, and expert—represent a shift toward practical, commercially oriented applications. The blending of these norms with academic science has given rise to postacademic science, which reflects the hybridization of traditional and market-driven norms. Research conducted in Poland by Bieliński and Tomczyńska (2019) identified four ethos types classified according to scientist's acceptance or rejection of the norms of academic and industrial science: academic, industrial, postacademic, and opportunistic/nonethos adaptation, where no strong normative commitments are present. Within this paper we build on a theoretical and empirical approach to studying ethos types by Bieliński and Tomczyńska (2019) and utilize the same dataset.

The ethos of science can thus be seen as a system of values that moderates the penetration of market-specific values described by IAT. While the C.U.D.O.S. norms offer protection against the marketization, the P.L.A.C.E. norms facilitate the integration of economic priorities into scientific practice. MM emerges when individual scientists internalize market-specific values, potentially weakening their adherence to the traditional ethos.

The Marketization of Science

The marketization of science represents a broad structural process through which market principles reshape the funding, definition, and practice of scientific research. While much of the existing literature examines marketization at the macro level—focusing on phenomena like the knowledge-based economy or academic capitalism (Sigahi and Saltorato 2020; Slaughter and Rhoades 2004; Slaughter and Leslie 1999)—its impact at the individual level remains underexplored. To bridge this gap, we must distinguish between the structural mechanisms engineered at the state level and an adaptive response of scientists in the form of Marketized Mentality.

The marketization of science is not a "natural" expansion of the economic sphere, but a deliberate, state-led project. Far from withdrawing, the state actively engineers marketization through the principles of New Public Management (NPM), implementing "steering from a distance" mechanisms (Shore and Wright 2015). A central feature of this process is the creation of quasi-markets (Grand & Bartlett, 1993)—competitive environments within the public sector where scientific institutions and individual researchers are forced to compete for scarce resources (grants, status, and funding) based on state-defined performance metrics. The concept of Marketized Mentality (MM) offers a promising framework for analyzing individual-level effects of these processes.

Regarding science funding, it is often stated that since the 1990s, universities in OECD countries have been evaluated based on their economic efficiency and contributions to national innovation systems. The concept of the knowledge-based economy has shaped government funding strategies, leading to stricter accountability measures in higher education (Jessop 2017; Olssen 2016). The process of the science metricization reduces scientific productivity to activities measured by popular science metrics (Kulczycki 2023: 49–69; see also Kandiko Howson, Coate, and De St Croix 2018) as evidenced by the

national research evaluation systems adopted by many EU countries (Zacharewicz et al. 2019).

The definition of science has also evolved, with increasing emphasis on commercialization as a measure of research excellence (Jacobsson, Vico, and Hellsmark 2014; Wigren-Kristoferson, Gabrielsson, and Kitagawa 2011). Research funding organizations across Europe, including Poland, now prioritize projects that support economic growth and collaboration between academia and industry (Kwiek and Szadkowski 2018).

The conduct of research has been impacted as well, with funding constraints narrowing the range of research topics and influencing management strategies. The application of business principles to scientific research—aligned with new public management theories—means that scientists must align their work with the priorities of funding bodies (McClure 2016).

In Poland, insufficient research funding from both private and state budgets has amplified these trends. Since the introduction of a national evaluation system in 1991, later refined to be more metrics-driven by 1999, scientific institutions have been categorized from A+ to D. This system influences their prestige, funding, and development prospects (Kulczycki, Korzeń, and Korytkowski 2017). Over the first decades of the XXI century, these changes have progressively reshaped academic practices (Kulczycki 2023: 47–69), raising questions about the extent to which market-oriented values have permeated the academic culture in Poland.

Scholarly debates about the marketization of science are polarized. Proponents argue that it enhances knowledge transfer and social impact, while skeptics caution that it undermines the impartiality and credibility of science, particularly in addressing public good issues (Glenna et al. 2011: 957). These concerns are particularly relevant in countries facing reduced state research funding (Mendoza, Kuntz, and Berger 2012; Mendoza et al. 2020) where intense competition for limited funds can lead to detrimental practices (Chubb and Watermeyer 2017; Macfarlane 2017; Mishra et al. 2018).

The marketization of science fundamentally challenges the ethos of science, as traditional Mertonian academic norms are increasingly supplanted by market-specific values. MM thus serves as a tool for analyzing the individual-level consequences of this transformation. In this article, we clearly distinguish between state-driven processes of marketization of science and their consequences observable at the level of scientists' values and norms. The concept of marketized mentality is a heuristic tool that allows us to empirically observe the adaptive strategies of scientists to top-down changes in the science system.

Research Questions and Hypotheses

This article addresses three questions regarding the MM of scientists in Poland: 1) How prevalent is the marketized mentality among scientists? 2) What characteristics of scientists and scientific institutions foster higher degrees of MM?; and 3) Do scientists who adhere to traditional academic norms exhibit greater resilience to the marketization of science, resulting in lower levels of MM?

Polish institutions differ in their primary missions: universities focus on teaching and research, institutes of the Polish Academy of Sciences (PAN) specialize in research, while governmental research institutes prioritize commercializing research outputs (see Bieliński and Tomczyńska 2019: 157–159). Based on these distinctions, we hypothesized that MM of employees of research institutes should be higher compared to academics employed at higher education institutions or institutes of PAN. Moreover, we expected differences in MM variance across institutions of employment, due to the distinct organizational cultures of individual research departments (Lowe and Gonzalez-Brambila 2007; Mendoza et al. 2020). Another aspect to consider is the parametric evaluation result of academic institutions. Given that evaluation is based on productivity measures and having in mind that scientific productivity itself may boost entrepreneurship (Bojko, Knapińska, and Tomczyńska 2021; Lowe and Gonzalez-Brambila 2007), we expected to observe a positive effect of scientific category of an institution on MM of its employees.

The second question investigates how sociodemographic and professional factors contribute to MM. We focused on variables such as gender, age, marital status, parental status, subjective household material conditions, and additional income sources. Drawing on prior research into the mitigating effects of family and social institutions on economic dominance (Baumer and Gustafson 2007; Bjerregaard and Cochran 2008; Chamlin and Cochran 1995; Cullen, Parboteeah, and Hoegl 2004; Hövermann, Groß, and Messner 2016; Hövermann and Messner 2019c; S.-W. Kim and Pridemore 2005; Stults and Baumer 2008; Stults and Falco 2014; Walters 2023; Zito 2018), we hypothesized that being in a formal or informal relationship, having children, and being older, have a "protective effect" against economic dominance resulting in lower degrees of MM. Conversely, we anticipated that a negative subjective assessment of household material conditions would result in higher degrees of MM. We also expected that male gender, higher level of seniority, and conducting applied research or research in fields with higher potential for commercialization such as exact, technical, or medical sciences, would be compatible with higher degrees of MM. Positive relationships between these characteristics and academic entrepreneurship have been observed in other studies (Cohen, Sauermann, and Stephan 2020; Miller et al. 2018; Perkmann et al. 2013). Although academic entrepreneurship differs from MM, the entrepreneurial behavior observed among scientists may serve as a proxy for MM.

The second question also addresses the relationship between job satisfaction and MM. According to the matching domain perspective (Amstad et al. 2011), work-to-life conflict fosters low job satisfaction (see meta-analysis in Allen et al. 2000; Shockley and Singla 2011). Therefore, we hypothesized a negative relationship between job satisfaction and MM. This expectation enjoys additional support in studies on job satisfaction and work–life balance among academics (Dorenkamp and Ruhle 2019; Eddy and Gaston-Gayles 2009; Grandey and Cropanzano 1999).

Finally, to assess scientists' resilience to the marketization of science, we examined adherence to traditional academic norms. In line with Merton's theory (1973) and based on the results of De Silva (2016) and Macfarlane (2023), we hypothesised that adherence to traditional Mertonian values reduces MM. Consequently, adherence to alternative academic norms (e.g., postacademic, industrial, or opportunistic) does not provide the same protective effect against MM. This expectation is further reinforced by the theoretical

assumptions of Institutional Anomie Theory and results of empirical research. IAT posits that strong embeddedness in non-economic social institutions has a protecting effect against the negative consequences of market dominance in institutional (im)balance of power (Messner and Rosenfeld 2001). This relationship was empirically demonstrated by Messner and Rosenfeld (1997), Chamlin and Cochran (1995) and Hövermann et al. (2016) in a cross-country study of 25 European countries.

Data, Methods, and Statistical Analyses

The empirical analysis presented in this paper is based on data collected in 2016 as part of a larger research project investigating the transformations of the scientific ethos and normative orientations among scholars in Poland. The study employed a representative sample of Polish scientists, the detailed sampling procedure and socio-demographic characteristics of which were described in Bieliński and Tomczyńska (2019). By utilizing this existing dataset, the current study situates itself within a cumulative research program while shifting the analytical focus toward a new set of research questions.

While the previous research established a taxonomy of normative orientations (academic, industrial, postacademic, and "non-ethos") and analyzed the erosion of Mertonian norms, this article introduces "marketized mentality" (MM) as a distinct analytical category. Following the operationalization developed in our earlier work (Bieliński and Tomczyńska 2019), we utilize the same measurement scales for the normative structure of science to explore a different phenomenon: the interaction between these normative foundations and the internalization of market logic. Notably, the application of the MM construct to this academic dataset was only possible following the prior development and validation of the Marketized Mentality SEM model on a representative sample of the Polish adult population (Bieliński and Hövermann 2023). This sequential approach ensured that the measurement tool was rigorously tested in the broader Polish social context before being applied to the specific professional group of scientists. This allows for a more nuanced understanding of how specific institutional and individual factors foster or inhibit a marketized mentality within the Polish academic landscape.

The survey was conducted from December 2015 to January 2016 on a sample of academics and governmental researchers in Poland. The research firm IQS conducted computer-assisted personal interviews (CAPIs). The population of interest included individuals with a Ph.D. degree or higher who were employed at higher education institutions (HEIs), governmental research institutes, or institutes of PAN and whose professional duties included conducting research (see Table 1 in the Appendix). The sampling frame was based on the most accurate data on scientific institutions and academics in Poland collected by the National Information Processing Institute (OPI PIB).

The sampling scheme was designed as a two-stage disproportionate stratified random sampling. Our sample of 801 researchers mapped population characteristics such as type and size of research organization or HEI, field of science, academic degree, and gender (see Table 1 in the Appendix). Survey responses were supplemented with data on both the respondents and their academic institutions, obtained from the sampling frame database.

The analysis began by reporting the frequencies of MM indicators. We then employed confirmatory factor analysis (CFA) and fuzzy clustering to model MM and the ethos of science, following methodologies previously applied by Bieliński and Hövermann (2023), and by Bieliński and Tomczyńska (2019).

To test our hypotheses, we utilized random intercept linear mixed effects models, with MM modeled as a function of both individual level and academic institution level characteristics. Multilevel models diminish bias of regression parameters and their standard errors allowing to avoid false negative results, aggregation bias and the heterogeneity of regression (Raudenbush 1993; Raudenbush and Bryk 2002).

The sociodemographic and control variables (e.g., gender, age, marital status, having children, subjective assessment of material conditions, earning additional income, academic degree, main field of science, and conducting applied research) were included in Model 1. We then added compound indicators of discrepancy between perceived and expected work conditions: a work dissatisfaction index (WDI) and an income dissatisfaction index (IDI) (Models 2–4; see Table 1). Model 5 tests the effect of ethos type on MM, controlling for sociodemographic variables. We proceeded with the models that control for cross-ethos type differences (Model 6) and academic productivity (Model 7). We analyzed the joint effect of all individual level independent variables and interactions in Model 8. Finally, we incorporated level 2 independent variables in models that tested for the effects of academic institution level characteristics (Models 9–10; see Table 1).

We standardized the continuous independent variables by two standard deviations. The binary independent variables were centered around the mean. This facilitated a comparison of regression coefficients between the continuous and the binary variables and thus easier interpretation of the results (Gelman 2008). Consequently, the coefficients for all continuous and binary predictors could be compared, given that we measured them using approximately the same scale. The coefficients indicate the effect of a two-standard-deviation increase in a predictor on the dependent variable.[1]

Measurement and Compound Indicators

We operationalized MM using the strategy proposed by Bieliński and Hövermann (2023). We measured accommodation using a set of statements that denote the resolution of role conflict situations in favor of economic social roles. Following Bieliński and Hövermann, it is operationalized in terms of the frequency of individual prioritization behavior (see Figure 4). Respondents were asked to specify on a five-point scale (1 = never; 5 = always) how often they abandoned private and social commitments due to job responsibilities.

In Bieliński and Hövermann's MM model the penetration aspect is composed of two dimensions: American dream values (individualism, universalism, and achievement orientation) and money fetishism/anomic success. The penetration was measured by

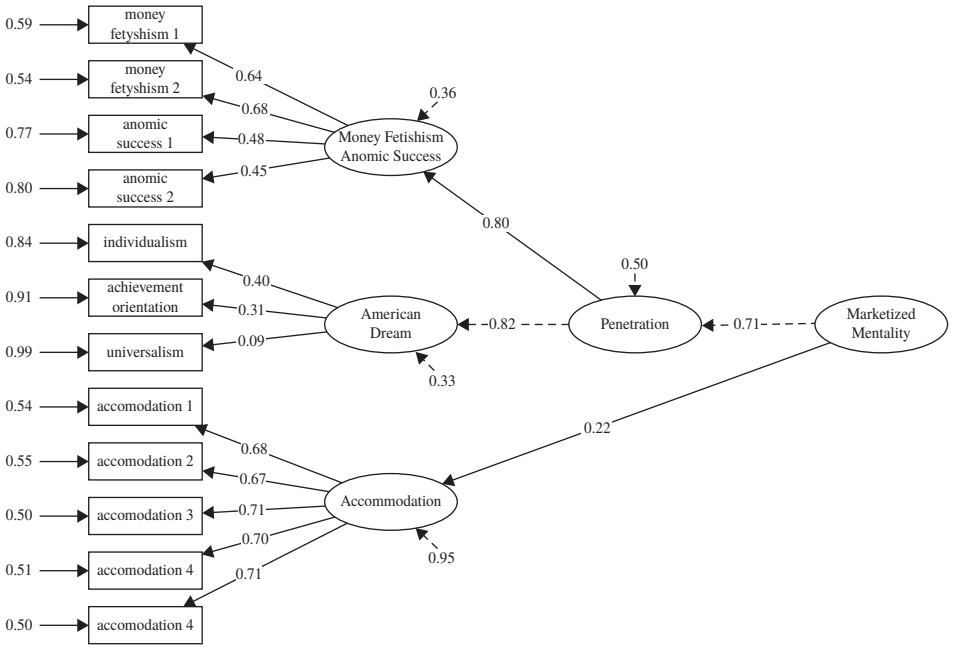
[1] The data transformations and analyses were performed using R Language and Environment for Statistical Computing (R Core Team 2023). The SEM models were estimated using the lavaan package (Rosseel 2012), The HLM models were estimated using the lme4 package (Bates et al. 2015) with BOBYQA optimization. The model fit measures: marginal and conditional R2, were computed using the MuMIn package (Bartoń 2023).

agreement with a set of statements on a four-point bipolar semantic scale (1 = strongly disagree; 4 = strongly agree—see Figure 4).

We modelled the MM as a Confirmatory Factor Analysis (CFA) model, based on the work of Bieliński and Hövermann (2023). The MM latent variable loads on penetration and accommodation. Penetration is defined by American dream values and money fetishism/anomic success. Some minor differences in model specification enabled the model to converge on a sample of academics in Poland. The differences in model specification are: 1) we fixed the loading of penetration on American dream to 1; 2) we utilized a diagonally weighted least squares (DWLS) estimator. Due to these differences, we do not claim that our MM model is identical to that of Bieliński and Hövermann; nevertheless, we are firmly convinced that it expresses the same theoretical assumptions with acceptable model parameters and even better fit measures. The MM model, together with the model fit measures, is presented in Figure 1.

Fig. 1

Marketized mentality: SEM path diagram (standardized model parameters and DWLS estimator) and model fit measures



Notes: The dashed line represents the fixed factor loading employed to identify the structural model. All model parameters and measurement error variances are significant at $p < 0.001$ with the exception of the universalism effect on the American dream ($p < 0.05$). Model fit measures: $\chi^2 = 152.823$, df = 52, $p < 0.000$, GFI = 0.975, AGFI = 0.962, RMSEA = 0.054, RMSEA lower 90% CI = 0.044, RMSEA upper 90% CI = 0.064, CFI = 0.940, TLI = 0.923, SRMR = 0.058.

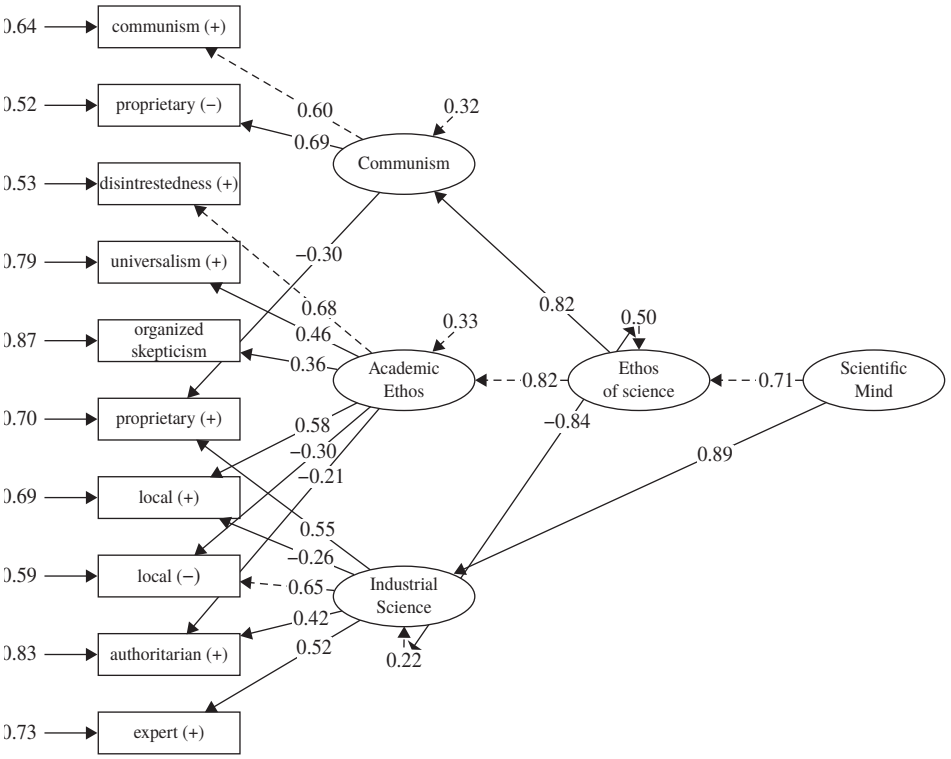
We measured and modelled the normative structure of science in contemporary Poland based on the work of Bieliński and Tomczyńska (2019). Items that denote opposing value–norm orientations measuring academic and industrial science values: C.U.D.O.S. and

P.L.A.C.E. The respondents evaluated ten statements on an eleven-point numeric scale, in which 0 indicated "strongly disagree" and 10 indicated "strongly agree" (see Table 2 in the Appendix).

We started with a CFA model that reflects theoretical assumptions of the normative structure of science. The scientific mind loads on the ethos of science and industrial science. The ethos of science is defined by two first order latent variables, communism and academic science. The model specification assumes that the ethos of science and industrial science covary. The ethos of science model, together with model fit measures, is presented in Figure 2.

Fig. 2

Ethos of science: SEM path diagram (standardized model parameters and ML estimator) and model fit measures



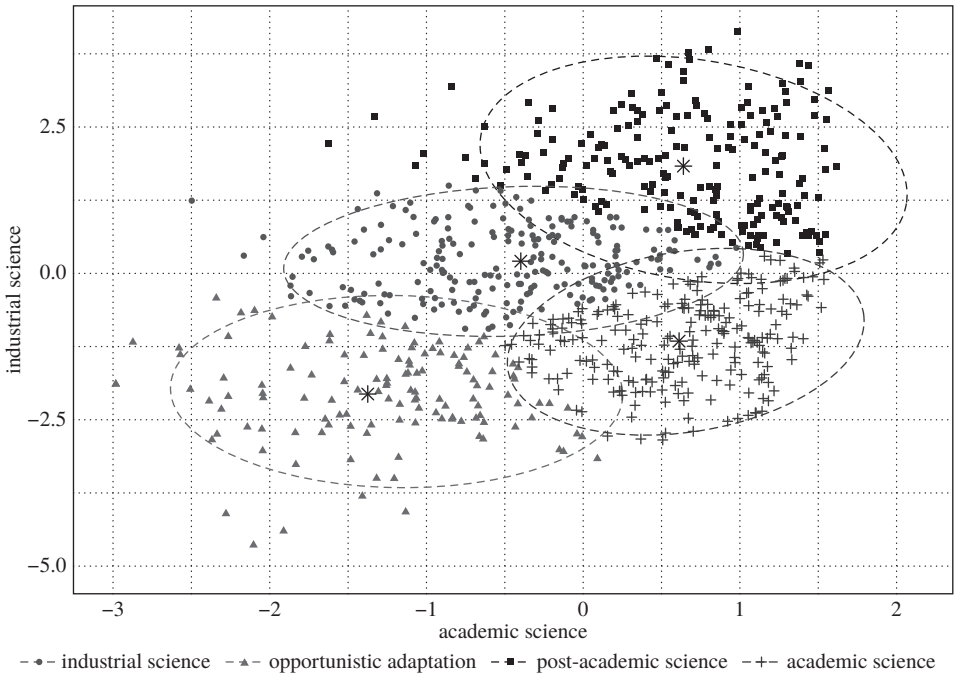
Notes: The dashed line represents the fixed factor loading employed to identify the structural model. All model parameters and measurement error variances are significant at $p < 0.001$ except for the local science + item effect on the academic ethos ($p < 0.03$). Model fit measures: $\chi^2 = 103.587$, df = 31, $p < 0.000$, RMSEA = 0.054, RMSEA lower 90% CI = 0.043, RMSEA upper 90% CI = 0.066, GFI = 0.997, AGFI = 0.993, CFI = 0.916, TLI = 0.878, NFI = 0.886, SRMR = 0.05.

Using fuzzy clustering analysis, we identified four types of science ethos. The academic science and industrial science latent variables were saved in the dataset as regression scores and used in fuzzy K-means clustering with entropy regularization of k = 4 clusters and an

entropy parameter of 0.7. The results are consistent with Bieliński and Tomczyńska's ethos of science model and ethos types, which enabled us to capture the complex normative structure of science. We identified four types of modern ethos of science: 1) academic science; 2) industrial science; 3) postindustrial science; and 4) opportunistic adaptation (see Figure 3).

Fig. 3

Types of ethos: Fuzzy clustering with entropy regularization



*—cluster centers; k = 4 clusters; entropy parameter = 0.7; partition coefficient (PC) = 0.824; Modified PC (MPC) = 0.766; Xie and Beni Index (XB) = 0.297

Degree of work dissatisfaction was measured by a set of fifteen items that list the tasks performed by researchers at work (for the complete list of items, see Table 3 in the Appendix). The respondents indicated how much time they had spent in the last twelve months on each of the tasks using a five-point bipolar semantic scale. The answers were recoded so that 0 represented the ideal amount of time spent, while values of 1 or 2 indicated that they had spent either too little or too much time on a particular task. We computed the work dissatisfaction index (WDI) as the sum of recoded items for each respondent.

Income dissatisfaction was measured by two questions: 1) the income earned by a respondent, and 2) the income that academics with similar skills and experience to the respondent should earn. Both questions used nine predefined income categories. We defined the income dissatisfaction index (IDI) as the difference between postulated and actual income.

Academic productivity was evaluated using two metrics. First, respondents were asked how many research grants (national or international) they had been awarded during the last three years. Their answers were recoded to a dummy variable that denotes whether a respondent was awarded at least one research grant during that period. The respondents declared how many articles they had published during the last three years. We defined productivity related to publication practices as a respondent's deviation from the mean number of articles published in their main field of science.

Results

Prevalence of MM among Polish Scientists

Over 70% of respondents reported having to neglect family (77.5%) and social commitments with friends (74.3%) at least "from time to time" due to their job responsibilities. Additionally, more than 30% indicated that they had to forgo medical appointments (31.2%) or delay addressing important administrative matters (34.9%) for work-related reasons. Over half of the respondents reported canceling other prior commitments because of job responsibilities (see Figure 4). These findings suggest that Polish scientists often resolve role conflicts by prioritizing work-related responsibilities over other social roles.

Two of the American dream values: achievement orientation and universalism, are notably prevalent among Polish scientists. Nearly 64% agreed with the statement that "anyone can be successful if only he/she works hard enough" (universalism) while just under 72% agreed that "being successful in life is very important to me" (achievement orientation). However, scientists were less individualistic, as only 26% agreed with the statement that success depends on relying solely on one's own abilities (see Figure 4).

Money fetishism appears to have limited resonance among Polish scientists. Only 6% of respondents agreed with statements reflecting the belief that an individual's worth is measured by their financial success, and 13.1% stated that they "would sacrifice much in life to have a lot of money." These percentages are significantly lower than those reported for working adults in Poland by Bieliński and Hövermann (2023), where agreement levels reached 31.1% and 43.7%, respectively.

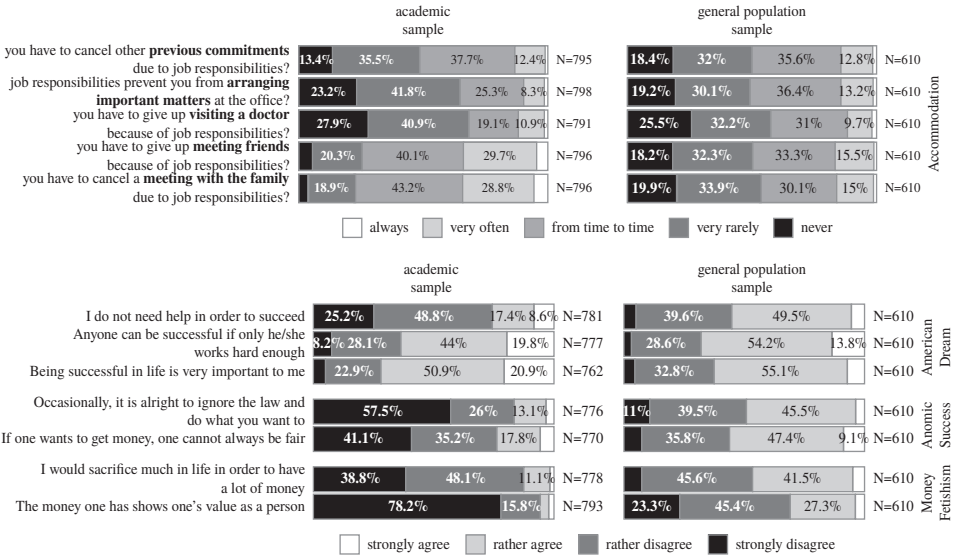
Finally, the notion of anomic success, defined as "a conviction that economic success can be achieved only via illegitimate means" (Bieliński and Hövermann 2023: 30), also appears to be relatively low among scientists. Only 23.8% of respondents agreed with the statement "if one wants to get money, one cannot always be fair," and just 16.6% agreed that "occasionally, it is alright to ignore the law and do what you want to." By contrast, Bieliński and Hövermann found agreement with these statements to be more than 30 percentage points higher among working adults in Poland.

Factors Influencing MM

The mean level of MM varied across academic institutions, with 12.4% of the variance explained by institutional affiliation (ICC = 0.1237). This finding underscores the importance

Fig. 4

Marketized mentality indicators. Frequency distributions



of institutional characteristics influencing MM and supports the use of multilevel linear models to account for these effects.

Sociodemographic independent variables showed relatively stable effects across all models. Among individual level predictors, gender, subjective assessment of household material conditions, earning additional income, and field of science were statistically significant in explaining MM. In contrast, no significant effects were observed for age, marital or relationship status, having children, academic degree, or involvement in applied research.

Male academics demonstrated higher levels of MM, with the effect of gender increasing from Beta = 0.09 ($p < 0.05$) in Model 1 to Beta = 0.12 ($p < 0.01$) in Model 10. Positive subjective assessments of household material conditions were associated with lower MM levels (Beta = –0.07/–0.09, $p < 0.001/0.01$), while earning additional income consistently increased MM, with statistically significant effects observed in Models 3 through 6 and the full models. The model parameter for not earning additional income varies between Beta = –0.09 and –0.12, $p < 0.05/0.01$.

Field of science also played a significant role in shaping MM. Using social sciences as the reference category, respondents in humanities, agricultural and veterinary sciences, and medical sciences exhibited lower levels of MM. The model parameters for these fields of science are relatively high, ranging from Beta = –0.15, $p < 0.05$ (Models 1–2 for agricultural and veterinary sciences) to Beta = –0.33, $p < 0.01$ (Models 9–10 for humanities). We also observed a negative effect of exact sciences relative to social sciences when all individual level independent variables are controlled for (Beta = –0.17, $p < 0.05$; Model 8) and in our full random intercept models (Beta = –0.18, $p < 0.05$; Models 9–10).

Interestingly, no significant effects were found for relationship status or parental status, suggesting the absence of a "protective effect" of family related embeddedness against MM. Model 1 accounted for 12.9% of MM's variance, with fixed effects accounting for approximately 6.5% indicating the need to expand the range of explanatory variables beyond the respondents' social locations.

When discrepancies between perceived and expected work conditions were introduced—via the WDI and IDI—their effects on MM were minor (Models 2–4; see Table 1). WDI had a modest positive effect (Beta = 0.05, $p < 0.01$) in Model 4, but this effect became insignificant in the full models (Models 9–10). Similarly, IDI showed a small positive effect on MM (Beta = 0.07, $p < 0.01$). Hence, dissatisfaction with work duties and income contributed to higher MM levels. These results aligned with the observed negative effect of household material conditions and the positive effect of earning additional income. Model 4, which incorporates both work-related independent variables, explains 19.1% of MM's variance; fixed effects account for approximately 11%.

The relationship between academic ethos and MM was explored in Models 5–6. Ethos type was included in models that control for socio-demographics (Model 5) followed by the interaction of ethos type and conducting applied research (Model 6). A negative effect of adherence to traditional academic values on MM was found (Beta = −0.12, $p < 0.05$), supporting the hypothesis that commitment to academic values reduces MM. This effect persisted when interactions between ethos type and applied research were added (Model 6) but lost significance in the full models (Models 9–10). We tested the hypothesis of applied research fostering the effect of industrial and postacademic science in Model 6 by adding appropriate interaction terms. The interaction between nonethos type and applied research revealed a strong effect on MM (Beta = −0.32, $p < 0.05$ in Model 6), which increases in the full models (Beta = −0.42 to −0.43, $p < 0.01$ in full models). Academics engaged in applied research and aligned with the nonethos type (opportunistic adaptation) exhibited higher MM levels than those associated with industrial ethos and applied research (see Figure 1 in the Appendix). Model 6 explained 16.8% of the variance in MM, with fixed effects contributing to 10.4%.

The impact of academic productivity on MM was assessed in Model 9. No significant relationship was found between publication productivity and MM. However, being awarded a research grant had a positive effect on MM (Beta = 0.12, $p < 0.01$; Beta = 0.10–0.11, $p < 0.05$ in the full models). Additional tests revealed a relatively strong negative correlation between MM and the number of articles published for those in the postacademic ethos (Beta = −0.28, $p < 0.01$), relative to industrial science, indicating a crossover effect of ethos types and publications. Academics belonging to the academic or opportunistic type elicit a positive effect of publications on MM, whereas academics aligned with postacademic ethos showed negative effect, while no such effect was observed for the industrial ethos type (see Figure 2 in the Appendix).

Finally, Models 9–10 examined institutional characteristics. No significant differences in MM were observed between academics at public universities and those at nonpublic universities, research institutes, or PAN institutes. However, a negative relationship emerged in Model 10 between parametric evaluation category, a proxy for institutional academic excellence, and MM (Beta = −0.12, $p < 0.05$), indicating that higher institutional quality is associated with lower MM levels.

Table 1

Individual level predictors (Model 1) of marketized mentality (random intercept linear mixed effects models; model parameters standardized by two standard deviations)

	Model 1
(Intercept)	**0.37*****
gender: male	**0.09***
age	–0.10
age squared	0.15
lives in romantic relationship: no	0.01
has children: no	–0.02
subjective assessment of household material conditions	**–0.09*****
earns additional income: no	–0.07
academic degree: doctor habilitatus	–0.03
academic degree: full professorship	–0.09
field of science: humanities	**–0.21****
field of science: exact sciences	–0.11
field of science: natural sciences	–0.05
field of science: technical sciences	–0.07
field of science: agricultural and vet. sciences	**–0.21***
field of science: medical sciences	**–0.15***
field of science: art	–0.22
conducts applied research: no	0.04
AIC	1046.85
BIC	1135.41
Log Likelihood	–503.42
Marginal R2	0.065
Conditional R2	0.129
Num. obs.	619
Num. groups: institution	131
Var: institution (Intercept)	0.02
Var: Residual	0.21

***p < 0.001; **p < 0.01; *p < 0.05

Synthesis of Sociological Profiles

In order to provide a comprehensive answer to the second research question regarding the individual and structural determinants of marketized mentality (MM), the following synthesis identifies three distinct sociological profiles of scientists based on the statistically significant predictors and interactions presented in Tables 1 and 2.

A distinct sociological profile of a scientist with a high level of marketized mentality (MM) emerges as the "academic entrepreneur." This profile is most prominently represented by male researchers who report subjective dissatisfaction with their material conditions. In the framework of IAT, this suggests that MM functions as a compensatory adaptive strategy: when traditional academic rewards are perceived as insufficient, the "fetishism of money" and instrumental success become primary motivators. This mentality is further reinforced by structural factors, such as high involvement in the competitive grant system and affiliation with technical or social sciences. Notably, Model 10 reveals that this pro-

Table 2

Individual and institution level predictors of marketized mentality
(random intercept linear mixed effects models; model parameters standardized by two standard deviations)

	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
work dissatisfaction index	**0.05****		**0.05***				0.04	0.04	0.04
income dissatisfaction index		**0.08*****	**0.07*****				**0.07****	**0.07****	**0.07*****
ethos of science: academic science				**−0.12***	**−0.11***		−0.11	−0.11	−0.10
ethos of science: nonethos				−0.02	−0.05		−0.05	−0.05	−0.04
ethos of science: postacademic science				0.07	0.06		0.05	0.05	0.06
applied research: no ∗ academic science					−0.14		−0.18	−0.18	−0.19
applied research: no ∗ nonethos					**−0.32***		**−0.43****	**−0.43****	**−0.42****
applied research: no ∗ postacademic science					0.08		0.02	0.02	0.02
academic productivity—research grant: yes						**0.12****	**0.12****	**0.12****	**0.12****
academic productivity—no. of articles std. for field of science						−0.04	−0.05	−0.05	−0.04
academic institution type: nonpublic								−0.02	−0.08
academic institution type: research institute								0.05	0.07
academic institution type: PAN institute								0.02	0.06
parametric evaluation category									**−0.13***
AIC	1047.97	889.49	892.87	1051.92	1053.90	1051.09	905.53	920.14	920.71
BIC	1140.96	979.06	986.70	1153.76	1169.03	1148.51	1033.49	1060.89	1065.73
Log Likelihood	−502.98	−423.74	−424.43	−502.96	−500.95	−503.54	−422.77	−427.07	−426.35
Marginal R2	0.076	0.105	0.113	0.086	0.104	0.078	0.166	0.163	0.175
Conditional R2	0.143	0.179	0.191	0.144	0.168	0.137	0.240	0.241	0.243
Num. obs.	619	526	526	619	619	619	526	526	526
Num. groups: institution	131	127	127	131	131	131	127	127	127
Var: institution (Intercept)	0.02	0.02	0.02	0.01	0.02	0.01	0.02	0.02	0.02
Var: Residual	0.20	0.19	0.19	0.20	0.20	0.20	0.18	0.18	0.18

***p < 0.001; **p < 0.01; *p < 0.05

Reference categories for nominal variables: female, in romantic relationship, has children, PhD, social sciences, industrial science ethos, no research grant awarded during last three years, public academic institution.

file is also shaped by institutional precariousness; lower parametric evaluation categories are associated with higher MM. This suggests that individuals in less prestigious institutions may feel greater pressure to adopt a market-oriented logic to compensate for a lack of institutional symbolic capital.

In contrast, the profile of a scientist resistant to marketization—exhibiting low MM—aligns with the "traditional-autonomous" archetype. This individual is more likely to be found in the humanities, medical sciences, or arts, where disciplinary cultures and professional codes of ethics act as a "cultural shield" against market intrusion. While the statistical models indicate that higher subjective satisfaction with household material status independently reduces the pressure to adopt market-oriented values, the resistance of this specific archetype is primarily driven by normative commitments. This is particularly noteworthy given the Polish context, where earnings in the humanities and arts are often lower than in other fields; thus, their low MM levels persist despite economic disadvantages, suggesting that disciplinary habitus outweighs material deprivation. Their professional identity remains anchored in the traditional academic ethos (Mertonian C.U.D.O.S.), where the autotelic value of knowledge and peer recognition are the primary drivers of professional conduct. Structurally, this resistance is further bolstered by "institutional excellence," as affiliation with high-performing units (category A or A+) provides the symbolic and material resources necessary to maintain scientific autonomy.

A third, distinct profile identified in the analysis is the "disengaged" or "alienated" researcher, characterized by the significant negative interaction between the absence of applied research and the "nonethos" adaptation. While a low MM is usually associated with a strong academic ethos, in this case, it stems from a normative vacuum. Researchers in this group reject both the traditional Mertonian norms (C.U.D.O.S.) and the instrumental values of industrial or postacademic science. By distancing themselves from applied research—the primary conduit for market logic—and simultaneously failing to internalize any professional regulatory framework, these individuals remain outside the "marketized" struggle for success. Their low MM does not signify a commitment to academic autonomy, but rather a state of academic alienation or "normative withdrawal," where neither the prestige of the ivory tower nor the financial incentives of the market serve as effective motivators for their professional conduct. Moreover, this group appears particularly vulnerable to systemic marginalization under current parametric evaluation regimes, as their simultaneous rejection of both academic excellence and socio-economic impact leaves them without a viable strategy to meet contemporary performance-based requirements.

Discussion

Our findings provide a micro-level validation of Institutional Anomie Theory (IAT), illustrating how economic dominance reshapes the scientific field. In particular, we have questioned the degree of market penetration into science, and the results reveal a nuanced picture. MM among Polish scientists manifests primarily through accommodation—the subservience of non-economic roles (family, health, social life) to the demands of the market social institutions. The findings indicate that MM among Polish scientists is primarily

expressed through accommodation, specifically the tendency to resolve role conflicts in favor of professional duties at the expense of personal and social life. This prioritization of accountability and efficiency over well-being aligns with the adoption of industrial values and mirrors trends observed in other international academic contexts (Kinman and Jones 2009). This confirms that even if scientists do not fully internalize market values, they are forced to adopt market behaviors to survive in a neoliberal institutional framework.

The study offers a complex answer to the "exceptionalism" thesis—the belief that science is impenetrable by capital. On one hand, scientists demonstrate a selective resilience: they reject money fetishism and extreme individualism, distinguishing them significantly from the general population surveyed by Bieliński and Hövermann (2023). This suggests that the "scientific mind" remains anchored in a logic of prestige rather than pure profit. On the other hand, the high prevalence of achievement orientation and universalism (American Dream values) shows that the "culture of success" has successfully penetrated this profession.

The study highlights that organizational culture plays a critical role in fostering or resisting MM. The higher levels of MM found in research institutes compared to universities or the Polish Academy of Sciences (PAN) suggest that institutions with a primary mission of commercialization are more susceptible to market penetration. Furthermore, the negative correlation between an institution's parametric evaluation grade and MM suggests that economic pressure and lower academic prestige may drive scientists toward an acceptance of market values and behavioral adaptation, potentially at the cost of research quality.

The relationship between MM and productivity is complex. While MM positively correlates with grant acquisition, it does not directly translate to higher publication counts and is even negatively associated with the number of articles for those adhering to a postacademic ethos. This suggests that marketization may shift focus toward securing external funding rather than producing scholarly output. The finding that scientists with an opportunistic ethos type engaged in applied research exhibit high MM raises significant concerns; such a mentality may hinder the scientific community's ability to address long-term, non-profitable societal challenges like climate change or migration. Financial instability and dissatisfaction with working conditions further exacerbated MM, signaling the adverse effects of economic hardship on academic integrity.

At the individual level, the study reveals a gendered response to marketization, with male scientists exhibiting higher MM levels. Crucially, the data challenges traditional Institutional Anomie Theory (IAT) assumptions regarding the protective role of social institutions; neither marriage nor parenthood appears to shield scientists from internalizing market values. This indicates that the professional pressures of neoliberal science policy may override the mitigating influence of private social embeddedness.

The most significant interpretation of this data is the confirmed incompatibility between the traditional Mertonian ethos and MM. Scientists embodying Mertonian values showed lower MM levels compared to those in the industrial ethos group. Adherence to C.U.D.O.S. norms acts as a functional barrier, effectively shielding researchers from the internalization of market logic.

The main limitation of our analyses was the geographic scope of the study. However, we believe that the implications of our findings extend beyond Poland, especially as

neoliberal policies continue to reshape academia. Policymakers must balance economic incentives with the preservation of academic excellence, recognizing that excessive market pressures may undermine the long-term societal contributions of science. To address these challenges, we advocate for the development of a research program dedicated to studying the marketization of science. Such a program should prioritize the measurement of MM as a tool for evaluating the impact of market-oriented reforms across different contexts. By fostering MM research, social science scholars gain deeper insights into how economic pressures reshape the normative foundations of science, while policymakers can better understand how to mitigate the negative consequences of marketization to safeguard the integrity and societal relevance of scientific inquiry. Furthermore, it would be insightful to verify the hypothesis that the traditional academic ethos and Marketized Mentality (MM) are incompatible in the sphere of teaching and learning—specifically by examining the differences between mission-driven public higher education institutions and business-model private HEIs.

Conclusion

IAT describes how economic dominance imposes market-specific values on social institutions, undermining their regulative functions. MM represents the individual-level manifestation of these processes in science, highlighting how scientists internalize market-oriented values such as achievement orientation, individualism, universalism, and money fetishism. The ethos of science, rooted in Merton's norms, is believed to offer a countervailing system of values that resists marketization, promoting autonomy and integrity in research. This study addressed the prevalence of marketized mentality (MM) among scientists in Poland, the factors contributing to higher MM levels, and the potential of traditional Mertonian norms to protect scientists from market pressures. It also provides answers to three questions regarding the academic community in Poland. First, while marketization is present, scientists remain a "normative exception"; they exhibit significantly lower levels of individualism and money fetishism compared to the general Polish working population. Second, the "marketized" scientist is typically characterized by male gender, a subjective sense of material hardship, and employment in social sciences or institutions with lower excellence ratings. Finally, the study confirms that traditional Mertonian norms (C.U.D.O.S.) are the only effective shield against the internalization of market logic; other adaptations, such as the industrial, post-academic or opportunistic ethos, offer no such protection.

The research therefore highlights that the traditional academic ethos and MM are fundamentally incompatible, which may serve as a warning to policymakers. Neoliberal reforms and excessive economic pressure may yield short-term gains in grant acquisition but risk destroying the normative foundations of science. Our research suggests that intensified economic pressure and neoliberal management are unlikely to produce the long-term outcomes intended by their architects, such as sustainable productivity growth, maximized funding efficiency, or enhanced technology transfer and socio-economic innovation. Our findings indicate that such "economic tightening" is counterproductive because the normative foundations of science are negatively correlated with MM. This

is evidenced by the fact that higher institutional excellence, as reflected in parametric evaluation categories, is consistently associated with lower MM levels, suggesting that the logic of the market permeates most deeply where academic quality is already under pressure.

To safeguard the integrity of research, policies must balance economic incentives with the preservation of academic autonomy and recognize that an opportunistic mindset in research may leave society unable to address critical but "unprofitable" challenges, such as climate change, migration, or pandemics. Ultimately, it is scientific autonomy, rather than the subordination of research to specific instrumental goals, that remains the most viable path toward achieving the high-level performance and societal impact that neoliberal reforms ostensibly seek to promote. The authors advocate for utilization of the measurement of MM as a diagnostic tool to monitor how reforms impact the behavior of scientists and standards of research.

Appendix

Table 1

Structure of the academic sample

Variable	Value	Weighted sample *n*	Weighted sample %	Population % (based on sampling frame)
Gender	Female	342.1	42.8	42.6
	Male	457.4	57.2	57.4
Academic degree	PhD	569.2	71.2	66.4
	Doctor habilitatus	131.5	16.4	19.8
	Professor	98.8	12.4	13.8
Field of science	Humanities	119.2	14.9	13.9
	Social sciences	197.3	24.7	19.9
	Exact sciences	110.5	13.8	14.2
	Natural sciences	84.0	10.5	16.3
	Technical sciences	148.5	18.6	17.9
	Agricultural and veterinary sciences	34.5	4.3	6.44
	Medical sciences	91.0	11.4	8.12
	Art	14.5	1.8	3.19
Institution type	Public higher education institution	624.5	78.1	80.0
	Nonpublic higher education institution	87.5	10.9	8.3
	Research institute	50.9	6.4	6.7
	PAN institute	36.5	4.6	5.0

Table 2

Ethos of science measurement items and descriptive statistics

Latent construct	Item	*n*	mean	s.d.
Universalism (+)	Scientific statements should be evaluated solely on the basis of their compliance with empirical data and previously confirmed knowledge; never on the basis of who claims them or for what reasons they are claimed	782	8.50	2.23
Communism (+)	Scientific discoveries are the property of the whole community of scientists, so keeping them secret or sharing them for money is unethical	772	7.00	3.03
Disinterestedness (+)	Research activities should be dedicated solely to seeking the truth	780	8.31	2.46
Organized skepticism (+)	A scientist should be distrustful of any universally shared judgments, because only with such a skeptical approach is the development of science possible	782	7.28	2.87
Proprietary (+)	Scientifically produced knowledge should be owned by the sponsor of the research, even if such ownership limits the possibilities of its lawful use by others	766	4.24	3.09
Proprietary (−)	The results of scientific research should be available to all interested parties	779	7.23	3.03
Local (+)	Science should primarily be used to solve practical problems of a limited scope; the utility of general theories is low	790	3.65	3.18
Local (−)	Science should expand our understanding of reality, regardless of whether its findings have immediate practical application	790	8.54	1.99
Authoritarian (+)	Scientific work should be subject to strict control and management, as it is in industry	783	3.42	2.90
Expert (+)	With the current extent of scientific knowledge, only limiting the field of research to narrow specializations enables new discoveries	787	5.47	3.36

Table 3

Work dissatisfaction items

Item	*n*	mean	s.d.
administrative and clerical work	799	2.50	.52
organizational work related to the conduct of research	799	2.93	1.26
reading literature related to the subject of the research being conducted	799	3.36	0.82
writing academic material (articles, monographs, etc.)	799	3.44	0.91
teaching	799	2.94	1.53
participation in meetings related to current work	799	2.92	1.00
participation in seminars, symposia, and conferences	799	3.36	0.76
popularization of research results outside academia	799	3.74	1.15
preparation of applications for research funding	799	3.62	1.51
performing for-profit work not related directly to the research conducted	799	4.13	1.66
reviewing academic material, grant applications, etc.	799	3.87	1.40
conducting scientific research (field research, laboratory work etc.)	799	3.71	1.15
analyzing empirical data	799	3.47	1.08
work for the scientific community (e.g. activities in scientific societies)	799	3.74	1.22
work related to commercialization (i.e. making the results of one's own scientific research available for financial gain)	799	4.84	1.34

Table 4

Individual and institution level predictors of marketized mentality
(random intercept and random slope linear mixed effects models; model parameters standardized by two standard deviations)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
(Intercept)	**0.37** (0.08)***	**0.35** (0.08)***	**0.37** (0.09)***	**0.36** (0.09)***	**0.36** (0.09)***	**0.39** (0.09)***	**0.39** (0.08)***	**0.40** (0.09)***	**0.40** (0.10)***	**0.39** (0.10)***
gender: male	**0.09** (0.04)*	**0.09** (0.04)*	**0.10** (0.04)*	**0.11** (0.04)*	**0.09** (0.04)*	**0.10** (0.04)*	**0.08** (0.04)*	**0.11** (0.04)**	**0.12** (0.04)**	**0.12** (0.04)**
age	−0.10 (0.33)	−0.13 (0.33)	0.15 (0.37)	0.12 (0.37)	−0.02 (0.32)	0.05 (0.32)	−0.01 (0.33)	0.40 (0.36)	0.39 (0.36)	0.47 (0.36)
age squared	0.15 (0.33)	0.19 (0.33)	−0.09 (0.38)	−0.05 (0.38)	0.06 (0.33)	0.01 (0.33)	0.08 (0.33)	−0.30 (0.37)	−0.29 (0.37)	−0.37 (0.37)
lives in romantic relationship: no	0.01 (0.06)	0.01 (0.06)	0.03 (0.07)	0.03 (0.07)	0.03 (0.06)	0.03 (0.06)	0.02 (0.06)	0.05 (0.07)	0.05 (0.07)	0.05 (0.07)
has children: no	−0.02 (0.06)	−0.01 (0.06)	−0.02 (0.06)	−0.01 (0.06)	−0.02 (0.06)	−0.01 (0.05)	−0.02 (0.06)	0.01 (0.06)	0.01 (0.06)	0.02 (0.06)
subjective assessment of household material conditions	**−0.09** (0.02)***	**−0.09** (0.02)***	**−0.08** (0.02)**	**−0.08** (0.02)**	**−0.08** (0.02)***	**−0.09** (0.02)***	**−0.09** (0.02)***	**−0.08** (0.02)**	**−0.07** (0.02)**	**−0.07** (0.02)**
earns additional income: no	−0.07 (0.04)	−0.07 (0.04)	**−0.10** (0.04)*	**−0.09** (0.04)*	**−0.10** (0.04)*	**−0.10** (0.04)*	−0.07 (0.04)	**−0.12** (0.04)**	**−0.12** (0.04)**	**−0.11** (0.04)**
academic degree: doctor habilitatus	−0.03 (0.06)	−0.02 (0.06)	−0.08 (0.06)	−0.08 (0.06)	−0.02 (0.06)	−0.01 (0.06)	−0.04 (0.06)	−0.08 (0.06)	−0.07 (0.06)	−0.07 (0.06)
academic degree: full professorship	−0.09 (0.07)	−0.08 (0.07)	−0.11 (0.08)	−0.10 (0.08)	−0.09 (0.07)	−0.10 (0.07)	−0.11 (0.07)	−0.13 (0.08)	−0.12 (0.08)	−0.12 (0.08)
field of science: humanities	**−0.21** (0.07)**	**−0.19** (0.07)**	**−0.28** (0.07)***	**−0.26** (0.07)***	**−0.19** (0.07)**	**−0.20** (0.07)**	**−0.20** (0.07)**	**−0.24** (0.07)***	**−0.24** (0.07)***	**−0.25** (0.07)***
field of science: exact sciences	−0.11 (0.07)	−0.09 (0.07)	**−0.15** (0.07)*	**−0.14** (0.07)*	−0.10 (0.07)	−0.11 (0.07)	−0.13 (0.07)	**−0.17** (0.07)*	**−0.18** (0.07)*	**−0.18** (0.07)*
field of science: natural sciences	−0.05 (0.07)	−0.04 (0.07)	−0.08 (0.07)	−0.08 (0.07)	−0.02 (0.07)	−0.03 (0.07)	−0.06 (0.07)	−0.07 (0.07)	−0.08 (0.07)	−0.08 (0.07)
field of science: technical sciences	−0.07 (0.07)	−0.06 (0.07)	−0.09 (0.07)	−0.08 (0.07)	−0.07 (0.07)	−0.08 (0.07)	−0.09 (0.07)	−0.11 (0.07)	−0.12 (0.07)	−0.13 (0.07)
field of science: agricultural and vet. sciences	**−0.21** (0.10)*	**−0.22** (0.10)*	**−0.28** (0.10)**	**−0.29** (0.10)**	**−0.21** (0.10)*	**−0.25** (0.10)*	**−0.21** (0.10)*	**−0.32** (0.10)**	**−0.33** (0.11)**	**−0.33** (0.10)**
field of science: medical sciences	**−0.15** (0.07)*	**−0.15** (0.07)*	**−0.24** (0.08)**	**−0.24** (0.08)**	**−0.16** (0.07)*	**−0.16** (0.07)*	**−0.18** (0.07)*	**−0.27** (0.08)***	**−0.27** (0.08)***	**−0.29** (0.08)***
field of science: art	−0.22 (0.15)	−0.20 (0.15)	−0.29 (0.16)	−0.27 (0.16)	−0.21 (0.14)	−0.21 (0.14)	−0.23 (0.14)	−0.29 (0.16)	−0.29 (0.16)	−0.30 (0.16)
conducts applied research: no	0.04 (0.04)	0.03 (0.04)	0.01 (0.04)	0.00 (0.04)	0.04 (0.04)	0.10 (0.08)	0.03 (0.04)	0.12 (0.08)	0.12 (0.08)	0.12 (0.08)
work dissatisfaction index		**0.05** (0.02)**		**0.05** (0.02)*				0.04 (0.02)	0.04 (0.02)	0.04 (0.02)
income dissatisfaction index			**0.08** (0.02)***	**0.07** (0.02)***				**0.07** (0.02)**	**0.07** (0.02)**	**0.07** (0.02)***
ethos of science: academic science					**−0.12** (0.05)*	**−0.11** (0.05)*		−0.11 (0.06)	−0.11 (0.06)	−0.10 (0.06)
ethos of science: nonethos					−0.02 (0.06)	−0.05 (0.06)		−0.05 (0.07)	−0.05 (0.07)	−0.04 (0.07)
ethos of science: postacademic science					0.07 (0.05)	0.06 (0.05)		0.05 (0.06)	0.05 (0.06)	0.06 (0.06)
applied research: no ∗ academic science						−0.14 (0.10)		−0.18 (0.11)	−0.18 (0.11)	−0.19 (0.11)
applied research: no ∗ nonethos						**−0.32** (0.13)*		**−0.43** (0.14)**	**−0.43** (0.14)**	**−0.42** (0.14)**
applied research: no ∗ postacademic science						0.08 (0.10)		0.02 (0.11)	0.02 (0.11)	0.02 (0.11)
academic productivity—research grant: yes							**0.12** (0.04)**	**0.12** (0.04)**	**0.12** (0.04)**	**0.12** (0.04)**
academic productivity—no. of articles std. for field of science							−0.04 (0.04)	−0.05 (0.05)	−0.05 (0.05)	−0.04 (0.05)
academic institution type: nonpublic									−0.02 (0.08)	−0.08 (0.08)
academic institution type: research institute									0.05 (0.09)	0.07 (0.09)
academic institution type: PAN institute									0.02 (0.10)	0.06 (0.10)
parametric evaluation category										**−0.13** (0.06)*
AIC	1046.85	1047.97	889.49	892.87	1051.92	1053.90	1051.09	905.53	920.14	920.71
BIC	1135.41	1140.96	979.06	986.70	1153.76	1169.03	1148.51	1033.49	1060.89	1065.73
Log Likelihood	−503.42	−502.98	−423.74	−424.43	−50 2.96	−500.95	−503.54	−422.77	−427.07	−42 6.35
Marginal R2	0.065	0.076	0.105	0.113	0.086	0.104	0.078	0.166	0.163	0.175
Conditional R2	0.129	0.143	0.179	0.191	0.144	0.168	0.137	0.240	0.241	0.243
Num. obs.	619	619	526	526	619	619	619	526	526	526
Num. groups: uczelnia2	131	131	127	127	131	131	131	127	127	127
Var: uczelnia2 (Intercept)	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.02	0.02	0.02
Var: Residual	0.21	0.20	0.19	0.19	0.20	0.20	0.20	0.18	0.18	0.18

***p < 0.001; **p < 0.01; *p < 0.05

Reference categories for nominal variables: female, in romantic relationship, has children, PhD, social sciences, industrial science ethos, no research grant awarded during last three years, public academic institution.

Figure 1

Predicted values of marketized mentality by ethos type and the conducting of applied research

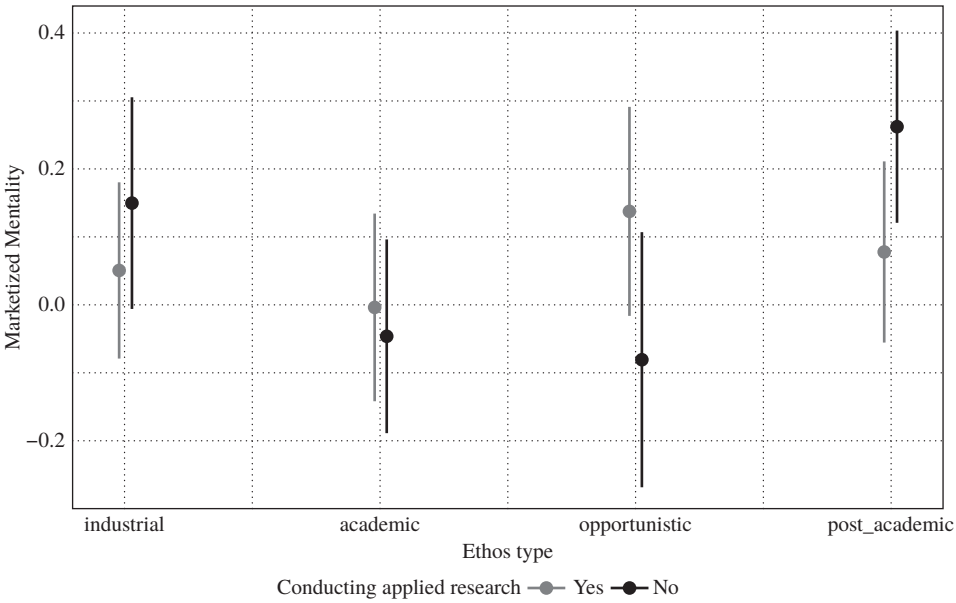
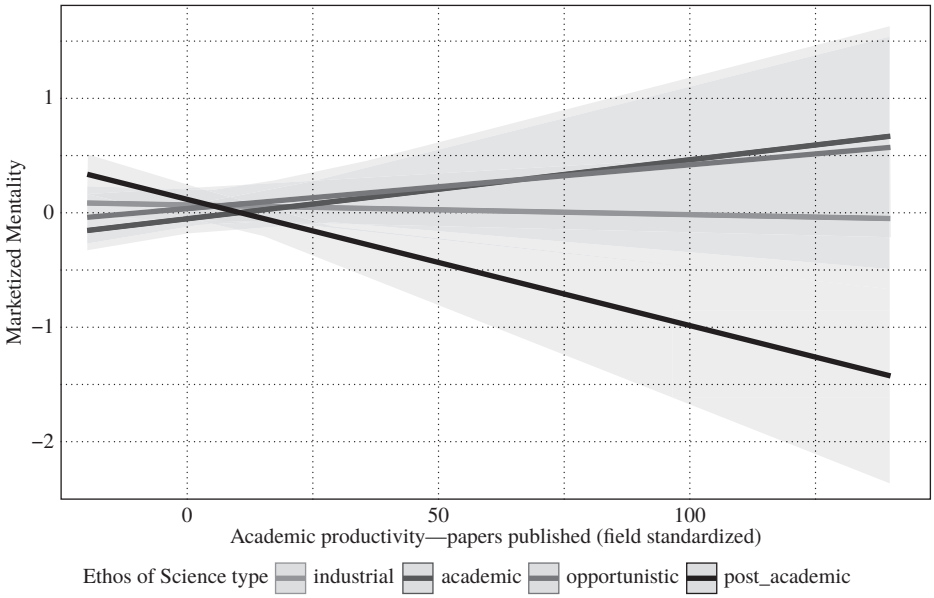


Figure 2

Predicted values of marketized mentality by academic productivity (number of articles published as deviation from field of science mean)



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