All scientists are equal but some are more equal than others: theory of justice applied to academic institutions to create a fair community with true equality of opportunities

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Abstract

1.   The lack of diversity and equality of opportunities in academia is often seen as evidence of unfair processes in academic institutions when it comes to the distribution of goods. In this paper, I propose a novel framework to address this issue.

2.   The framework integrates the body of literature on human developmental ecology with the theory of justice by John Rawls. The underlying premise of the framework is that academic institutions should account for the arbitrary ecological factors (e.g., culture, socioeconomic background) that influence the opportunities for academic achievements by individuals throughout their lives prior to application for goods.

3.   The framework is designed to help academic institutions mitigate (or potentially, eliminate) the benefits accrued over time by individuals that experienced arbitrary but favourable ecological conditions, and assess and judge candidates relative to the expected academic performance given candidates' ecological contexts (i.e., objective fairness). In doing so, this framework is a process that, if adopted by academic institutions, can result in fair equality of opportunities in the distribution of goods.

4.   I also discuss the concept of 'years post-PhD', which attempts to make competition fair by discretising career trajectories. I propose a different landmark, which takes into account years post-first authorship publication, and argue that years post-first authorship publication is less relativistic and accounts for differences in academic structure between countries. I discuss the limitations and alternative attempts to make processes in academic institutions fair throughout the text.

5.   Overall, this paper proposes a framework designed to improve the academic environment by creating fairness in the distribution of goods by academic institutions, thereby generating true equality of opportunities to all.

Keywords: social justice; policy; equality; minorities

Introduction

Academic institutions and more generally, academia have been under criticism due to their lack of equality and diversity (of gender, ethnicity, socioeconomic background and so on) (Kalpazidou Schmidt & Cacace, 2019; Mayer & Rathmann, 2018; Munar, Khoo-Lattimore, Chambers, & Biran, 2017; Nielsen, 2017a). This is a global issue that, despite ongoing debates and targeted policies, continue to affect both developing and developed countries [e.g., (Chitsamatanga, Rembe, & Shumba, 2018; De Angelis & Grüning, 2020; Maximova-Mentzoni & Egeland, 2019; Monroe, Ozyurt, Wrigley, & Alexander, 2008; Moschkovich, 2017; Nielsen, 2017b). For instance, even in Scandinavian countries which are often perceived as gender-equal societies, female staff representativity at associate professorship and full professorship levels were just ca. 35% and 20% in six major universities in 2017 (Nielsen, 2017b), revealing strong gender biases through the academic career path. This finding in Scandinavia is of course representative of a global pattern (Chevreul et al., 2018; Treviño, Gomez-Mejia, Balkin, & Mixon Jr, 2018; Winchester & Browning, 2015). Likewise, although far

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less acknowledged, is the role of ecological factors such as socioeconomic class, parental education, country of origin and so on in promoting (or hindering) fair equality of opportunities in academia (Björklund & Salvanes, 2011). There is strong evidence that ecological factors can significantly skew ones' opportunity for academic achievements. For instance, in a longitudinal study in Finland, parental education significantly affect the proportion of individuals obtaining a Masters degree, PhD, and professorship before or at the age of 49 (Helin, Koerselman, Nokkala, Tohmo, & Viinikainen, 2019). The authors of the study conclude that:

"[...] Finnish professors born in the years 1964–1966 are highly selected in terms of parental education. A large part of this selection is already present among master's degree holders, but both the PhD and professorship transitions are associated with further selectivity. For example, among master's degree holders whose parents lack post-secondary education, about 1 in 110 became professors, while the same number is 1 in 40 among master's degree holders with at least one university-educated parent."

[page 96, (Helin et al., 2019)]

Interestingly, the authors also note (although did not directly measure) the effects of other latent ecological factors that potentially influence individuals' academic achievements:

"[...] individuals of non-academic backgrounds who nevertheless become professors are more likely than others to have been advantaged in other ways. It stands to reason that the top of Finnish academia is therefore likely to be even more socially selected than our results may suggest."

[page 97, (Helin et al., 2019)]

To date, however, academic institutions disregard ecological factors that have contributed to ones' academic achievements within the pool of applicants when allocating goods (e.g., grants, fellowships). In this sense, and based on the growing evidence of the importance of ecological factors in shaping individuals' development and opportunities, few could disagree with the statement that academia is overall unfair. But can we do better?

Here, I advocate for academic institutions to change their current framework used to allocate goods in order to account for the heterogeneity in the applicants emerging from past ecological factors. By ecological factors, I mean the arbitrary conditions of the environment immediate to – or affective of – the focal individual (e.g., an applicant) for which in many cases, the individual has little or no control over. This includes (but is not limited to) parental education and marital status [as there are evidences of single-parenting and academic achievement; see e.g., (Bronfenbrenner & Morris, 1998)], country of origin and socioeconomic background (especially during an individual's development) within the new country, average tertiary education of the country and so on. Note that this includes social, economic, geographic, demographic, cultural and environmental factors. I argue that incorporating ecological data is not only fair and morally necessary, but will also create a framework to objectively ensure fair equality of opportunities to all. This, in turn, will lead to a more diverse and equal academia.

I first draw from the literature of child development – particularly concepts and evidences from the field of human developmental ecology (Bronfenbrenner, 1979, 1995) – to argue that current academic institutions and their processes easily apply an unfair selection criteria that confound academic merit with achievements emerging (partly from) ecological factors; I will focus primarily on the effects of socioeconomic background but the argument applies to virtually all ecological factors of an individual. Next, I present the foundations of the theory of justice by John Rawls (Rawls, 1971) [for completeness of argument] and describe in detail

that, when the concepts of Rawls' theory of justice are combined with modern technology, it can create a fair framework (or at least *more* fair than the *status quo*) that can be used by academic institutions to allocate goods. This framework requires that academic institutions collect more data on an individuals' ecological factors experienced up to the point of the application, and use technology to eliminate biases and account for these ecological factors in the final score of each individual of the application pool. Thus, the framework unifies our growing knowledge of human developmental ecology with the concept of justice as fairness that, if adopted by academic institutions, can create true equality of opportunities to all. Lastly, I briefly discuss a concept used by academic institutions which was designed to discretise academic careers to make competition for goods fair – i.e., the concept of *years post-PhD.* I argue that this landmark is relativistic and fails to account for ecological factors (e.g., differences in academic culture); it is therefore unfair. I then proposed a new landmark to discretise academic careers that relies on the principles of academic first authorship publication (which is in theory, consistent within the realm of Science) and therefore is less relativistic, more reliable, and fair. I anticipate that the framework proposed here may encounter some resistance from the members of the academic community, and that practical applications of the framework need to be subject of debate and data collection for verification and validation. However, I believe that, should this framework ultimately be discarded as impractical or useless, its value was found primarily on stirring debates towards true fairness in academia.

Clarification of intent and scope

Before discussing the details of the framework, it is important to clarify few points in regard to the intent and scope of this paper. First, this paper is not intended to review the literature on the many challenges of academia (e.g., publish-or-perish), as these are not directly within the scope of the proposed framework and have been thoroughly reviewed elsewhere [see e.g., (Lee, 2014; Mayer & Rathmann, 2018; Munar et al., 2017; Yamada, 2019)]. Likewise, the framework is not a direct attack towards academic institutions *per se* but rather a criticism of the criteria for the allocation of goods that have been implemented by these institutions over their existence. Note that the arguments used here do not imply that individual members that are part of the academic institutions, or the academic community more broadly are unfair. Unfairness can arise (unconsciously) as long as the criteria by which goods are distributed are themselves unfair. In other words, all scientists can act fairly upon a system that is inherently unfair, thereby generating unfair outcomes. Third, this is not an attack to a group or sub-group of individuals in our society (e.g., males), nor is this advocating for discrimination against – or preferential treatment towards – specific groups. Rather, this paper aims to provide a framework that could lay the foundation of fair academic environment for all, regardless of their (protected) characteristics. Later, I discuss how this framework would be the most rational option for everyone if inequalities are known factors in the system and each individual does not know their place in the academic community (i.e., veil of ignorance described below). With these points clarified, I shall now move to the first part of the paper.

Human developmental ecology and the possible confounding effects of the environment in academic merit

Ecological factors – particularly during development – shape the opportunities that individuals have to develop and fully engage with educational skills that support the realisation of individuals' full (academic) potential (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 1998). This, in the short-, mid- and long-terms can have important consequences to individuals' opportunities to progress in their tertiary education (e.g., PhD), acquiring supportive network of peers and mentors, and securing jobs in academia (Björklund & Salvanes, 2011; Helin et al., 2019). Socioeconomic status is perhaps one of the most studied ecological factors of the ecosystem of an individual, and one which possess a large amount of data from governments and NGOs; I shall therefore focus on socioeconomic status as a 'proof-of-concept', but the arguments proposed here are applicable to all aspects of the ecology of human development.

A longitudinal study in the US has shown that children growing in poverty have significantly lower academic achievements as measured by scores in standardised tests (Hair, Hanson, Wolfe, & Pollak, 2015). This is evidence that poverty decreases the immediate opportunities for education in the environment of a developing individual (e.g., lack of educational resources, motivation) [see e.g., (Gorski, 2017)], that can translate into mid- and long-term access to opportunities to further education (Johnson, Riis, & Noble, 2016). Other ecological comorbidities of poverty such as poor health (Wickham, Anwar, Barr, Law, & Taylor-Robinson, 2016), stress (Blair & Raver, 2016), violence (Aber, 1994; Hashima & Amato, 1994), social discrimination that leads to further academic disengagement (Osypuk, Schmidt, Kehm, Tchetgen, & Glymour, 2019; Verkuyten, Thijs, & Gharaei, 2019) interact to further reinforce the unfavourable nature of the developmental ecological environment. Over time, the consequences of such unfavourable environment can cumulate and strongly disfavour individuals' opportunities to academic achievements (Black et al., 2017; Bronfenbrenner, 1995; Chan, Lake, & Hansen, 2017; Daelmans et al., 2017; Lo, Das, & Horton, 2017; Shonkoff, Radner, & Foote, 2017). Of course, the opposite side of this story is also true, and children developing in favourable ecological conditions have far more and better opportunities to fully engage with educational material, concentrate on mastering academic skills, networking, and gaining opportunities to develop new skills. As a result, these individuals are surrounded by an environment far better – both in quality and also in quantity – of opportunities than those individuals from poverty (Battle & Lewis, 2002; White, 1982), leading to large cumulative differences between the academic achievements of individuals on different sides of this socioeconomic spectrum. In this context, one can ask: to what extent are individuals different in academic potential *per se*? Is it fair to expect an individual to be as competitive as other given strikingly different developmental environments from which these individuals have been shaped throughout their lives?

An additional problem is that in the UK at least, poverty is not independent of ethnicity (https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/demographics/people-living-in-deprived-neighbourhoods/latest) or gender (https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/articles/persistentpovertyintheukandeu/2015#:~:text=1.,to%20roughly%204.6%20million%20people.&text=A%20higher%20proportion%20of%20women,data%20became%20available%20in%202008), whereby non-white and/or females are less favoured. It is at least intriguing that non-white and/or females are the same groups that have been historically denied access to education as well as to academic positions. Thus, on average, some groups have historically been less likely to experience ecological factors that nourish and develop (academic) skills compared to other groups and these differences, I shall argue, likely contribute to some groups' success in the current academic system. Note that, the rules by which distributive goods are allocated have themselves been historically shaped by individuals in high academic positions which have been the privileged. This forges a self-perpetuating process which on the hand, selects individuals that experienced favourable ecological conditions and on the other hand, forges and enforces rules that guaranteed that individuals that experienced these favourable ecological conditions continue to receive support in the next generations. As George Orwell puts it:

"All animals are equal but some animals are more equal than others."

[page 115, (Orwell, 1945)]

In the academic context, this can be paraphrased to read 'all scientists are equal but some are more equal than others.' Of course, I shall be careful here because these relationships can be nothing but spurious correlations between unrelated variables. For instance, the fact that poverty is unevenly distributed across ethnicities may not have any association with the lack of academic opportunities to individuals from low

socioeconomic background or underrepresented ethnicities. The lack of diversity and equality in academia can, in theory, be caused by other factors. This will only be truly uncovered with data, and this is one of the values of this paper: to stimulate further empirical work on the topic. I nevertheless shall proceed based on the assumption founded on recent data which suggests an association between an individuals' ecological context and the academic opportunities that these individuals can attain [see e.g., (Helin et al., 2019)].

Discretisation of academic paths and the concept of relative to opportunity

Academic institutions are aware of the unfairness of their processes. In fact, one might claim that academic indtitutions have tried to adapt and accommodate the ecology of human development in their systems. For instance, research councils have the academic career to allow for competition to be relatively 'fair' amongst applicants. For example, the UKRI Future Leaders Fellowship claims to support

'...early career researchers and innovators with outstanding potential in universities, UK registered businesses, and other research and user environments including research councils' institutes and laboratories' (https://bbsrc.ukri.org/funding/filter/future-leader-fellowship/).

In a similar initiative to attain fairness, academic institutions have incorporated the concept of *relative to opportunity*, which aims to evaluate candidates in light of their achievement relative to the opportunities that a given candidate has had in their career path. The concept of relative to opportunity therefore also aims to mitigate differences in ecological factors affecting individuals' careers, thereby promoting fair access to research funding. For example, the Australian Research Council (ARC) has incorporated the 'Research Opportunity and Performance Evidence (ROPE)' into funding calls as a way to ensure

'that all eligible researchers, from universities and the wider research sector, including industry have fair and equitable access to the research funding available through the National Competitive Grants Program (NCGP)' (https://www.arc.gov.au/policies-strategies/policy/arc-research-opportunity-and-performance-evidence-rope-statement).

Both of the above methods to ensure fairness rely upon calculating years post-PhD as an indicator of experience and opportunities. I shall leave the discussion of the concept of 'years post-PhD' for later (see section 'Years post-PhD: is there a better indicator of career stage?' below). For now, I shall focus on more alarming matter, which is the subjectivity injected into the selection process through the methods described above. This subjectivity emerges from the fact that, the selection criteria relies on subjective assessment of panel members and reviewers – which are humans with their own biases, limitations, prejudices, and cultural background – to judge whether the achievements of a candidate given their career stage and (described) opportunities is outstanding and worth supporting. How can assessors judge whether a candidate maximised the full potential of their opportunities relative to another candidate? More generally, how can an assessor *know* or *guess* what is the full potential of an opportunity in the first place? The truth is, they cannot, and thus the entire premise that current methods of selection implements rely on an unattainable concept of *relative to opportunities*. Given this subjectivity, it is difficult to envisage that the parties involved in this process – with their cultural differences, backgrounds, biases, limitations, and ecological influences – promote a fair assessment of candidates that have themselves diverse backgrounds, biases, limitations and so on. Ultimately, numbers will inevitably play a role, and candidates with a more substantial list of achievements (e.g., more papers) are inevitably selected forward – generating the present crisis in academia (Lee, 2014; Yamada, 2019). Instead, if academic institutions take into account the ecological history of individuals, the assessment can be made (more) fair because the achievements of individuals are judged in

light of empirical data, and the achievements of applicants can be judged relative to the expectation from a candidate that has experienced the same overall ecological context. In this way, outstanding achievements are truly standardized.

Here, perhaps a more concrete example could better illustrate the point. In Slovenia, ca 8% of 25–34 year-old with tertiary education possess a PhD while in Colombia or South Africa, this value is lower than 1% (Education at Glance, 2020; https://doi.org/10.1787/69096873-en). Is obtaining a PhD the same 'opportunity' in Slovenia and Colombia?

With the data, it is reasonable to assume that there are far more opportunities – and support (both social and economic) – for completing a PhD in Slovenia than in Colombia. Thus, simply obtaining a PhD in Colombia could be seen as a significantly higher achievement than in Slovenia. As it stands, however, academic institutions ignore or leave to the benevolence of panel members and reviewers (which are often from a yet different cultural background) to decide whether candidates from Colombia deserves some sort of encouragement due to the relative condition of their original ecological environment. If, on the other hand, academic institutions were to consider the ecological context (in this case, country of origin) in the selection process for allocating goods, then applicants would be judged based on the expectations for a candidate that experienced the same ecological contexts (i.e., the candidate from Colombia (or Slovenia) would be judged based on the opportunities available in their own country). Note that this argument does not favour one applicant at the expense of another. Candidates from Colombia do not gain 'free' points and candidates from Slovenia are not penalised – that too, would be arbitrary and unfair. In this framework, both candidates are compared against a hypothetical candidate which experienced similar ecological conditions and only then, academic merit can be evaluated objectively. It may well be that a candidate from Colombia achieved less than expected given his/her opportunities. But at least this candidate was judged based on a fair expectation; candidates were judged based on skills, not context.

Critics may argue that the standards for getting a PhD should be similar across the world, and therefore obtaining a PhD in Slovenia, US, UK, Colombia or anywhere should not matter. To this, I have two points. First, even in leading academic countries such as the US, UK, and China, PhD structure varies widely in many ways, including the time span, teaching, training and so on. Thus, it is unlikely that that PhD programmes provide the same opportunities for students within countries, let alone around the world. But even if the structure of the PhD candidature were the same, there is an entire ecological aspect of the society surrounding the individual undertaking the PhD that contribute (or discourages) to the individuals' motivations throughout the degree. In Slovenia for instance, there may well be a social expectation – or at least a sense of normalcy – from the society for those who obtain a PhD [e.g., (Arzenšek, Košmrlj, & Širca, 2014)] whereas in Colombia, obtaining a PhD can be seen as an achievement reserved to the highly gifted ('nerds') of the society (this is based on anecdotal experience from the author, who is Latin American) or can lead to emigration of skilled workers to other (developed) countries [see (Pellegrino, 2001) for discussion]. As such, not only the social context influences the likelihood of any given student to progress to the PhD in the first place, but also the public perception and public policies that support a student to pursue such degree (e.g., less scholarships or funding for research). Overall then, it may well be that the simple fact of obtaining a PhD in an unsupportive ecological environment is an achievement in itself, but which might be taken for granted in cultures with more supportive ecological contexts during the selection processes for academic goods.

Overall, the point is that, academic institutions might be unconsciously skewing the distribution of individuals that are awarded access to goods by overlooking and subjectivizing (i.e., leaving to the judgement

of reviewers and panel members) the contribution of ecological factors that have affected individuals' opportunities during their life prior to the application. More alarming though, the current selection process ignores surmounting scientific evidence from social sciences, child development and psychology literature [e.g., (Bronfenbrenner & Morris, 1998; Dotterer & Lowe, 2011; Wang, Smith, Miller-Cotto, & Huguley, 2020)] and therefore can be considered obsolete in many aspects. But can we make academic institutions and consequently, academia, fair?

Years post-PhD: is there a better indicator of career stage?

In previous sections, I described ways in which academic institutions have attempted to discretise career paths as well as estimate achievement relative to career stage using the concept of years post-PhD. To attain fairness and equality fo opportunity, the first step should be obtaining landmarks that are themselves fair. In this section, I shall discuss in more detail a way in which career path discretisation can be made fair.

Discretisation of academic careers is an attempt to make the competition for academic goods fair. After all, a scientist with one-year experience post-PhD has had different experiences and opportunities than an established scientist with twenty years or more of career in the field. However, this discretisation is rather arbitrary and, as I shall argue below, ineffective. For once, the length and structure of PhDs vary widely between countries and the career paths before and after the PhD also vary widely between and within countries as well as between individuals. For example, some individuals obtain a master's degree while others move straight to the PhD. While these are different strategies, they offer different opportunities to the individuals that can influence their competitiveness for goods later in their career. In our current system, with the arbitrary landmark of 'post-PhD', it is in theory more profitable for a candidate to obtain multiple master's degrees, or at least extend the length of a master's degree already underway, provided that this will increase the number of publications to the individual. Likewise, during the PhD, is advantageous to an individual to extend the length of the PhD to as long as possible (given the constrains of funding and/or the University) as this allows the individual to maximise publication numbers prior to the start of the post-PhD years. In doing so, the individuals can become more competitive after graduation, placing the individual in a better position to obtain jobs, fellowships, and to advance in academia. Combine this with the obsessive focus on publications and awards in the current academic context, and we have a system that is unfair. In fact, challenges with the definition of career stage based on years post-PhD have received attention in the literature because career path after graduation is strongly affected by ecological factors (e.g., job availability, family commitments) (Bosanquet, Mailey, Matthews, & Lodge, 2017). While there has been claims that an self-definition of career stage could be a better estimate of career status (Bosanquet et al., 2017), the subjective nature of self-definitions may be criticised due to vulnerability to exploitation.

Here, I propose that a fair and objective metric for career stage is years post-first authorship publication. This is because in many academic fields, the first author is considered to have contributed the most to the study, from experimental design through to manuscript writing (Riesenberg & Lundberg, 1990). This implies that the individual has gained enough skills to lead a research quest from start to publication, and therefore is, in theory, a functional unit within the academic environment and capable of continuing to publish in the same or different settings independently. This definition accounts for differences in postgraduate programs worldwide while eliminating the relativistic nature of years post-PhD.

One possible issue that emerges from this concept, which is worth mention here, is for disciplines that use alphabetical ordering in authorship list in manuscripts. In those cases, two alternatives are possible: (1) consider the landmark as years post-first publication, if authorship in manuscript of this disciplines involves equal amount of work for all listed authors or (2) formalise the authorship contribution statement

and consider years post-publication of a work with significant contribution. Whether or not the alternative discretisation landmarks are useful and fair will require further studies, for example, comparing the estimated experience and career forecast of individuals in discretised distributions using post-PhD *versus* post-first authorship publication (or the discipline-specific variants). Nonetheless, the landmarks proposed here remove the relativistic nature of the concept of post-PhD years and inherently account for differences in PhD structure and career paths between individuals across contexts.

Theory of justice applied to academia: can we make things fair?

In section, I shall now focus not on the discretisation of academic career paths, but on changes that need to be made in the academic system as a whole to generate fair equality of opportunities to all. Absolute fairness is impossible to attain, but I argue that with an appropriate framework, academic institutions can at least move towards objective fairness. Here, I propose such framework, which is based on the 'A Theory of Justice' by John Rawls with the fundamental concept of *justice as fairness* (Rawls, 1971). Before discussing the details of the framework, I shall first describe the basic concepts and principles underpinning Rawls' theory of justice, which form to varying degrees the backbone of the framework proposed later. I then discuss how Rawls' theory can be adapted and used within the academic context, and discuss a practical route for the application of the framework, which is possible thanks to recent technological advances that can automate data analysis and scoring of applicants independently of humans (e.g., Artificial Intelligence and Machine Learning). Note that the aim in this section is not to take Rawls' theory of justice as face-value to create a 'one-size-fits all' abstract principle. Instead, the aim to build bridges between the original concepts laid out in Rawls' theory of justice with the urgent need for a fair system of allocation in academia. Having said that, I present an overview of Rawls' theory to provide the background knowledge to readers that may not be familiar with, or come from different disciplines other than philosophy. I judge this to be of value because it gives due credit to previous work, but also provide the rationale for the reader to grasp the concepts proposed in this paper. It is worth remarking that this is a conceptual paper and therefore does aim to detail all steps of the practical implementation of the proposed framework (i.e., this paper describes the forest, not its trees); practical details will come over time, with experiments and data.

Rawls' original position and fair inequalities

Rawls recognised that unjust utilitarian societies are arbitrary and disregard individuals' ecological conditions, both of which principles of justice should attempt to regulate.

"In this way the intuitions of society favour certain starting places of others. These are especially deep inequalities. Not only are they pervasive, but they affect men's initial chances in life; yet they cannot possibly be justified by an appeal to the notions of merit of desert. It is these inequalities, presumably inevitable in the basic structure of any society, to which the principles of social justice must in the first instance apply" (page 7).

"Utilitarianism does not take seriously the distinction between persons." (page 24).

Rawls' theory of justice uses a concept known as the *original position*, from which individuals are to decide the principles of justice that constitute a fair society without any knowledge of each individuals' roles, talents, and position within such society ('*veil of ignorance*'). This precludes individuals to tailor principles of justice as to benefit the groups to which the individual belongs.

"The principles of justice are chosen behind a veil of ignorance. This ensures that no one is advantaged or disadvantaged in the choice of principles by the outcome of natural chance or the contingency of social circumstances. Since all are similarly situated and no one is able to design principles to favor his particular condition, the principles of justice are the result of a fair agreement or bargain." (page 11)

Rawls' also propose the principles of justice that underpin a just (hence fair) society, from which rational individuals in the original position would agree upon. Briefly, the principles state that (1) each person is to have an equal right to the most extensive scheme of equal basic liberties (e.g., freedom of speech) compatible to the same scheme of liberties for others and (2) social and economic inequalities are to be arranged that (a) is to the greatest benefit to the least advantaged (the difference principle) and (b) is attached to positions open to all under conditions of fair equality of opportunity (the equal opportunity principle). Interestingly, note that, from principle 2b, there is a potential to exist inequalities that are just, as long as these inequalities are to the benefit of the least advantaged in the society; Rawls' theory of justice does not necessarily advocate for equal partitioning of goods.

The impossibility of the original position in real academic institutions

Rawls' concept of the original position changes the setting for individuals deciding the principles of a just society. This is because individuals lack information of their own place within the society and thus cannot tailor the principles for self-benefit. The key here is that individuals become *ignorant* of their role within the society due to the *removal of prior information.* However, in academia (as in any real-life setting), this concept of the original position is impossible to be encountered in practice. Candidates for, say, a fellowship are required to submit a list of their past achievements in support of the application. As a result, academic institutions are never free of information about candidates that can bias the distribution of goods (i.e., conditions for the original position are never met). Even if proposals are submitted anonymously, the project proposal itself contains information about the project as well as the applicant. For instance, virtually all manuscripts and many grant proposals are written in English, which is not the first language for many applicants and consequently, imposes barriers to effective writing communication (especially in early career stages) (Hyland, 2019). These barriers can be overcome, but the solution introduces additional ecological factors that further aggravates the issues raised here. For instance, effective English writing will depend upon age at exposure to second language, access to resources and education in the second language, opportunities to write in the second language, quality of feedback received from peers that are native speakers and so on [see e.g., (Nikolov & Djigunovic, 2006; Saville-Troike & Barto, 2016; Tucker, Hamayan, & Genesee, 1976)], which are ecological factors that did and will continue to affect individuals' careers. Thus, the original position of complete ignorance is not attainable in practice.

Despite this, previous efforts by academic institutions have attempted to make the process fair – and to some extent, recover the idea of the veil of ignorance –through for example a lottery system, which arguably removes inherent biases in decision-making in the allocation of goods (Roumbanis, 2019). A modified version of such lottery model has been adopted in New Zealand and received with reasonable acceptance, although not for all types of research grants (Liu et al., 2020). By using randomness to select amongst qualified proposals, the lottery system adopts a fair process of selection. However, this lottery system is only fair if the academic institutions enforce that the pool of candidates and proposals from which the lottery is drawn from is a pool of candidates that have had true equality of opportunities. Otherwise, the lottery system will simply replicate the unfairness of the academic system as a whole. For example, suppose that the candidate pool in the lottery reflects gender inequalities of academia and say that this inequality has ratio 70:30 male:female scientists. In this context, even a fair lottery system will, on average, award 2.5 times more grants to male than to female scientists, thereby propagating the unfairness of the system even if the process of selection is fair. In other words, while the process of decision-making for the allocation of distributive

shares is fair (lottery), the pool from which the process is drawing from reflects a historically unfair academic environment, ultimately leading to unfairness. To my knowledge, the system implemented in New Zealand uses anonymised project proposals during a pre-selection peer-review assessment, which helps remove some of the biases in the pre-selection process but does not necessarily control for biases in candidate pool (e.g., gender inequalities) or other information contained in the application itself (e.g., non-native writers) (Liu et al., 2020).

Adapted theory of justice applied to academic institutions

Based on the overarching idea of Rawls' theory of justice, I propose a novel framework that could be implemented in practice to integrate the ecology of human development into the process of distribution of goods by academic institutions. In this framework, collecting *more* data from the ecological conditions experienced by individuals can in fact be used to compensate for ecological factors known to influence academic achievements. This is perhaps counterintuitive given the concept of the veil of ignorance which aims to *remove* information from individuals thereby allowing for a fair agreement of principles. It is perhaps even more paradoxical given the idea that we should *decrease* (rather than increase) the amount of data collected from individuals in order to generate fair judgements. Yet, I argue that collecting more information is the only way in which academic institutions can compensate for the impossibility to access the original position. This is because documenting known ecological factors that have influenced equality of opportunity in the immediate and broader (e.g., country, cultural values) context of an individual is the only course of action that allows for an expectation of academic achievement relative to opportunity to be built. In other words, academic institutions cannot make fair judgements unless the information about the causes of unfairness is known. Such system require that the academic institutions collect data on, for example, ethnicity, average income, country of education, native language and so on for every applicant, which is then processed using algorithms to minimise human biases [although in the present time, algorithms too have biases (Noble, 2018) which further research should eliminate in the future]. Only with this pool of information can academic institutions standardise and compare the academic opportunities and merit of applicants *given* the ecological context that different applicants developed. The algorithm uses data from the same ecological context of a given individual to generate an expected prediction of academic performance from which a standardised score of the applicant relative to the ecological context can be generated ('ecological score' of the applicant, Fig 1). In parallel, an anonymised version of the project is then peer-reviewed and scored using traditional peer-review process for methodological merit ('peer-review score', Fig 1). Both scores are then combined to create a standardized score for the application ('total standardized score', Fig 1), which can then be used for decision-making. The final score represents a fair process through which academic institutions respect and comply to the concept of *equality of opportunity* (or *relative to opportunity)*.

This does not restore our ability to access the original position described in Rawls' theory but allows us to arrive at a fair outcome. This is because even though the original position is inaccessible in practice, the above framework would be preferred by any rational individual in an imperfect original position. For instance, imagine that, in the original position, individuals know and are forced to accept that societies have inequalities, that other individuals are aware of these inequalities and will attempt to benefit from them, but each individual does not know which side of these inequalities (e.g., rich *vs* poor) they will belong to. The fair outcome – the outcome that all individuals can and will agree upon – is that of a fair process through which individuals are judged, based on the inequalities that are present in the society. For an individual in the lower side of inequalities (e.g., poor), the best possible outcome *a priori* of knowing its place in this inequality is to demand that (s)he is to be judged relative to the inequalities that (s)he will have experienced, and not based on the average experience of the society (let alone the average amongst those on the other side of the spectrum). In this way, the individual capacity to perform above the expected from the individuals' environment is measured, rather than the capacity of an individual to perform relative to the average of the society. This approach, if adopted widely across academic institutions, is what I argue will make academia a

system of fair equality to opportunities. Note that the above framework agrees with the principles originally laid out by Rawls' theory of justice because ensures that each person is guaranteed to have an equal rights to apply (*Principle 2b*) and access (*Principle 1*) academic goods and that any eventual inequalities ought to be beneficial to academia as a whole, given that the entire process of judgement and selection is fair (*Principle 2a*).

Potential immediate criticism

Applicants may not be willing to share detailed background information for various reasons, including for example fear of discrimination. However, it is difficult to envisage the design of a fair system that makes fair judgements but which does not take into account factors that are the source of such injustices. In other words, how can an academic institution correct for unfairness (in a fair and objective way) if academic institutions are not given the data necessary to account for the source of such unfairness?

Another criticism and limitation of the framework proposed here is that, with the aid of technology, the academic institutions should not have access to (all of the) ecological information of the applicant, and therefore the applicants' data should remain private and if shared at all, confidential. This opens up for the possibility of 'cheating' behaviour where applicants claim to have had ecological conditions that they did not, for which veracity of claims cannot be checked. Academic cheating is not exclusive of this framework (Anderman & Murdock, 2011; McCabe, Treviño, & Butterfield, 2001) and thus, it is not a fatal limitation of this approach in particular, but an issue for all aspects of human interactions. As it stands, the costs of the lack of diversity and opportunities far outweighs the costs of potential cheaters in the system, although this limitation should be addressed once an application of this framework is put into practice.

Another source of criticism, and perhaps a more difficult to rebut, is that this framework is likely to make the entire selection process 'too personalised' and the cut-off point for collecting information may be obscure. Academic institutions may raise questions such as: what are the factors that influence academic opportunities and merit in the first place? How much details should we record for each individual? To answer these questions, I propose a pragmatic approach to this matter, based on the literature in social sciences and psychology. An ecological factor should be recorded if and only if there is substantial scientific evidence demonstrating the role of such ecological factor on the opportunities for an individual to develop. Earlier, I used the example of poverty, which can have major impact on individuals' academic potential (Johnson et al., 2016). Thus, socio-economic status of an applicant during development should be collected during the application process. Similar procedure should be followed in the decision pertaining other ecological factors of human development [see for instance (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 1998) for discussion on human developmental ecology]. It will be important for practical applications to be implemented – even if as pilot experiments – to provide information on the computational limitations that may constrain the amount of data that can be collected and process.

Concluding remarks

Historically, academia has lacked in diversity and equality of opportunities due to an unfair process through which academic institutions select and distribute goods. I proposed that integrating the body of literature in human developmental ecology with the theory of justice by John Rawls creates a novel framework that addresses the unfairness in academia. This framework can be implemented in other contexts, such as in the job selection for industry and (non-)governmental position. I am aware that the framework in this paper is likely to encounter fierce criticism and may, ultimately, be render useless and abandoned. Thus, I hope that

the framework proposed here generates debates that ultimately leads to an academic environment with fair equality of opportunities to all.

Conflict of interests

The author has no conflict of interests to declare.

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Figure caption

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Figure 1. A schematic example of the way in which academic institutions could implement a fair system to allocate goods amongst applicants (e.g., grants, fellowships).