Relation of early career performance and recognition to the probability of winning the Nobel Prize in economics

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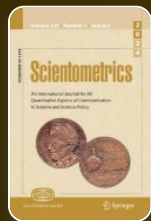
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Abstract

To explore the relation between early career performance or recognition and receiving the Nobel Prize in Economic Sciences, we compare winners of the John Bates Clark Medal, the most prestigious early career recognition for economists, with other successful scholars. The initial comparison combines JBCM winners with scholars published in leading economics journals, controlling for educational background (institution conferring the Ph.D.) and publication and citation success. We then narrow the comparison group down to those given relatively early recognition (based on age category) in the form of other major awards. Lastly, we compare the JBCM awardees with synthetic counterfactuals that best resemble their pre-award academic career performance. All three analyses provide strong

support for the notion that winning the JBCM is related to receiving the Nobel Prize, the award of which is also correlated with early career performance success as measured by number of publications and citations.
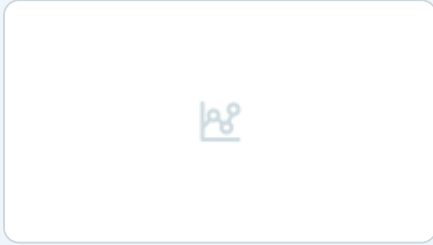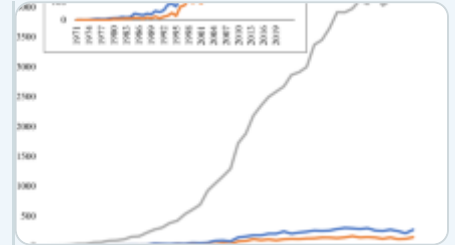
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Introduction

Academic economists generally regard the Nobel Prize in Economic Sciences (NPE) and the John Bates Clark Medal (JBCM) as the two most prestigious awards that an American economist can receive. The NPE, created by the Swedish Academy of Sciences in 1968 to recognize significant achievement in the field of economics,[1] was first awarded in 1969 to Norwegian economist Ragnar Frisch (1895–1973) and Dutch economist Jan Tinbergen (1903–1994). The current holders are English economist Oliver Hart and Finnish economist Bengt Holmström, who are affiliated with Harvard University and the Massachusetts Institute of Technology, respectively. The JBCM was established over 60 years ago and named after American economist John Bates Clark (1847–1938). The American Economic Association (AEA) awards the medal "to that American

economist under the age of 40 who is judged to have made the most significant contribution to economic thought and knowledge".[2] Often referred to in the U.S. as the Baby Nobel (Shah [2014]), the JBCM was awarded biannually from 1947 until 2009 when substantial growth in the field (Rampel [2009])[3] prompted the change to annual awards beginning in 2010 (Mixon and Upadhyaya [2014]). Unlike the NPE, which has historically been awarded to up to three economists annually (or 1.625 individuals yearly, on average), the JBCM is awarded to a single economist each year.

As Rampel ([2009]) and Shah ([2014]) indicate, a number of JBCM winners have also gone on to win the NPE, including Paul Samuelson and Milton Friedman, and more recently, Joseph Stiglitz. In fact, at the time of writing, 12 of the first 22 JBCM awardees (around 55%) also later won the NPE.[4] These statistics provide the foundation for our in-depth empirical investigation of the JBCM and NPE link, a study designed to advance the literature on awards and recognitions in economics by examining the relation between early career performance and end-of-career recognition of professional achievements. More specifically, by comparing JBCM winners with closely matched non-winners and focusing on early career success, we formally investigate the impact of winning the JBCM on the probability of receiving the NPE later in an academic career. Our work thus complements Chong et al.'s ([2012]) earlier empirical evidence that the JBCM winners among 237 widely cited economists were around 20% more likely than the non-medalists to also win the NPE.

By exploring early career recognition and performance, we are able to test whether early excellence correlates with later success, and thus whether the corresponding proxies are valid indicators of talent. Although it would seem that early career recognition and receipt of major awards such as the Nobel Prize are unquestionably linked, recent research on the fields of chemistry and physics by Gingras and Wallace ([2010]) and Iwami et al. ([2014]) indicates that the fragmentation of academic fields combined with the proliferation of published research has weakened the correlation between citations to scholarship and the bestowal of major academic awards and prizes, thus making it more difficult to predict Nobel Prize recipients. As such, a scientific examination of the relationship

between early excellence and later success such as that presented here is essential to developing a more complete understanding of this aspect the sociology of science.

Receiving a major award also signals that the qualities of the young scholars awarded have come to the attention of the (successful) peers who evaluated them, so that potentiality becomes actuality and provides reassurance (Merton [1973]). According to Merton ([1973]), one key function of awards is to curb acute self-doubt. Hence, to throw more light on the potential psychological implications, we first explore whether JBCM winners are more likely to win the Nobel Prize than scholars with comparable career lifecycle performances before the JBCM award. We also compare the Clark medalists with other scholars in the area of economics who received recognition early in their academic career in the form of other major awards, such as being elected as fellows in esteemed scientific communities.

The economics of workplace awards and recognition

The conceptual framework for this analysis draws on the relatively new branch of research into the economics of workplace awards and recognition. One important focus of this research is how awards serve as direct incentives when workers exert explicit effort to win them, and as indirect incentives when the award creates role models, highlights social values, and brings individual prestige (Frey and Neckermann [2009]; Frey and Gallus [2014]). For recipients (employees), awards often provide remuneration that is not taxed in the same way as traditional work-related compensation (Frey and Neckermann [2009]). Hence, a review of field experiments in this area attests to the power of awards and recognition in motivating employees, with even a purely symbolic award motivating a 12% increase in recipients' workplace performance (Kosfeld and Neckermann [2011]). Not only are these findings supported by more recent studies (Levitt and Neckermann [2014]; Neckermann et al. [2014]; Kosfeld et al. [2016]), but Neckermann and Frey ([2013]) further show that finely tuned workplace awards and recognition can motivate greater employee cooperation and teamwork. Previous academic research has also delved into the power that early career performance and recognition have in generating additional individual awards later in one's

academic career. Seminal work in this area by Cole and Cole ([1967](#)), Garfield and Malin ([1968](#)), Inhaber and Przednowek ([1976](#)), and Ashton and Oppenheim ([1978](#)) provide an examination of this power, with a particular focus on predicting Nobel Prize winners in the fields of chemistry, medicine, physics and physiology. For example, Garfield and Malin ([1968](#)) point out that the selection of Nobel Prize winners in chemistry, physics and physiology relates not only to a scholar's citation count, but also to the length of time between the award and publication of his or her most frequently cited paper, the type of research undertaken, the population of published papers in the relevant field, and the individual's ability to "sell" his or her ideas (i.e., the individual's communication skills).[5]

Inhaber and Przednowek ([1976](#)) find that scientists who are elected to the U.S. National Academy of Sciences (NAS) from medicine and physiology experience a boost in citations after election that exceeds that for those elected from chemistry and physics. Given the established relationship between performance and receipt of the Nobel Prize, election to the NAS will serve as a more effective predictor of receipt of the Nobel Prize for medicine and physiology.[6] Likewise, Ye et al. ([2013](#)) have provided some statistical links between obtaining the Nobel Prize in physiology or medicine and the Gairdner Award, Lasker Award, Wolf Prize, and the Louisa Gross Horwitz Prize. The authors find that almost 70% of the Nobel laureates (during 1983–2012) had obtained the Gairdner Award prior to getting the Prize. Lastly, and as mentioned previously, modern research by Gingras and Wallace ([2010](#)) points out that changes in the size and organization of the fields of chemistry and physics have resulted in a rapid decrease in the ability of bibliometric data to forecast Nobel Prize winners over the last 100 years. More specifically, they assert that the decrease in the ability of bibliometric data to forecast Nobel Prize winners has resulted from the growing size and fragmentation of the two disciplines, combined, in the case of physics, with an implicit hierarchy in the most legitimate research topics within the relevant discipline. To the extent that similar changes occur in economics, an understanding of the link between early career awards and the NPE is essential.

This emerging stream of economics research mentioned above also focuses on the power of awards and recognition in academia (e.g., Mazloumian et al. [2011](#); Chan

et al. 2014), with particular attention to such accolades in the field of economics. For example, Chan and Torgler (2012) report that 14.4% of all individuals selected for Fellowship of the Econometric Society (FES) up to 1970 would later go on to win the NPE. They interpret this finding as implying a strong link between early ES fellowship and becoming a Nobel Laureate later in the career, perhaps through increased motivation. In more recent work, Chan et al. (2014) also demonstrate the importance of JBCM reception[7] by comparing post-JBCM publication counts with those of a synthetic counterfactual control group of non-JBCM winners with similar human capital and pre-award productivity characteristics.[8] By 5 years after JBCM conferral, the typical JBCM winner's weighted publications are 13% higher than those of the counterfactuals, a difference that the authors attribute, at least in part, to a prestigious award or honor inducing greater effort in its recipients.[9]

Dataset, sample, and counterfactual control

To assess how early career performance and recognition affect the probability of winning the NPE, we employ the same dataset of academic researcher career profiles as Chan et al. (2014). This dataset contains the publication and citation records of 26,517 researchers who published in the top 23 journals in economics and finance before December 2011. The citation records were obtained from *Web of Science*. The selection of journals in Chan et al. (2014) is based on the journal rankings from Leibowitz and Palmer (1984), Kalaitzidakis et al. (2003, 2011), Palacios-Huertas and Volij (2004), Kodrzycki and Yu (2006), Ritzberger (2008), and Koczy and Strobel (2010), where each journal selected appears at least once in the top 10 positions of any ranking. The 23 selected journals are listed in "Appendix Table 3".

For each economist, Chan et al. (2014) evaluated researcher productivity (proxied by number of quality-adjusted publications) and professional recognition and status (proxied by quality-adjusted citations per publication); both are widely employed measures in academic performance evaluation.[10] Chan et al. (2014) use the average value of all the reported rankings for each journal as the journal quality adjustment weights, such that higher ranked journals are assigned more

important weights (see Chan et al. [(2014)](), for details).[11] They also control for coauthor influence by dividing both the publication and citation counts by the number of authors for each article.[12] In this current study, the initial sample includes 77 Nobel laureates in economics[13] and all 39 JBCM recipients as of May 2017. To measure early career achievement and recognition, we also include information on whether, as young professionals, these economists received the Yrjö Jahnsson Award (biennial award given to a European economist younger than 45 years old, established by the Yrjö Jahnsson Foundation in 1993 and co-organized by European Economic Association (EEA)) and the Frisch Medal (best article award established by Econometric Society in 1978), or fellowships in the American Economic Association, Econometric Society, American Academy of Arts and Sciences, and National Academy of Sciences, or were invited to present at prestigious events such as the Richard T. Ely and Yrjö Jahnsson lecture series.[14]

To account for the quality of formal human capital attainment, we also record the institutions at which the economists earned their doctoral degrees and the rankings of their economics departments. Information on the doctoral institutions is taken from *ProQuest Dissertations & Theses* (*PQDT*), the economists' own curriculum vitae, and various university records, as well as Google searches.[15] Department rankings are based on Coupé ([2003]()), where the economics departments of respective institutions are ranked based on their aggregated citation counts (weighted for co-authorship and multiple affiliations) during 1990–2000.[16] To account for the JBCM not being established until 1947, we limit the sample to economists who were younger than 40 in 1947 (i.e., born after 1907) or published their first article in our listed journals after 1930.[17] We also exclude economists whose first article in our journal listing is dated after 1990 to allow sufficient time for the economists to be considered in the Nobel selection process.[18] The resulting final sample contains 6565 observations.

In setting up a test of the relation between economists' early career success (winning the JBC medal) and the probability of later winning a prestigious award like the NPE, in our second analysis, we establish a counterfactual by constructing a synthetic control group of non-JBCM winners. To do so, we borrow Chan et al.'s [(2014)]() list of counterpart economists whose weighted average pre-award

academic performance trajectory closely matches the first 27 Clark medalists in academic productivity (number and quality of publications) and work quality (citations per publication). This matching procedure accounts for academic background by excluding economists with doctorates from institutions whose Coupé (2003) rankings are five positions above or below that of the corresponding JBCM winner. It also controls for cohort effects by including only those whose debuts are no more than 5 years away from that of their match (Chan et al. 2014). For our sample, we select from this list a group of economists whose weighted pre-award publication-citation combination is closest to that of the paired medalist (see "Appendix Table 4" for a full listing).

Econometric model

The foundation for testing whether early career performance explains some of the probability of later recognition through receipt of a prestigious award can be expressed as follows:

$$Y_{i}^{*} = \beta_{0} + \beta_{1} {\text{Pub}}_{i} + \beta_{2} {\text{Cit}}_{i} + \beta_{3} {\text{JBCM}}_{i} + \gamma {\text{Edu}}_{i} + \varvec{\varphi}^{\prime} \varvec{C}_{i} + \varepsilon_{i}$$

(1)

where Y_{i}^{*} measures the latent (and continuous) tendency of the sampled economist, i, to be recognized by the Swedish Academy through the awarding of the highest honor in economics, the Nobel Prize. Given that this tendency is unobserved, it is replaced with an indicator variable, Y_i, which is a dichotomous variable equal to 1 if economist i has been awarded the NPE and 0 otherwise. This substitution yields the following specification:

$$Y_{i} = \beta_{0} + \beta_{1} {\text{Pub}}_{i} + \beta_{2} {\text{Cit}}_{i} + \beta_{3} {\text{JBCM}}_{i} + \gamma {\text{Edu}}_{i} + \varvec{\varphi}^{\prime} \varvec{C}_{i} + \varepsilon_{i}$$

(2)

which, given the limitations of the dependent variable, is estimated by maximum likelihood (probit) rather than OLS (Greene 2003). The estimation model thus takes the following form,

$${ \Pr }\left({\left. {Y_{i} = 1} \right|{\mathbf{x}}_{i} } \right) = \varPhi \left({\beta_{0} + \beta_{1} {\text{Pub}}_{i} + \beta_{2} {\text{Cit}}_{i} + \beta_{3} {\text{JBCM}}_{i} + \gamma {\text{Edu}}_{i} + \varvec{\varphi }^{{\prime }} \varvec{C}_{i} + \varepsilon_{i} } \right),$$

(3)

where $Pr(Y_i = 1\mathbf{x}_i)$ = the probability that economist i wins the NPE, Pub$_i$ = economist i's cumulated publications, Cit$_i$ = economist i's cumulated citations per publication, JBCM$_i$ = a dummy variable equal to 1 if economist i is a JBCM winner, and 0 otherwise, Edu$_i$ = an indicator of the quality the PhD-granting institution of each economist i, C_i = a series of dummy variables for the 1930, 1940, 1950, 1960, 1970, and 1980 cohorts.

The economist i's academic career productivity is measured by his or her cumulated publications (Pub$_i$) and cumulated citations per publication (Cit$_i$). We test the effects of early career productivity at 5, 10, 15 or 20 years after the completion of PhD.[19] Each of these variables is expected to display a positive relation with Y_i. JBCM$_i$ is the binary variable equal to 1 if the sampled economist i has received the JBCM and 0 otherwise. Given the medal's motivational impact on its recipients, we expect a positive relation between such early recognition and the probability that economist i is recognized for his or her scholarly achievements through award of the NPE. Edu$_i$ is an indicator of the quality of each economist's source of formal academic training (human capital) as measured by the quality of the doctoral institution using the rankings based on Coupé (2003). We expect this to be negatively related to the dependent variable as it is reverse coded (smaller values indicate higher ranks). The vector of determinants, denoted by C_i, is included to capture any lingering cohort effects and comprises a series of dummies for the 1930, 1940, 1950, 1960, 1970, and 1980 cohorts, with the latter used as the reference (i.e., omitted category). ε_{i} is the error term.

We make no priori assumptions about the relation between any of these cohort variables and the probability of winning the NPE.

Summary data and econometric results

The summary data for the scholarly productivity variables (see Table 1) indicate that over the 5 years following publication of a first article, the typical economist in our sample has produced 1.02 publications (weighted by number of authors) and garnered 1.44 citations (weighted by publication). By the 10-year point, these numbers have climbed to 1.42 and 3.00, respectively; after 15 years, to 1.68 and 4.49; and after 20 years, to 1.88 and 6.08.

Table 1 Summary statistics of early career researchers' productivity measures

The separate probit estimates of (3) for the first 5, 10, 15, and 20 years of an academic career (see Table 2) are each jointly significant at better than the 1% level with a pseudo R^2 of 0.306 or higher. To understand the relative strength of each covariate, we also report the standardized beta coefficients obtained from the linear probability model for each specification. In each case, the number of accumulated publications is positively and significantly (at the 1% level) related to the probability of the economist being awarded the NPE during his or her academic career. However, as indicated by the monotonically decreasing marginal effects estimates also shown in the table, the impact of this accumulation is not uniform. For example, in the 5-year case, the impact of a marginal increase in accumulated publications is 0.58 percentage points, while its 20-year counterpart in the probit regression is only 0.24 percentage points. Accumulated citations per publication are also positively and significantly but non-uniformly related to the probability of NPE reception (at the 1% level), with the monotonically decreasing marginal effects estimates showing a 0.12 percentage point impact in the 5-year case compared to 0.034 percentage point impact in the probit estimations for the 20-year case.

Table 2 Probability of winning the Nobel Prize (probit estimations)

With respect to the importance of early career recognition, as evidenced by the estimated relation between receiving the JBCM and the probability of winning the NPE, the results are once again compelling. In all four regression specifications reported in Table 2, having previously been awarded the JBCM is both positively and significantly related to the probability of winning the NPE, and according to the marginal effects estimates, JBCM winners are anywhere from about 1.7–3.3 percentage points more likely (dependent on time frame) to later win the NPE than are their non-medalist counterparts. On the other hand, the proxy for formal human capital attainment (quality of doctoral institution) does not reach statistical significance in any model and the estimated marginal effect is also trivial. By assessing the standardized beta coefficients (change in the dependent variable measured in standard deviations followed by 1 standard deviation change in the explanatory variable) obtained from the linear probability model, we can also see that the relative strength of being awarded the JBCM is the highest, followed by publication and citation performance.

In a next step, we increase the comparability between the control group of non-JBCM economists and the Clark medalists by restricting the sample to economists who have received at least one major award or recognition (including the Clark medal) in the early stages of their career (see "Dataset, sample, and counterfactual control" section). The more refined control group consists of economists who were elected as fellows in learned societies, namely, American Economic Association, Econometric Society, American Academy of Arts and Sciences, and National Academy of Sciences, or received the Yrjö Jahnsson Award or the Frisch Medal, or were invited to present at named lectures such as the Richard T. Ely and Yrjö Jahnsson lecture series. Applying the same set of controls as in the previous analysis (specification 2 in Table 2), we calculate and visualize the marginal effect of JBCM on winning the NPE using different cohort samples by running regressions for 16 age categories, i.e., obtaining at least one award prior to age of 35–50 (see Fig. 1).[20] Here, the coefficient is always statistically

significant and the quantitative effects of the JBCM dummy are both stable and large (around 17 percentage points and thus 5 times larger than the effect in Table 2). Our result did not change much since only a small number of non-JBCM economists were added to the control group, as most of the recipients were captured by the data on scholars who had presented in the lecture series or had received the ES Fellowship. We have looked at other early-career awards in economics, such as the Gossen Prize (annual award to a German-speaking economist under 45, established in 1997), Nakahara Prize (annual award to Japanese economists under the age of 45, established in 1995), Prix du meilleur jeune économiste de France (annual award given to French economists under 40, established in 2000), Assar Lindbeck Medal (bi-annual award to Swedish economist under 45, established in 2007), however these prizes were established quite recently and none of the recipients have (so far) won the Nobel Prize, therefore we have not included these awards in our analysis.

Fig. 1
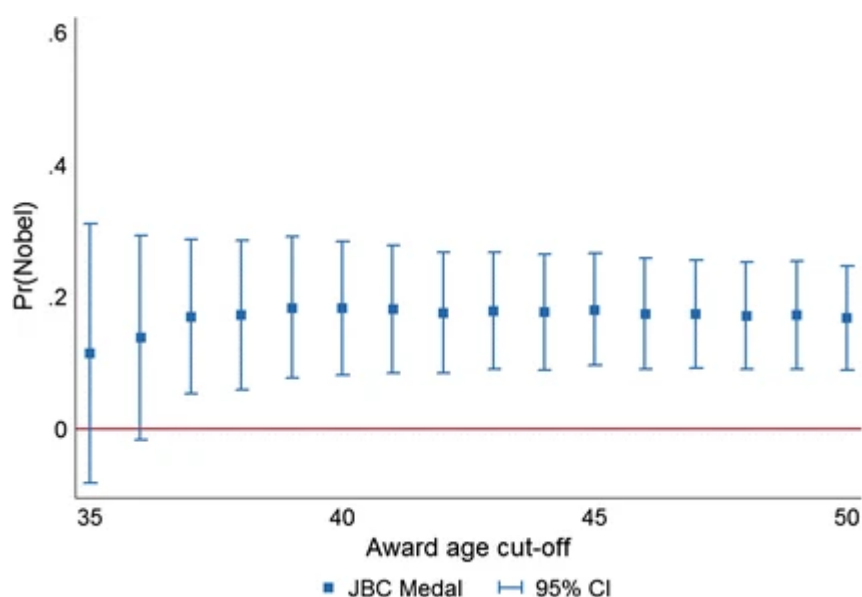
Marginal effects of winning the Clark Medal

Lastly, we look only at the first 27 Clark medalists and their synthetic counterfactuals, for each of which we create a weighted probability of obtaining the NPE using the weights suggested in the creation of the synthetic control unit. We find that 12 out of the 27 medalists went on to win the Nobel Prize, which is a

44.44% probability versus a weighted 7.54% probability for the synthetic control group (Fig. 2). A Wilcoxon Rank Sum test for statistical differences between the two groups' probabilities of winning the NPE reveals that these probability distributions are not equal at the 10% level of significance ($p = 0.06$).

Fig. 2
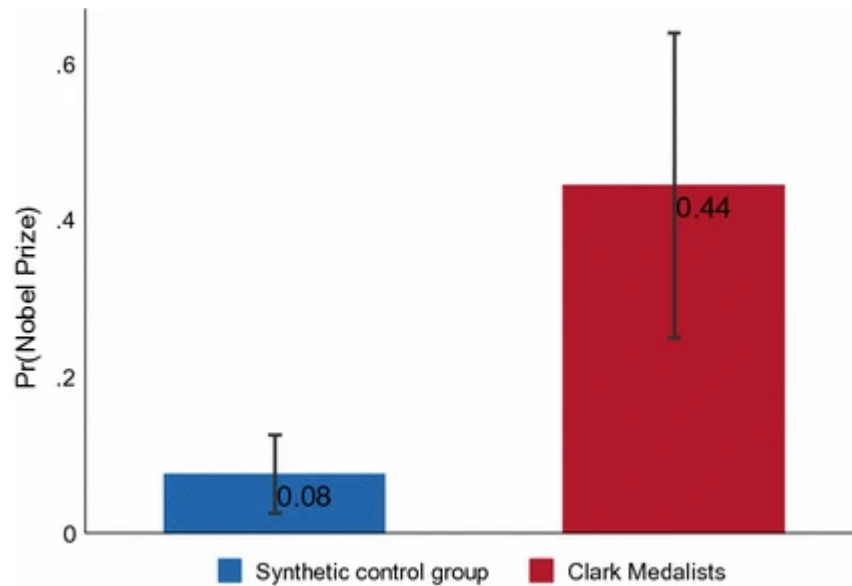
Probability of winning the NPE: Clark medalists versus their synthetic control counterparts

The pairwise difference—that is, the binary variable of whether a JBCM economist won the Nobel Prize minus the weighted proportion of the NPE share of the corresponding synthetic JBCM group—is reported in Fig. 3. Whereas most of the earlier JBCM economists did later win the NPE, the synthetic control group members are more likely to have won the NPE after 1993.

Fig. 3
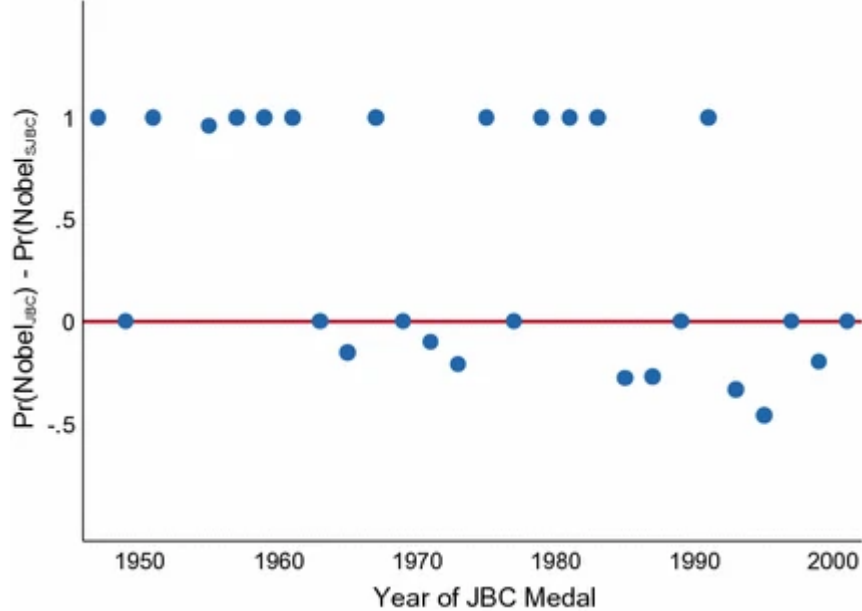
Net probability of winning the Nobel Prize

Concluding remarks

In his autobiography *Models of Life,* Nobel laureate Herbert Simon (1996) reports frequently being asked the following question: "When did you first suspect that you might win it?" (p. 319). Although his usual answer was "The day I got it," he admits that this response is not strictly true. In reality, professional peers and colleagues within the academic sphere often view portents such as fellowship in the Econometric Society or Simon's nomination as a Distinguished Fellow of the American Economic Association as steps toward Nobel nomination. As a result, outsiders are seldom put forward, and Simon (1996) recollects the astonishment that his being chosen prompted in some economists (who regarded him as just that) and most media. He also points out, however, that he was not wholly unknown to those who mattered: "If I was an outsider to the economics profession as a whole, I was an insider to its elite. Without that accreditation, I suspect that I would not have won the prize" (p. 326).

Winning the prestigious JBCM can also be seen as a major accreditation, so it is not uncommon for research to link this award to the NPE, especially given how many winners of the former went on to receive the latter. The purpose of this study, therefore, has been to uncover further insights into a potential relation between these two awards. According to our first comparison of JBCM winners

with other economists published in major economics journals (simultaneously controlling for educational background and publication-citation success), JBCM winners have a 1.7–3.3 percentage point higher probability of winning the NPE, dependent on career stage. When we compare JBCM winners with a narrower sample of scholars who have received other major economics awards or recognitions, the former again have a substantially higher probability of winning the NPE than the latter, a consistent effect of around 17 percentage points, in line with results reported by Chong et al. (2012). A final comparison of JBCM winners with a group of similarly talented synthetic counterfactuals who best resemble the pre-award academic career profile of the corresponding award winners (cf. Chan et al. 2014) also indicates that JBCM awardees have a substantially higher (44%) probability of winning the NPE than their counterfactuals (8%). All these analyses thus seem to confirm the JBCM as a good indicator of future Nobel Prize success.

Our results also provide some evidence that early career performance success, measured as publication and citation numbers, is correlated with winning the NPE, although given the comparative recency of the NPE and JBCM relative to academic awards with a 100 + year history, future studies would benefit from better data availability. The proxies used are quantitative in nature, with the core advantages of being measurable and quickly identifiable. They combine a substantial amount of information related to recognition, reputation, and perceived quality. Nevertheless, applying such proxies can be seen as a "brute force" approach. For example, the rapid expansion of activity in science since the 1960s enhanced the potential pool of central scientists that could be chosen due to (similar) bibliometric results (Gingras and Wallace 2010). A natural method for further disentangling potential factors contributing to winning the Nobel Prize is to focus, for example, on major discoveries, the Nobel committee decision process, the extent to which scholars are well-connected among the elite group, their public image, their collaboration pattern and intensity, on a better mapping of their educational background and mentors, their perceived creativity, the path of idea acceptance, or the actual *zeitgeist* [21] and therefore the socio-cultural context. Many of those factors are hard to measure, identify or isolate, and some aspects are more qualitative in nature. Currently, we have evidence on aspects such as how Nobelists' educational background affects success (Chan and Torgler 2015a),

how their collaborative pattern emerges (Chan et al. 2015), or which collaborations are more successful (Chan et al. 2016). However, if we are to go beyond just looking at Nobelists, this will require the development of large datasets. One could consider the implications of the impact generated by the 'landmark' publications relative to the scholars' life-time impact, timing of the pioneer discoveries (early vs. late career), or the institution at which such work was conducted (Schlagberger et al. 2016), particularly when estimating the probability of winning the NPE in other discipline. Yet, the Economic Prize is more often awarded to economists for their life-time contribution rather than specific contribution due to the multidimensional nature of economic research. Future investigators might also consider a more detailed exploration of the implications of winning a major reward early in life by examining such psychological factors as motivation, self-confidence, level of self-doubt, and reassurance. Interviewing Clark medalists or examining any changes in their work environments (e.g., better access to research resources or talented scholars) could also help researchers identify the factors that generate future productivity.

Lastly, it is important, going forward, to account for differences between the characteristics of the researchers who are recognized through the awarding of the NPE and those who garner Nobel Prizes in the humanities and the other sciences, which represent the fields that were examined in the early years of "the science of science" (Garfield, 1970). For example, Van Dalen (1999) finds that winners of the NPE generally begin their careers at a relatively young age, and that their most important and creative contributions are written between the ages of 29 and 38. In fact, the average creative age of Nobel economists is slightly below that of laureates in physics, and considerably younger than winners of the Nobel Prize in chemistry, medicine and physiology (Van Dalen 1999). Our results, when combined with those from recent research on the fields of chemistry and physics by Gingras and Wallace (2010) and Iwami et al. (2014), point out that the increasing specialization of academic fields combined with the proliferation of academic journals and research has weakened the ability of bibliometric data to predict Nobel Prize recipients in these fields. These observations provide a good indication that there are notable differences across the various academic fields to which the Nobel Prize applies.

Notes

1. In their recent history of the NPE, Mixon and Upadhyaya (2014) point out that NPE winners are selected from lists nominated by "qualified nominators", a group that includes members of the Swedish Academy, past NPE winners, NPE committee members, various "permanent professors" from Scandinavian countries, and other scientists and academics (p. 2). The qualified nominators work within a nomination process that runs from September to February, with the selection process spanning February through early October. Although selection criteria disqualify deceased scholars, the academy may, and often does, select multiple NPE winners in a given year (see also www.nobelprize.org/nobel_prizes/economics/nomination/).

2. Economists under 40 of all nationalities are eligible for the JBCM provided they are affiliated with an American institution at the time of award; for example, the second female medal winner, Ester Duflo (2010 prize), is a French economist affiliated with MIT (see www.aeaweb.org/honors_awards/clark_medal.php).

3. Mixon and Upadhyaya (2014) also point out that although the JBCM was not awarded in 1953, it has otherwise been given on every appropriate occasion since 1947 (see also https://www.aeaweb.org/about-aea/honors-awards/bates-clark).

4. Based on authors' counting as of August 2017.

5. Cole and Cole (1967) find, from their examination of 120 university physicists, that the quality of one's academic output holds greater significance in the receipt of awards than the quantity of that output.

6. In their examination of a sample of 83 eminent chemists, Ashton and Oppenheim (1978) find that although receipt of the Nobel Prize is positively

correlated with citation counts, it is more strongly correlated with the number of papers one has co-authored wherein the senior author's name is not the first in the list of authors.

7. For more information on the JBCM, see Mixon and Upadhyaya (2014) and Faria et al. (2016).

8. Such a comparison distinguishes whether JBCM bestowal simply reflects the past activity of particularly gifted economists or whether the awards actually raise subsequent productivity (Chan et al. 2014).

9. In addition to this motivation-related effect, conferral of such awards and honors has the added benefit of increasing the likelihood of research grant funding, teaching load reduction, and access to more talented colleagues, all of which supplement motivation in enhancing research productivity (Chan et al 2014, p. 189).

10. See, for example, Cole and Cole (1973), Hansen et al. (1978), Hamermesh et al. (1982), Sutter and Kocher (2001), and Johnston et al. (2013).

11. For example, one *Journal of Political Economy* publication (citation) is counted as roughly 0.8 of an *American Economic Review* publication (citation).

12. For more on this approach, see Lindsey (1980), Long and McGinnis (1982), and Hollis (2001).

13. With the exception of the Soviet mathematician and economist Leonid Kantorovich (1975 Nobel Prize).

14. The biennial Yrjö Jahnsson Award was established in 1993 for a European

economist under 45 (see https://www.eeassoc.org/index.php?site=&page=25&trsz=23). The Frisch Medal was first awarded in 1978 (https://www.econometricsociety.org/society/awards). The AEA Distinguished Fellow was first awarded in 1965, but we also include Foreign Honorary Members, first awarded in 1976. The first FES was elected in 1933, and the first lectures in the Richard T. Ely and Yrjö Jahnsson series were given in 1962 and 1963, respectively.

15. In addition, Van Dalen (1999) provides a source of information on the Ph.D. institutions of Nobel laureates in economics.

16. These data were available for only 13,063 economists; Coupé (2003) does not list the rankings of 10 Nobel laureates' doctoral institutions, and Clark medalist Kenneth E. Boulding has no Ph.D.

17. Given the median first publication age of 30 for economists in our sample born between 1910 and 1919, economists who published before 1930 are likely to have been older than 40 by the time of the first JBC medal. For example, the first publication by a JBC medalist in our journal sample was a 1932 article in *The Economic Journal* written by a 22-year-old Kenneth E. Boulding (1949 medalist).

18. Because the median birth year of economists who first published in the 1990s is 1961, all Nobel Laureates to date were born before 1954, which excludes younger economists from the sample. Obviously, being based on a list of journals, this process is limited; for example, Nobel Laureate Elinor Ostrom (2009 winner) is excluded for not publishing in any of the 23 journals (*Journal of Economic Perspectives* in 1993) until the age of 60 because of her strong focus in political science and her tendency to communicate her influential insights via books (see, e.g., *Governing the Commons or Rules, Games, and Common-Pool Resources*).

19. The mean and median age of PhD completion equals to 29.

20. The sample size and pseudo R^2 for each model are given in "Appendix Fig. 4".

21. The *zeitgeist* can affect the number of potential candidates, which affects the development of creative potential in youthful geniuses (Simonton 1975). Chan and Torgler (2015b) found some evidence that great minds appear in cycles or batches, but results mainly hold for the greatest of the great.

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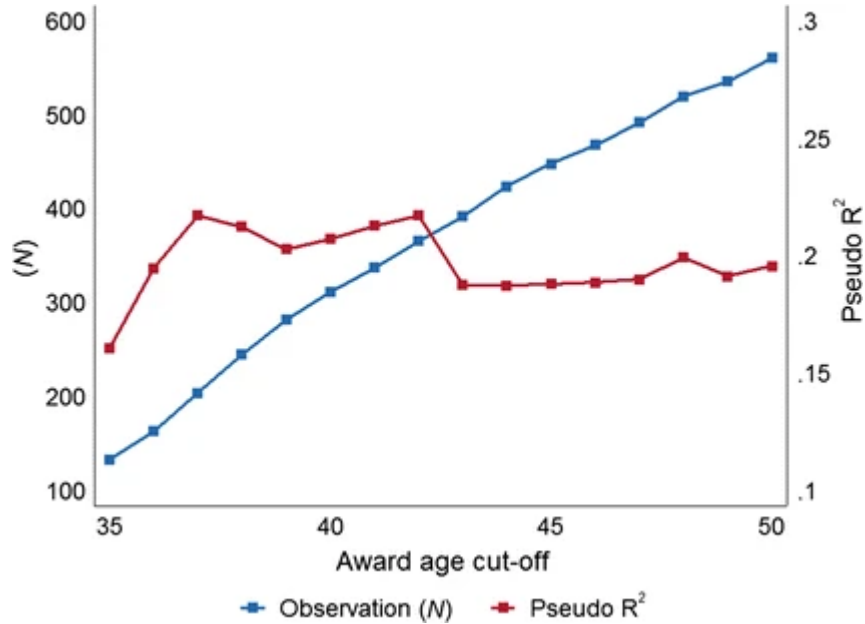
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Appendix

See Tables 3 and 4 and Fig. 4.

Table 3 List of journals

Table 4 JBCM winners and synthetic control group (SCG)

Fig. 4

Sample size and pseudo R^2

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