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Working Paper

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CREMA Working Paper, No. 2009-02

Provided in Cooperation with:

CREMA - Center for Research in Economics, Management and the Arts, Zürich

Suggested Citation: Stroebe, Wolfgang (2009) : Age Discrimination in the Allocation of Research Funds: The Dutch Model, CREMA Working Paper, No. 2009-02, Center for Research in Economics, Management and the Arts (CREMA), Basel

This Version is available at:

<https://hdl.handle.net/10419/214429>

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**Age Discrimination in the Allocation of
Research Funds: The Dutch Model**

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**Age discrimination in the allocation of research funds:
The Dutch model**

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Abstract

The major funding source for fundamental scientific research in the Netherlands (NWO), reserves more than half of their research budget for grants for young researchers. Researchers, who received their doctorate more than 15 years ago, cannot apply. Apparently NWO believes in a negative correlation between age and scientific creativity or productivity. This article reviews research on this relationship and concludes that there is no evidence to support the myth that science is a young person's game. By allocating a major part of their budget to early career award and by under-funding research or individuals in the second half of their careers, NWO may have lowered the level of innovative research in the Netherlands.

According to Albert Einstein “a person who has not yet made his great contribution to science before the age of thirty will never do so” (quoted in Brodetsky 1942, p. 699). And indeed, Einstein had completed his Nobel-price winning research when he was in his mid-twenties. What might he have achieved, if he had already had the money and facilities, which were at his disposal later in life? If Einstein had lived in present day Netherlands, he could have applied for one of the earlier career grants of the Dutch research funding organization NWO and received substantial funding at a very early age. (Though being a clerk at a patent office would have been an impediment). Like no other country, the Netherlands believe that scientific creativity is inversely correlated with age and that real innovation will mainly come from the young.

NWO has allocated a major proportion of their budget to grants for young scientists (so-called Veni, Vidi, Vici grants). Researchers more than 15 years past their doctorates cannot apply. The Dutch minister of education believes so strongly that one has to be young to conduct innovative research that he decided to take € 100.000.000 out of the Dutch University system to add to the NWO budget for early career awards. Not to be outdone, the largest university in the Netherlands (Utrecht University) has instituted “high potential awards” to fund research of young researchers. It is therefore timely to assess whether creativity declines with age and whether there is any evidence that only (or even mainly) the young are likely to have innovative ideas.

Distribution of success in science

Given the “publish or perish” mentality of most universities it is an interesting paradox that universities are full of people, who have published hardly anything. For example, in a study of the scientific output of more than 1000 American academic psychologists, Dennis (1954) found that the most productive 10% authored 41% of all publications, whereas the bottom

10% produced less than 1%. In fact, the top half were responsible for 90% of total output, the bottom half for the remaining 10%. Similarly biased distributions have been shown for other sciences as well as for arts and humanities (Simonton, 2002). Findings such as these led Derek Price (1963), a historian of science, to propose Price's law. According to this law, if k is the number of researchers, who have made at least one contribution to a given field, the square root of k will be responsible for half of all contributions in this field. Thus, if there are 100 contributors in a field, the top 10% will be responsible for half of the contributions to this area.

If one looks at the impact rather than the mere number of publications, the distribution becomes even more biased. Impact is typically measured in terms of the citations a publication receives within a given period of time. For example, a study of 299 Australian academic psychologists showed that the most productive 10% were responsible for 36% of the publications but for 60% of total citations (White & White, 1978). Similarly, in a study of 291 American academic psychologists, 10% averaged more than 50 citations per year, whereas 36% averaged two or less (Helmreich et al., 1980).

Age and success in science

There can be little doubt that the best strategy for an organization that funds research would be to subsidize the research of these prolific and impactful contributors. But how can they be identified? Obviously, NWO takes age as an important predictor. And indeed, studies of the productivity of researchers during the span of their careers demonstrate that productivity increases up to a certain age, but then decreases until the end of their careers (Kanazawa, 2003; Simonton, 1988, 1997, 2002). The precise location of the peak, as well as the magnitude of the post peak decline appears to depend on the area of achievement, with areas such as lyric poetry, pure mathematics, and theoretical physics peaking rather earlier than

psychology. Researchers in psychology appear to reach their peak somewhere around age 40 (Horner et al., 1986; Lehman, 1953; Over, 1982; Zusne, 1976) and then decline more slowly than pure mathematicians or theoretical physicists. However, these age effects account for very little variance in productivity. Thus, in a study of the productivity of more than 1,000 academic psychologists, age explained less than 7% of the total variance (Horner et al., 1986). A study of the publication rates of Australian and British academic psychologists arrived at an even lower estimate of 5% (Over, 1988).

But one great publication can have more impact than a hundred mediocre ones. Thus, if age were highly correlated with quality of publications, funding the young would still be justified. However, there is little evidence that the quality of scientific contributions declines with age. For example, a study of more than 200 single authored papers published in *Psychological Review*, arguably the top journal in psychology, found zero correlations between the number of citations an article received 5 years after publication and either the age of the author or the time since his or her PhD (Over, 1988). Similar findings were reported by Simonton (1985) in a study of the impact of the publication of 10 psychologists, who had received the APA's Distinguished Scientist award. He found that the ratio of high-impact publications to total output fluctuated randomly throughout their career. Thus, "the odds that an octogenarian will make a major contribution are no better than the odds for a psychologist near the onset of his or her career" (Simonton, 2002, p. 77).

The importance of past performance

Past performance is the best predictor of future performance. People who are highly productive in their 30s will also be productive in their 40s and 50s. Furthermore, they will be more productive in their 60s than one of the "silent" majority of unproductive researchers will be at his or her peak. A study of the number of publications over a 25 year period of 435

mathematicians, who had earned their PhD's in American universities between 1947 and 1950, showed that the output at any given 5-year period correlated between .61 to .79 with the output at other 5-year period (Cole, 1979). Similarly, a study of 156 scientists belonging to a number of different specialities reported equally high correlations, at least for the later stages of the careers of the scientists studied (Dennis, 1956). These findings suggest that the rate of past publications is a much better predictor of research productivity than age.

Since NWO uses past performance as one of the criteria in allocating early career awards, they compensate to some extent for the fact that age is a rather poor predictor of creativity and success in publishing. However, they are hampered by the fact that they are dealing with individuals, who are in the early stages of their careers. Publication rates during the first 10 years are generally a much poorer predictor of future productivity than are publication rates in later years (Simonton, 2002). Similarly, citation rates are much less reliable during the early phases of an individual's career than they are later in life. Thus, by allocating a major proportion of their budget to individuals with less than 15 years of past performance, NWO is replacing a highly reliable and valid predictor of productivity (i.e., mid career publications and citations) with a poor predictor, namely age.

The waste of human capital

Nobody would mind that NWO offers funding to young people, were it not for the fact that this is done so extravagantly that relatively little money left for other funding at least in the social sciences. As two former colleagues of mine, at the time one of the most productive social psychologists in the Netherlands (and since returned to his native Great Britain), once observed, if you are over 40, you cannot get research money in the Netherlands. If researchers, who received their PhD's more than 15 years ago want to get funded by NWO, they have to apply within the "free competition." The maximum that can be applied for in the

free competition is an PhD project amounting to approximately € 180.000. This is less than the Veni grants given to new PhD's (€ 2008.000). The free competition has also numerous procedural shortcomings at least the way it is organized within the NWO section funding the social sciences (NOW/MaGW). First, past performance is no criterion for decisions within the free competition. Thus, when dealing with an age group, where past performance would be an excellent predictor of research success, NWO does not use this criterion. Second, each proposal in the free competition is reviewed by only two reviewers. This is problematic, due to the low level of agreement that can be expected between reviewers. For example, Daniel (1993) reported inter-referee correlations that ranged from 0.12 – 0.25 for the journal "Angewandte Chemie" and Scott (1974) reported correlations for the Journal of Personality and Social Psychology, which ranged from .07 (probable reader interest) to 0.26 (accept or reject). Given these low inter-referee agreement rates, the chances that two reviewers will disagree is substantial. This would be less of a problem, if the NWO committees assembled for the free competition would always contain members, who are competent to evaluate a given proposal. However, this cannot be guaranteed. As a result, the theoretical importance of a research proposal in a specific discipline might be evaluated by individuals, who have are no more than distantly familiar with this area. Given the low agreement competent reviewers have demonstrating in evaluating research proposals or reports (e.g., Daniel, 1993), one has to expect that evaluations by non experts are even less valid.

Conclusions

Since scientific productivity reaches its peak around the ages of 35 to 40 and slowly declines afterwards (Horner et al., 1986; Lehman, 1953; Over, 1982; Zusne, 1976), it does seem a good idea to give special funding to young researchers. However, in view of the fact that age is only weakly associated with scientific productivity and that future productivity is more

difficult to predict during early rather than later stages in a researchers career, one has to wonder whether it is efficient to weigh age so heavily as it is done in the Netherlands. By allocating a major part of their budget to early career awards and by under-funding research of individuals of 40 years and older, NWO may have lowered the level of innovative research in the Netherlands.

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