Contract academic staff career development: An oxymoron?

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As part of its Strategic Review, the New Zealand Tertiary Education Commission (TEC) is seeking to foster a broad discussion about the issues confronting the research workforce. This paper examines the increasing predominance of contract or 'temporary' staff amongst research academics in biomedical sciences. This transformation of the academic workforce has gone almost unnoticed amongst the wider community. However, New Zealand's research performance is critical to developing the knowledge-based economy. As highlighted in major reviews overseas, the instability associated with an excessive dependence on contract staff for research has major implications for the future. We explore some of the factors behind this transformation, implications for research and academic performance, and some potential policy changes that have been proposed to mitigate its effects. This review particularly highlights an immediate policy issue, in that we found that there are no systematic data to either quantify the changes over time or the current extent of New Zealand's dependence on contract staff for tertiary research and teaching.

Background

The New Zealand Tertiary Education Commission's (TEC) Strategic Review of the Tertiary Education Workforce has recently called for input. This provides a unique opportunity to help develop policies that will improve research performance in the tertiary sector. The tertiary institutions are seen as playing a key role in the development of a prosperous and confident nation (Tertiary Education Commission 2005), and thus the quality of the workforce is central to the sector's ability to achieve New Zealand's goals, including increasing innovation, economic development and sustainability, and supporting social and Māori development. A major issue that seriously affects the performance of both academic staff and their institutions, and which has only been indirectly touched on in the first stage of the TEC Review, is the career development of academic researchers.

There has been a slow, nearly invisible sea change in the way that universities are staffed and how they carry out research. Instead of most academic research staff being appointed to permanent or 'tenured' positions after relatively short periods as postdoctoral fellows, many, if not a majority, are now employed on short-term contracts ('contract' or temporary positions). Understanding how this evolution may affect the development of science in New Zealand is obviously vital for universities and Government because of the impact our country's research performance has on the ability to develop a knowledge-based economy. Pragmatically, tertiary institutions also need

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to consider how this may affect Performance Based Research Fund (PBRF) evaluations in the future.

The changing face of the academic research workforce

Traditionally, most academics were appointed to permanent or 'tenured' positions, after a probationary period of a few years. Typically, before this, these academics would have undertaken one or at the most two postdoctoral fellowships to gain further research experience. In contrast, contract or 'temporary' staff now make up a large percentage of the academic research workforce; indeed, in some biomedical faculties, it appears that they are in the majority. Both contract and permanent/tenured staff may be either full time or part-time.

Temporary, of course, does not necessarily mean brief. Indeed, individual contracts are seldom longer than three years, and one- or two-year contracts are common amongst junior research staff. However, increasing numbers of staff at the senior lecturer, associate professor, and even professorial level are now employed on serial contracts for many years.

This apparent long-term trend, for an increasing proportion of academic staff being employed on repeated fixed term contracts, mirrors well-documented changes overseas. In the USA, for example, fully tenured positions are few, with most tenured posts requiring grant support for a proportion of their salary. Just 22% of 'tenured' positions in biomedical science in the USA in 2002 offered full salary support in case of grant failure, and this proportion is falling (Liu & Mallon 2004). Similarly, in the UK, tenured posts now account for only 55% of all research staff, 85% of whom hold full-time posts (Higher Education Statistics Agency 2004).

There are limited hard data within New Zealand on how big this change has been. Within the School of Medical Sciences at the University of Auckland, for example, it is estimated that, at present, 55% of staff are on contracts, and only 45% are tenured. However, this is based on an informal internal survey. Surprisingly, and of considerable concern, in preparing the this paper the authors found that there are no available quantitative data on either current numbers of academic (or general) contract staff or on changes over time in the proportion of contract versus permanent academic staff, either within the University of Auckland or the Ministry of Education. TEC has highlighted the need to significantly improve tertiary education workforce statistics in their preliminary review, including staff career structures and pathways (Tertiary Education Commission 2005). We would propose that high priority should be given to quantifying the extent of dependence of the tertiary sector on contract staff.

What is driving the increasing proportions of contract academic staff?

It is likely that, as in the USA, one major driver for this change has been the widened availability of contestable research grants, which allow expansion of research capability, independent of the traditional formal link with undergraduate teaching (Board on Life Sciences 2005). Within New Zealand some local factors must be considered. The impact of having more grants available has probably been augmented by the agreement to pay chief investigator salaries, and by a recent policy of transfer of overhead funding, from being embedded within education funding to being explicitly attached to salary funding in contestable government grants. This direct link between staff salaries and overhead payments obviously favours employing more contract staff, who must seek to cover the largest possible proportion of their own salaries, and those of their research associates, from research funding. It is of interest that not all countries allow the principal or chief investigator to be paid for their time on projects. For example, although the US National Institutes of Health (NIH) grants do, Canadian and Irish research grants typically do not (Garrett-Jones et al. 2004). The authors have not been able to find any evaluation of the impact of this difference on academic career structures or tertiary development; clearly such an analysis would be of considerable relevance.

It is also important to appreciate that, although the term 'soft money' academic or researcher may not be widely recognised outside of biomedical science, increasing numbers of lecturers are also employed in other academic divisions on fixed-term contracts, as highlighted by TEC (Tertiary Education Commission 2005). This change may well reflect a different set of issues, such as greater financial pressure on tertiary institutions, but also a perhaps understandable desire to increase institutional flexibility, in the face of changing government policies and rapid changes in student numbers and course preferences.

There is some evidence for relative financial limitations of academic research. Total research and development funding in New Zealand is relatively modest compared with other OECD countries, as is health research funding in particular, per capita or as a percentage of GDP (Statistics New Zealand 2004). Interpretation of long-term trends and international comparisons are difficult because the policy of paying overheads on investigator salaries has meant that there has been a real transfer of funding from direct support to overheads; overall there seems to have been limited growth in direct health research funding, albeit with some very recent increases (Garrett-Jones *et al*. 2004). However, financial constraint *per se* cannot possibly explain the shift in biomedical science, since the USA which has had the single largest expansion of research funding over the past decade, has shown a similar if not larger shift to contract staff (Board on Life Sciences 2005).

Part-time and mixed employment academics

In New Zealand universities in 2003 (the most recent statistics), 39% of all academic staff worked part-time. Women hold a large percentage of the part-time positions, often due to family commitments, with 47% of women working part-time compared with only 34% of men (see page 45, table 4 (Tertiary Education Commission 2005)). Similarly, in the UK, of the approximately 45% of staff who are currently on fixed-term contracts, only 54% have full-time posts (Higher Education Statistics Agency 2004). All New Zealand universities acknowledge the career difficulties faced by part-time staff in their Equal Employment policies. To quote one example, 'Part-time, temporary and casual staff have been included in the list of target groups to ensure that they are not disadvantaged in their work conditions or career development in the University' (University of Auckland, http://www.eo.auckland.ac.nz/eeo).

Additionally, there are sectors of the university where academic research work is balanced with other professional roles. In the Auckland School of Medicine, for example, clinical staff may hold joint clinical and academic posts, but the academic tenths may be far less than 0.5FTE. A recent survey indicates that one third of health services staff may have contracts for

only one year (Pirkis *et al*. 2005). Such staff contribute significantly to the university's research and are vital to the translation of research into clinical policy and practice, but their engagement in research is markedly limited due to external funding constraints and lack of access to internal resourcing (Pirkis *et al*. 2005). In public health disciplines, the quality and robustness of the academic and research work of many part-time researchers relies on or is strengthened by their active participation in community-based or non-governmental organisations, or work in local, regional or national government agencies outside the university environment (Pirkis *et al*. 2005).

External funding opportunities in New Zealand and internationally

In New Zealand the relatively limited level of funding for research compared to other OECD countries is nationally recognised (Kingston 2003; New Zealand Association of Scientists 2005; Tallon 2005). Further, recent science reforms have fragmented funding, making it difficult to take a centralised approach to issues (Devine 2003). As part of this overall lack of coherence, there is no policy for defining a career-track for contract staff from junior to senior levels that is independent of funding of particular research projects. The traditional view that high-quality contract staff will naturally transition to permanent posts when they have completed postdoctoral training appears to prevail within charitable and government funding bodies, and indeed the tertiary institutions themselves, although in reality this seems to be no longer the case for the majority of staff.

The situation for contract staff in New Zealand is more precarious than in most other developed nations, due to the comparatively low and fluctuating levels of funding (Garrett-Jones *et al*. 2004; Statistics New Zealand 2004) and lack of policies that support an integrated career track in research. This problem was highlighted in an open letter to the New Zealand Government in 2004 from scientists (Public Service Association (PSA) 2004). Key issues include:

Few agencies support full-time academic salaries

Many grants, such as those from the charities such as the Auckland Medical Research Foundation (AMRF), do not permit academic salary support. Other grants, particularly from smaller charitable trust grants and even grants from government agencies that are intended to provide early career development, have total grant award limits that have the same practical effect of being insufficient to cover more than token academic FTEs (full-time equivalents). In practice, only a very few funding bodies, such as the Health Research Council (HRC) and Foundation for Research Science and Technology (FRST) will or are able to support senior salaries. Overseas funding available to New Zealanders has similar constraints on FTE support. Grants which will support full-time FTEs, such as those available from the NIH, are difficult for non-US research groups to obtain, given the natural preference to prioritise local researchers. Others do not support the principal investigator's salary.

The double bind

The practical financial constraint on smaller funding bodies is understandable. However, of much more concern is the fact that some grants, including the Royal Society of New Zealand's Marsden Fast-Start (www.rsnz.org/funding) and the HRC's Emerging Researcher grants (www.hrc.govt.nz) require that the recipient already has their own salaried position. It might reasonably be felt that in reality a researcher who already has a salaried position is in a comparatively favourable situation or is no longer really an emerging researcher. Moreover, charitable funding agencies such as the AMRF increasingly require that the applicant has a contract that will last for the full duration of the grant proposal. Given that many junior investigators do not have tenure-track salaried positions and are on contracts lasting only a few years, this means that they either cannot apply for these grants, or can only do so in a limited window of opportunity.

This situation is highly iniquitous, since of course a major part of career development for junior research fellows is to get grants of their own in order to develop their own, independent ideas and research profile, and to demonstrate productivity. Thus having obtained a post, either with a more senior researcher or with one of the few postdoctoral fellowships, the developing researcher has surprisingly limited options to progress their careers.

Fragmentation of funding

The current structuring of funding in New Zealand does not promote continuity and the fostering of long-term development of researchers and programmes of research. Grants to the HRC, for example, which seek to continue ongoing research are treated as completely new grants rather than renewals or re-applications. In some ways this may be seen to penalise junior investigators, who must now compete against senior fellows in the same review process. Conversely, it also means that even successful senior fellows have no reasonable certainty of ongoing funding support, regardless of their previous productivity and performance. Even HRC programme grants (large, multi-investigator, multi-project grants) can only be renewed once, and then must be redeveloped from scratch (www.hrc.govt.nz).

Limited duration of grants

Few research project grants are for more than 3 years. It is often not appreciated that, since it typically takes nearly a year from submission to award and 6–12 months to obtain compelling data for the next application, this schedule means that the researcher will need to begin preparing the next grant, within 12–18 months of receiving the first one. Indeed, many smaller grants (e.g. Marsden Fast-Start grants, Lottery Health, and the AMRF) are only for two years.

Intense competition

The highly competitive nature of research in an extremely limited funding environment means that a large number of grants which are of a high international standard (graded A by international referees) are not funded (New Zealand Association of Scientists 2005). Further, the increased funding pressure has meant that smaller grants, which have traditionally been the primary source for junior to mid-level fellows, are now being applied for by senior fellows in order to 'top-up' their larger grants. This further reduces the capacity of junior fellows to attract independent funding.

Transitional support (and the lack thereof)

There are no formal schemes to provide partial or transitional funding support for salaries in the event of a researcher being unsuccessful in obtaining funding. Indeed, the HRC's Senior Fellowship scheme, which provided a contractual guarantee of up to two years of transitional funding supported jointly by the HRC and the university, was recently suspended indefinitely.

Lack of fellowships

There is no systematic or formally identified approach to career development support through fellowships at all levels. Few junior fellowships exist, and there is no system of mid- to senior-level fellowships. Most of the available fellowships are often further limited by eligibility criteria related to age or time since the award of the PhD degree. Few granting agencies make exceptions for time-out taken for family commitments (which leads to a disjointed track record, delayed entry, or later re-entry into research). Where this exception is offered, the candidate is normally required to make a special case, with no guarantee of being considered. This limitation affects women disproportionately. Similarly, there is generally no provision on fellowship schemes for part-time employment.

These examples underscore the narrow range of opportunities to obtain and maintain continuous funding to support full-time or part-time contract salaries, and highlight the particularly difficult position faced by developing scientists (i.e. junior research fellows). There is an enormous gap between the junior, postdoctoral fellowships and the point at which a research fellow can realistically obtain sufficient project grant support to cover their own salary. US data suggest that the mean age at award of first major project grant for a PhD is now 42 years, and rising. Those with medical qualifications as well were two years older on average (Board on Life Sciences 2005).

The limited contracts offered by many grants (up to three years) further demonstrate why it is difficult for most contract staff to meet the formal eligibility criteria for many grants, thus creating a vicious circle. Gaps between grants are common, and indeed realistically are inevitable. The lack of career fellowship schemes in New Zealand and limited opportunities to obtain academic salary support on grants is in contrast to international trends in our bench-mark countries, such as Australia, the USA, and the UK.

There has been some discussion of the possibility of funding using a less contestable approach (Ministry of Research Science and Technology (MoRST) 2002). Similarly, the broad impact of the recent introduction in New Zealand of the Centre for Research Excellence grants is yet to be formally evaluated. The latter represents new funding, which is almost always a good thing for research! We may question to what extent either initiative will materially improve career development for contract researchers, since it is institutions or centres and not particular researchers who would be given the funding. One concern is whether these initiatives will reduce the flexibility of individual academics to develop individual profiles or to transfer between institutions. It is instructive to note that the equivalent Australian block grants to research centres have been drastically revised, at least partly because of these concerns (Willis 1999).

Situation in other countries

Australia

In Australia, the government-commissioned Willis report highlighted several key issues which impeded scientific progress (Willis 1999). These included the increasing number of contract staff, and their limited career development and funding opportunities. As a consequence of the Willis report there have been significant changes to the Australian fellowship schemes, with the expansion of research career track funding from junior to very senior levels. Further, academics can apply for a fellowship at the time of award of a project grant, which provides cover for two years after that specific project ends, thus firstly separating personal funding from project funding, and secondly providing a dependable time to regroup in cases of complete or partial grant failure. Fellowships and grants are now transportable between institutions, which further facilitates independent career development by research fellows.

In 2002, the Australian government commissioned a further assessment of the implications for universities of changes in the academic workforce and work conditions (Anderson *et al*. 2002). This report concludes that Australian universities have experienced, over the last twenty years, higher student to staff ratios, a shift from collegial to managerial decision-making, greater use of technology and casual staff, and a relative decline in the status, salaries and attractiveness of academic work. This has led to staff feelings of 'frustration and disillusionment' and associated problems of attracting and retaining staff (Anderson *et al*. 2002). The current New Zealand TEC Review acknowledges that the main elements of the Australian experience are rather similar to those in New Zealand, and this will be the focus of phase 2 of their review (Tertiary Education Commission 2005).

USA

In the USA, although few contracts in biomedical science provide full long-term salary support, promotion from assistant to associate professor typically provides both transitional support and partial salary support, usually tied in some way to the academic's teaching or administrative role, in the long-term. Furthermore, it is important to appreciate that although NIH funding is extremely competitive, statistically it is much easier for an established academic to retain or renew an existing grant in the long-term (over 80% success) than it is to obtain new grants (less than 20% success even for very competitive, established academics) (Board on Life Sciences 2005). Thus, pragmatically, once obtained, project funding is much more stable than it is in New Zealand.

Grant and Fellowship schemes at all levels are available from the NIH. Notably, there are specific schemes for junior researchers from studentships to junior fellowships, which means that they do not need to compete against more experienced researchers until they have developed and consolidated their research programmes. Junior fellows are actively encouraged to participate in these schemes for as long as they can before beginning to apply for the standard NIH project grants (which are similar to HRC project grants).

It is acknowledged that the major NIH project grants are highly competitive and require an established track-record in order for candidates to be successful. Despite these training schemes, as in Australia, a recent US government review has highlighted the need to aggressively address career-track development among contract staff in order to improve retention and attract the next generation of scientists, and thus counteract the progressive and seemingly inexorable aging of the scientific workforce (Board on Life Sciences 2005). Of particular importance, there is concern that the study sections for the major type of project grant effectively act as the promotion committees for biomedical science for many institutions (Board on Life Sciences 2005). This arises from the observation that effectively tenure of such grants is required for promotion,

while, in contrast, many of their smaller and start up grants seem to have effectively become stigmatised as grants for 'weak' researchers. Thus obtaining these 'lesser' grants, while allowing some independent research development, did not seem to be associated with greater success in academic promotion or in eventually obtaining major grant support. This extremely difficult conundrum clearly will need to be very carefully considered if it is not to be a major stumbling block for developing researchers.

United Kingdom

In the UK, the Dearing Report into higher education highlighted the problems for research and teaching created by the 1988 Education Reform Act (National Committee of Inquiry into Higher Education 1997). Dearing observed that short-term contracts require proper management if there is not to be "a detrimental effect on the quality of higher education institutions' activities". Since the Dearing Report, the UK Government has further evaluated the issue and acknowledges that to attract and retain staff it is necessary to provide more stable and attractive routes into academia through improved funding strategies and incentives, improved career opportunities for researchers, an assurance of equal opportunities for all staff within universities, limited use of successive short-term contracts, and by introducing regulations against "the less favourable treatment of fixed-term employees", such as equitable access to university resources and engagement by contract staff in all aspects of university life (Department for Education and Skills 2003; Roberts 2002, 2003).

In the external funding sector, The Wellcome Trust (http://www.wellcome.ac.uk/) has recently reorganised their fellowship scheme to offer a more comprehensive career track from PhD to professorial levels. The Trust states that these awards are: 'in order to foster the long-term research careers of our Fellows through increased partnership with host institutions.' This system fosters collaboration between the Trust and universities in terms of developing long-term career strategies for high-quality research staff.

Importance of contract and part-time staff for research and teaching

An emphasis on limited fixed-term contract research, while potentially advantageous in an economically constrained tertiary funding environment, is not without cost to the university as it endeavours to improve performance-based research ratings (PSA 2004; Tertiary Education Commission 2005). Recruitment, retention and development of research staff and students are essential for sustained productivity (Tertiary Education Commission 2005).

The next generation of researchers

Students

A clearly defined and attractive career pathway in research is necessary to attract the next generation of researchers. In New Zealand, MoRST has highlighted two concerns regarding the future supply of science and engineering graduates (MoRST 1998). Firstly, the number of young people graduating with relevant tertiary education must increase. There is a danger that the future pool of young scientists and engineers may well not meet demand and this is against a backdrop of an aging research workforce (Tertiary Education Commission 2005). The second concern is the growing tendency of tertiary graduates in science and engineering fields to be attracted to other non-technical professions such as law and management, including students who have completed PhD programmes. This problem is recognised worldwide (Board on Life Sciences 2005; Roberts 2002).

Career choices for students are influenced by a number of factors: the career path insecurity that researchers face, the perception that research fields (e.g. science and engineering) are relatively hard to succeed in and require too much work and a long period of training, student debt levels, and poor pay levels compared to other employment sectors. Outside of the scientific areas, the comparatively low levels of stipends may be a disincentive to mature candidates who have built up valuable skills in the non-academic marketplace. The prospect of entering an indefinitely long series of postdoctoral research positions in order to pursue the possibility of an academic career is seen as particularly unattractive for many of the best PhD graduates (Roberts 2002).

Postdoctoral junior fellows

Postdoctoral research is a crucial phase in a researcher's career, for it is here that researchers can make a name for themselves through ground-breaking, innovative research (Board on Life Sciences 2005). Indeed, they undertake a large proportion of a university's research work, with the support and/or guidance of their mentors. They are themselves the next generation of mentors. It is also an important phase in which they can develop the leadership skills to undertake their own research projects (Roberts 2002). However, as for students, entering the environment of postdoctoral research work is an uncertain, and for many fellows, unattractive prospect. In the UK, where this has been assessed, it is estimated that although a large proportion remain intent on pursuing academic research careers, fewer than 20% reach a permanent academic job (Roberts 2002).

Attraction and retention of mid- to senior-level staff

Research excellence depends on the development of researchers at all levels, the building of research teams including researchers and support staff (e.g. well qualified and experienced technicians), and the consequent evolution of research programmes and the acquisition of essential skills and capabilities (Adam 2003). For a research team to 'grow' their research to world-class performance levels, considerable time and resources are needed. Maintaining such productivity is equally demanding. It requires long-term commitment from a well-trained multidisciplinary cadre of researchers. Scientific breakthroughs and technological advances are not achieved overnight on short timescales.

In Australia, the UK, and the USA, it is now universally recognised that the lack of a clear career structure and uncertain career prospects for contract staff are major barriers to the recruitment and retention of high-quality research staff, and this in turn impacts negatively on research performance. In New Zealand, there is undeniably a loss of good staff to overseas universities and businesses who offer better pay and conditions (Inkson *et al*. 2005). General salary levels, compressed pay scales between junior and senior staff levels, and an ill-defined career structure are increasingly being recognised as being a significant barrier to attracting and retaining mid- to senior-level academic staff within New Zealand universities and indeed within academia as a whole (Tertiary Education Commission 2005).

The Association of University Staff and the New Zealand Vice Chancellors' Committee have commissioned a joint study by Graeme McNally on academic salaries and government funding to begin addressing these issues. They are also an important part of the TEC Review (Tertiary Education Commission 2005).

Key issues for contract staff

Key issues include:

1. Insecurity, uncertainty and feelings of vulnerability lead to low morale of researchers, especially for those working in organisations where 100% of funding is regularly at risk. This is recognised as a significant problem in New Zealand (Sommer & Sommer1997; Serio & Sommer 2000; Kingston 2003).
2. Low morale and frustration also occurs when there is a perception that inequality exists in the way contract and permanent staff are treated (Bassett 1998). Inequitable access to internal research grants and to many government and charity developmental grants is a major example of this. Many staff feel that they are seen as 'expendable' because of their status and thus not 'real members' of the university. This is reinforced by the common reference to contract staff as 'temporary' versus tenured staff as 'permanent'. In turn, low morale and feelings of marginalisation or disenfranchisement of the workforce leads to loss of engagement in research and teaching and thus loss of productivity.
3. Funding insecurity often leads to failure to retain staff through both funding shortfalls and staff leaving to take up other more secure and better paid opportunities. This results in a loss of essential skills and capabilities, and slows or reduces research productivity (Department for Education and Skills 2003). Those who stay report lower achievement and motivation than those who work in overseas institutions. However, inferior salary levels, poor conditions, lack of incentives, and significant job insecurity all play a role in promoting this (Collins 2003; PSA 2004; Tertiary Education Commission 2005).
4. Short-term contracts lead to fragmented research time and impede consolidation of research effort and funding, and dramatically increase the portion of contract staff time that is spent writing grants in order to secure salary support. This added burden reduces available time for research and teaching. These factors compromise the quality and quantity of results and the development of experience which underpins scientific capability (PSA 2004).
5. The need for contract staff to request their salaries on grants, and, in New Zealand, the need to include overhead payments in the grant, dramatically increases the total amount of money typically requested on grants. When compared to similar grant applications from tenured/permanent staff, who do not need to request the same level of salary support, grants from contract staff are not always seen as competitive, i.e. they appear to be 'less good value for money'.

It will be apparent from this discussion that money and career development are closely interlinked. Simply providing greater support for research without reforming the career structure would merely defer the problems in to the future.

Role of the researcher in teaching

Academic staff contribute to a university's research performance both directly, through innovative research and knowledge transfer activities, and through training the next generation of researchers. Moreover, high-quality research significantly underpins a surprising proportion of undergraduate and graduate teaching (New Zealand Association of Scientists 2005). It is improbable that New Zealand could just 'buy in' research from overseas. To implement the results of research, whether from New Zealand or overseas, we need to have many highly educated people in many different areas (Adam 2003). Effective learning requires doing and thinking – few of us learn much in the darkened lecture hall, alone. Thus it is vital for New Zealand to maintain a cadre of internationally competitive scientists and teams within the education system in order to provide the opportunity for this learning. Contract staff now constitute a high proportion of the members of those teams, performing a substantial amount of teaching within the university, not only of research students, but also basic undergraduate and graduate teaching as well. Thus contract staff attract high levels of support through grant overheads but also through student funding. While this contribution to teaching is well understood, it is not generally formally recognised, and in most cases it is not remunerated.

Recommendations

Strategies for addressing the issue of contract staff and their role in high-quality research are already being developed and refined internationally. This provides the New Zealand research community with a template for developing similar strategies to address the specific issues faced by our own researchers. Such strategies must focus on the two complementary issues— money and career structure:

1. There must be a significant increase in the level of government funding of research as a percentage of GDP

It is clear that:

- The major structural solutions required to improve the development of research proposed below cannot be resolved without both more money and strategic co-operation between the Government, the funding agencies, and the universities.
- A simple increase in funding will not be sufficient without a change in the culture of funding to one which balances contestability with the need for continuity and long-term development.
- The solution to the need for funding is not increased commercial involvement. While acknowledging that links with industry play an important role in fostering some types of research, particularly at the point of transition to clinical or consumer, such links cannot replace or generally fulfil the role of government in research funding. Indeed commercial links are recognised as having the potential to undermine basic research, the quality of tertiary teaching, and fundamental academic freedom (PSA 2004). The potential for industry sponsorship to compromise the reported results of clinical trials has been recently highlighted (Mello *et al*. 2005).

2. It is essential to tangibly recognise contract staff as central and critical to the pursuit of research excellence by supporting a more stable career structure

Key elements of this would include:

- The need for career scholarships and fellowships, from the level of student to senior staff member, which are independent of research grants. The number of existing junior fellowships should be significantly increased, and a new range of new mid- and senior level fellowships created. Postdoctoral fellowships should be a minimum of three years, junior to mid-level career fellowships for five years, and senior fellowships for ten years. Fellowships should not be limited by only a small number being available.

- The need for partnership programmes with government and funding agencies to develop ways of ensuring these career programmes are implemented, and to provide clearly identified processes for transitional funding to support researchers when grants are unsuccessful.
- Aiming to identify researchers with an academic career track potential early in their careers. To facilitate the progress of those identified, institutions may need to underwrite salaries in order to recruit or retain such staff.
- Ensuring that staff who are identified as career-track academics capable of developing and sustaining productive research portfolios do not normally remain on a series of short-term research contracts for a long period, particularly within a single institution.
- Acknowledging and clearly supporting the role of part-time staff (both contract and permanent) in research productivity. Ensuring that women and minority groups are not disproportionably disadvantaged through being employed on short-term or part-time contracts.

Conclusions

This review highlights an important policy issue, in that we found that there are no systematic data to quantify the changes over time or current extent of New Zealand's dependence on staff employed on internal and external contracts for tertiary research and teaching. To allow informed policy to be formulated, priority should be given to formally documenting this issue.

Realistically, the substantial policy changes required to resolve the problems faced by contract research staff cannot possibly be made by any one tertiary institution in isolation. Such changes require a strong partnership between the universities, government, and funding agencies. The recently announced Tertiary Education Commission Strategic Review of the Tertiary Education Workforce provides a major opportunity for universities to begin addressing these issues and develop strategies which address the needs of the academic workforce as a whole. Without such substantive changes, the drive to develop a knowledge economy is likely to stall for lack of critical mass in the workforce.

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