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The new tools of the science trade: contested knowledge production and the conceptual vocabularies of academic capitalism

Over the last three decades, scientists at research universities have responded in a wide variety of ways to the pressures of academic capitalism. Institutional research has under theorised this trend by assuming entrepreneurialism passively follows formal organisational change. In contrast, I treat academic capitalism not as *a fait accompli* but as a complex field characterised by contested knowledge production. An increased emphasis on knowledge capitalisation does not necessarily displace traditional academic values, although it may, but it has facilitated the diffusion of conceptual vocabularies that are retooling scientific culture and practice at the centre and margins. These vocabularies are (1) market-oriented entrepreneurialism, (2) external consulting work, (3) consumer-oriented research, and (4) interdisciplinarity. Their impact is diffuse across units, but involves processes of group and individual adoption, adaptation or resistance, as the case may be. Their local flavour varies by research domain, level and type of university embeddedness, and epistemic identity.

Key words organisations, institutional change, university–industry relations, science, knowledge production

Introduction

Academic capitalism is the zeitgeist of the contemporary research university. Consider a typical workday. I began by reading an email newsletter from my university's technology transfer office. The headline story discussed a report on the large number of 'angel investors', or venture capitalists who descend from the heavens to sprinkle money on university-based research and development (the heavenly metaphor proves limited if we consider equity agreements). Next came a story on the annual Inventors and Entrepreneurs Reception, which noted that university patents had doubled in recent years. Then a feature on the 'visionary innovator' and winner of the 'Entrepreneur Spirit Award', a colleague who partnered with an area cancer research institute to bring a surgical simulator to the medical technology market. An hour later, at a faculty meeting, I learned that the Dean was encouraging us to become 'more entrepreneurial' in the face of state budget cuts. At least our satellite programme in Singapore was growing and bringing in needed funds for a variety of departmental initiatives. Global academic entrepreneurialism was paying off, in part. Upon return to my office, I checked my

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email again and found an ad for a web-based course that promised to save 'hundreds of frustrating hours going down needless dead-ends' when commercialising research findings.

In isolation, it might be possible to ignore these multiple indicators of academic capitalism.[1] In concert, they reflect a significant push toward knowledge capitalisation at research-intensive universities.[2] The newsletter highlighted a regional economic ecology conducive to commercialisation. The message from the Dean's office suggested that marketing our research skills is a legitimate professional activity, one to be encouraged given the state's and public's waning commitment to fund higher education. And lastly, given that many faculty worry about having the savvy to explore such possibilities, and nearly all of us lack formal training in entrepreneurialism, there was a convenient cottage industry of web-based seminars.

This confluence of events was indicative of a broad-scale reorientation of academic culture within large, research-intensive public and private universities over the last three decades. The first pillar of the university, which emerged from the monastic tradition in medieval Europe and characterised the institutions of the American colonies, involved the instruction of accepted scholarly and theological knowledge, mental discipline, and civic leadership. The second pillar was the production of new knowledge, which emerged with the Enlightenment and diffused globally through the 19th century. These two pillars, teaching and research, long lived side-by-side, sometimes in complement and other times in conflict. However, the two missions were fused by a social charter backbone oriented to a broad vision, vaguely specified by civic and academic elites, of the university's role in promoting the public good and civil society. In the last three decades, this charter has been increasingly remade to include knowledge capitalisation, revenue generation and economic growth (Etzkowitz et al. 2000; Geiger and Sá 2008; Gumport 2007), igniting controversies over whether the public good side of universities are being shoved aside by initiatives aimed at capitalising university assets for revenue generation.[3]

1 I use the term academic capitalism, instead of the too metaphorical 'entrepreneurial university', or the overly specific 'patent grant institution' (Rhoten and Powell 2010) for much the same reason as Slaughter and Rhoades (2004; see also Hackett 1990). The term capitalism is both more precise and more inclusive than entrepreneurialism. The latter refers to risks associated with an enterprise of some kind, whether on the private market or some other exchange. One can be an entrepreneur of research without seeking to monetise it. Capitalism signifies a social structure predominately characterised by private ownership of goods and services exchanged on a pecuniary market. It is more inclusive because it refers to a wide array of mechanisms for attracting revenue, from direct market activity such as patenting, licensing and short-term production contracts to market-like behaviour such as grant competition, short-term teaching programmes, institutes or certificate programmes.

2 For the sake of analytic simplicity, I am collapsing the complex distinctions between public and private research universities with this term. However, I note from time to time where the analysis is particularly relevant to public institutions.

3 The history of research-intensive universities and their relationship to the public good is a complex one, far beyond the scope of this paper (but see Hackney 1986; Lucas 1994; Rhoten and Powell 2010). In the United States, for example, the public land-grant universities established in the 19th century involved an intertwining of knowledge production, public service, and federal and state subsidy for economic growth in agricultural and industrial infrastructure. In the decade leading up to World War II, and the decade following it, there was a significant shift toward a federal science policy that increased support for basic scientific research that, in the language of Vannevar Bush's

Alongside this emphasis on knowledge capitalisation has been a parallel development – massive growth at the administrative and managerial tiers of universities (Brainard et al. 2009) and the relative disempowerment of faculty within university governance (Ginsberg 2011). Some scholars have discussed this growth as both response to and constitutive of an 'audit culture' within higher education (Shore 2008), indicative of a shift from the discourse of university governance and academic freedom to a discourse of corporate management and coercive accountability (Wright and Rabo 2010).

This reorientation, whether we call attention to its different aspects with descriptive terminology like the entrepreneurial university (Clark 1998; Etzkowitz 2003), the patent grant university (Rhoten and Powell 2010), the all-administrative university (Ginsberg 2011), or academic capitalism (Slaughter and Leslie 1997; Slaughter and Rhoades 2004), poses significant challenges to universities as complex systems. One challenge involves competency and motivation, in the sense that few academics receive formal training in commercial activity and significant numbers have reservations about engaging in it. As Tuchman points out, for an audit culture to work, the university and its members must make themselves auditable, or 'entities that can be defined, delineated, and measured' (2009: 11). Another challenge involves institutional risk, in the sense that prioritising the profit motive threatens the social legitimacy of academic science by engendering incentives for secrecy, the withholding of results, conflicts of interest, and the demise of science aimed at the public welfare.[4] While these challenges should be taken seriously in terms of research policy and university governance, my focus is on how such dilemmas, and in particular the ways they are confronted, mould institutional change itself.

Academic capitalism offers an analysis of a Bourdieuian contested field *par excellence*, in which multiple actors are negotiating the definition of the organisation and its central missions (Cyert 1992 [1963]), how it should be embedded in its larger organisational and economic ecology (Pfeffer and Salancik 1978), and how different forms of cultural and social capital ought to be valued, rewarded and internalised (Bourdieu 1984 [1979]). For Bourdieu, a field is the site of struggle over relative position in an institutional domain of social life. It is in the complex position taking of faculty, researchers, students, administrators, professional staff, government officials and policymakers, industry stakeholders and investors, as well as journalists and other external critics, that a complex and often contradictory institutional model of the 21st-century research-intensive university is being remade.

I argue that an increase in market-orientation has not displaced more traditional academic practices and values but has facilitated the development of new conceptual vocabularies that are subtly remaking academic practice and culture. The four main vocabularies are (1) market-oriented entrepreneurialism, (2) external consulting work, (3) consumer-oriented research and (4) interdisciplinarity. Each involves a set of commonly (if loosely) understood concepts, technical definitions and ways of knowing that have become deeply entangled in the academic field. Ground-level reactions and

famous report to the President, risked being 'cultivated inadequately if left without more support than will come from private sources' (Bush 1945). This federal policy provided the material basis for the mythologies, values and practices that broadly characterise the federal grant-driven research university until the early 1980s.

4 For the classic statement of the four norms of science, see Merton (1973 [1942]). For a classic statement of how academic capitalism can pervert them, see Krimsky (2004).

decision-making to these new tools of the science trade are fraught and varied, ranging between *adoption*, *adaptation* and *resistance*. For examples, I draw from my own ethnographic case study of two high-tech computer science labs and a number of secondary sources. While the local flavour of these vocabularies varies by research domain, embeddedness of the university in different regional and national economic ecologies, and researcher-level epistemic identity, their impact on academic culture is highly diffuse. Scientific practice at the ground level depends on the scientist's or scientific group's relative position within their organisational field and strategic reaction to the new rules of the game. I conclude with implications for university policy and management, organisational studies of institutional change, and the remaking of academic science.

The rise of academic capitalism as model, ideal and contested institution

A broad if far from unanimous consensus emerged in the late 1970s and early 1980s among American and European policymakers, entrepreneurs, corporate leaders, economists, as well as many academic leaders that universities should strive to contribute directly to regional and national economic growth (Bok 2003; Etzkowitz 2003; Geiger and Sá 2008). This arose, in part, from the example of the rapid commercialisation of the biological sciences in the late 1970s and 1980s (Krimsky et al. 1991). The money brought in by these firms opened administrators, policymakers, industrialists and researcher's eyes to the possibilities of capitalisation as a mostly untapped source of university revenue. Bio-tech became the template for new forms of university–industry collaboration (Etzkowitz and Leydesdorff 2000).

Particularly in the United States, due to its comparatively large university research output, but also in Japan and the Nordic countries, policymakers argued for more efficient linkages between academic centres and corporate R&D. Simultaneously, corporations began scaling back their R&D departments and looked to research universities for competitive advantage. While national policy regimes shaped the particular ways that universities became entangled in such collaborations, and despite occasional state-based exceptions (Centellas 2010), the overall pressures associated with academic capitalism have been isomorphic on a global level (Frank and Gabler 2006). To be sure, such entanglements are not altogether new (see Bush 1945; Mowery et al. 2001). However, they represent a significant change in kind and extent (Rhoten and Powell 2010; Slaughter and Rhoades 2004). The institutional model that has emerged is one in which the state's job is to facilitate university–industry partnerships through incentives, weakened regulation on technology transfer, subsidy or some combination thereof. Henry Etzkowitz and his colleagues call this a 'triple helix' model oriented to increasing research interaction at the university–industry–government interface (Etzkowitz 2008).

Reactions to this model were mixed and contentious from the start. Some organisational scholars advocated for greater university accountability by bringing a 'hard management' style to university life (e.g. Clark 1998). The idea is that such practices improve innovation by opening up the slow-paced 'Ivory Tower'. Others express significant reservations, ranging from accusations that higher education has been 'McDonaldized' (Hayes and Wynyard 2002) to more careful work on research

policy assessing corporate influence over research design, publishing patterns, patenting trends and choice of topic.

Overall, the scholarship on this trend places a heavy emphasis on formal and direct ties between industry and university. One strand has been to document ethical violations or departures from Mertonian norms of science. A second focus has been on formal industry–university partnerships and the hybrid organisational structures developed to maximise research capitalisation (Etzkowitz et al. 2000; Gieger and Sá 2008; Slaughter and Rhoades 2004), ranging from research parks to on-campus commercial incubators to technology start-up companies. A third emphasis has been the large growth of non-academic staff and administrators (senior marketing and HR executives, administrators and non-academic staff), the rise of accountability regimes, and the stagnation of the size of full-time, tenure track faculty (Slaughter 2010). A final focus has documented the scientific impact of patenting law and new legal regimes intended to enhance the ability of universities to commercialise academic research (Owen-Smith et al. 2002; Powell and Snellman 2004). Organisational scholars have engaged in a lively and useful debate on the merits, history and consequences for scientific innovation of the loosening of entrepreneurial restrictions (Mowery et al. 2001; Murray 2002, 2010; Popp Berman 2008).

While this body of research provides insights into the formal restructuring of the academy, an emphasis on direct ties has several limitations. As my opening vignette suggested, even though my experiences would never show up in descriptive statistics on university–industry relations (UIRs), as I have few, my day was filled with empirical traces of these ties. Whether or not I directly engage in research capitalisation is important but a bit beside the point. Academic capitalism pervades the profession, and organisational scholars of all stripes need to get a better handle on this hidden dimension of a complex institution.

At an aggregate level, the emphasis on formal ties is disproportionate with material reality. For example, Table 1 shows that in the US, the vast majority of university research money still comes from the federal government. An even larger proportion comes from a combination of federal, state and local government alongside other funding institutions. Industry is the smallest funder, and not by a little.

Thus, formal partnerships and direct funding ties between industry and universities are a relatively minor contributor to academic research expenditure (about 6% in 2009, and this has remained steady over the last decade). And while industry as a source of funds for university research varies by research area and academic unit, it is still the case that even within biotechnology, direct university–industry collaboration only made up about 25% of incoming research in 2006 (see Kleinman 2010). Therefore, when scholars focus their attention on direct ties between universities and industry, they run the risk of being dismissed as making much ado about nothing.

These funding statistics are not meant to downplay the importance of knowledge capitalisation. Instead, the problem is that the diffuse impacts of knowledge capitalisation can be minimised when scholars focus on direct ties that are a relatively small proportion of 'where the action is' (Goffman 1961). The focus on formal organisation elides the subtle ways that commercial pressures remake university culture and scientific practice. Consider my Dean's casual advice that faculty become more entrepreneurial. Although this advice was exceedingly vague, it was clear that he meant something more than presenting research at academic conferences or publishing in peer-reviewed journals. Perhaps being entrepreneurial involves the ability to derive catchy marketing

Table 1: S&E R&D expenditures at universities and colleges: FY 2004–09 (Millions of current dollars)

Source of funds and character of work	2004	2005	2006	2007	2008	2009	% change 2008–09
All R&D expenditures	43,258	45,799	47,751	49,493	51,934	54,935	5.8
Source of funds							
Federal government	27,644	29,209	30,128	30,443	31,281	32,588	4.2
State of local government	2,879	2,940	2,962	3,143	3,452	3,647	5.7
Industry	2,129	2,291	2,402	2,670	2,865	3,197	11.6
Institutional funds	7,753	8,266	9,062	9,705	10,408	11,198	7.6
Other	2,852	3,093	3,196	3,533	3,928	4,305	9.6
Character of work							
Basic research	31,968	34,367	36,076	37,725	39,408	40,955	3.9
Applied research and development	11,290	11,432	11,674	11,768	12,526	13,980	11.6

S&E=science and engineering.
NOTE: Because of rounding, detail may not add to total.
SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges: FY 2009.

slogans for research results. Maybe it means coming up with research projects that will lead to both basic and applied insights. Whatever, its force was in the taken-for-granted fashion in which the language of pecuniary markets enters everyday discourse.

The new tools of the science trade tend to be conveyed in a notably casual fashion. It is through this studied casualness that they gain their power and influence. The language and vocabularies attached to them become *doxa*, converting an ambiguous or multivalent term, belief, or class of activities into something that appears self-evident because it 'goes without saying because it comes without saying' (Bourdieu 1977 [1972]). New conceptual vocabularies filter throughout the university, not just to those research fields, units and researchers most likely to turn up in descriptive statistics on university-based patent filings or external consulting contracts. They become part and parcel of academic culture, subtly reshaping the normative assumptions and administrative expectations for how science is done.

Methods

This paper provides an overview of the main conceptual vocabularies of academic capitalism, purposely switching between levels of analysis in an attempt to capture both the institutional and interactional scales of change (for a more elaborate justification of this methodological choice, see Vaughan 2004). It draws on both primary and secondary sources for examples, although it is heavily biased toward ethnographic reportage. In my discussion of ground-level science, I pull examples mostly from my three-year comparative ethnography of two Artificial Intelligence labs located in the same department of computer science at a prestigious and well-endowed private university in the American mid-west (conducted from 2003 to 2005 with follow-up observations in the summer of 2007). The university is generalist or liberal arts in orientation, not cut in

the model of a technical research university like Carnegie Mellon or MIT. Each lab was chosen to exemplify divergent approaches to the pressures of research capitalisation, and are used to theorise from extreme cases rather than controlled comparison (Stinchcombe 2005). I collected extensive observational, interview and archival data (i.e. lab papers, documentation, memos, emails, etc.) at both.

A full description of each AI lab is unnecessary for the purpose of this article, but is readily available upon request. Briefly, however, the IntelliLab is an information-processing lab that focuses on information classification and retrieval, drawing on an array of AI techniques but based primarily in the sub-field of case-based reasoning. The vast majority of its research projects are externally funded by the IT industry, the arts and entertainment industry, and venture capitalists. The co-directors of the IntelliLab maintain extensive social and professional networks within these fields. The QualGroup is a lab working on computer systems that can reason using analogy, and is based in the AI subfields of 'knowledge representation' and 'qualitative reasoning'. The QualGroup was, by far, the most well-endowed and largest CS lab on campus. It received the vast majority of its funding from the US Department of Defense, the US Naval Academy, the National Science Foundation and the US Department of Homeland Security, and the head of the lab maintained both thick and thin ties to research scientists working at these agencies, other researchers in the field of cognitive psychology and cognitive AI, and with military commanders (some of whom were university alumni).

In addition to lab observations, I pull examples from a number of secondary sources. These include, but are not limited to, the recent collection of case studies of university reform in *Social Anthropology*, a review of university–community partnerships in South Africa (Subotzky 1999), and the well-known study of American higher education by Slaughter and Rhoades (2004).

The new tools of the science trade

The underlying assumption of much of the organisational literature on university research capitalisation echoes the Hollywood movie, *The Field of Dreams*: 'If you build it, he will come.' But scientists do not respond mechanically to the pressure of policymakers, corporate investors and administrators.[5] Universities are heterogeneous and complex organisations in which change is lumpy, unpredictable and typically contested. The skills necessary to play this new game must be learned and, in many cases, resisted or, perhaps, ignored (which can be a form of resistance or adaptation depending on the circumstance). In all cases, the game forces a response of some kind,

5 There is a resurgent emphasis in institutionalist research on the importance of local adaptations to external institutional pressures, such as Hallett and Ventresca's (2006) 'inhabited institutions', Powell and Colyvas's (2008) 'microfoundations' of institutional change, or the 'creative syncretism' of local actors (Berk and Galvan 2009). To be sure, local adaptations are also a key theme in much of the best empirically oriented institutional research of the 1980s and 1990s (e.g. Barley 1986; DiMaggio 1982; Heimer 1999; Hutchins 1995). Indeed, the newer work draws much of its inspiration from parts of the 'old institutionalism' highlighted so well by Stinchcombe (1997). I like to consider myself a contributor to this tradition, although by now I think we have more than enough conceptual terminology to describe the general emphasis.

even if that response involves apathy. Slaughter and Rhoades (2004) point out, for example, that

> The academic capitalist knowledge/learning regime coexists with the public good knowledge regime. Some heads and many faculty who came into the institution under an 'old regime' with a different set of values attached to academic work coexist with newly arrived faculty and heads, some of whom are committed to a more entrepreneurial conception of academe. (2004: 196–7)

The distribution of faculty who adopt, resist or adapt to the pressures of academic capitalism directly influence the flavour of research capitalisation within specific university settings.

It is a mistake to reify a current distribution into a timeless institution, although this is the tendency when scholars present descriptive statistics of direct industry–university–government ties. Relative positions within a field are contested and re-contested. Bourdieu stressed this in his discussion of struggles over social position within fields:

> The social positions which present themselves to the observer as places juxtaposed in a static order of discrete compartments, raising the purely theoretical question of the limits between the groups who occupy them, are also strategic emplacements, fortresses to be defended and captured in a field of struggles. (Bourdieu 1984 [1979]: 244)

The large body of research that is highly critical of the commodification of university research provides a few obvious indicators that academic capitalism is a contested field. Members of research-intensive universities are also engaged in an ongoing struggle over which forms of social and cultural capital ought to be valued within the institution. I turn now to the four main arenas of this struggle.

Market-oriented entrepreneurialism

The conceptual vocabulary of market-oriented entrepreneurialism involves an implicit expectation that researchers develop fluency with the concepts and practices related to investment and stock portfolios, intellectual property and technology transfer law, market forecasting and accountability metrics like work process efficiency and productivity ratios (for an overview across multiple sectors, see Boström and Garsten 2008). The specific terminology of these vocabularies may be quite different. Proficiency in one does not ensure success in another, although mastery of all can have a multiplicative effect. For example, knowing the steps it takes to successfully apply for a patent on intellectual property may not lead to an accurate risk assessment for marketing that property. Doing both, however, can lead to revenue generation and university-wide entrepreneurial spirit awards. Thus, what holds market-oriented entrepreneurialism together as a loosely stitched conceptual vocabulary is that each of these areas involves terms, skills and assessment methods oriented to the marketing of university assets on a pecuniary market.

Faculty outside management, finance or property law are unlikely to have had formal training in any of these areas, so the transaction costs of learning them

are non-trivial. Also non-trivial are the coercive accountability mechanisms used by administrators to track the adoption of market-oriented entrepreneurialism, such as yearly reports that ask for patenting and tech transfer data, regardless if the faculty's research domain has any commercial ambitions.

Researchers have responded to this conceptual vocabulary in a variety of ways.[6] Researchers who see little to no conflict between scientific knowledge advancement and academic knowledge capitalisation will tend to *adopt* market-oriented entrepreneurialism (Stokes 1997). In fact, these 'new school' professors (Owen-Smith and Powell 2002) believe that the academy is enhanced by the emphasis on commercialisation. New schoolers seek to master a new set of skills or sub-contract that fluency out (for example, by relying on the staff of a tech transfer office for the legal aspects of the patenting process). *Adaptation* to market-oriented entrepreneurialism is a more complicated and varied response, typically involving tolerance for commercial activity while struggling to maintain a focused symbolic boundary between industry and the academy.[7] The QualGroup, for example, largely maintained its self-identification as 'hard' scientists and experimental research, but would, somewhat reluctantly, become enrolled in short-term commercial endeavours if members were unable to secure research support from either government agencies or foundations that still tend to prefer projects that can at least reasonably pass as having a significant 'basic science' component. Adaptation, then, encompasses both the 'reluctant entrepreneur' and the 'engaged traditionalist' in Owen-Smith and Powell's (2002) four-fold typology (which they derived from biologists, but can be applied generally to a wide variety of disciplines).

Finally, the 'old school' faculty (old not referring to age but to an allegiance to the scientific practices and boundaries typified by Mertonian norms) who *resist* must become fluent enough to contest its efficacy for university life in general or show how it is problematic for their research domain in particular. Resistance takes on a wide variety of forms, from faculty who dismiss corporate funding as 'dirty money' (Slaughter et al. 2004: 134), the idea that commercial pressures have 'McDonaldized' higher education (Hayes and Wynyard 2002), or data that demonstrate the winnowing of researcher autonomy (Ginsberg 2011), access to data and experimental tools (Murray 2010), and case selection (Kleinman 2003). Not surprisingly, the vast majority of these resisters or critics of academic capitalism can be found in those disciplines furthest removed from direct market potential, such as the humanities and social sciences.

At the level of daily practice, market-oriented entrepreneurialism frequently involves the crafting of marketing buzzwords and 'new' managerial practices for measuring performance. Most common are vague descriptors of university policy, such as 'freedom' and 'transparency', or words that connote performance, like 'accountability' and 'excellence'. These terms are used by administration to label, motivate and coerce faculty across the disciplines, no less in the humanities than in

6 This does not only impact faculty, of course. It is a significant source of resistance among student groups and advocates for liberal arts education too, as documented in Oxlund (2010). The impact on university life beyond faculty research is beyond the scope of this paper.

7 Examples can be raised that demonstrate that this boundary was always firmer on the symbolical level than in practice. To name a few, consider the university–industry–state collaborations characteristic of the land grant university, or the 'human relations school' of industrial psychologists led by Elton Mayo, or Columbia University's Bureau for Applied Statistics. Such examples are, however, anecdotal, typically involved non-profit research programmes, and were neither as widespread nor pushed so forcefully from the administrative level as are the contemporary analogues.

the technical sciences. Wright and Rabo (2010) provocatively label these terms 'weasel words', in the sense that there is little to disagree with in their lexical meaning but their sense gets shifted toward specific practices within the new rationality of governance (e.g. standardised annual performance reports that include metrics for faculty patents and industry collaboration). Cris Shore (2008, 2010) ties this to an 'audit culture' in higher education, documenting how accountability practices forge new regimes of power via increased self-regulation and internalised discipline (see also Sauder and Espeland 2009).

I observed how market-oriented entrepreneurialism can subtly remake scientific practice and even ontological assumptions in my ethnographic observations. The IntelliLab, in particular, adopted a vocabulary of branding and organisational culture, in a fashion strikingly similar to the branding practices of corporate marketing (Hatch and Schultz 1997). In addition to viewing their work as 'cutting-edge' and their organisational structure as 'transparent', members of the IntelliLab routinely mentioned that a common thread running through their research projects was the desire to 'remove friction' between a user and relevant information. This phrasing was mentioned repeatedly in publications, dissertations, project descriptions, in the lab's online mission statement, during interviews, during project meetings and during informal lab conversation.

The phrase was not just a buzzword. It profoundly structured their science. The group based its cognitive model of intelligence on the theory that higher-level sentient beings seek to minimise stress on decision-making. That is, intelligence, according to the IntelliLab, was the ability to remove friction between an actor and the information needed to accomplish a pre-defined task. Equipped with this ontology of intelligence, along with the conviction that computers are far better memory and computational devices than the human brain, members developed sophisticated search algorithms for information-intensive tasks. These tasks could range from mall shopping to internet data mining to corporate database analysis. Members then wrote scholarly reports that demonstrated how their search systems significantly improved the performance of human users on a number of search tasks. Performance metrics were represented as proof of non-human intelligent decision-making and scenario planning. That is, improving search performance above the human baseline that predated the introduction of an IntelliLab system was presented not just as an efficiency improvement but also as an indicator of the native intelligence of the IntelliLab's computer system. In this epistemic model, science and engineering have fully merged. We have entered a science of impact rather than a science of representation.

Their catchphrase or brand, 'removing friction', served as a master frame for IntelliLab decision-making on project selection, methodology and design choices. It simultaneously served as a symbol for the group's sense of local culture, a selling point for the group's commercialisable products, and the basis for their scientific knowledge claims. The co-directors of the IntelliLab, along with well-socialised members, did not believe there was any contradiction between their commercial entanglements and their scientific work. Rather, they tried to articulate how these entanglements improved both. In fact, many members revelled in poking fun at 'traditional AI' labs (their favourite target was their closest neighbour, the QualGroup), predicting that a focus on narrow and esoteric problems would soon collapse under the weight of its own self-important arrogance, especially as the government science agencies were starting to demand greater return on investments. When I asked them about the future of AI science, nearly every

member of the IntelliLab suggested that their lab's culture and practices were the way forward.

The content of a group's brand will vary by research unit and niche within particular economic ecologies. However, the pressure to develop literacy in the vocabulary of market-oriented entrepreneurialism will typically involve this type of symbolic work. What is striking is not so much that researchers seek to carve out a distinct identity but how this branding imports marketing theory into scientific practice.

An emphasis on market-oriented entrepreneurialism is also at the centre of new forms of intra-organisational inequality at research-intensive universities, particular between those academic units that are engaged in capitalisation and those that express greater ambivalence, resistance or ignorance. This dynamic taps into a long-standing rivalry, with the natural and hard sciences on one side and the humanities and social sciences on the other. It also creates stratification within schools, programmes and departments. Active resistance to market-based entrepreneurialism requires faculty to establish lines of attack that problematise both the conceptual rationales for commercially-oriented research and, increasingly, offer alternatives to the material incentives of research capitalisation (Slaughter and Rhoades 2004). While much of the ideological battle at the faculty-level involves issues of epistemology and methodology (academic freedom, communalism, objectivity, basic vs applied science, etc.), the shrinking of public investment and neo-liberal retrenchment of the state from public higher education is an obdurate material reality with its own momentum. Thus, even when researchers refuse to participate in the game, the institutional field structures their moves within it, a key insight for a Bourdieuian analysis of the subjective deployment of social and cultural capitals with an objectively structured field of interaction.

External consulting work

A second key conceptual vocabulary, and arena of contestation, is external consulting work. This directly involves faculty who leverage their research expertise within an external organisation. Direct engagement involves the ability to broker boundary-spanning professional networks, engage in organisation-specific needs assessment, and the ability to negotiate work contracts and non-disclosure agreements through corporate hierarchies. The key point of tension within this conceptual vocabulary is the question of scientific autonomy, or who sets and controls the research agenda.

Consulting work is, by most measures, the most common and historically long-lived interface between university and industry, more so than patenting and licensing (Slaughter and Rhoades 2004). While consulting can generate revenue, researchers also report a wide array of problems. These are most often related to nondisclosure agreements, or agreements that require the consultant to withhold findings during the pre-publication process. Some experience this as a relatively minor nuisance: 'Most professors normalized the constraints – pre-presentation, prepublication, nondisclosure agreements – that corporations imposed on their consulting agreements and managed to publish regardless. Even when there seemed to be egregious violations of traditional academic norms ... professors were willing to excuse it and work with the company' (Slaughter and Rhoades 2004: 121). Other faculty in Slaughter and Rhoades' study had more trenchant complaints, including the 'sanitizing of a thesis', having to pass publications through corporate hierarchies before sending results to publication venues,

and having to eliminate some of the data analysis due to concerns over market competition.

Given these complications, the adoption of external consulting work involves cultivating fluency with the crafting of corporate non-disclosure agreements. This ability, along with maintaining a much wider array of professional networks, has become an increasingly important source of social capital in the science trade. For example, several of the PhD candidates and graduates of the IntelliLab utilised their training to do external consulting work for the communication industry on a full-time basis. At the same time, most continued to co-publish research articles and conference papers with members of the academic lab, practising what Powell and Sandholtz (forthcoming) colourfully label 'amphibious entrepreneurship' by exporting parts of their academic science to industry while simultaneously importing commercially-derived practices to the lab. In fact, their peer-reviewed science publications added to their professional credibility within their industry networks.

External consulting work can take on interesting hybrid forms among those units that try to adapt more traditional scientific values to it. For example, Ylijoki (2003) documents how changes in the funding structure at a Finnish university presented significant challenges to the history programme there. This involved a move away from the individual-based, curiosity-driven model of scholarship long characteristic of the discipline and department to one that looked more like a Mode 2, project-based approach (Gibbons et al. 1994). This even involved contracts to write histories for private companies. However, Ylijoki points out that the traditional values and practices of her historians did not simply disappear: 'Although historians have established projects and obtained finance for them, they still continue to work in their traditional ways … [they] succeeded in accommodating their external pressures quite successfully to their own traditions, values, and ideals' (2003: 314).

Another example of adaptation to external consulting work involves faculty who develop ties, and in some cases contractual obligations, with external partners working on community development, service learning, a variety of social justice programmes, or other forms of university-based 'outreach' research. These kinds of partnerships are particularly prominent within the social sciences and civic engagement programmes are increasingly included in public research universities' strategic reform planning. Examples include urban community development programmes that partner academics with local housing activists, rural satellite campuses that focus on bridging theory with community practice, or academic involvement in community health clinics and urban agriculture. As Subotzky (1999) points out in his analysis of South African collaborative community partnerships, such programmes can offer 'complementary alternatives' to the industry-oriented 'triple helix' model and Mode 2 knowledge production. Such programmes are particularly appealing to faculty who resonate with the general idea that the academy should be responsive and responsible to its community, yet worry that a commercial orientation leaves out large swaths of that community.

Members of research universities who actively resist external consulting work focus on how such partnerships abridge academic freedom and curiosity-driven research. They might also point out that the vast majority of the university support for this type of work does not go to community collaboration model of 'civic engagement' but rather to corporate contracts. However, Subtozky's point does indicate that responses to the pressures of academic capitalism are far from mechanical. Rather, new conceptual

vocabularies can open up the conditions of possibility for novel alternatives not driven by a profit motive.

Consumer-oriented research

A third key conceptual vocabulary of academic capitalism involves the willingness to incorporate the concerns of potential consumers into the conceptualisation and execution of research planning and execution (for general overviews, see Oudshoorn and Pinch 2003; Woolgar 1991). Consumer-oriented research begins with the principle that good science ought to produce results that are useful or 'friendly' to lay audiences, often including members of such audiences in the conceptualisation, design and execution of research projects. At a more general level, it can include a variety of administrative-level pressures toward outreach and impact-oriented research.

There has been a ramp-up of such research in the social and behavioural sciences, most notably but not limited to marketing research on consumer behaviour. A quick look through faculty affiliations at most research-intensive universities reveals numerous formal indicators of a consumer-orientation, with endowed professorships like 'Sears Roebuck Professor of Education' or the 'Chevron Chair of Management'. While this rarely translates directly into narrowly conceived advertising research, such positions do send diffuse status and resource signals that academic work is relevant to corporate consumerism. A number of academic journals have arisen that focus on consumer behaviour, as have innumerable disciplinary magazines, from *Artificial Intelligence* to *Contexts* in sociology, that seek to translate academic research for lay and non-specialist audiences. Organisational studies journals increasingly publish research on consumer decision-making. Consider, too, the immense growth of public health departments and research, which has created a good deal of confusion, as well as academic scholarship, over the differences between healthcare practice and research (see Hodge and Gostin 2004).

Arguably the most well-articulated version of consumer-oriented research can be found in the computer and engineering sciences, where researchers adopt the terminology of 'user-centric' design, 'user-friendly' or 'intelligent user interfaces' (e.g. Norman 2002 [1988]). Not everyone holds the same attitude toward a consumer orientation in research design and implementation, including in the technical sciences where the advocates of 'user-friendly design' have made it an obligatory passage point (Callon 1986). For example, some members of the QualGroup openly worried that focusing on user-friendly research can dumb down their work, moving their discipline from its institutional origins as a hard science of human-level intelligent behaviour (see Crevier 1993) into gimmicky and superficial interface design.

The two AI labs I observed provide extreme caricatures of the three main responses to the conceptual vocabulary of consumer-oriented research. Nearly all AI researchers have to fashion their scientific contributions to consumer-oriented research in some way, whether to embrace it, resist it or assimilate to it. The QualGroup either resisted or adapted to user-centric design, whereas the IntelliLab adopted it as a central part of their identity and practice.

Members of the QualGroup self-described as basic scientists interested in cognitive simulations of human-level analogical reasoning. Members attend cognitive science

conferences and publish in journals that focus on experimental research. Their central AI system, from which their 'experiments' are based, is a computer simulation of a highly influential theory of analogy in the cognitive sciences, called structure-mapping theory. They are supported primarily by federal government research agencies like DARPA IPTO (a key funder of AI research that has historically been run by AI researchers), NSF, the Office of Naval Research, and the like. While some programmes within these agencies may push labs toward research oriented to consumers and 'societal impact', by and large QualGroup members sought grants from those programmes within these agencies that preferred research generally considered (and often coded by the agencies) as basic or Mode 1.[8] The head of the QualGroup summarised this before applying for a DARPA IPTO grant: 'They're tossing money at us as fast as we can spend it . . . Where we have been wanting to go, they want to go. It is nice when that happens with funders. There are plenty of funders that will give you lots of money and then go in some direction that isn't going to make any difference to you scientifically. So why bother.' QualGroupers described narrow project grants as 'tied down' or 'strings attached', whereas larger, more basic grants were 'open-ended', hopefully 'renewable' and 'good money'.

As such, members of the QualGroup struggled to adapt the pressures for consumer-oriented research within their vision of scientific AI. Several members talked about the dual pressures of doing science and focusing on computer users as a zero-sum game. During a project meeting, for example, a high-status and long-standing member of the QualGroup cautioned the freshman graduate students of the lab that 'There is a real difference between building applications . . . and building a laboratory. We are a laboratory.' In this statement and his follow-up, 'applications' were synonymous with consumers and 'laboratory' was synonymous with real science. Another lab member told me that the reason he came to the QualGroup was because he was tired of the 'corporate constraints' he had encountered at other AI labs (including a brief stint at the IntelliLab), by which he meant having to design according to the specification of the marketing department, manager or CEO.

Keith Fender, the head of the QualGroup, provided a bit of nuance to this position. At a lab meeting just before a demo to DARPA representatives, he warned his lab members to focus on scientific results and not a user-friendly interface: 'We will not divert to doing demo-specific code. Okay? Those are evil activities . . . it destroys your soul in the long run. [LAUGHTER] And in the short run it leaves you with a pile of bailing wire and bullshit code.' The day after the demo, Fender was noticeably angry because he believed his team did not heed this lesson, giving in to the evil temptation of a fancy but narrowly conceived system demo:

> I think there is still confusion about what we are doing here. First and foremost, we are scientists. What we do is come up with facts and provide results that prove theories. A cool demo is not a result. It is good to have a cool demo, but a result is something that can demonstrate an answer to a question on thermodynamics . . . If

8 I am not making an *a priori* distinction between different types of scientific research here. Rather, government-funding agencies typically have internal classification systems that, by necessity, get internalised within labs and the early conceptualisation of research design. DARPA, for example, has a 6-point system, with the largest grants allocated to Code 6 projects with a clear basic science contribution, and smaller, 'challenge' grants going to projects with a narrower or more applied focus.

> we can answer questions from the most difficult textbook in a field, then we have results. (Fieldnotes)

Fender struggled to demarcate the appropriate boundaries of his group's scientific work. The room fell silent before the lab head went on to say that a secondary aspect of their work is to design for users. There is nothing inherently wrong with this, but a concern with usability should not override scientific 'results'. One must know one's audience, Fender suggested, and it was vital that his members understand that DARPA representatives, typically drawn from the academic AI for temporary programme stints, are not impressed by fancy user interfaces and tight but narrow system demos.

This is radically different from how the members of the IntelliLab adopted consumer-oriented research. They believed that knowing a lot about users was *the* central pillar of scientific discovery and refuted the distinction between basic and applied science as a destructive false dichotomy. Consider, for example, how IntelliLab head Kevin Hallowell talks about a sensibility toward users as one of his most important recruitment standards:

> We like students who have more of a liberal arts education. Who are grounded in the world as opposed to grounded in computer science. The technical skills are important. I mean they are crucial. But being able to look at the world in certain kinds of ways is far more important. And that's hard to learn. An orientation around people . . . is what you need. If you . . . have no instincts in that area whatsoever, what you end up doing is working on technical problems that have little to do with anything. (Interview)

This quote is indicative of how Hallowell routinely tried to distance his group from the stereotypical image of the computer geek (i.e. people who speak in an indecipherably technical language and are more comfortable typing code than talking to a human being). In contrast, Hallowell wanted AI scientist-designers who cultivate 'an orientation around people'.

Hallowell sought out a tacit sensibility, a 'feel for the game' (Bourdieu 1984 [1979]), that enables his group members to credibly assess user needs, build appropriate technologies and then translate that process into scientific results. The focus on instincts in the previous quote has an interesting rhetorical effect. It serves to shut down explanatory possibilities for how this social capital might be cultivated (for a discussion of talk about 'instincts' as a temporary agreement to stop explaining things, see Bateson 2000 [1972]: 38–58). This allows Hallowell to emphasise the uniqueness of the IntelliLab's epistemic identity while simultaneously posing an orientation to lay users as a taken-for-granted feature of all good AI research.

At the IntelliLab, consumer needs were assessed via market research, industry deployment and, primarily, by informally polling potential users during frequent industry site visits to the lab. Results were regularly published in AI journals and conference proceedings amenable to the presentation of 'deployment' or 'user data'. Their published papers typically attempt to show how intelligence is a distributed process of acquiring the information necessary for sound decision-making, as described above. Thus, the IntelliLab positioned consumer-oriented research as the central pillar of their knowledge production, their recruitment strategies and their methodological practice.

To summarise, whereas members of the QualGroup considered consumer-oriented research highly problematic, even profane, members of the IntelliLab embraced it whole-heartedly. QualGroup researchers either actively *resisted* the intrusion of users into their science (as in the case of the researcher who suggested that building applications is not how to build a lab) or they *adapted* to it (as in the case of the head of the lab admitting that user design was important, but not central to their scientific credibility). Either way, science and engineering was carefully separated in word and deed. The countervailing tendencies of 'good science' and functional 'engineering' were carefully demarcated and prioritised. This boundary policing was central to both their identity and their epistemology. In contrast, the members of the IntelliLab, nearly without exception, fully *adopted* and worked to elaborate on the conceptual vocabulary of user-centric design. They argued that the best science results from an iterative process that tacks back and forth between user needs, research design and scientific inquiry.

While these two labs represent extreme responses to this conceptual vocabulary, they nicely illustrate how consumer-oriented research can get deeply entangled in the practice of science even within those academic units, groups and individuals who have little inclination to engage in it. Consumer-oriented research, and even the language of 'users' and 'user friendliness', has crept into a wide array of academic disciplines and units. It is very common in management science, nicely captured by a current buzzword in consumer behaviour, 'prosumption' (Humphreys and Grayson 2008), signalling the breached divide between producer and consumer. On an institutional scale, professional and vocational schools have grown far more quickly than any other part of the American university system (Menand 2011) and business degrees have become the most common type of major in the United States (US Department of Education 2010). Faculty reporting practices often require researchers to justify the benefits of research leaves not only for university life but also to the university's external stakeholders, thus adapting the social charter mission of old with the new accountability practices. Overall, the capitalisation of academic knowledge has largely pushed for greater degrees of 'transparency' and 'accountability' to lay publics across the disciplines, seemingly in response but also subtly contributing to a rather profound legitimacy crisis over the proper relationship between academic experts and the lay public.

Interdisciplinarity

The fourth new tool of the science trade is interdisciplinarity, which draws on terms like 'synergy', 'hybridity', 'translation' and 'problems-based research' to evoke both respect for the traditional academic disciplines and a simultaneous desire to recombine them in a fashion that leverages their respective strengths to remake science. The ideal of interdisciplinarity is similar in tone and idealism to the classical liberal economics of free trade between sovereign trading partners. That is, the relationship involves the free exchange of goods or services between good-faith partners who stand to mutually benefit from each other's respective products or expertise. And like free-trade agreements in practice, empirical studies of interdisciplinarity routinely demonstrate that innovative research projects exist right alongside uneven results, professional and personal struggles over scarce resources, communication barriers, unclear standards for

reward (which remain largely adjudicated by departmental unit) and power asymmetry (Jacobs and Frickel 2009).

Recent research indicates that interdisciplinary research centres, from biotech to centres for 'translation research' in engineering and medicine, have overtaken traditional departments in terms of university research output (Slaughter 2010). This underlines the immense importance of this trend for the 21st-century research academy, although the causal order of the relationship between interdisciplinary programmes and academic capitalism is far from straightforward. A common assumption is that interdisciplinarity has been driven by a 'cultural turn' in the sciences and a shift away from Enlightenment era assumptions of scientific specialisation. However, interdisciplinarity has also come to be embodied in research centres, institutes and administration-defined university 'strategic strengths', championed by federal agencies and private foundations looking to invest in problem-driven research (Geiger and Sá 2008) and corporate R&D units with needs at odds with disciplinary specialisation (Slaughter and Rhoades 2004). Thus, the trend requires a resource dependency explanation (Pfeffer and Salancik 1978), emphasising how universities have chased revenue and grant opportunities, at least as much as an epistemological one.

Administratively driven, 'top-down' initiatives have been able to tap into the bottom-up epistemological belief among many researchers in bridging disciplinary bailiwicks (Brint 2005; Jacobs and Frickel 2009). While some scholars called for an interdisciplinary epistemology long before the 1980s (e.g. Bateson 2000 [1972]; on cybernetics Pickering 2002), and indeed there have been efforts to promote interdisciplinary research since at least the 1920s (Jacobs and Frickel 2009: 48), the effort to capitalise university assets has given it the institutional steam no purely epistemic push ever could. This institutionalisation has, in turn, created a recursive effect on faculty who are not directly involved in these formal interdisciplinary programmes but have sympathies with the general idea that good scholarship should be broader than one's particular area of expertise.

The taken-for-granted value rationality of interdisciplinary research is strong, even in those fields and research programmes far removed from direct industry partnerships, such as the humanities or the area studies that sprung up in the wake of the civil, student, women's and gay rights movements. Cast in terms of the historical trend in research universities toward academic capitalism, the relationship between top-down and bottom-up initiatives may be best understood as synergistic, even if they have different historical trajectories and internal logics. On the one hand, there are the strategic initiatives that seek opportunities for knowledge capitalisation and revenue generation. On the other hand, there are epistemological efforts to re-imagine traditional disciplinary boundaries that have been more deeply institutionalised by the top-down strategic push. Like Subotzky's (1999) analysis of community partnerships, it seems that top-down pressures have opened up new possibilities for alternative forms of scientific research that neither fit well within traditional academic silos nor within the revenue-generation practices of knowledge capitalisation. An eclectic intellectual like Gregory Bateson surely would have fit this mould had he been active in the contemporary era.

Regardless of their origins, interdisciplinarity represents a significant and highly open-ended expansion of the scientific toolkit of discipline-specific trained faculty. It has created new forms of contestation and internal stratification. For example, the formal 'strategic initiatives' of many research universities tend to privilege those faculty

who adopt interdisciplinarity, and this involves the relative ability to synthesise and communicate knowledge across specialties, or provides incentives for researchers to take on relatively narrow functional roles within a large-scale research team's division of labour. Faculty who resist one of these two moves, either as a knowledge synthesiser or a knowledge specialist, are likely to be left out of the party, with consequences for their resource and status. The most typical responses are modest adaptations, such as joint appointments with academic units that one's research programme already articulates or fairly superficial involvement (e.g. attending talks, workshops, conferences) with interdisciplinary research centres.

Active resistance to this conceptual vocabulary, which is relatively rare in comparison with the other new three tools of the trade discussed above, will typically point to vocal complaints about the layering of duties and standards atop traditional ones, communication gaps and the lack of clear tenure standards. However, few critically confront the value-rationality or the epistemological ambitions of interdisciplinarity. Who does not support interdisciplinary research, in concept if not in practice? In fact, this paper is the first, to my knowledge, to critically interrogate interdisciplinary within the broader trend of academic capitalism. Mostly resistance is passive. That is, resistance comes via apathy: continuing to engage primarily in discipline-specific research.

A key skill required in large-scale interdisciplinary research projects is an aptitude toward managing the demands of large teams. This is certainly the case in the community outreach programmes in South Africa documented by Subtozky (1999). These programmes all have a strongly interdisciplinary and 'problem-based' flavour to them, in which faculty and students join forces with community partners from several professional occupations (e.g. healthcare, social workers, industrial engineers). This makes epistemological and methodological practice incredibly complex, in large part because team projects involve a great deal of distributed uncertainty. Problems are only vaguely defined in advance and solutions often emerge out of irregular or informal communication among members of the network (see Gibbons et al. 1994).

Conclusion

This paper begins with the assumption that institutions are 'constantly being realized', to borrow a phrase from Georg Simmel (1950: 10). Along these lines, I have suggested that the study of institutional change in research-intensive universities calls for a Bourdieu-inspired analysis of the ongoing formation of social and cultural capitals within a contested field (Bourdieu 1984 [1979], 1986).

My main point is that the disproportionate focus on formal university–industry linkages is both out of proportion with material reality and, more perniciously, elides the subtle ways that academic capitalism remakes scientific culture. Commercial logics have not replaced older forms of academic value and practice, but have facilitated the development of new conceptual vocabularies that push science in new directions. It is an analytic mistake, and an all-too common one, to make *a priori* assumptions about how these pressures are drilling down to the level of practice. The logic of social practice and sensemaking are locally developed, although by nature of the scientific profession, local practices and ways of knowing require extra-local legitimation. However, scientists do

not respond mechanically to external institutional pressures toward commercialisation. Instead, they actively shape how elements of academic capitalism are adopted, adapted or resisted within the set of practices they perceive as authentic and worthwhile within their institutional field.

In addition, we should be clear that the push toward academic capitalism does not occur across a single dimension. It is lumpy, contingent and can even open up space for research programmes that are not at all profit-driven. The wide variety of civic engagement and community-collaboration research occurring at many campuses, even if they tend to be woefully underfunded, provide ample examples of this. Similarly, it is the case that university leaders tend to wrap their discussions of knowledge capitalisation within a broader ethical discourse around the university's social charter and obligations to the surrounding community. This, paradoxically, creates openings for more community- and civic-driven research that is not consumer- or profit-driven. As the theorist Jeffrey Alexander (2006) points out, industrial capitalism paradoxically breathed life into the European civil society of salons and a free press. So too does academic capitalism remake its public spaces.

If it is the case, as I believe it is, that academic capitalism comes attached with conceptual vocabularies that more or less require faculty to react to them in some fashion, including those faculty who do not engage in direct industry linkages, then it follows that we are layering non-trivial complexity onto the responsibilities of faculty at research-intensive universities. After all, teaching loads and publishing expectations have not receded in the face of this trend. The dramatic increase in administrative and professional staff across universities does not seem to have lessened the faculty workload. If anything, faculty workloads have grown more harried as universities attempt to squeeze more research, more grant dollars, more students, and more revenue out of a body of full-time faculty that is barely keeping pace with the growth of student populations (Ginsberg 2011).

These pressures remaking academic science and culture are most dramatic and responses are most developed among researchers, such as faculty and students of the IntelliLab, who are actively involved in marketing and capitalising their research. However, the vast majority of faculty across the sciences and even the humanities are experiencing overt pressure to rethink and revamp their scholarly toolkits to generate alternative revenue streams. Annual reports that seek accounting for commercial collaboration are one indication of this widespread diffusion. Another is the amount of time departments, research units and individuals put into 'strategy'. The positioning of one's research strengths within a field of limited resources and uncertain information, whether to maximise faculty resources in the eyes of a Dean facing limited allocations or to best position one's lab for a large grant, may not be directly capitalistic but is occurring within a broader social structure of academic capitalism in which the units that can best generate university revenue from their knowledge win.

A policy implication of this paper is that universities are increasingly expecting faculty and students to become entangled in the complex uncertainties of academic capitalism, even when their research and training is far removed from market potential. Policymakers, administrators and faculty ought to take the transaction costs involved in this expansion of the faculty role seriously. At the very least, university leaders should facilitate open debates about the transformation of academic culture. We should also take steps to shield some research domains and programmes from these pressures

while taking measures to prevent the formation of second- and third-class citizenry of the academy. Absent the possibility of a fully redistributive university organisation, we should at least maintain a strongly Keynesian one. Otherwise, the public good mission of research universities, particularly in terms of comprehensive public research universities, risks becoming a relic of a simpler, gentler, more caring time. It is better to fight for valuable principles than to become nostalgic for them.

The net gains and losses of academic capitalism are not easily chalked up. Just as the research on norm violations can vividly demonstrate the negative side of academic capitalism, there are plenty of examples in which research capitalisation has made positive contributions to basic science, real-world problems and institutional revenue (see Stokes 1997). However, as the classical social theorists like Weber, Simmel and Tönnies worried in regards to the fate of communalism in the heat of the Industrial Revolution, a value system that privileges rational calculation and revenue generation over all other sources of value risks jeopardising what it is that makes a research university a uniquely valuable social institution in the first place. At the very least, we should all be legitimately worried about the symbolic weight of the growing perception that universities are placing greater emphasis on profits and managerial efficiency than knowledge advancement and learning.

My main argument remains descriptive, not proscriptive. The diffuse cultural repercussions of academic capitalism are only starting to become clear. We need a good deal more careful ethnographic research that can document the multiplicity of new strategies that are getting fitted to market-oriented and managerial-based logics of practice. And with that work, we should learn more about how the very meaning of science, along with the symbolic line that separates our ideals of the public and private good, are being actively reconfigured by the conceptual vocabularies of academic capitalism.

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