Faculty Workload and Productivity in the Arts and Sciences: Global Transformations

By Henry Lee Allen

Henry L. Allen studies the mathematical sociology of academic systems and the global transformations in societies related to their complexities. He explored these interests at the International Sociological Association meeting at the World Congress of Sociology in Yokohama, Japan, July 13–19, 2014. Allen examines the contours of scientific innovation, the production of academic expertise, and especially, the lives of Nobel Laureates. He has written about faculty workload and productivity, including diversity, contingent faculty, and proprietary institutions, for more than two decades.

Knowledge and skill diffusion is the key to overall productivity growth as well as the reduction of inequality both within and between countries.
— Thomas Piketty, Capital in the Twenty-First Century, 2014

The vitality of higher education systems and their central components—the academic disciplines—determines the fate of democratic societies. Thomas Piketty, an economist, looks beyond the law of supply and demand to reveal the determinants of inequality. The “diffusion of knowledge and investment in training and skills,” he concludes, are the main mechanisms for decreasing inequality. “The principal force for economic convergence—the diffusion of knowledge—is only partly natural and spontaneous,” he adds. “It also depends in large part on educational policies, access to training, and to the acquisition of appropriate skills, and associated institutions.”

Piketty’s prescription for safeguarding democratic values against capitalism’s imperfections emphasizes the production of experts. If he is correct, universities and colleges—designed to advance and transmit expertise—are the premier drivers of the economy. Others note the social consequences associated with neglecting or assaulting higher education. Professors cannot afford to ignore the global transformations underlying shifts in knowledge production and the resulting societal consequences.

TRANSFORMATIONS AFFECTING FACULTY WORK

Global transformations affect the structures, dynamics, and outcomes of universities. The academic professions are becoming progressively marginalized, except at some prestigious research universities. Faculty members lose status and power as populist ideologies and untested knowledge dominate the mass media.

Transformed information and communication
technologies, including massive open online courses (MOOCs), distance learning, assessment, and for-profit higher education, have so reshaped academic labor that contingent labor now dominates the professoriate. The advance of academic capitalism has diverted humanistic and scientific learning from basic theoretical research. Academic freedom is precarious, compromised by the dictates of applied research. Tenure is jeopardized as the Organization for Economic Cooperation and Development (OECD), the European Union (EU), and the U.S. government implement neo-liberal policies and respond to anti-intellectual political interests. These social and political forces engulf public higher education and the academic professions.

One scholar identifies four contingencies affecting the future of teaching and research:
1. The need to respond strategically to the pressures and opportunities created in a more intense international environment;
2. The decline of governmental commitment to, and funding of, higher education;
3. The crisis of values and university identity in an era of corporate reform, especially the decline of collegial systems of governance and the concomitant emergence of more professionalized management;
4. The erosion of academic professionalism.

Another scholar relates global transformations to international student mobility. OECD data shows that 3.7 million students matriculated at universities outside their native countries between 2000 and 2009, an 85 percent increase over previous levels. Facilitating this mobility, this observer notes, requires distance learning, MOOCs, branch and satellite campuses, and proprietary institutions. With modest reservations, he supports meritocracy, human capital, the Bologna Process, the emergence of China, and an expanded global academic marketplace.

Other researchers corroborate these observations, providing relevant national case studies. The quest for global universities, for example, attracted students across universities within Asia (Korea, Singapore, China), Latin America, India, Nigeria, Mexico and Russia. This quest affected technology transfer, resources, academic talent, research, and governance. But what social forces generate student mobility? Determining which individuals or groups are responsible (via agency and structure) for what trend, policy, or outcome under what set of conditions remains elusive: good evasive politics maybe, but poor science! Evidence ought to trump political ideology or media myths.

Here are several possibilities:

- Unbundling student learning from traditional campus infrastructures via information and communication technologies reveals the Matthew Effect: “For unto everyone that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath.”
- The continued globalization of academic science via networks of collaboration, branch and satellite campuses, distance learning, and MOOCs. Cumulative advantage and preferential social attachments will influence student mobility.
- The marginalization or neglect of qualified students from low-income or disadvantaged social origins. Increasing inequality is sustainable, given academic capitalism, neoliberalism, and the growth of counter-knowledge in popular cultures.
- Further erosion of the academic professions, usurped by mass media, politics, and proprietary institutions. Contingent labor may be here to stay, but, akin to luxury cars, elite universities and their faculties will cater to social privilege.
- Universities may form alliances to safeguard their institutional interests and intellectual capital.

SOCIAL FORCES AND HIGHER EDUCATION IN THE U.S.
Societal changes affecting U.S. postsecondary education have global implications. U.S. higher education involves 4,500 colleges and universities,
20 million students, 1.4 million faculty, and $400 billion in annual expenditures. The academic system is differentiated by type: 200 research universities, 700 comprehensive universities, 1,000 four-year colleges, more than 1,000 community colleges, and greater than 1,300 for-profit institutions. The system has a structural bias toward private institutions; they enroll only 20 percent of students but consume a disproportionate share of total resources. The top 60 research universities award nearly 50 percent of all Ph.D.s; have the largest budgets, and dominate national and international prestige rankings. They possess the largest endowments, the premier professional schools, and most federal research spending. These hubs reflect unequal opportunity; 40 percent of undergraduates, including many low-income students, attend community colleges.

The National Education Association tracked these academic transformations for two decades: the rise of contingent labor, the demise of tenure, the erosion of faculty salaries, performance measurement, cost containment, demographic changes among professors, and problematic proprietary institutions. Others chronicled distance learning, MOOCs, and student outcomes. One observer notes these trends:

- During the past 30 years, several nations have enrolled and graduated a higher proportion of young people than the U.S.
- The U.S. is less attractive to international students; its share of the overseas student market has dropped, possibly jeopardizing American academic hegemony.
- The U.S. academic system receives 55 percent of its financing from private sources; its expenditures amount to 2.4 percent of national income (roughly twice the average for European Union countries). About 75 institutions have endowments that exceed $1 billion, an amount few universities elsewhere can match.
- Other European nations, except Scandinavia, have imitated the U.S. pattern of obtaining funds from multiple or private sources.
- Financial aid for low-income students has declined; fewer low- and moderate-income students attend selective private colleges and flagship state universities.
- “During the last four decades, academic salaries have fallen 30 percent below the compensation earned by other professions requiring advanced study.”

Another observer notes how social forces associated with bureaucracy, academic power, contingent labor, and even corruption affect higher education. Few mainstream accounts examine how the growth of administration has harmed the academic professions:

- Half of the professoriate is employed on a contingent basis, while the percentage of part-time administrators has declined.
- “Administrators and staffers actually outnumber full-time faculty members at America’s colleges and universities”—an estimated 675,000 faculty and 756,405 administrators and staff in 2005. Administrative positions and staff grew by 85 percent and 240 percent, respectively, between 1975 and 2005; the total number of professors increased by only 51 percent. The number of administrators grew by 66 percent at public universities, and by 135 percent at private universities. The faculty to student ratio held relatively constant, but the administrator to student ratio exploded.
- Senior administrative salaries increased by as much as 50 percent.

These findings require explanation. Has the professoriate declined in proportion to the ascendancy of academic administration in community colleges, sectarian universities, and liberal arts colleges? Why? Are there differences between proprietary colleges and nonprofit universities? What role does power play in determining these outcomes? Do these patterns exist elsewhere? Answering these questions requires creative research.
THE ACADEMIC DISCIPLINES AND THEIR FACULTIES

Several reports provide insight into the contours of the academic disciplines in an era of globalization, inequalities, student mobility, policy oscillations, perplexity, intergenerational changes, and contingent labor. The National Center of Education Statistics (NCES) provides current data on the number of degrees by field. Degree distributions are a proxy for determining the status of academic disciplines and their faculties because student preferences affect supply and demand for college and university faculty.

Degrees Awarded: 2001–02 to 2011–12

The number of associate’s degrees increased from 595,100 in 2001–02 to 1,017,500 in 2011–12 (71 percent). The liberal arts and related studies dominated, increasing from 207,200 to 336,600 degrees between 2001–02 and 2011–12. Health professions increased from 82,400 to 218,000; business and related fields grew from 86,700 to 122,000 degrees. Liberal arts faculty members failed to retain undergraduate students as they progressed toward graduation. The experiences of students who fail to transfer to four-year institutions may affect their assessment of the value of the arts and sciences. Will these encounters in institutions dominated by ill-treated contingent faculty affect their voting behavior?

Postsecondary institutions awarded 1.8 million bachelor’s degrees in 2011–12, a 39 percent increase (499,100) between 2001–02 and 2011–12, and a four percent increase from 2010–11. The two fields awarding the largest numbers of bachelor’s degrees—business and social sciences and history—showed 32 percent and 34 percent increases, respectively. Combined, these fields accounted for almost one-third of the bachelor’s degrees awarded in 2011–12—business (20 percent) and social sciences and history (ten percent). Then followed health professions and related programs (nine percent), psychology (six percent), and education (six percent). The same five fields awarded the largest percentages of bachelor’s degrees in 2001–02, 2006–07, and 2010–11.

The number of bachelor’s degrees awarded in business has been twice the number awarded in social sciences and history since 2001 (Figure 1). Among the 20 majors awarding the most bachelor’s degrees in 2011–12, the fields showing the largest percentage increases were health professions and related programs (124 percent, from 72,900 to 163,400)—and homeland security, law enforcement, and firefighting (111 percent, from 25,500 to 53,800). Psychology degrees increased by 42 percent, from 76,800 in 2001–02 to 109,000 in 2011–12. By contrast, the number of degrees conferred in computer and information sciences and support services declined by six percent (from 50,400 to 47,400). The number of bachelor degrees awarded in education remained about the same: 106,300 in 2001–02, 105,800 in 2011–12.

The number of master’s degrees awarded between 2001–02 and 2011–12 increased by 55 percent (from 487,300 to 754,200, an increase of 266,900) (Figure 2). Applied fields dominate the list of fields awarding the most degrees. The total number of master’s degrees in business grew from 119,700 to 191,600 (71,900) between 2001–02 and 2011–12, a 60 percent increase in a decade. The number of master’s degrees awarded in education—the field awarding the second largest number—increased by 32 percent, from 135,200 to 178,100, that is, by 42,900 degrees. Education remained the field awarding the second largest percentage of master’s degrees despite a four percent decline between 2010–12 and 2011–12.

The total number of master’s degrees in health professions (and related programs) grew from 43,600 to 83,900 between 2001–02 and 2011–12, an increase of 40,300 degrees. Master’s degrees in public administration and social services grew from 25,400 to 41,700, while degrees in engineering increased from 24,800 to 40,300. The number of master’s degrees conferred in each of the top 20 major fields in 2011–12 exceeded the number awarded in the
same field a decade earlier. Homeland security, law enforcement, and firefighting showed the largest increase—186 percent (from 2,900 to 8,400). Then followed parks, recreation, leisure, and fitness studies (173 percent, from 2,600 to 7,000). Theology and religious vocations saw the smallest percentage increase (33 percent, from 10,100 to 13,400 degrees).

The number of doctorates awarded increased by 42 percent between 2001–02 and 2011–12, and by four percent (from 163,800 to 170,100) between 2010–11 and 2011–12 (Figure 3). The number of doctorates awarded grew between 2001–02 and 2011–12 in each of the top 20 major fields. The same five fields accounted for the largest percentages of doctoral degrees awarded in 2001–02, 2010–11, and 2011–12. Two fields—health professions and related programs (37 percent) and legal professions and studies (28 percent)—accounted almost two-thirds of the doctoral degrees awarded in 2011–12.

Doctorates awarded in the health professions and related programs grew from 39,400 in 2001–02 to 62,100 in 2011–12 (57 percent), while doctorates in the legal professions and studies expanded from 39,100 to 46,800 (20 percent). Computer and information sciences exhibited the largest percentage increase (126 percent, from 752 to 1,700 degrees) between 2001–02 and 2011–12. Next came business (119 percent, from 1,200 to 2,500 degrees). Growth in education, growing from 6,500 to 10,000, engineering (from 5,100 to 8,700), and biological and biomedical sciences (from 5,100 to 7,900) further signified the importance of applied fields or pragmatic disciplines. Each of these three fields awarded at least five percent of all doctoral degrees in 2011–12. English language and
literature/letters saw the smallest percentage increase among the top 20 (11 percent, from 1,300 to 1,400 degrees). Changes in degree distributions affect employment, funding, and curricula at the institutions awarding them.

Degrees Awarded: 2011–12
In 2011–12, colleges and universities awarded 1,791,046 bachelor’s degrees, 754,200 master’s degrees, and 170,100 doctorates. Table 1 shows the total number of degrees conferred by category of academic discipline in 2011–12. The distribution by field affects social institutions and emerging leadership. Business, computer science, engineering, and education degrees account for 618,524 out of 1,791,046 total degrees. When “other fields” are subtracted from the 1,172,522 remaining degrees, at best the arts and sciences account for 724,104 bachelor’s degrees.

The rank order of arts and sciences degrees at the bachelor’s level is: humanities (295,221), social and behavioral sciences (287,529), and natural sciences and mathematics (141,354). Business (191,571), “other fields” (184,310), and education (178,062) degrees are more prevalent at the master’s level, followed by computer science (66,014), humanities (59,979), social and behavioral sciences (48,723), and natural sciences (25,570).

By contrast, the natural sciences and mathematics (14,974), computer sciences and engineering (10,554), and social and behavioral sciences (10,525) prevail at the doctoral level. Arts and sciences degrees are in the minority when contrasted with the combined totals of all other academic disciplines.

The U.S. has more private than public colleges and universities, but public institutions produce more academic degrees at all levels.36
Public institutions account for more than three times the number of associate’s degrees than private, for-profit schools. Public institutions produce more than double the number of bachelor’s degrees than private nonprofits. Public colleges and universities award 23,884 more master’s degrees. The ratio is slimmer at the doctoral level—5,244 degrees. Public institutions and their faculties are essential for the future of arts and sciences (Table 2).

In 2011–12, public institutions awarded 202,276 bachelor’s degrees in business, 121,679...
in the social sciences and history, and 91,828 degrees in health professions (Table 3). These totals exceed the degrees awarded by both types of private institutions. The private, for-profit sector awards few bachelor’s degrees in biological and biomedical sciences (138 out of 132,654). For-profit institutions make minimal contributions to the arts and sciences; they mainly confer degrees in business and health professions.

Public institutions awarded 66,464 master’s degrees in business in 2011–12. Private, nonprofits awarded 88,410; while private, for-profit schools awarded 36,697 (Table 4). The corresponding numbers in the social sciences were: public—11,898; private, nonprofit—9,410; private, for-profit—581. The trend is away from the arts and sciences and towards applied fields at the master’s level.

Discipline and institutional control influenced the distributional pattern of doctoral degrees conferred in 2011–12 (Table 5). Private, for-profit institutions produce more doctorates in business than private, nonprofit colleges and universities; they produce no doctorates in the social sciences, biomedical sciences, or engineering. Public universities produce the majority of doctorates in business, health professions, education, engineering, social sciences, and biology/biomedicine, while private, nonprofit institutions award the majority of doctorates in psychology. Students earn many more doctorates in applied fields than in arts and sciences.

Global transformations, especially changing demands for degrees across fields, shapes postsecondary institutions and their faculty.37 Table 6 shows degrees conferred in economics, history, political science and government, and sociology in 2000–01 and 2011–12. The largest increases in bachelor’s degrees: political science, from 27,792 to 39,800; in master’s degrees: history, from 2,365 to 4,155; in doctorates, economics from 851 to 1,130.

Table 7 depicts degrees conferred for selected natural sciences for the same years.

Table 2. Distribution of Degrees, by Type of Institution, 2011–12

<table>
<thead>
<tr>
<th>Type of Institution</th>
<th>Associate Degrees</th>
<th>Bachelor’s Degrees</th>
<th>Master’s Degrees</th>
<th>Doctoral Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>756,084</td>
<td>1,131,886</td>
<td>349,311</td>
<td>84,727</td>
</tr>
<tr>
<td>Private, Nonprofit</td>
<td>54,346</td>
<td>526,506</td>
<td>325,427</td>
<td>79,483</td>
</tr>
<tr>
<td>Private, For-profit</td>
<td>207,108</td>
<td>132,654</td>
<td>79,491</td>
<td>5,852</td>
</tr>
</tbody>
</table>

Source: Adapted from Digest of Education Statistics 2013, Table 318.40.

Table 3. Bachelor’s Degrees in Selected Fields of Study, by Type of Institution, 2011–12

<table>
<thead>
<tr>
<th>Top Selected Fields</th>
<th>Public Institutions</th>
<th>Private, Nonprofit</th>
<th>Private, For-Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>202,276</td>
<td>111,974</td>
<td>52,565</td>
</tr>
<tr>
<td>Social Sciences and History</td>
<td>121,679</td>
<td>54,181</td>
<td>2,683</td>
</tr>
<tr>
<td>Health Professions and Related Programs</td>
<td>91,828</td>
<td>52,023</td>
<td>19,585</td>
</tr>
<tr>
<td>Education</td>
<td>73,277</td>
<td>29,283</td>
<td>3,225</td>
</tr>
<tr>
<td>Psychology</td>
<td>72,921</td>
<td>32,754</td>
<td>3,311</td>
</tr>
<tr>
<td>Biological and Biomedical Sciences</td>
<td>65,732</td>
<td>29,283</td>
<td>138</td>
</tr>
<tr>
<td>Engineering</td>
<td>62,850</td>
<td>18,218</td>
<td>314</td>
</tr>
</tbody>
</table>

Source: Adapted from Digest of Education Statistics 2013, Table 318.50.
Mathematics and chemistry show the greatest increases in the bachelor's degrees. The number of master's degrees awarded in mathematics nearly doubled, from 3,209 to 6,245. Mathematics and chemistry increased their output of doctorates at a much higher rate than physics or geology. Capturing the dynamics behind these varying growth rates remains a challenge.\(^{38}\)

**IMPLICATIONS AND PROSPECTS**

We've seen that the number of master's and doctoral degrees awarded increased by 55 percent and 42 percent, respectively between 2001–02 and 2011–12.\(^{39}\) NCES also reports the simultaneous replacement of full-time employees by contingent workers:

From fall 1991 to fall 2011, the number of full-time instructional faculty in degree-granting postsecondary institutions increased by 42 percent (from 536,000 to 762,000), while the number of part-time faculty increased by 162 percent (from 291,000 to 762,000). As a result of the faster increase in the number of part-time faculty, the percentage of faculty who were part-time increased from 35 to 50 percent during this period.

Many questions remain unanswered about the fate of arts and science faculty. What is the impact of changes in the academic labor market on faculty workload and productivity in the arts and sciences? How has the growth of applied fields affected academic work? Why
Table 6. Degrees Conferred in Selected Social Science Fields, 2000–01 to 2011–12

<table>
<thead>
<tr>
<th>Type of Degree</th>
<th>Bachelor’s</th>
<th>Master’s</th>
<th>Doctorates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2000–01</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economics</td>
<td>19,437</td>
<td>2,139</td>
<td>851</td>
</tr>
<tr>
<td>History</td>
<td>25,090</td>
<td>2,365</td>
<td>931</td>
</tr>
<tr>
<td>Political Science</td>
<td>27,792</td>
<td>1,596</td>
<td>688</td>
</tr>
<tr>
<td>Sociology</td>
<td>25,268</td>
<td>1,845</td>
<td>546</td>
</tr>
<tr>
<td><strong>2011–12</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economics</td>
<td>27,995</td>
<td>3,890</td>
<td>1,130</td>
</tr>
<tr>
<td>History</td>
<td>35,121</td>
<td>4,155</td>
<td>969</td>
</tr>
<tr>
<td>Political Science</td>
<td>39,800</td>
<td>2,508</td>
<td>746</td>
</tr>
<tr>
<td>Sociology</td>
<td>30,132</td>
<td>1,696</td>
<td>626</td>
</tr>
</tbody>
</table>

Source: Adapted from Digest of Education Statistics 2013, Table 325.92.

Table 7. Degrees Conferred in Selected Natural Science Fields, 2000–01 to 2011–12

<table>
<thead>
<tr>
<th>Type of Degree</th>
<th>Bachelor’s</th>
<th>Master’s</th>
<th>Doctorates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2000–01</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>9,466</td>
<td>1,952</td>
<td>2,056</td>
</tr>
<tr>
<td>Geology/Earth Science</td>
<td>3,495</td>
<td>1,220</td>
<td>472</td>
</tr>
<tr>
<td>Physics</td>
<td>3,418</td>
<td>1,365</td>
<td>1,169</td>
</tr>
<tr>
<td>Mathematics/Statistics</td>
<td>11,171</td>
<td>3,209</td>
<td>997</td>
</tr>
<tr>
<td><strong>2011–12</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>13,472</td>
<td>2,435</td>
<td>2,599</td>
</tr>
<tr>
<td>Geology/Earth Science</td>
<td>5,111</td>
<td>1,807</td>
<td>612</td>
</tr>
<tr>
<td>Physics</td>
<td>5,531</td>
<td>1,872</td>
<td>1,752</td>
</tr>
<tr>
<td>Mathematics/Statistics</td>
<td>18,842</td>
<td>6,245</td>
<td>1,669</td>
</tr>
</tbody>
</table>

Source: Adapted from Digest of Education Statistics 2013, Tables 325.65, 325.72, and 325.92.

did administrators and politicians permit this momentous shift toward contingent employment? Were they indifferent or blinded by neoliberal pretensions regarding the longitudinal implications for society? Would a more enlightened academic and political leadership, anticipating a possible decline in the quality of the academic enterprise, have curtailed the worst aspects of employment shifts? Academics must rigorously scrutinize the hidden implications of the decline in good academic jobs in the United States.40 Research about academic labor markets or faculty recruitment must match candidates to departmental, institutional, and systemic dynamics.41

The destiny of the academic core—arts and sciences and their faculties—remains unclear. Will technology, academic capitalism, neoliberalism, and marginalization continue to erode their significance? Faculty unions should stimulate quality education and solid employment practices in these fields.42 In 2014, the American Academy of Arts and Sciences called for substantially increased research funding.
for the humanities.43 “Colleges and universities are key to the humanities enterprise, through their direct subsidy of students and faculty, both in the classroom and in their research,” the Academy stated. “The data show that state support for public colleges and universities has been waning over the past 15 years.” That support declined in 46 of 50 states between 2008 and 2013.44 One cannot divorce the fate of the humanities from the fate of higher education.

Recognizing global scientific and technological challenges, transdisciplinary research opportunities, the complexity of social problems, and the need for innovation, the Academy proposed many innovations for the physical and life sciences:

- Creating knowledge networks across scientific disciplines.
- Infusing educational paradigms with transdisciplinary approaches, and revising administrative policies and practices to maximize these endeavors.
- Expanding funding and support for shared core research facilities.
- Connecting appointments and promotions to these networks and approaches.
- Creating synergy between the academic, industrial, and governmental sectors to tackle social challenges and improve technology transfer.

Other reports echo these ideas.45 The National Science Board—affiliated with the National Science Foundation—assessed global knowledge-and-technology-intensive economic activity, focusing on the implications for higher education of funding and costs, productivity, recruitment, internationalization, immigration, and research and development.46 Future assessments must include the welfare of the arts and sciences and their faculties.47

CONCLUSION

Colleges and universities control the production, distribution, and legitimization of expert knowledge in 21st century societies.48 On how departments, divisions, and universities construct and mediate issues related to undergraduate studies, graduate research, and professional education depends the fate of nations. From science to the humanities to vocational or professional studies, popular and elite subcultures must react in degrees to the codifications they articulate within culture and society. As universities interact, they form academic systems—composed of multi-level organizational structures, values and policies, intergroup and intragroup processes and relationships, behaviors and decisions of actors. The outcomes of these academic systems affect the fortunes of any nation. Unlocking their mysteries is a major scientific challenge; all the more for their ubiquitous intergenerational social impact.

A CODA ABOUT METHODOLOGY

Descriptive research informs us about the strategic place of universities in the scientific infrastructure, their ability to attract students from around the world, the free trade of ideas, the virtues and limitations of undergraduate education, and the internationalization of the professoriate and of academic labor markets.

We also possess polemics about policy fluctuations, assessments, affordability, and threats to academic freedom. These polemics are based on datasets biased toward institutional and bureaucratic agendas. Polemicists rely on disciplinary viewpoints in shaping their attacks—the ideological aspects of an unchangeable past in historical accounts; a focus on pecuniary rewards; game-theoretic decisions, and markets by economists, and privileging governments and ideologies by political scientists. They also benefit from an anthropological focus on cultural adaptations and from a sociological emphasis on institutional problems, structural organization, and population dynamics.

There are many significant gaps in social scientific knowledge of universities.49 The purposes and effects of universities “for whom” is still an open scientific question.50 What “inconvenient
facts” are absent? What models help us understand the dynamics of global academic systems and of individual institutions? Is our research inherently asymmetric?51 There’s much to explore; amorphous explanations about markets or traditions no longer suffice.52

We need a systems approach integrating disciplinary insights into social network analysis.53 People matter, for they create markets, government policies, institutional cultures, and the social and academic divisions of labor.54 Visionary unions can change academic prospects. A mathematical sociology of academic systems could connect universities, societies, and science.55 This endeavor requires modeling “academic climate change” to connect structure, agency, processes, and outcomes.

Universities today are affected by: (1) the commodification of knowledge, (2) market forces tied to technological innovations, (3) international student mobility, (4) institutional expansion via satellite campuses, and (5) the imperfections of reliance on a narrow range of statistical data. But social networks, resource allocations, and ecology affecting institutional decisions in a global political economy remain undetected. Robust studies would focus on: vitality/growth vs. stagnation/decline; multidisciplinarity or transdisciplinarity; policy shifts/ecological changes; neoliberalism; bureaucratisation vs. collegiality; matrix organizations; basic vs. applied research; public vs. private goods; brainpower; resource-dependency, and ideology.56

Sociologists must also monitor the contours and parameters of “academic climate change.”57 Narratives and surveys cannot account for the complexities of academic systems.58 A sociology of academic systems must incorporate empirical results into models involving cellular automata, genetic algorithms, simulated annealing, and algebraic networks.59 We must move from simplistic depictions of universities to assessing their roles in the social division of labor.60

NOTES
1 Piketty, 2014, 22.
2 Ibid., 20-26.
3 Ibid., 21.
4 Ibid., 22.
5 Giroux, 2014; Standing, 2011.
6 Rasmussen, 2014.
10 Bok, 2013, the former president of Harvard University, offers a robust analysis of changes in U.S. higher education.
11 Guruz, 2011.
12 Altbach and Salmi, 2011.
13 Coleman, 1986.
16 Mullin, 2010.
17 Thompson, 2008.
18 Bok, 2013.
19 See the articles by this author in the following reference section for extended evidence (listed in reverse chronological order).
20 Bowen, 2013.
21 Bok, 2013.
22 Ibid., 18.
23 Ibid., 20.
24 Ibid., 100.
25 Ibid., 226.
26 Ginsberg, 2011.
27 Ibid., 19.
28 Ibid., 24-25.
29 Ibid., 30.
The American Academy of Political and Social Science and the American Council on Education websites contain little data on the employment status of postsecondary faculty.

**Digest of Education Statistics**, 2013, Table 321.10.
Could the large number of college or university graduates with degrees in business and health professions form the basis for neoliberal political ideas or ideological leanings as they become leaders in mainstream social institutions, such as school boards, trusteeships, philanthropic agencies, media, corporations, financial institutions, policy boards and think tanks, and political parties, legislators? Is it plausible that comfort with contingency labor, for-profit institutions, abolishing tenure, and similar diatribes is at least a partial function of these academic proclivities? Is this the basis for anti-unionism?

Ehrenberg, 2006.


Kallenberg, 2011.
American Academy of Arts and Sciences, 2013.

“Spending for humanities research equaled 0.55 percent of the amount dedicated to science and engineering R&D (when all scientific fields—including agricultural sciences and others not depicted here—are considered).”

Ibid., 12-13.
National Research Council, 2014; Roco, Bainbridge, Tonn, and Whitesides, eds., 2013.
National Science Board, 2014. Chapters two and five contain comprehensive data.
Meinwald and Hildebrand, 2010.
The converse is also true.
Greenfeld, 2012.

Weidlich and Haag, 1983.
Coleman, 1982.

For an example, see Hunt, 2007. No mathematical model(s) could capture every aspect of social reality: formal, informal, and their interconnections. Qualitative and quantitative research is needed. The model is a heuristic device for understanding social phenomena. See Beamish, 2010, and Stark, 2012.

Hedstrom, 2005; Sawyer, 2005.
Carroll and Hannan, 2000.

Mathematica 10 software, produced by Wolfram Research, is a useful tool.

**REFERENCES**


