

BSN4811 Innovation and Productivity, 4MCs
BSN4811A Innovation and Productivity (with Econometrics), 5MCs

Wednesday, 8.30-11.30am
BIZ1-03-02

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A key challenge for Singapore and other developed economies is to sustain economic growth. Growth can be based on working harder (more labour, more investment, more resources) or working smarter (raising productivity). Innovation contributes to working smarter -- getting more from the same resources.

This module introduces recent research in productivity, innovation, and entrepreneurship, focusing on implications for economic policy and business strategy. The module will be highly interactive and apply multiple disciplines including economics, psychology, and management. Students will present research papers, analyze data, write reports, and engage in discussion.

The prerequisite is basic knowledge of microeconomics, statistics, and algebra.

The following syllabus is subject to revision and will be updated online. Please refer to the LumiNUS for the current version.

Assessment (BSN4811), 4MCs

- Class participation: 20%
- Research papers including discussion questions -- presentation and slides: 50%
- Examination (open book, during week 13): 30%

Assessment (BSN4811A), 5MCs

- Class participation: 15%
- Research papers including discussion questions -- presentation and slides: 20%
- Empirical exercises – presentation, slides, and written report: 35%
- Examination (open book, during week 13): 30%

Submit one printed copy of the slides and written report at the beginning of class. Note: Penalty of 25% for submission after the deadline.

BSN4811 (4MCs) and BSN4811A (5MCs) are recognized for the Economics major.
http://www.fas.nus.edu.sg/ecs/undergraduate/matriculated_16-17%20onwards.html#maj

Mode of teaching: Hybrid in-person and remote lecture, by rotation to comply with Business School teaching policy.

Supplementary reading (for econometrics): Joshua D. Angrist and Jorn-Steffen Pischke, *Mastering "metrics": the path from cause to effect*, Princeton University Press, 2015. (Central Library: HB139 Ang 2015).

Syllabus

(# All to read; ^ Student presentation; + For reference only)

Date	Subject	Assignment
#1 Jan 12	Introduction Productivity <ul style="list-style-type: none"> • TFP • Estimation • Sources Policy evaluation	Readings # Chad Syverson, "What Determines Productivity?" <i>Journal of Economic Literature</i> , Vol. 49 No. 2, 2011, 326-365. # Martin Wolf, "The long wait for a productivity resurgence", <i>Financial Times</i> , 13 June 2018. # "An Evaluation of the Impact of Enterprise Singapore's Loan Schemes", <i>Economic Survey of Singapore</i> , 2018 Quarter 1, 44-52. Questions (In-class discussion; no presentation) 1. Identify a mistake in Mr Wolf's essay and comment. 2. Comment on the empirical strategy of the evaluation of Enterprise Singapore's loans.

Date	Subject	Assignment
#2 Jan 19	Productivity <ul style="list-style-type: none"> • Management • Customer 	Readings # Nicholas Bloom, Benn Eifert, et al., "Does management matter? Evidence from India", <i>Quarterly Journal of Economics</i> , Vol. 128 No. 1, February 2013, pp. 1-18, 20-44, and 45-47. # Ju-ye Lee and Simon Freebody, "Management Practices in Singapore", Policy, Research and Benchmarking Working Group, National Productivity and Continuing Education Council, (undated). Questions (In-class discussion; no presentation) 1. In the Bloom et al. study, why was it important to include a control group? 2. Bloom et al. show that \$250,000 of consulting raised profit by \$325,000. Why didn't the manufacturers engage consultants before Bloom et al.'s experiment? 3. A fundamental proposition in economics is that perfect competition allocates resources in an economically efficient way. Comment on this proposition in light of the Bloom et al. study. 4. Refer to the Lee and Freebody study. Suppose that you estimate a company-level regression to explain the management score of Singapore businesses. What explanatory variables would you include? What are the signs of the coefficients that you expect?

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#3 Jan 26	Innovation strategy	<p><i>Empirical exercise #1</i> NUS Overseas Colleges and Entrepreneurship.</p> <p>Readings ^ James Bessen, <i>Learning by Doing: The Real Connection between Innovation, Wages, and Wealth</i>, Yale University Press, 2015 [CL: HD6331 Bes 2015] Chapter 4. ^ Malcolm Gladwell, <i>Outliers: The Story of Success</i>, Penguin, 2008 [HSS: BF637 Suc.GI 2008] Chapters 7 and 8.</p> <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. Critically review the author's evidence and analysis. 2. Explain the managerial implications of the analysis. 3. How would you test the author's theories? Describe the study – whether laboratory experiment, field experiment, or observational study.
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Date	Subject	Assignment
#4 Feb 2	Innovation strategy, cont'd	<p>Readings # Philip Anderson and Michael L. Tushman, "Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change", <i>Administrative Science Quarterly</i>, Vol. 35 No. 4, December 1990, 604-18 only. # "Crossed lines in the boardroom", <i>Economist</i>, 15 November 2018. https://www.economist.com/business/2018/11/17/crossed-lines-in-the-boardroom # Edward White, "Samsung mounts 5G offensive as countries review Huawei networks", <i>Financial Times</i>, 5 October 2020. ^ Clayton M. Christensen, <i>The Innovator's Dilemma</i>, Harvard Business Review Press, 1997, Introduction. # Jill Lepore, <i>The Disruption Machine</i>, <i>New Yorker</i>, 23 June 2014.</p> <p>Questions (In-class discussion; no presentation)</p> <ol style="list-style-type: none"> 1. Anderson and Tushman (1990: 614-615) argue that "In regimes of low appropriability, a single dominant design will emerge following each technological discontinuity ... majority of potential adopters will await the emergence of an industry standard before purchasing a new product or installing a new process technology". Discuss in the context of smartphones -- comparing the iOS, Android, and other systems. <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. "Nokia was already a classic example of the perils of disruptive innovation" (<i>Economist</i> 2018). Please comment. 2. In <i>The Innovator's Dilemma</i>, Clayton Christensen applied his theory of disruptive innovation to electric cars. Electric cars have limited driving range. Christensen advised

		<p>manufacturers to target markets where limited range would be less concerning, “growing, crowded, noisy, polluted cities of Southeast Asia. Vehicles can sit on Bangkok’s roads all day, mostly idling in traffic jams ... Electric motors would not need to run and hence would not drain the battery while idling” (page 211). Please comment.</p> <p>3. To what extent does the Anderson and Tushman theory apply to the competition between mRNA and inactivated vaccines against Covid-19?</p>
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Date	Subject	Assignment
#5 Feb 9	Creativity <ul style="list-style-type: none"> • Types • Measures • Influences 	<p>^ Andrew A. King and Baljir Baatartogtokh, “How useful is the theory of disruptive innovation?” <i>MIT Sloan Management Review</i>, Vol. 57 No. 1, 2015, 77-90.</p> <p># Beth A. Hennessey and Teresa M. Amabile, “Creativity”, <i>Annual Review of Psychology</i>, Vol. 61, 2010, 569-98.</p> <p>^ Marily Oppezzo and Daniel L. Schwartz, “Give Your Ideas Some Legs: The Positive Effect of Walking on Creative Thinking”, <i>Journal of Experimental Psychology: Learning, Memory, and Cognition</i>, Vol. 40 No. 4, 2014, 1142.</p> <p>Questions (In-class discussion; no presentation)</p> <ol style="list-style-type: none"> 1. Amabile defines creativity as the production of ideas or outcomes that are novel and appropriate to some goal. How does this model apply to totally new, blue-sky inventions (eg, electricity, nuclear physics, Internet) as contrasted with problem-driven innovations (eg, electric vis-a-vis petrol-engine car)? 2. Amabile’s Consensual Assessment Technique uses experts to rate creativity. Compare it to the divergent thinking test as a measure of creativity. 3. How does Annabile’s componential framework help organizations in managing creativity? 4. If individual creativity is purely neurological, what are the implications for management and policy? <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. Referring to King and Baatartogtokh (2015), for the purposes of helping managers, does it matter whether Clayton Christensen’s theory of “disruptive innovation” is consistent with the empirical evidence? 2. Referring to Oppezzo and Schwartz (2014), explain why walking stimulates divergent thinking, but not convergent thinking. 3. When economists conduct randomized controlled trials, they typically check for selection (control and treatment groups are similar in observable characteristics) and spillovers from the treatment to control groups. In the walking experiments, what would you check?

		4. Refer to Opezzo and Schwartz (2014). How would variation of creativity by age or gender affect their findings and managerial implications?
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Date	Subject	Assignment
#6 Feb 16	Human resource management <ul style="list-style-type: none"> • Incentives • Training • Selection • Implementation • Mood 	<p><i>Empirical exercise #2:</i> Supermarket self-service payment.</p> <p># Diwas KC, "Worker Productivity in Operations Management", Foundations and Trends in Technology, Information and Operations Management, Vol. 13 No. 3, 2020, 174-200. ^ Edward P. Lazear, "Performance pay and productivity", <i>American Economic Review</i>, Vol. 90 No. 5, 2000, 1346-1361. ^ Diwas Singh KC, "Heuristic thinking in patient care", <i>Management Science</i>, Vol. 66, No. 6, June 2020, 2545-2563.</p> <p>Question (In-class discussion; no presentation) 1. What did you learn from the KC survey?</p> <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. In analyzing the effects of the switch in compensation scheme, Lazear's (2000: Table 3) regressions include month and year dummies, and worker dummies. The switch coincided with new management at Safelite. Comment on other factors that might confound Lazear's inference. 2. How would you design an experimental study to deal with the confounds in #1? 3. Given the large effect of performance pay (Lazear 2000), why might businesses still pay workers fixed wages rather than by piece rate? 4. Should KC (2020) have reported a figure showing the frequency of discharges by minute before and after midnight? Illustrate what the figure should look like for a regression discontinuity analysis to be valid. 5. Suppose that hospitals assess ward managers on the percentage occupancy of beds, with higher occupancy being better. How would this affect the interpretation of KC's (2020) results? 6. Does KC's research contribute relatively more to understanding of: (a) Attribute substitution among surgeons, or (b) Effects of longer stay on hospital performance?

Date	Subject	Assignment
#7 Mar 2	Job design	<p>^ Jie Gong and IPL Png, "Automation, Job Design, and Productivity: Field Evidence", February 2021.</p> <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. Discuss whether the Gong and Png (2021) study is confounded by a Hawthorne effect. 2. Gong and Png (2021) show that automation of collecting payments increases productivity. Discuss what other jobs have been automated and redesigned so that work has become more specialized, and productivity increased. 3. Compare the scan-only format studied in Gong and Png (2021) with the Western-style full self-checkout systems from the perspectives of retailers, customers, and society.

Date	Subject	Assignment
#8 Mar 9	Learning <ul style="list-style-type: none"> • Experience • Knowledge decay • Spillovers 	<p><i>Empirical exercise #3: Benchmarking: Singapore hawkers.</i></p> <p># Wesley M. Cohen and D.A. Levinthal, "Absorptive capacity: A new perspective on learning and innovation", <i>Administrative Science Quarterly</i>, Vol. 35 No. 1, March 1990, 128-152.</p> <p>^ C. Lanier Benkard, "Learning and Forgetting: The Dynamics of Aircraft Production", <i>American Economic Review</i>, Vol. 90 No. 4, 2000, 1034-54.</p> <p>Question (In-class discussion; no presentation)</p> <ol style="list-style-type: none"> 1. What did you learn from the Cohen and Levinthal study? 2. "The more of its competitors' spillovers there are..., the more incentive the firm has to invest in its own R&D" (Cohen and Levinthal 1990). True or false? Please explain. <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. Suppose that experience leads factory management to build specialized tools that reduce labour requirements. How would Benkard's (2000) model represent such "learning"? 2. Benkard (2000) shows that if the learning parameter is estimated without considering possible decay, then the parameter will be under-estimated. Please explain this intuitively. 3. How does research into learning in the aircraft manufacturing industry apply to other industries?

Date	Subject	Assignment
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#9 Mar 16	Benchmarking <ul style="list-style-type: none"> • Practices • Performance 	<p>^ Hummy Song, Anita L. Tucker, Karen L. Murrell, and David R. Vinson, "Closing the productivity gap: Improving worker productivity through public relative performance feedback and validation of best practices", <i>Management Science</i>, Vol. 64, No. 6, June 2018, 2628-2649.</p> <p>^ Patricio S. Dalton, Julius Rüschenpöhler, Burak Uras, and Bilal Zia, "Curating Local Knowledge: Experimental Evidence from Small Retailers in Indonesia", <i>Journal of the European Economic Association</i>, Vol. 19, No. 5, October 2021, 2622-2657.</p> <p>Questions for presentation</p> <ol style="list-style-type: none"> 1. In the Song et al. (2018) study, why are the following important? (a) Physicians were paid a fixed salary, with no additional compensation for attending to more or working longer hours; and (b) Patients were assigned on a round-robin basis independent of physician work speed or idle time. 2. Song et al. (2018) found that publication of relative performance only improved performance if the identities of top performers were also published. Please explain this result in other ways besides the Song et al. (2018) theory. 3. Would you want your future employer to publish relative performance? Yes or no? Please explain. 4. Dalton et al. (2021) concluded that the handbook alone did not affect shop owners' behaviour. Reflecting on the design of handbook, how would you explain the null effect? 5. How did Dalton et al. (2021) arrange for shop owners to see the movie? How might the arrangements affect the managerial and policy implications of the empirical results? 6. How would the Dalton et al. (2021) findings apply to benchmarking of practices among Singapore law firms?
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Date	Subject	Assignment
#10 Mar 23	Adoption of innovations <ul style="list-style-type: none"> • Innovation cycle • Absorptive capacity • Incentives • Network effects 	<p># Michael L. Katz and Carl Shapiro, "Systems competition and network effects", <i>Journal of Economic Perspectives</i>, Vol. 8 No. 2, Spring 1994, 93-115.</p> <p>^ David Atkins, et al., "Organizational Barriers to Technology Adoption: Evidence from Soccer-Ball Producers in Pakistan", <i>Quarterly Journal of Economics</i>, Vol. 132, No. 3, 1 August 2017, 1101-1164 [Ignore Sections V.B, VII, VIII, and online Appendix]. https://www.youtube.com/watch?v=ybobE0ijbeY</p> <p>Questions (In-class discussion; no presentation)</p> <ol style="list-style-type: none"> 1. With network effects, current adoption depends on past adoptions by others. Discuss the challenges in estimating network effects. <p>Questions for presentation:</p>

		<ol style="list-style-type: none"> 1. In the Atkins et al. (2017) study, the businesses that did not respond to the initial survey tended to be larger than those that did respond. Discuss the possible reasons and implications. 2. To better understand the diffusion of the new soccer ball making technology, why should we study the management of the diemakers?
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Date	Subject	Assignment
#11 Mar 30	Geography <ul style="list-style-type: none"> • Clustering • Knowledge spillovers • Professional mobility • Location choice 	<p><i>Empirical exercise #4</i>: Patenting among Singapore publicly-listed companies.</p> <p># Gerald Carlino and William R. Kerr, "Agglomeration and Innovation", Chapter 6 in Gilles Duranton, J. Vernon Henderson, and William C. Strange, <i>Handbook of Regional and Urban Economics</i>, Vol. 5B, Amsterdam: North Holland 2015, 349-404 (Exclude Sect 4.3.1)</p> <p># I.P.L. Png, Teaching Note: Clusters, 2017.</p> <p>^ Jarle Moen, "Is Mobility of Technical Personnel a Source of R&D Spillovers?" <i>Journal of Labor Economics</i>, Vol. 23, No. 1, January 2005, 81-84 and 89-99 only.</p> <p>^ I.P.L. Png, "Fukui: Eye-glass Prefecture", 2018.</p> <p>Questions (In-class discussion; no presentation)</p> <ol style="list-style-type: none"> 1. How would improvements in information and communication technologies change the effect of geographical proximity on innovation? 2. Suppose that the total factor productivity of businesses is positively correlated with the stock of knowledge in the vicinity. Does this mean that businesses benefit from a positive externality? <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. Moen (2005) finds that workers with secondary technical education in more R&D-intensive industries earn relatively less in the earlier years and more in later years. (a) How does this theory apply to doctors vis-a-vis satellite engineers? (b) How does it apply to a small labour market like Singapore? 2. How would Moen's (2005) results depend on the law on non-competition agreements?

Date	Subject	Assignment
#12 Apr 6	Appropriability <ul style="list-style-type: none"> • Patents • Trade secrecy 	<p>^ Teece, David J., "Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy", <i>Research Policy</i>, Vol. 15, No. 6, 1986, 285-305.</p>

	<ul style="list-style-type: none"> • Complementary assets 	<p>^ Heidi L. Williams, "Intellectual Property Rights and Innovation: Evidence from the Human Genome", <i>Journal of Political Economy</i>, Vol. 121 No. 1, 2013, 1-27 (ignore footnotes).</p> <p>Questions (In-class discussion; no presentation)</p> <ol style="list-style-type: none"> 1. Does stronger protection of intellectual property increase innovation? 2. How do knowledge spillovers depend on the laws of intellectual property rights, trade secrets, and employment? <p>Questions for presentation:</p> <ol style="list-style-type: none"> 1. "Although subsequent court decisions have upheld some of EMI's patent claims, once the product was in the market it could be reverse engineered and its essential features copied" (Teece 1986: 298). Please discuss. 2. Teece (1986) emphasized the role of complementary assets in securing profit from innovations. Compare the innovation strategies of Qualcomm, a pure design semiconductor firm, and Tesla, which is vertically integrated into manufacturing. 3. Williams' (2013) Table 1 shows that more innovations were derived from non-Celera genes than Celera genes. How would follow-on innovation from Celera genes depend on the efficiency of the market for licensing? 4. Williams (2013) interprets Figure 2 as showing that genes with more scientific publications produced more diagnostic tests. Please discuss other explanations for the correlation between tests and publications.
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#13 Apr 13		Final examination (open-book)
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