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## Appendix: Expand Wikipedia stub on supplier - induced demand

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**Short title: Engaging health professionals in economics online**

We describe a Wikipedia-based project designed for a graduate course introducing health economics to experienced healthcare professionals. The project allows such students to successfully write articles on niche topics in rapidly evolving sub-specialties within health economics. These students are given the opportunity to publish their completed projects in Wikipedia. Despite the lack of conventional classroom incentives, we have found that our students generally choose to enter their final projects into Wikipedia. We explore the motivators for this behavior from the perspective of human capital development and reflect on the implications for enhancing economics education. Finally, we comment more generally on the value of assignments within graduate education that allow adult students to determine their degree of effort and reward along the intensive margin.

Keywords: Wikipedia, human capital, economics education, supplier-induced demand

JEL classification codes: A23, I10, J24

## **HEALTHCARE PROFESSIONALS AS ADULT LEARNERS OF ECONOMICS**

Economists teaching today's students face pressing questions about how to integrate new technologies into the classroom. At the same time, these educators confront the perennial challenge of assuaging student apprehensions about the difficulty of learning economics—a challenge that can be exacerbated as online courses put teachers in contact with a broader range of students than ever before. However, when these students are experienced healthcare professionals, the economist's standard human capital model may help explain the learner's motivation for engaging in economics education in ways conventional models of pedagogy for traditional undergraduates do not. This fuller understanding can help economics educators craft more effective instructional activities for a broader range of students.

When regarding adult learners from the perspective of human capital development, a working assumption for us is that such students have the ability, background, and opportunity to choose varying degrees of intensity of study. Especially relevant for these students is the individual value of the intensive margin to determine their level of engagement in their course of study. At the Jefferson School of Population Health graduate students in our online programs serve as an excellent sample for considering the benefits and challenges of health economics education for experienced healthcare practitioners and the instructional relevance of the intensive margin for them.

In accord with the human capital model, we view our students' decisions to engage in graduate study as part of their effort to increase their profession-specific human capital. That is, when viewed through the human capital framework, the prime motivation for these adult learners is to advance their careers and increase their workplace compensation. We posit, however, that adult learners such as ours, who have already accumulated a large quantity of professional

experience, would be especially interested in the ability to increase their earnings through education. This conjecture would imply that students who face trade-offs between additional engagement in the course and time spent on other activities would choose engagement beyond the minimum requirements of the course when such engagement furthered their overall goal of increased professional accomplishment.

Given that the general rationale for utilizing an intensive margins approach is to determine how deeply individuals will engage in an activity conditional on the decision to engage in it, we decided to investigate student motivations for digging more or less deeply into our health economics course, HPL540: Health Economics, and we conducted a post-hoc review of a session of HPL540 that was offered during the summer, 2012 semester. HPL 540 includes an optional, Wikipedia-based instructional activity through which a student's voluntary application of discretionary effort could be gauged relatively directly. The Wikipedia-based activity itself is conducted within a student-centered, largely learner driven instructional environment: Our online programs are offered part time and are delivered asynchronously in 14-week terms, so students have a large amount of independence. There are no required meeting times for classes and a large set of choices as to how and when to engage with the weekly learning activities. Instead of classroom sessions, students are required to participate in one or more weekly discussion forums online. The minimum requirement for participation is for students to post at least one comment early in each of a week's discussion forums. Then, students must respond later in the week with substantive replies to at least two posts created by their classmates. Other assignments in the course are workplace and application oriented, often taking the form of practical projects into which each student can invest varying degrees of effort while meeting the core requirements of the task at hand. This type of real-world, "applied" learning is

well established as highly valued by adult learners (Merriam, Caffarella and Baumgartner 2007), and we find that healthcare professionals are no exception.

Our “applied” orientation poses a particular challenge for a health economics survey course, though, since there is little to immediately “apply,” and direct connections to patient care are rare. Consequently, we have addressed our students’ needs to apply health economics to their professional practice in part by embracing distinctive strengths of these students—their ability to think as experts think.

Many healthcare professionals come to us as experts in knowledge domains that are abstract, such as chemistry or pharmacokinetics. They have superior cognitive skills developed to assimilate and draw upon complex, abstract representations when compared to students bringing less expertise into the classroom. Thus, while in the area of procedural knowledge and experience (“how to”) our student experts are less likely to be able to draw upon their professional backgrounds or “do” economics in some immediate, direct way in their workplace setting, at the level of abstract, declarative knowledge (the kind of explicit knowledge that can be represented in textbooks or encyclopedias and drawn upon to explain things) they tend to bring highly developed cognitive competencies. In the summer 2012 course under consideration here, supplier-induced demand (SID) served as the abstract economic concept we hoped to see our adult experts exercise their discretionary effort in studying with an intensity reflecting their freedom along the intensive margin.

### **WHY SUPPLIER-INDUCED DEMAND (SID)?**

SID is commonly framed as part of the physician’s role as an agent for his or her patient (the principal). A patient seeks healthcare in order to produce health. The physician as agent has a wide knowledgebase that they can use to guide the patient in terms of what treatments to seek

and how to utilize these treatments to attain the goal of improved health. It is generally assumed that the physician's knowledge of healthcare is substantially superior to that of the patient, giving the physician access to asymmetric information regarding the healthcare that would be required by a specific patient with a specific disease or condition. A perfect agent would act in such a way as to maximize the utility of the principal. In other words, a physician following only the best interests of his or her patient in delivering care, without regard to personal gain, would be considered as a perfect agent (Folland, Goodman, and Stano 2010, 302). Are physicians perfect agents?

Health economics assumes that physicians have preferences and incentives, just as would be true of any individual, regardless of their profession. Thus, health economists consider cases where imperfect agency would allow the physician to increase his or her utility from a patient encounter. For example, a physician could increase revenue by advising the use of a more costly treatment that did not improve patient outcomes, taking advantage of the patient's informational disadvantage. In this case, the physician is said to "induce" demand for the more costly service by the patient, since ultimately it is a combination of physician supply and patient demand for healthcare that determines the goods and services provided in the healthcare market. Thus, in this sense the physician as the supplier of healthcare is said to be engaged in "supplier-induced demand." On the other hand, physicians may experience some disutility from inducement when compared to acting as a perfect agent, which can act as a restraining factor on the level of inducement. McGuire and Pauly, 1991, for example, examine the effect of changing fees for services on the degree of inducement in an environment where there are multiple health insurers (McGuire and Pauly 1991).

Due to the complexity and contentiousness of teaching SID to providers of healthcare services, our students are exposed to SID in a number of different ways in HPL 540. This topic is covered extensively in the chapter on “The Physician’s Practice” in the textbook used in the course. Students read this chapter in week 6 and watch a recorded lecture video that covers the concept of SID. Students also engage in an online discussion of the “target income hypothesis,” which health economists have used to explain the motivation for SID.

SID is also a useful subject for focus throughout the course because it is an important part of health economics. During the summer, 2012 semester of the course, students referenced or discussed “supplier-induced demand” specifically four times, and the instructor added additional material about SID to the online discussion board. Finally, SID was the focus of a semester long Wikipedia-based project during the summer, 2012 semester in which students wrote brief encyclopedia-like entries on SID. Students who took HPL540 during other semesters completed a Wikipedia based project focused on a broad topic other than SID (see Table 1).

[Insert Table 1 about here]

### **THE WIKIPEDIA PROJECT, RATIONALE AND PROCEDURES**

In designing our online health economics course we originally aimed to bring the distinctive strengths and motivations of our students to bear on the design and implementation of an instructional activity. Participating in Wikipedia’s open system of collaborative knowledge construction and sharing by improving Wikipedia articles presented itself as a promising way to promote student learning through an application-oriented exercise of their existing cognitive and professional skills. We expected that these adult learners would be gratified by the authenticity of providing expert knowledge into the public domain and would find that the relative ease and speed of production accommodated their time constraints. In addition, a wiki-based project



would be inherently collaborative, whereas other online work products such as blogs, editorial pages, or various school media might not be. The widely recognized Wikipedia site in particular offered our students exposure to a larger critical readership than most other equally accessible vehicles for publication. We also expected that this group would share with Wikipedia volunteers worldwide the intrinsic motivations of learning and knowledge creation (Zhao and Bishop 2011). In addition, we were aware that previous efforts to engage both undergraduate and graduate level students in editing Wikipedia articles had been demonstrated to promote student learning while enhancing the value of Wikipedia entries on topics ranging from chrono-biology to the ecology and evolution of plant-animal interactions (Chiang et al 2012; Callis et al 2009). In the case of our student population, we expected that the topic of SID would be considered highly engaging, since they shared professional experiences that were likely to be concordant with, or discordant with, the theory of SID.

The Wikipedia assignment used in HPL 540 is a 10-week, cumulative project conducted in four stages. While the summer, 2012 session's focus was on SID, other topics in other terms have included pharmacoeconomics, the incremental cost effectiveness ratio (ICER), and highly cited papers in health economics. Regardless of topic, the Wikipedia assignment includes:

- an individual writing assignment
- work conducted in pairs or groups to produce a group charter (work plan), and
- two group writing assignments (see Figure 1).

[Insert Figure 1 about here]

While all students are expected to participate in the production of articles, posting the resulting articles into Wikipedia is an optional step for which a small amount of extra credit is awarded<sup>1</sup>.

The first stage of the Wikipedia project, due in the third week of the course, is a bullet pointed listing of topics produced by each student on the assigned subject—SID, for example. While the bullet points must be substantive, no references to scholarly literature are required at this stage. Instead, students are required to connect at least one of their bullet points to a pressing research or policy question in order to stress health policy aspects of the topic under study. This assignment is low stakes in that it is worth 20 points out of the 500 points available for the entire course. After turning in the assignment, students are paired up by the instructor based on their approaches to the assigned subject.

The second stage of the Wikipedia project involves a group charter, due in the fifth week of the course and incorporated as part of each student's overall participation grade for the term. In the group charter students must outline the way in which they plan to address the upcoming project work, including who is responsible for which elements, how group members will communicate, and whether they will opt to do the extra credit posting to Wikipedia. Both students in each group must submit identical charters, documenting their consensus on the plan for the project work to be completed during the semester. In the group charter, students also make their communications plans more tangible by describing when they will use phone calls, email, or an online group workspace to collaborate. The communications plan helps to keep students coordinated and accountable, especially in an online class where students never meet face to face. The charter also forces students to choose a level of engagement upfront, since each group can only submit one version of their group assignment and one Wikipedia entry for extra credit.

The third stage of the Wikipedia project is second bullet point list, due in week eight. This bullet point list will consist in part of combining the two individual lists created for the first

assignment. Students must supplement this list with additional bullet points if necessary, depending on how much overlap there is in their original lists. At this stage, they also add references to their group bullet point list. The references must be a mix of academic references, links to other pages within Wikipedia, and links to other webpages outside Wikipedia. These references, when carried in the final article, will interlink Wikipedia, the greater World Wide Web, and academic sources, enriching the web of available sources for others who want to dig deeper into the topic students are describing as well as conveying the sources students chose beyond course materials in researching the topic. Stage 3 is also a low stakes assignment, worth 20 points.

The final assignment, due in week eleven, is a concise group article that turns the bullet points into expository narrative. The assignment is cumulative in that it only requires students to convert the prior assignment from bullet points into text (coherent paragraphs). At this stage the composition is made to conform to the style requirement of a Wikipedia entry, adopting the embedded links, superscript references, and "See also" section for additional references characteristic of Wikipedia. This formatting detail facilitates posting to Wikipedia. While this final stage of the Wikipedia project has the highest point value of any, it is still low stakes, as it is worth 35 points out of the course total of 500.

The extra credit portion of the assignment is to post the student entries into Wikipedia. The extra credit is worth as much as 15 points out of 500. However, students are generally not aware of the impact these point will have on their final grade, since they must make their decision as to whether or not to post the entries to Wikipedia in their week 5 group charter. Students who wish to earn the extra credit must also learn the skills required to post content to Wikipedia independently, since this is not a skill taught in the course. After the project ends, the

fate of content that students post to Wikipedia will be decided by the Wikipedia community. Others in Wikipedia could decide to keep student generated content, edit it, or delete it entirely.

## **RESULTS**

In the term under consideration, summer, 2012, and in every term that the Wikipedia project has been offered, the majority of students have decided to post their completed articles to Wikipedia. The results of these postings can be seen mainly at [http://en.wikipedia.org/wiki/Supplier-induced\\_demand](http://en.wikipedia.org/wiki/Supplier-induced_demand). Thus, regarding the apparent intensive margin of the course, most students have chosen to post their entries to Wikipedia, meaning that most chose a high level of engagement with the project and, more generally, the concept of SID (see Table 1). Our students' behavior demonstrated the value they placed on additional opportunities to engage with the material in the course beyond the mandatory work of the assignment and further their education beyond the strict requirements of their Master's or certificate program.

### **Pedagogical issues addressed in teaching HPL 540**

In designing and conducting this Wikipedia-based instructional activity, we addressed specific and pressing pedagogical challenges for a graduate course in economics taught online to adults without prior training in economics. In keeping with the nature of our survey course, the Wikipedia project was designed to teach health economics while simultaneously teaching broader economic concepts to students lacking a deep background in economics. Pedagogical challenges for HPL 540 included the "fear factor" for economics as well as the need for teaching at the graduate level to students most of whom would never have taken undergraduate economics. Our students could rely neither on their formal education nor their professional experience when participating in a Master's level course in health economics. Abstract health

economic concepts such as SID would challenge students to go beyond their knowledge base and their professional experience, as would topics such as pharmacoeconomics and the incremental cost effectiveness ratio (see **TABLE 1** for a listing of challenging economics topics addressed through the Wikipedia project).

Studying health economics also challenged our students because their worldviews often clashed quite strikingly with classical economic models. For example, students were not familiar with the idea that physician licensing is a policy that raises prices and restricts supply—they were unaware of the concept that professional licensing can be considered more generally as a restraint on trade. The Wikipedia project on the subject of SID allowed the instructor to explain and justify the economic perspective to the students, while facilitating the process of the students defining and integrating new economic concepts that they may have found foreign or distasteful into their educational experience. Individual students could then respond to the availability of this novel concept by fulfilling the basic requirements of the assignment, or by engaging more deeply in the material through additional study.

We observed varying student decisions at this intensive margin through the Wikipedia project itself in terms of the quality of submissions. The majority of our students submitted high quality final products that went well beyond the requirements of the assignment rubric.

### **Incremental progress towards overall objectives**

The content of the final product was created through smaller assignments, each of which had a separate grade and grading rubric. Each assignment in the project demonstrated progress towards learning goals and culminated in the completed group Wikipedia article. In the first assignment for the Wikipedia project regarding SID, the individual bullet lists, students pointed out the use of Accountable Care Organizations and value based purchasing within the Affordable

Care Act (ACA) as policies that were designed specifically to reduce the impact of SID (see individual bullet point example available via the endnotes). In the second assignment, the group bullet lists with identification and use of references, students mixed classic references in health economics, such as Pauly and Satterthwaite’s “The pricing of primary care physician's services: a test of the role of consumer information,” with references to new sources, such as the CMS Innovation Center created by the ACA (see group bullet point example available via the endnotes) (Pauly and Satterthwaite 1981). In the final assignment, one student created an image that represents the SID model. As of January 2014 the image remains available at: <http://upload.wikimedia.org/wikipedia/commons/thumb/c/c5/Physicianscale.png/220px-Physicianscale.png> (see group article section example (posted to Wikipedia)).

A year after the completion of the Wikipedia project on SID the twelve-month average of page requests for the article in Wikipedia is over double what it was before the project. The content produced by the course in the summer of 2012 has also stood up well—remaining without significant change or challenge as of this writing (see Table 2). Searches conducted with major search engines for “supplier-induced demand” routinely return the summer, 2012, session’s page in Wikipedia as the first item listed.

[Insert Table 2 about here]

## **DISCUSSION**

### **Implications for economics education**

Why do we see the significant exertion of discretionary effort in HPL 540 that the intensive margin for this course attests to as student develop their educational capital? We feel that the Wikipedia project is particularly well suited to graduate education in economics because

it involves adult learners producing low-stakes articles on niche topics in rapidly evolving sub-specialties.

The adult learner aspect is important because adult learners want to engage in authentic activities—they are not satisfied with “fake” activities generated in order to have something to grade. While learners at all levels will value authentic learning experiences, the professional experience of our adult learners allows them to combine didactic content with personal experience that they share through the Wikipedia project and the online discussion forums. The use of niche topics means that there is not a great deal of content within Wikipedia concerning the assigned topic, which increases the authentic need to publish the results of the assignment. Our adult learners provided a service to other students and the world at large by posting what they have learned to Wikipedia.

Structuring a project as a series of low-stakes assignment also lowers perceived barriers for novices. The Wikipedia activity is low stakes in that it is a cumulative project with four components produced over 10 weeks, and early stages do not weigh heavily in the final grade. Thus, students do not need to be expert in economics at the beginning of the course. “Niche topics” means that all students are given a common topic, with a small, well defined scope, one about which they can generate two paragraphs on average of final text—a meaningful and manageable amount for Wikipedia. Targeting evolving sub-specialties (through the instructor’s selection of approved subjects) is especially important for health economics, which is currently a rapidly evolving discipline due to the ACA. To bring out the relevance of the more abstract concepts students are required to tie their summaries (their Wikipedia articles) to emerging issues in policy or current research.

Perhaps equally valuable, the Wikipedia project promotes the economic point of view by making it publicly available, and by having non-experts explain and promote health economics concepts to the general public. By taking economics out of the hands of experts alone, it transforms the students in the class into peer educators within an open-access learning community with global membership. We speculate that the process by which our students contribute to economic education despite differing levels of proficiency in economics would extend to other graduate courses, as well as advanced undergraduate courses where students have begun to gain and demonstrate mastery of their discipline. Economics classes at all levels would benefit students by adding additional opportunities for student engagement such as the Wikipedia project.

#### **Possible enhancements to this activity's motivators and skill transfer**

We have also identified several possible enhancements to the Wikipedia project. One way to enhance student motivation is to raise awareness of Wikipedia's legitimacy as a component in a student's deliberate practice of Personal Knowledge Management (PKM). The barriers to this enhancement may be lower for students than for faculty peers, since students commonly use Wikipedia, while many faculty members deride it as an "unreliable" source.

It would also be useful to use a pre/post design to test the reliability of Wikipedia in terms of facilitating student learning, in order to test the conjecture that Wikipedia can enhance student knowledge. By framing Wikipedia article submission as a form of publication, students may be motivated both to post their work to Wikipedia, and to use this experience as an entrée to formal, peer-reviewed publication. While publication is not a part of the job requirements of our students, it is a competency that some students seek out as part of our degree programs. To our knowledge, at least one student has taken this step, using the material from the other major



assignment in this course, the health economic literature review, as the basis for an article he published in his profession's newsletter. This is an example of engagement in the course along the intensive margin that we plan to use in order to explain the concepts of "intensive versus extensive margins" to our students in future iterations of this course.

A second motivator would be to raise awareness of Wikipedia's value to professional communities of practice. Wikipedia is already a commonly used source, and many doctors complain that their patients "look things up on the internet" before coming into the office. Use of Wikipedia can help healthcare professionals to engage with their patients' sources of knowledge. Finally, the skill-building aspect of the project may be another motivator, as the project aids in the transfer of cognitive skills by exercises such as creation of concept maps or early drafting of Wikipedia entry in "simple English"

([http://simple.wikipedia.org/wiki/Wikipedia:Simple\\_English\\_Wikipedia](http://simple.wikipedia.org/wiki/Wikipedia:Simple_English_Wikipedia)).

An additional motivator would be the explicit introduction into the course of the concepts of "intensive margins" and "human capital" that we have drawn upon in this discussion. Though the concepts are touched upon in week one and used throughout the course, distinctions between intensive versus extensive margins currently remain at a level of detail that is not explicitly discussed in the course.

We speculate that, by using the learning process in an online approach as an *example* of intensive margins, students may increase their understanding of this foundational economic concept and more easily grasp the learning options available to them in an online course. We feel that relating the human capital approach in the course to student motivation may allow students to more easily grasp this foundational economic concept. In addition, we feel that the human capital approach is a foundation upon which to build future evaluations of the course. Current

evaluation proceeds through weekly short evaluations and a course evaluation by students completed at the end of the course. Future evaluation should include the explicit collection of measures that can evaluate student success from their point of view—what is their professional achievement and salary at the time of entering their master’s program, how does those variables change over time, and do they advance in a substantive way in their careers as a result of completing the master’s program? The use of such data will allow us to validate the quality of our online programs by using “hard” measures of success in addition to the “soft” measures of student satisfaction and peer review of courses by peer faculty and program directors.

### **Conclusion**

Recent behavioral research suggests that users participate in open collaboration systems such as Wikipedia to varying degrees, and their use of the system is highly dependent upon their motivations (Forte and Lampe 2013). Most are passive consumers of information but a minority serve as core, highly involved editors. Recent sociological research documents, somewhat surprisingly, that while committed editors are reliable producers of high quality content, it is the one-time contributors who tend to provide the highest quality content of all (Anthony and Williamson 2009). Thus, the single editorial pass provided by a graduate classroom’s Wikipedia project need not necessarily be seen as a lower quality contribution.

We should also note in closing that the Wikipedia project was one of many modalities used to teach the concept of SID. Students were exposed to this concept through the textbook reading and the lecture. Assignments related to SID included a discussion board about the target income hypothesis and a quiz on the weekly lesson focused on the physician practice. Students’ demonstrated knowledge of facts related to the concept through their participation in the discussion and completion of the weekly quiz. The Wikipedia project allowed the students to

engage in higher level cognitive activities, including the evaluation of the concept and the creation of new content related to SID.

The Wikipedia project gives students access to authentic educational experiences that assume that they can receive and communicate the same information as experts. Health professionals who are also graduate students are mainly in need of guidance and coaching to filter and integrate such knowledge into their own professional practice and personal lives. Students may know that they need opportunities to further their education, and rely on the expertise of instructors with subject matter experts to help identify what those opportunities are. Whether this finding is generalizable to any economics class, on site (traditional face-to-face) or online, at the undergraduate or at the graduate level, is an empirical question that we consider to be a fruitful avenue for future research. We speculate that the lessons learned from this experience can be applied to improve economics education, to disseminate economic concepts for economics educators at large, and cast light on the intensive value of education within the human capital model.

## NOTES

<sup>1</sup> See <http://jdc.jefferson.edu/healthpolicyfaculty/64/> for a link to the Jefferson Digital Commons site carrying the assignment overview, and assignment files, rubrics, and examples for each aspect of the project.

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## TABLES

TABLE 1: Student Posting to Wikipedia by Class

Semester	Students	Topic	Online / Onsite Course	Number of Goups (Pairs)	Participation
Summer, 2011	13	Pharmacoeconomics	Online	6 <sup>a</sup>	5
Spring, 2012	5	Incremental cost effectiveness ratio	Online	3 <sup>b</sup>	3
Summer, 2012	4	Supplier-induced demand	Onsite	2	2
Summer, 2012	12	Supplier-induced demand	Online	6	4
Summer, 2013	10	Paper by a well known health economist	Online	5	4

Sources: Internal course data

Notes:

<sup>a</sup> There was one group of three students, while the rest were pairs

<sup>b</sup> There was one singleton (group of one), while the rest were pairs

TABLE 2: Estimated Impact of Student Generated Wikipedia Article on Supplier-Induced Demand

Impact Timing	Average Monthly Page Views
12 months prior to Wikipedia class project's completion.	560
12-month period beginning one year after project's completion	1350

Source: Alexa.com 2014



## FIGURES

**FIGURE 1: Elements of the Wikipedia assignment**

