Proposal to Revise the Undergraduate Economics Curriculum

The Department of Economics proposes to increase the level of mathematics required of all majors and to require an econometrics course in the major. The number of electives in the major will drop from six to five so that the required number of credit hours in economics remains the same. At least five economics courses must be taken on the Vanderbilt campus.

Motivation

There are several reasons to increase the mathematics and metrics required in the core of the economics curriculum. First, in recent years seniors in our exit interviews have asked that we offer more mathematically based courses and that we require econometrics.

Second, universities like ours typically require two terms of calculus and two terms of statistics and econometrics in their standard economics majors. Table 1 below summarizes the calculus and econometrics requirements at 16 universities including Vanderbilt. Vanderbilt alone requires only one term each of calculus and statistics.

The table also reports that seven of the 16 offer an advanced track in their economics major. Vanderbilt does not. The table shows that eight universities offer joint majors in mathematics and economics. Vanderbilt offers an applied major in mathematics that can function in a way that is similar to a joint major. A formal joint math/econ major listed in the Undergraduate Catalog remains a possibility. Requiring more mathematics and an econometrics course in the major would improve the success of an intensive track and joint major should the Department choose to pursue them in the future.

Third, our discipline is becoming more reliant on mathematical reasoning in the development of theory and in empirical investigation. As table 1 below suggests, an undergraduate economics major should promote the mathematical and statistical ideas used in economics.
### Table 1  Math and Statistics/Econometrics Requirements at Other Universities

<table>
<thead>
<tr>
<th>#</th>
<th>University</th>
<th># of calculus</th>
<th>stats+ metrics</th>
<th>linear algebra</th>
<th>Track in major</th>
<th>Joint Major</th>
<th>math/econ program</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chicago</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>yes</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Princeton</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>yes</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Stanford</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Columbia</td>
<td>3</td>
<td>2</td>
<td></td>
<td>no</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Duke</td>
<td>3</td>
<td>2</td>
<td></td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CMU BA</td>
<td>2</td>
<td>4</td>
<td></td>
<td>BS</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Wash U</td>
<td>2</td>
<td>2</td>
<td></td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Brown</td>
<td>2</td>
<td>2</td>
<td></td>
<td>yes</td>
<td>yes, two types</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Penn</td>
<td>2</td>
<td>2</td>
<td></td>
<td>no</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Northwestern</td>
<td>2</td>
<td>2</td>
<td></td>
<td>no</td>
<td>MMSS double major</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Emory</td>
<td>2</td>
<td>2</td>
<td></td>
<td>no</td>
<td>yes (also QSS major)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Cornell</td>
<td>1</td>
<td>2</td>
<td></td>
<td>yes</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Dartmouth</td>
<td>1</td>
<td>2</td>
<td></td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Harvard</td>
<td>1</td>
<td>2</td>
<td></td>
<td>yes</td>
<td>Yes, applied math</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Yale</td>
<td>1</td>
<td>2</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Vanderbilt</td>
<td>1</td>
<td>1</td>
<td></td>
<td>no</td>
<td>generic double major</td>
<td></td>
</tr>
</tbody>
</table>

Source: Program websites. Note some universities are on trimester calendars.

Fourth, half of our majors already complete two terms of calculus. Table 2 reports the highest numbered course in mathematics completed by students who graduated in the 2015-16 academic year with a major in economics. Forty-eight percent completed only one term of calculus spread across the three introductory options. Twenty-four percent completed just two terms of calculus spread over two options. Twenty-eight percent completed more than two terms of calculus. Math 2300 is a multivariate calculus course. This was the highest number completed by eight percent of economics majors.
Fifth, most majors in the College of Arts and Science include a senior seminar. Vanderbilt’s strategic plan calls for an immersion experience for each undergraduate. A senior seminar in the major is a necessary step in offering immersion experiences to economics majors who seek immersion in economics. Major students should have the experience of developing seminar essays and presenting them to their colleagues. Increasing the required level of mathematics and requiring econometrics will better prepare economics majors for their immersion experiences.

**Adding Mathematics in the Economics Major**

The Department proposes to require two terms of calculus. A student who enters with no calculus would take two terms of calculus to satisfy the basic requirement for the economics major.

The first term of calculus develops differentials; the second term integrals. These courses include trigonometry. Math 1301 serves as prerequisite for Math 2300, the multivariate calculus course. The Department of Mathematics offers more advanced sequences that would serve as well.

The mathematics courses are prerequisite to our program and do not count in the hours in our major. Many students enter Vanderbilt with credit for at least one term of calculus. Students who are interested in economics but enter with no
background in calculus will be able to take calculus in their first and second years and complete the major within four years. They will be able to take our principles courses and 2000-level electives while completing two-terms of calculus.

**Require Econometrics**

The Department will require an econometrics course. A new course, ECON 3032 Applied Econometrics, will be accessible to all majors. The content will address multivariate regression with an emphasis on application. Students will use statistical software. ECON 3035 Econometric Methods will be a more sophisticated course offered in parallel to 3032. The new econometrics courses will no longer have intermediate theory courses as prerequisite to reduce the length of the prerequisite cascade. The current course, ECON 3050 Introduction to Econometrics, will continue as the new curriculum comes on line, to be discontinued after 2019-20. Most students who take 3050 have had more than the minimum level of mathematics. With current enrollment in the major, we would expect to offer about eight sections per year of entry level econometrics.

All majors would then have experience in completing an original multiple regression project and evaluating regression estimates. The skills will be sufficient for all majors to include empirical analysis in senior seminar essays if they desire.

We will require five rather than six ECON electives, with at least three numbered over 3050. This adjustment keeps the number of courses required for the major at the same level as the present major. Offering the required econometrics course in smaller sections than the 2000-level electives will increase the level of learning in the courses.

ECON 3035 will be a more intensive version of econometrics offered in parallel to 3032, more closely matching the role 3050 plays now. We will introduce ECON 3012 as microeconomics and ECON 3022 as macroeconomics along with ECON 3032. These courses will carry the new prerequisites to be offered in parallel with the current ECON 3010 and 3020 during a transition period. Students who enroll at Vanderbilt before August 2018 may take either version of each theory course for which they meet the prerequisites. The Department will discontinue ECON 3010 and 3020 after students who enroll before August 2018 have graduated. As mentioned above, we will discontinue 3050 after 2019-20.

We propose to retain ECON 3050 Introduction to Econometrics through the 2019-20 year to allow current students access to an econometrics course with one term of calculus as prerequisite.

**Minimum Hours at Vanderbilt**

Some students transfer to Vanderbilt having completed a significant number of credit hours in economics at their previous college. The revised major requirements stipulate that at least 15 credit hours in economics must be completed on the Vanderbilt campus. In this way, we assure that all who graduate with economics
majors at Vanderbilt have significant experience in courses with Vanderbilt faculty. A student must complete at least nine credit hours on the Vanderbilt campus for the minor.

**Pedagogy**

We will make pedagogical changes to take advantage of the higher level of mathematical and econometric sophistication of our majors. To this end, the Department will appoint a faculty committee for each segment of the core curriculum. A committee for statistics and econometrics, for example, will allow the appropriate faculty to review the courses to assure that the new required courses use the higher level of mathematical preparation. Each committee might recommend to the Chair support for instructors in a course to improve specific skills, integrate software, and otherwise improve the performance of the course.

**Decision Points**

1. Design and introduce ECON 3032 and 3035 econometrics.
2. Introduce ECON 3012 and ECON 3022.
3. Require two terms of calculus as prerequisite to ECON 3012, 3022, 3032, and 3035.
4. Require ECON 3012 and 3022 of all majors who matriculate in August 2018 or thereafter.
5. Require ECON 3032 or 3035 of all majors who matriculate in August 2018 or thereafter.
6. Announce that ECON 3050 will not be offered after 2019-20.
7. Update the prerequisites for upper level electives in light of the new core requirements as the new curriculum ramps up.
8. Establish continuing faculty committees to guide the evolution of the core courses in the major.
9. Require that each major complete at least 15 credit hours in economics on the Vanderbilt campus.
Proposal To Modify the Statistics Requirement in the Current Economics Major and Minor.

Math 2821 (formerly Math 219) no longer includes regression as a topic. For this reason, the course has limited value for economics. We will stop accepting 2821 as an element of the statistics required for the economics major or minor. The Department of Mathematics is comfortable with this change.

Math 2810 is an introduction to mathematical statistics with multivariate calculus as a prerequisite. It is designed for electrical engineering. It is parallel to Math 2820 but with somewhat different topics. A student may earn credit for only of these two courses. Some engineering students also major in economics and take Math 2810 to satisfy engineering requirements. The topics in Math 2810 are a somewhat better fit for economics than 2820. The department of mathematics encourages students in either course to take the one-credit hour lab, Math 2820L concurrently. ECON 3050 already accepts “Math 2820L and either Math 2810 or 2820” as prerequisites. This proposal will treat math 2810 and 2820 as in parallel for the current major. The proposal will have the same statistics requirement for the current and future major and minor.

The economics major now requires:

“... at least 33 credit hours in economics courses, including 101, 1020, 1500 or 1510 (or Math 2820, Math 2820L, and Math 2821). Students who complete Economics 3050 with Math 2820 and 2820L as a prerequisite need not take Economics 1500 or 1510. ...”

The economics minor now requires:

“... 1500 or 1510 (or Math 2820 and Math 2820L) ...

Here are proposed modified requirements for the current major:

“... 1500 or 1510 ... For students who complete ECON 3050, Math 2820L and either Math 2810 and 2820, these math courses will stand in lieu of Economics 1500 or 1510.”

and for minor, the same language:

“... 1500 or 1510. For students who complete ECON 3050, Math 2820L and either Math 2810 and 2820, these math courses will stand in lieu of Economics 1500 or 1510.”
Proposals for Catalog changes for economics 2016-17  Nov 7, 2016

Delete:  2240  Russia in the World Economy

Delete:  3180  History of Economic Thought

These courses are unlikely to be taught again.

This is a New Course from Zara Sahakyan who is teaching the course as a special topic in Fall 2016.

ECON 3330  Economics of Risk
Decision making under risk and uncertainty. Expected utility, risk aversion, and the value of information. Investments, insurance, and lotteries. Moral hazard and adverse selection. Prospect theory. Prerequisite: 3010 and 1500 or 1510 or Math 2820L with either Math 2810 or 2820. [3] (SBS)

New Course for Revision of the Economics Major (to be parallel to ECON 3010 during a transition period)

ECON 3012  Microeconomics
Consumer choice and firm behavior from the fundamentals of preference and production theory. Calculus-based optimization. Price-determination, analysis of market equilibrium, perfect competition and the effect of market power in monopolies and oligopolies. Efficiency, welfare, and market failures. No credit for students who have completed 3010. Prerequisite: 1010, 1020, and either MATH 1201 or 1301. [3] (SBS)

New Course for Revision of the Economics Major (to be parallel to ECON 3020 during a transition period)

ECON 3022  Macroeconomics
Contemporary models of national income, employment, interest rates, price level, and economic growth. The study of decisions underlying consumption and investment behavior, as well as the effect of government policies. No credit for students who have completed 3020. Prerequisite: 1010, 1020, and either MATH 1201 or 1301. [3] (SBS)
ECON 3032 Applied Econometrics

Quantitative economic analysis with emphasis on multivariate regression. Measurement, specification, estimation, inference, prediction, and interpretation of econometric models. Experience with data and computer applications. No credit for students who have completed 3035 or 3050. Prerequisite: 1020, either 1500, 1510, or both MATH 2820L and either MATH 2810 or 2820 and either Math 1201 or 1301. [3] (SBS)

Current Description of ECON 3050 Introduction to Econometrics

[Formerly ECON 253] Quantitative methods of economic analysis. Measurement, specification, estimation, and interpretation of economic models. Econometric computation using microcomputers. No credit for students who have completed 3032 or 3035. No credit for graduate students in economics. Prerequisite: 3010 or 3012 and either 1500, 1510, or both MATH 2820L and either MATH 2810 or 2820. [3] (SBS)

Revision of ECON 3050 Introduction to Econometrics

[Formerly ECON 253] Quantitative methods of economic analysis. Measurement, specification, estimation, and interpretation of economic models. Econometric computation using microcomputers. No credit for graduate students in economics Not offered after 2019-20. Prerequisite: 3010 or 3012 and either 1500, 1510, or both MATH 2820L and either MATH 2810 or 2820. [3] (SBS)

ECON 3035 Econometrics Methods

Properties and problems in estimating economic relationships with multiple regression. Statistical and econometric theory to address empirical questions in economics. Hands-on experience with economic data analysis with programming in statistical software. No credit for students who have completed 3032 or 3035. Prerequisite: 1020, Either 1500, 1510, or both MATH 2820L and either MATH 2810 or 2820 and either Math 1201 or 1301. [3] (SBS)
Program of Concentration in Economics (for students who enroll in the fall 2018 and thereafter)

The requirements for the major include completion of at least 33 credit hours in economics courses, including 1010, 1020, 1500 or 1510, 3012, 3022, and 3032 or 3035. Students who complete Economics 3032 or 3035 with Math 2820L and Math 2810 or 2820 as prerequisites need not take Economics 1500 or 1510 and may complete the major with 30 credit hours in economics. At least 9 credit hours must be in courses numbered above 3035. At least 15 credit hours must be taken on the Vanderbilt campus. Courses with the word economic in their titles but offered in other disciplines do not carry credit in economics programs unless listed in this section of the catalog. Economics 1111 may be counted as an elective. No more than 3 credit hours of independent study may be included in the minimum 33 credit hours required for the major.

Mathematics Prerequisite

Students who enter Vanderbilt in the Fall 2018 and thereafter are required to complete two semesters of calculus before enrolling in economics courses numbered above 3000.

Minor in Economics

The minor in economics requires 21 credit hours, including 1010, 1020, 1500 or 1510 (or Math 2820L and Math 2810 or Math 2820), 3012, and 9 credit hours of electives. At least 3 credit hours must be in courses numbered above 3012. Two semesters of calculus are prerequisite to all economics courses numbered above 3000. At least nine credit hours must be taken on the Vanderbilt campus.

Honors Program

An honors program is available in economics. This program is designed for highly motivated students interested in doing independent research. Honors candidates who enroll in Fall 2018 and thereafter must complete 36 credit hours of work in economics, including the 18 credit hours of courses required of all economics majors. Honors candidates should complete an econometrics course before senior year. In addition, the Honors program requires completion of (1) Economics 3698 Junior Honors Research (1 credit hour), (2) Economics 3851-3851 Senior Thesis (6 credit hours), (3) Economics 4981-4982 Honors Seminar (2 credit hours), (4) 9 credit hours of electives including at least 6 credit hours in Economics courses above 3050. Students who are not sure whether they want to complete the Honors Program should take an additional 3 credit hour elective. Honors candidates are required to write a senior thesis and to defend it in an oral examination. On satisfactory completion of this program, a student will graduate with honors or highest honors in economics. Interested students who meet the College of Arts and Science’s requirements for honors candidacy as set forth elsewhere in this catalog...
should consult the director of undergraduate studies no later than the fall term of their junior year.
Program of Concentration in Economics

The requirements for the major include completion of at least 33 credit hours in economics courses, including 1010, 1020, 1500 or 1510 (or Math 2820L with Math 2810 or Math 2820L, Math 2820L, and Math 2820L), 3010, 3020. Students who complete Economics 3050 with Math 2820L and Math 2810 or Math 2820L as a prerequisite need not take Economics 1500 or 1510. At least 9 credit hours must be in courses numbered 3050 or above. Courses in Financial Economics (FNEC) courses do not count toward the major. Economics 1111 may be counted as an elective. No more than 3 credit hours of independent study may be included in the minimum 33 credit hours required for the major.

Mathematics Prerequisite

Two semesters of calculus are strongly recommended for majors and minors in the department. Calculus is a prerequisite for Economics 1500, 1510, 3010, and 3020, courses that are required in the economics major and minor. At least one semester of calculus is required for all our programs.

Minor in Economics

The minor in economics requires 21 credit hours, including 1010, 1020, 1500, or 1510 (or Math 2820L with Math 2810 or Math 2820L), 3010, and 9 credit hours of electives. Students who complete Economics 3050 with Math 2820L and Math 2810 or Math 2820L as a prerequisite need not take Economics 1500 or 1510. At least one elective must be numbered 3050 or above. One semester of calculus is prerequisite to 1500, 1510, and 3010. Financial Economics (FNEC) courses may not be taken for credit in the minor in economics.

Honors Program

An honors program is available in economics. This program is designed for highly motivated students interested in doing independent research. Students who meet the College of Arts and Science’s requirements for honors candidacy as set forth elsewhere in this catalog should consult the director of undergraduate studies no later than the fall term of their junior year. Honors candidates must take two semesters of calculus and 36 credit hours of work in economics, including all 15 credit hours of courses required for the Economics major. The following Honors Core requirements must be met in order for Honors in Economics to be awarded: (1) Economics 3050, Introduction to Econometrics (3 credit hours); (2) Economics 3698, Junior Honors Research (1 credit hour); (3) Economics 3851–3852, Senior Thesis (6 credit hours), culminating in a written thesis; (4) Economics 4981–4982, Honors Seminar (2 credit hours); (5) 9 credit hours of electives including 3 credit hours in an Economics course above 3050. Students who are not sure whether they want to complete the Honors Program are urged to take an additional 3-credit-hour elective. Honors candidates are also required to write a senior thesis and to defend it in an oral examination. On satisfactory completion of this program, a student will graduate with honors or with highest honors in economics. Interested students who meet the College of Arts and Science’s requirements for honors candidacy as set forth elsewhere in this catalog should consult the director of undergraduate studies no later than the fall term of their junior year.

Program of Concentration in Economics and History

This is an interdisciplinary program split between Economics and History that provides a more focused program of study while requiring fewer credit hours than a double major in the two fields. The program consists of 45 credit hours of course work of which 9 credit hours are from a common economics history core and the remaining 36 credit hours are evenly divided between Economics and History. Students are expected to observe course-specific requirements in each department. The details are spelled out below under Economics and History.

Licensure for Teaching

Candidates for teacher licensure in economics at the secondary level should refer to the chapter on Licensure for Teaching in the Peabody College section of this catalog.
The description of the Concentration in Economics below will apply to students who matriculate at Vanderbilt in August 2018 and thereafter.

**Program of Concentration in Economics**
The requirements for the major include completion of at least 33 credit hours in economics courses, including 1010, 1020, 1500 or 1510 (or Math 2820L with Math 2810 or Math 2820), 3012, 3022, and 3032 or 3035. Students who complete Economics 3032 or 3035 and Math 2820L with Math 2810 or Math 2820 as a prerequisite need not take Economics 1500 or 1510. At least 9 credit hours must be in courses numbered above 3035. At least 15 credit hours that count toward the economics major must be taken at Vanderbilt. Financial Economics (FNEC) courses do not count toward the economics major. Economics 1111 may be counted as an elective. No more than 3 credit hours of independent study may be included in the minimum 33 credit hours required for the major.

**Mathematics Prerequisite**
Students who matriculate at Vanderbilt in the fall 2018 and thereafter are required to complete two semesters of calculus before enrolling in Economics courses numbered above 3000.

**Minor in Economics**
The minor in economics requires 21 credit hours, including 1010, 1020, 1500 or 1510 (or Math 2820L with Math 2810 or Math 2820), 3012, and 9 credit hours of electives. At least one elective must be numbered above 3015. Students who complete Economics 3050 with Math 2820L and Math 2810 or Math 2820 as a prerequisite need not take Economics 1500 or 1510. Financial Economics (FNEC) courses do not count toward the economics major.

**Honors Program**
An honors program is available in economics. This program is designed for highly motivated students interested in doing independent research. Students who meet the College of Arts and Science’s requirements for honors candidacy as set forth elsewhere in this catalog should consult the director of undergraduate studies no later than the fall term of their junior year. Honors candidates who matriculate in fall 2018 and thereafter must complete 36 credit hours in economics, including the 18 credit hours of courses required of all economics majors. Honors candidates should complete 3032 or 3035 before senior year. In addition, the Honors program requires completion of (1) Economics 3698 Junior Honors Research (1 credit hour), (2) Economics 3851-3852 Senior Thesis (6 credit hours), culminating in a written thesis, (3) Economics 4981-4982 Honors Seminar (2 credit hours), (4) 9 credit hours of electives including at least 6 credit hours in Economics courses above 3035. Honors candidates are required to write a senior thesis and to defend it in an oral examination. On satisfactory completion of this program, a student will graduate with honors or with highest honors in economics.

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Mathematics Prerequisite
Two semesters of calculus are strongly recommended for majors and minors in the department. Calculus is a prerequisite for Economics 1500, 1510, 3010, and 3020, courses that are required in the economics major and minor. At least one semester of calculus is required for all our programs.

Minor in Economics
The minor in economics requires 21 credit hours, including 1010, 1020, 1500 or 1510 (or Math 2820L with Math 2810 or Math 2820), 3010, and 9 credit hours of electives. Students who complete Economics 3050 with Math 2820L and Math 2810 or Math 2820 as a prerequisite need not take Economics 1500 or 1510. At least one elective must be numbered 3050 or above. One semester of calculus is prerequisite to 1500, 1510, and 3010. Financial Economics (FNEC) courses do not count toward the economics major.

Honors Program
An honors program is available in economics. This program is designed for highly motivated students interested in doing independent research. Students who meet the College of Arts and Science’s requirements for honors candidacy as set forth elsewhere in this catalog should consult the director of undergraduate studies no later than the fall term of their junior year. Honors candidates must take two semesters of calculus and 36 credit hours of work in economics, including all 15 credit hours of courses required for the Economics major. The following Honors Core requirements must be met in order for Honors in Economics to be awarded: (1) Economics 3050, Introduction to Econometrics (3 credit hours); (2) Economics 3698, Junior Honors Research (1 credit hour); (3) Economics 3851–3852, Senior Thesis (6 credit hours), culminating in a written thesis; (4) Economics 4981–4982, Honors Seminar (2 credit hours); (5) 9 credit hours of electives including 3 credit hours in an Economics course above 3050. Honors candidates are required to write a senior thesis and to defend it in an oral examination. On satisfactory completion of this program, a student will graduate with honors or with highest honors in economics.

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Mathematics Prerequisite
Students who matriculate at Vanderbilt in the fall 2018 and thereafter are required to complete two semesters of calculus before enrolling in Economics courses numbered above 3000.

Minor in Economics
The minor in economics requires 21 credit hours, including 1010, 1020, 1500 or 1510 (or Math 2820L with Math 2810 or Math 2820), 3012, and 9 credit hours of electives. At least one elective must be numbered above 3015. Students who complete Economics 3050 with Math 2820L and Math 2810 or Math 2820 as a prerequisite need not take Economics 1500 or 1510. Financial Economics (FNEC) courses do not count toward the economics major.

Honors Program
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