

Requirements of the Undergraduate Economics Major: An Update and Comparison

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ABSTRACT

This paper describes the undergraduate economics curriculum for most of the 793 U.S. colleges and universities that conferred an economics bachelor's degree in 2019. In addition to updating the prevalence of the core requirements of the economics major and how these differ by institution type, we record new information on the variation in requirements across economics degree types, as classified by the National Center for Education Statistics, including STEM-designated degree types. We also investigate the prevalence of calculus-based intermediate courses and find that nearly two-thirds (63%) of economics degrees require calculus for the intermediate microeconomics and macroeconomics courses. In addition, 67% of degrees require single-variable calculus, 10% require multi-variable calculus, and 54% require basic econometrics (up from 41% in 2010) and these requirements also vary highly by degree type.

JEL Codes: A22, C10

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1. Introduction

Since the seminal work of Siegfried et al. (1991), there has been some consensus on both the goal of the economics major – to think like an economist – and the broad requirements of the economics major: *foundational* requirements (principles of microeconomics and macroeconomics, intermediate microeconomics and macroeconomics, and quantitative methods); *breadth* requirements (topical electives); *depth* requirements (upper-level electives), and *capstone* requirements (application of skills and knowledge through research and writing) (Siegfried et al. 1991). Over the decades since, several survey-based assessments of the discipline have documented this consensus (Siegfried and Bidani, 1992; Bosshardt, Watts, and Becker 2013; Siegfried and Walstad 2014; McGoldrick 2008). However, to our knowledge, only one comprehensive (non-survey based) assessment of the undergraduate economics major requirements has been published – it describes degree requirements as of the summer of 2010 (Petkus, Perry, and Johnson 2014; Johnson, Perry, Petkus 2012).

Thus, the motivation for our work is (1) to determine how economics degree requirements have changed since 2010; (2) compare and contrast the requirements of STEM-designated and traditional economics degrees; and (3) estimate the requirements of the “typical” undergraduate economics degree. The discipline has continued to evolve since 2010, becoming increasingly empirical, perhaps changing the nature of the undergraduate curriculum, as evidenced by more undergraduate institutions requiring econometrics (Angrist et al. 2017; Hamermesh 2013; Johnson, Perry, and Petkus 2012; Siegfried and Walstad 2014). Additionally, the economics degree titled “Econometrics and Quantitative Economics” as classified by the U.S. Department of Education’s National Center for Education Statistics (NCES) and made available through the Integrated Postsecondary Education Data System (IPEDS) has increased in popularity, rising from 1.2% of all economics degrees conferred in 2012 to 22.4% of economics degrees conferred in 2019 (Marshall and Underwood 2020; 2022). In this paper, we consider how the requirements of the traditional Economics degree and the Econometrics and Quantitative Economics degree differ and, to augment the previous literature, we

describe the requirements of the “typical” economics degree, through weighting by total degrees conferred at the various institutions.

2. Data and Methods

According to IPEDS, 793 institutions conferred some type of undergraduate (four-year) economics degree in 2019.¹ To distinguish between economics degrees of different types we use the NCES Classification of Instructional Programs (CIP) codes² and first define “economics” as all CIP codes beginning with “45.06” (other than Home Economics) as well as Agricultural Economics and Natural Resource Economics, as listed in Table 1.³

Table 1: Degree Types

CIP Code	Title	(1)	(2)	(3)	(4)
		Degree Types Conferred (IPEDS 2019)	% of Degree Types Conferred	Degree Types Cataloged	% of Degree Types Cataloged
45.0601	Economics, General	745	71.2%	617	74.5%
45.0602	Applied Economics	24	0.79%	16	0.73%
45.0603	Econometrics and Quantitative Economics	104	21.5%	86	20.5%
45.0604	Development Economics & International Development	30	0.82%	14	0.28%
45.0605	International Economics	30	0.81%	19	0.43%
45.0699	Economics, Other	44	0.92%	28	0.29%
1.0103	Agricultural Economics	34	3.8%	23	3.1%
3.0204	Natural Resource Economics	9	0.20%	6	0.20%
<i>Total</i>		1,020	100%	801	100%

Notes: Columns (1) and (2) are based on 2019 IPEDS completions data while columns (3) and (4) are based on the requirements of 801 degrees conferred by 653 unique institutions with complete requirements, CIP code, and classification information.

¹ These data are collected on every college, university, and technical or vocational institution with federal student financial aid programs by the NCES as required by Title IV of the (amended) Higher Education Act of 1965.

² The CIP code “provides a taxonomic scheme that supports the accurate tracking and reporting of fields of study and program completions activity. CIP was originally developed by the U.S. Department of Education's National Center for Education Statistics (NCES) in 1980, with revisions occurring in 1985, 1990, and 2000.”

³ We also exclude degrees classified as Business/Managerial Economics (CIP code: 52.0601).

During the summer and fall of 2020, we collected information on the requirements of each type of economics degree offered at the various institutions through college and university webpages and bulletins. Many of these institutions offer more than one economics degree, for a total of 1,020 different degree types, as reported by IPEDS and listed in Column (1) of Table 1. We discovered 1,178 different degrees from these 793 institutions. As this is more than reported by IPEDS, some of these are likely classified under the same CIP code at these institutions. For example, some institutions offer several degree tracks with different requirements. In our data collection, we recorded these as distinct degrees, but in many cases, these are reported to IPEDS under the same CIP code.

We maintain the data at the degree level to capture variation in requirements for the different programs. For some of these 1,178 degrees we were unable to determine some or all the degree requirements, yielding a sample of 964 degrees (from 664 institutions) with valid institutional characteristics and all *core* requirements cataloged. Finally, we match these data with 2019 IPEDS completions to categorize the degrees by CIP code and establish the number of each degree type conferred that year. This results in some missing information as it is sometimes ambiguous which degree should be matched with which CIP code and yields a sample of 801 degrees (from 653 institutions) with valid CIP codes, *complete* requirements, and institutional characteristics.⁴ In Columns (2) and (4) of Table 1, we show the percentage of each degree type conferred according to IPEDS ($n = 1,020$) and the percentage of each degree type we catalogued with complete information ($n = 801$). These similarities suggest no systematic issues with the representativeness of our sample. We cataloged information on principles, intermediate, mathematics and statistics, econometrics, and some commonly required electives. We define statistics courses as those covering probability and statistics offered outside the economics department and economic statistics courses offered within economics departments. We define basic econometrics similar to Johnson, Perry, and Petkus (2012) as courses that clearly

⁴ We are missing requirements data for 212 degrees from 187 institutions that are listed in IPEDS as conferring an economics degree in 2019 that did not include information online about their degrees.

indicate core topics in econometrics including regression analysis, model development, and causal inference in the description. Courses that focus only on topics such as descriptive statistics, probability theory, variance, and correlation were counted as statistics, not econometrics, even if they claim an introduction to regression.

The complete list of requirements and a taxonomic guide for cataloging requirements are included in Appendix B. We also recorded information on the order of Principles of Microeconomics and Principles of Macroeconomics and whether calculus was required for the intermediate level courses.

3. Requirements of the Economics Major

In what follows, we present the results of our data collection on requirements for the economics major compared to the previous literature, requirements by institution type (Section 3.1), and requirements by degree type (Economics compared to Econometrics and Quantitative Economics) (Section 3.2). Table 2 shows the core requirements of the economics major based on the data we collected (not including the additional IPEDS information on completions). We classify core requirements as principles, intermediate, and mathematics/econometrics courses. In this case, we have the larger sample of 964 degrees with cataloged *core* requirements which represent 38,902 (93%) of the 42,022 total undergraduate economics degrees conferred nationally in 2019, as defined in Table 1. In Table 2, we compare our estimates with the previous literature (Petkus, Perry, and Johnson (2014); Bosshardt, Watts, and Becker (2013); Siegfried and Walstad (2014)).

The most notable difference is in the percentage of economics degrees that require basic econometrics. While gains since 2010 appear modest, in comparison to the most comprehensive investigation (Johnson, Perry, and Petkus 2012; Petkus, Perry, and Johnson 2014) the prevalence of econometrics in the undergraduate economics curriculum has increased by over 10 percentage points in the past decade. While we find that 69% of degrees require single-variable calculus, consistent with previous estimates, we also find that only 63% of economics degrees teach calculus-based intermediate level courses (with single-variable calculus as a

prerequisite). Additionally, we are the first, to our knowledge, to estimate that around 12% of degrees require multi-variable calculus (in addition to single variable calculus).

Table 2: Core Requirements of the Economics Major

<i>Course</i>	<i>Percentage of Degrees Requiring</i>	<i>Petkus, Perry, Johnson (2014)</i>	<i>Bosshardt, Watts, & Becker (2013)^c</i>	<i>Siegfried & Walstad (2014)</i>
	N = 964	N = 1601	N = 160; N = 77	N = 283^d
principles of economics	99.3%	99.9%	-	80%
combined principles (1 semester)	13.8%	12.3%	21%; 16%	19%
separate principles (2 semesters)	85.6%	85.1%	83%; 88%	-
principles in any order	77.8%	69.0%	-	-
micro before macro	10.4%	23.0%	-	-
macro before micro	2.4%	8.1%	-	-
intermediate micro and macro	95.1%	94.8%; 94.1% ^a	99%; 99%	99%
intermediate with calculus	63.3%	-	-	-
math and econometrics				
single-variable calculus	69.0%	64.8%	-	74%
statistics	92.1%	93.9%	79%; 66%	74%
basic econometrics	54.2%	40.7% ^b	41%; 56%	50%

Notes: Based on the requirements of 964 degrees conferred by 662 unique institutions; a. Petkus, Perry, and Johnson computed these separately; b. defined as requiring *at least one* econometrics course; c. Bosshardt, Watts, and Becker (2013) provide results only for B.A. (N = 160) and B.S. (N = 77) degrees separately; d. using estimates from Table 3A on Arts & Sciences Colleges only.

In Table 3, we add advanced econometrics and the elective course requirements. We define advanced econometrics as any required course that has basic econometrics as a prerequisite and define history of economic thought as any course with either “history” or “historical” in the title. This includes both history of economic thought and economic history. We find that 2.5% of degrees require an advanced econometrics course, similar to the results of Johnson, Perry, and Petkus (2012) who find that 2.2% require advanced

econometrics. There are no notable differences in the prevalence of these elective requirements over the past decade.

Table 3: Complete Requirements of the Economics Major

<i>Course</i>	<i>Percentage of Degrees Requiring</i>	<i>Petkus, Perry, Johnson (2014)</i>	<i>Bosshardt, Watts, & Becker (2013)^c</i>	<i>Siegfried & Walstad (2014)</i>
	N = 956	N = 1601	N = 160; N = 77	N = 283^d
principles of economics	99.3%	99.9%	-	-
intermediate micro and macro	95.2%	94.8% / 94.1% ^a	99%; 99%	99%
intermediate with calculus	63.2%	-	-	-
single-variable calculus	69.0%	64.8%	-	74%
multi-variable calculus	11.8%	-	-	-
statistics	92.0%	93.9%	79%; 66%	74%
basic econometrics	54.3%	40.7% ^b	41%; 56%	50%
advanced econometrics	2.5%	-	-	-
money and banking	19.0%	-	14%; 25%	10%
political economy	15.5%	-	-	-
history of economic thought	11.3%	-	15%; 16%	11%
senior capstone	44.4%	-	33%; 29%	49%

Notes: Based on the requirements of 956 degrees conferred by 662 unique institutions; a. Petkus, Perry, and Johnson computed these separately; b. defined as requiring *at least one* econometrics course; c. Bosshardt, Watts, and Becker (2013) provide results only for BA (N = 160) and BS (N = 77) degrees separately; d. using estimates from Table 3A on Arts & Sciences Colleges only.

3.1 Requirements by Institution Type/Characteristics

Using Basic Carnegie Classifications, in Table 4 we show how degree requirements vary by type of institution. Ph.D. granting universities and liberal arts colleges, together responsible for approximately 88% of all undergraduate economics degrees conferred in 2019, are more likely to require single- and multi-variable calculus, teach calculus-based intermediate level courses, and require introductory econometrics.⁵ Notably, 64% of liberal arts colleges require senior capstone courses, compared to only 31% of Ph.D. granting

⁵ The Basic Classification is an update of the traditional classification framework developed by the Carnegie Commission on Higher Education in 1970 to support its research program. The Basic Classification was originally published for public use in 1973, and subsequently updated in 1976, 1987, 1994, 2000, 2005, 2010, 2015 and 2018. See here for additional details and methodology: https://carnegieclassifications.iu.edu/classification_descriptions/basic.php.

universities. Consistent with the results of Petkus, Perry, and Johnson (2014) and Bosshardt, Watts, and Becker (2013), baccalaureate colleges are less likely to require intermediate microeconomics and macroeconomics than all other types of institutions.

Table 4: Requirements by Institution Type

<i>Course</i>	<i>Total</i>	<i>Universities (PhD)</i>	<i>Masters</i>	<i>Liberal Arts</i>	<i>Baccalaureate</i>
	N = 956	N = 429	N = 288	N = 209	N = 30
principles of economics	99.3%	98.8%	99.7%	99.5%	100.0%
intermediate micro and macro	95.2%	95.7%	95.0%	96.7%	80.0%
intermediate with calculus	63.2%	71.1%	45.8%	73.9%	43.3%
single-variable calculus	69.0%	76.5%	53.3%	78.0%	50.0%
multi-variable calculus	11.8%	16.9%	4.9%	11.5%	6.7%
statistics	92.0%	92.9%	92.9%	90.2%	83.3%
basic econometrics	54.3%	57.5%	49.0%	56.9%	43.3%
advanced econometrics	2.5%	3.5%	1.7%	1.9%	0.0%
money and banking	19.0%	15.2%	27.1%	11.7%	46.7%
political economy	15.5%	11.1%	18.8%	17.0%	36.7%
history of economic thought	11.3%	6.6%	16.7%	11.0%	30.0%
senior capstone	44.4%	31.0%	48.8%	63.9%	56.7%
number of institutions	656	267	215	148	26
% of degrees conferred (2019)	100%	75.1%	11.3%	13.1%	0.4%

Notes: Based on the requirements of 956 degrees conferred by 656 unique institutions with complete requirements and classification information.

3.2 Requirements by Degree Type

In what follows, we further differentiate the degrees into STEM and non-STEM economics. In 2012, the Department of Homeland Security (DHS) expanded their list of STEM-designated degree programs to include “Econometrics and Quantitative Economics” (CIP code 45.0603) while all other economics degrees listed in Table 1 are considered non-STEM. Table 5 shows the difference in degree requirements for STEM and non-STEM economics degrees and presents weighted and unweighted requirements by degrees conferred.

Table 5: Requirements by STEM Designation

<i>Course</i>	<i>Total</i>		<i>STEM</i>		<i>non-STEM</i>	
	N = 801		N = 86		N = 715	
	(1) <i>unweighted</i>	(2) <i>weighted</i>	(3) <i>unweighted</i>	(4) <i>weighted</i>	(5) <i>unweighted</i>	(6) <i>weighted</i>
principles of economics	99.4%	99.6%	100.0%	100.0%	99.3%	99.5%
intermediate micro and macro	95.7%	98.5%	100.0%	100.0%	95.5%	98.1%
intermediate with calculus	62.6%	77.9%	93.0%	94.3%	58.7%	73.7%
single-variable calculus	67.1%	81.8%	93.0%	94.3%	63.7%	78.6%
multi-variable calculus	9.5%	14.2%	50.0%	51.5%	4.7%	4.6%
statistics	92.5%	97.0%	95.9%	97.0%	92.0%	96.9%
basic econometrics	54.2%	62.7%	85.5%	88.4%	50.3%	56.1%
advanced econometrics	2.5%	3.2%	11.6%	7.9%	1.4%	2.0%
money and banking	17.1%	8.4%	7.0%	14.5%	18.1%	6.8%
political economy	13.7%	5.7%	4.7%	1.7%	14.7%	6.7%
history of economic thought	11.9%	4.6%	3.5%	0.6%	13.1%	5.6%
senior capstone	43.3%	22.5%	45.9%	20.8%	43.4%	23.0%
number of institutions	656		85		617	
% of degrees conferred (2019)	100%		20.5%		79.5%	

Notes: Based on the requirements of 801 degrees conferred by 656 unique institutions with complete requirements, CIP code, degrees conferred, and classification information. The weighted columns reflect the "typical" major of that type: weighting by degrees conferred of that type (among degrees with complete information).

First, Columns (1) and (2) summarize the complete degree requirements for the full-information sample (801 degrees from 656 institutions). The figures in Column (2), weighted by degrees conferred (accounting for 38,492 (91.6%) of the degrees conferred in 2019) are the best representation of the requirements of the “typical” undergraduate economics degree. These weighted requirements better reflect the experience of the average student graduating with a four-year economics degree in the United States in 2019.⁶ Notably, this suggests 82% of economics majors take single-variable calculus, 78% take calculus-based intermediate courses, and 63% take econometrics. Second, Columns (3) through (6) summarize the weighted and unweighted requirements of STEM-designated economics degrees (Econometrics and Quantitative

⁶ The weighted requirements better reflect the typical or average student experience. These percentages are the probability that a randomly selected degree conferred in 2019 required that course.

Economics) and non-STEM economics degrees (all other CIP codes in Table 1). The (unweighted) requirements across all 8 degree types in Table 1 are provided in Appendix A. In comparing STEM and non-STEM degree requirements we focus on the weighted averages in Columns (4) and (6), respectively, but the unweighted averages tell a similar story. STEM-designated economics degrees are much more likely to require multi-variable calculus (52% vs 5%) and econometrics (88% vs 56%), and to some extent advanced econometrics (8% vs 2%), and less likely to require elective courses in history of economic thought (1% vs 6%) or political economy (2% vs 7%).

4. Conclusion

As the economics discipline continues to evolve, becoming more empirical, we provide an updated comprehensive description of the requirements of the undergraduate economics major. Consistent with this evolution we find that most economics majors are required to take single-variable calculus, calculus-based intermediate level classes, and econometrics. These findings may inform department decisions regarding curriculum changes and trends in discipline, including considerations regarding transition to or adding a STEM-designated degree. However, we also recognize and appreciate that departments have different strengths and value diversity in course offerings across institutions and degree types.

Consistent with previous literature, we show how requirements vary by institution type finding that Ph.D. granting universities and liberal arts colleges are more likely to require single- and multi-variable calculus, teach calculus-based intermediate level courses, and require introductory econometrics than other institutions. Finally, given the rapid pace of (re-)classification of undergraduate economics degree as STEM-designated, as highlighted by Marshall and Underwood (2020; 2022), we are the first to show how requirements differ by degree type, as categorized by CIP codes used to determine STEM-designation. We are also, to our knowledge, the first to weight degree requirements by degrees conferred using IPEDS

completions data to determine the “typical” economics, STEM-designated economics, and non-STEM economics degrees. We find that STEM-designated economics degrees are much more likely to require multi-variable calculus and econometrics and less likely to require courses in history of economic thought or political economy.

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7. Appendix A: Requirements by Degree Type

<i>Course</i>	<i>Total</i>	<i>Economics, General.</i>	<i>Applied Economics.</i>	<i>Econometrics and Quantitative Economics.</i>	<i>Development Economics and International Development.</i>	<i>International Economics.</i>	<i>Economics, Other.</i>	<i>Agricultural Economics.</i>	<i>Natural Resource Economics.</i>
	N = 809	N = 617	N = 16	N = 86	N = 14	N = 19	N = 28	N = 23	N = 6
principles of economics	99.4%	99.7%	100.0%	100.0%	92.9%	94.7%	96.4%	100.0%	100.0%
intermediate micro and macro	95.7%	96.7%	100.0%	100.0%	57.1%	94.7%	96.4%	82.6%	66.7%
intermediate with calculus	62.6%	59.2%	62.5%	93.0%	28.6%	52.6%	67.9%	65.2%	50.0%
single-variable calculus	67.1%	63.6%	68.8%	93.0%	42.9%	57.9%	64.3%	82.6%	83.3%
multi-variable calculus	9.5%	3.6%	12.5%	50.0%	0.0%	10.5%	26.8%	0.0%	0.0%
statistics	92.5%	92.5%	93.8%	95.9%	64.3%	89.5%	92.9%	100.0%	83.3%
basic econometrics	54.2%	51.8%	68.8%	85.5%	14.3%	47.4%	50.0%	28.3%	50.0%
advanced econometrics	2.5%	1.3%	0.0%	11.6%	0.0%	5.3%	3.6%	0.0%	0.0%
money and banking	17.1%	17.7%	50.0%	7.0%	21.4%	10.5%	14.3%	21.7%	16.7%
political economy	13.7%	11.2%	12.5%	4.7%	64.3%	68.4%	28.6%	13.0%	50.0%
history of economic thought	11.9%	13.5%	0.0%	3.5%	28.6%	21.1%	7.1%	0.0%	0.0%
senior capstone	43.3%	43.2%	37.5%	45.9%	50.0%	47.4%	48.2%	17.4%	83.3%

Notes: Based on the requirements of 809 degrees conferred by 656 unique institutions with complete requirements, CIP code, and classification information.

8. Appendix B: Taxonomy of Requirements

In cataloging degree requirements, we accessed institutional/departmental websites and academic bulletins. Given differences across institutions we developed a taxonomic guide to help in maintaining consistency in cataloging. In most cases, we viewed lists of degrees requirements and course titles, descriptions, and prerequisites as needed. If, after thorough consultation, we were unable to confirm the requirements of the degrees we coded some or all the requirements as missing.

- Principles of Economics (combined one semester)
 - When only a combined survey course is required.
- Principles of Microeconomics and Principles of Macroeconomics (two semesters)
 - When both are required. We also record whether students are required to take one before the other and, if so, in what order.
- Intermediate Microeconomics and Intermediate Macroeconomics (two semesters)
 - When both are required.
 - For intermediate microeconomics, we include courses titled Price Theory, Intermediate Microeconomics, Intermediate Microeconomic Theory, and some other minor variations.
 - For intermediate macroeconomics, we include courses titled Intermediate Macroeconomics, Intermediate Macroeconomic Theory, and some other minor variations.
- Single-Variable Calculus
 - While course titles vary, this course typically covers both differential and integral calculus. Many institutions title this course Calculus 2, whereas Calculus 1 is typically an introduction to limits and derivatives together with a review of polynomial, rational, trigonometric, exponential, and logarithmic functions.
- Multivariable Calculus
 - Often titled Calculus 3, this course typically covers topics such as parametric and polar equations, vectors, three-dimensional analytic geometry, vector-valued functions, functions of several variables, partial derivatives, and multiple integrals.
- Statistics
 - We include courses in probability and statistics offered outside the economics department and economic statistics courses offered within economics departments covering topics such as sampling methods, observational and experimental studies, graphical and numerical summaries of data, probability, sampling distributions, significance testing, estimation, and simple linear regression.
- Econometrics
 - We follow rules similar to Johnson, Perry, and Petkus (2012) to catalog econometrics courses since many econometrics courses do not have “econometrics” in the title, such as “Introduction to Regression Analysis”. We include courses that clearly indicate in the course description that the course was centered on core topics in econometrics including regression analysis, model development, and causal inference. Courses that focused only on topics such as descriptive statistics, probability theory, variance, and correlation were not counted as

- econometrics courses even if they claim an introduction to regression – these were classified as statistics courses.
- Advanced Econometrics
 - We include any required course that has introductory econometrics as a prerequisite.

Required Electives

As expected, the cataloging of required electives is more difficult and, as a result, the rules are less precise. So, in cataloging the required specialty (elective) courses we looked closely at both course titles and descriptions to determine which of the following categories to assign the course:

- Political Economy
 - We include all courses that focused on national, local, or world politics in relation to economic thought and policy. We also included courses covering equity and social justice and courses focusing on a particular issue in political economy.
- History of Thought
 - We include all courses with either “history” or “historical” in the title. This includes both History of Economic Thought and Economic History. We also include courses focusing on one (or several) economic philosophers.
- Money and Banking
 - We include all courses including banks, banking, and/or financial institutions in the course description. This includes courses in monetary economics and finance.
- Senior Seminar or Capstone
 - We include all required senior capstone experiences and senior seminars. If all seniors are required to write a thesis, we recorded that separately.