



Munich Personal RePEc Archive

Classifying Economics for the Common Good: Connecting Sustainable Development Goals to JEL Codes

Heikkilä, Jussi

Jyväskylä University School of Business and Economics

5 April 2020

Online at <https://mpra.ub.uni-muenchen.de/99559/>
MPRA Paper No. 99559, posted 13 Apr 2020 13:32 UTC

**Classifying economics for the common good:
Connecting sustainable development goals to JEL codes**

Jussi Heikkilä¹

April 2020 version

Abstract

How does economics research help in solving societal challenges? This brief note sheds additional light on this question by providing ways to connect Journal of Economic Literature (JEL) codes and Sustainable Development Goals (SDGs) of the United Nations. These simple linkages illustrate that the themes of SDGs have corresponding JEL classification codes. As the mappings presented here are necessarily imperfect and incomplete, there is plenty of room for improvements. In an ideal world, there would be a JEL classification system for SDGs, a separate JEL code for each of the 17 SDGs.

Keywords: JEL codes, social development goals, Agenda 2030, keyword search

JEL codes: A11, O20, Q01

¹ email: jussi.heikkila@jyu.fi I thank Salla Laukkanen for excellent research assistance.

1 Introduction

Economists play an increasingly important role in helping governments design new policies and regulations (Duflo 2017) but how does academic economics research help in solving global challenges? One way to analyse this is to explore the link between economic research and the Sustainable Development Goals (SDGs, LaFleur 2019). In 2015, the member states of the United Nations adopted 17 sustainable development goals, as part of the 2030 Agenda for Sustainable Development (United Nations 2015a). Great progress has been made but there is still a lot of work to do before achieving these goals (United Nations 2019).² Indexing and classification of documents are important since they decrease search costs and therefore promote efficient allocation of attention. In the context of economics research, Journal of Economic Literature (JEL) codes have been used to classify economic research since the early 20th century (Cherrier, 2019). However, there does not yet exist an explicit JEL coding for sustainable development goals.

This brief note suggests that the existing classification systems of economic literature could be utilized to track how much attention is allocated within economics research to topics that are related to global challenges. The contribution of this brief note to existing literature is to connect SDGs to JEL codes. The remainder of the paper is organized as follows. Section 2 presents SDGs and JEL classification system. Section 3 links JEL codes and SDGs goal by goal and discusses the limitations. Section 4 concludes.

2 SDGs and JEL codes

2.1 SDGs

According to the United Nations, sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.³ The 17 sustainable development goals succeeded the United Nations’ eight Millennium development goals (MDGs) in 2015 (United Nations 2015a, 2015b).⁴ The eight MDGs were international development goals for the year 2015 established following the Millennium Summit of the United Nations and adoption of the United Nations Millennium Declaration in September 2000.⁵ In September 2015, 193 countries of the UN General Assembly adopted the 2030 Development Agenda (“Agenda 2030”) which paragraph 59 outlines the 17 Sustainable Development Goals and the associated 169 targets and 232 indicators (United Nations 2015a). Currently, the aim is to achieve all SDGs by 2030 and the progress is monitored continuously (United Nations 2015, 2019; Sachs 2019). The 17 SDGs are:

² See e.g. SDG Tracker of Our World In data: <https://sdg-tracker.org/> (Accessed on 21 March 2020), Sustainable Development Report: <https://www.sdindex.org/> (Accessed on 21 March 2020) and Sachs et al. (2019).

³ See <https://www.un.org/sustainabledevelopment/development-agenda/> Accessed on 21 Mar 2020.

⁴ The MDGs were: Goal 1. Eradicate extreme poverty and hunger; Goal 2. Achieve universal primary education; Goal 3. Promote gender equality and empower women; Goal 4. Reduce child mortality; Goal 5. Improve maternal health; Goal 6. Combating HIV/AIDS, malaria, and other diseases; Goal 7. Ensure environmental sustainability; Goal 8. Develop a global partnership for development. See Millennium development goals: <https://www.un.org/millenniumgoals/> SDGs: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/> Accessed on 21 March 2020.

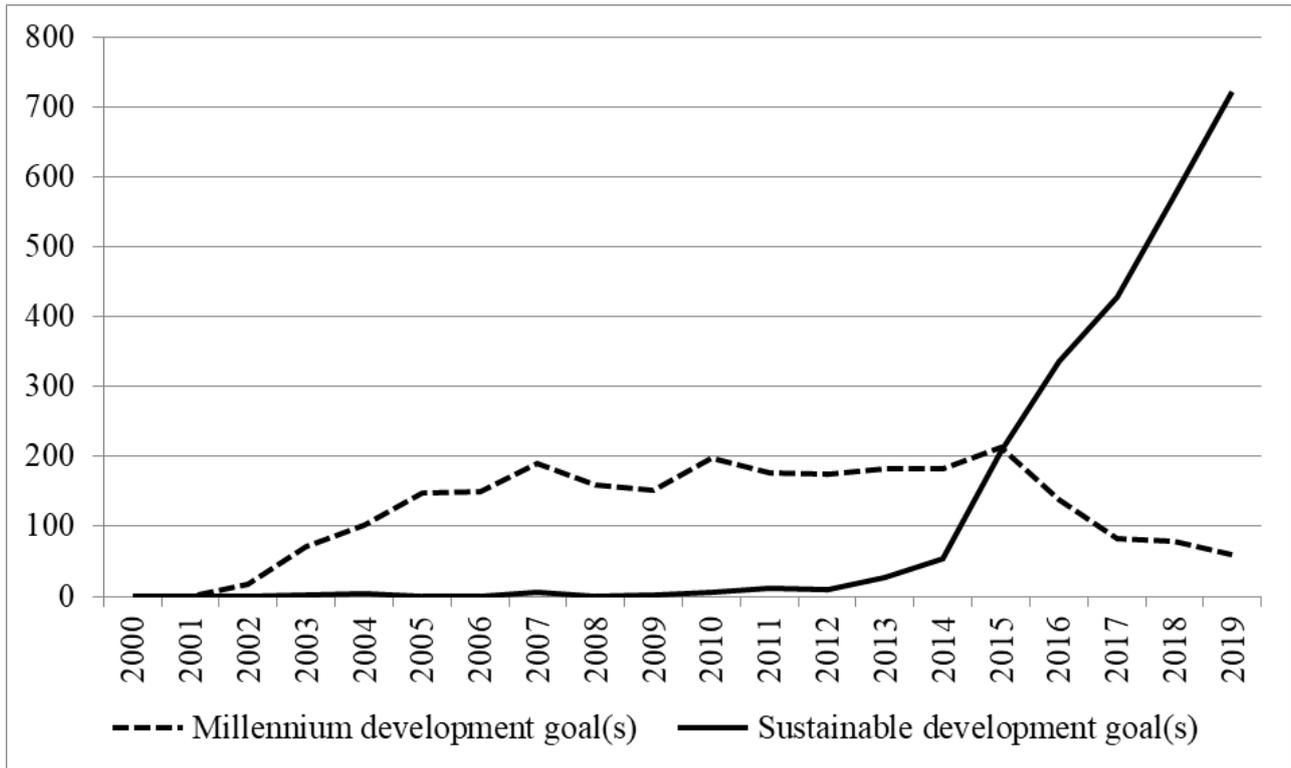
⁵ See <https://www.un.org/millenniumgoals/bkgd.shtml> Accessed on 4 April 2020

- Goal 1. End poverty in all its forms everywhere
- Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 3. Ensure healthy lives and promote well-being for all at all ages
- Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- Goal 5. Achieve gender equality and empower all women and girls
- Goal 6. Ensure availability and sustainable management of water and sanitation for all
- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 10. Reduce inequality within and among countries
- Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 12. Ensure sustainable consumption and production patterns
- Goal 13. Take urgent action to combat climate change and its impacts
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

In order to get a rough overview of the occurrence of MDGs and SDGs in economics research during the past two decades, we conduct some very general keyword searches. Figure 2 shows the trends of simple keyword searches in IDEAS/RePEc bibliographic database⁶ for both search queries “sustainable development goal” and “millennium development goal”. As expected, the trends in the number of publications clearly show that SDGs have replaced MDGs after Agenda 2030 was introduced in 2015. It is also noteworthy that the increase in the number of research papers mentioning SDGs is growing very steeply.

⁶ IDEAS is an economics-focused bibliographic database with over 3,100,000 indexed items of research, see <https://ideas.repec.org/>. It is based on RePEc database, see <http://repec.org/>. Accessed on 4 April 2020.

Figure 1. Publications mentioning MDGs or SDGs



Notes: Source is IDEAS/RePEc search, available at <https://ideas.repec.org/search.html>. Search queries: SDGs "sustainable development goal" OR "sustainable development goals" and MDGs "millennium development goal" OR "millennium development goals". No filters applied, i.e., search "All" (incl. Articles, Papers, Chapters, Books, Software) in "Whole record". Retrieved on 4 April 2020.

2.2 JEL codes

In the field of economics, Journal of Economic Literature classification is the *de facto* standard in classifying articles (Cherrier 2017; Kosnik 2018). Majority of economics journals require authors to choose JEL codes which best describe their manuscripts when submitting (Kosnik 2018) and bibliographic databases such as IDEAS and SSRN allow users to browse articles by JEL codes. The first version of the JEL codes (or EconLit subject descriptors) by the American Economic Association (AEA) was published in 1911 and it has since been occasionally updated and extended (Cherrier 2017). According to the webpage of the AEA:

*"The JEL classification system was developed for use in the Journal of Economic Literature (JEL), and is a standard method of classifying scholarly literature in the field of economics. The system is used to classify articles, dissertations, books, book reviews, and working papers in EconLit, and in many other applications."*⁷

As of the beginning of 2020, there are 20 JEL categories, which have 122 second level sub-categories that have altogether 856 third level sub-categories. Table 1 shows that the number of sub-categories varies across main JEL classes. Interestingly, despite the important role of JEL codes, they have received only limited attention in research until recently (Cherrier 2017; Kosnik 2018).

⁷ <https://www.aeaweb.org/econlit/jelCodes.php?view=jel> Accessed on 21 March 2020.

Table 1. JEL codes

	1st level JEL codes	Number of 2nd level codes	Number of 3rd level codes
1	A General Economics and Teaching	3	16
2	B History of Economic Thought, Methodology, and Heterodox Approaches	5	32
3	C Mathematical and Quantitative Methods	9	70
4	D Microeconomics	9	65
5	E Macroeconomics and Monetary Economics	7	47
6	F International Economics	6	53
7	G Financial Economics	5	33
8	H Public Economics	8	56
9	I Health, Education, and Welfare	3	23
10	J Labor and Demographic Economics	8	62
11	K Law and Economics	4	30
12	L Industrial Organization	9	72
13	M Business Administration and Business Economics, Marketing, Accounting, Personnel Economics	5	29
14	N Economic History	9	74
15	O Economic Development, Innovation, Technological Change, and Growth	5	41
16	P Economic Systems	5	43
17	Q Agricultural and Natural Resource Economics, Environmental and Ecological Economics	5	49
18	R Urban, Rural, Regional, Real Estate, and Transportation Economics	5	31
19	Y Miscellaneous Categories	9	11
20	Z Other Special Topic	3	19
	Min	3	11
	Max	9	74
	Average	6.10	42.80
	Median	5	42
	Total sum	122	856

Notes: "General" JEL classes under 1st level codes with no 2nd level codes (e.g., B00 and C00) have been counted as 3rd level codes.

3 Connecting SDGs and JEL codes

3.1 Methods and data

In an ideal or the first best world, there would be own JEL classification for SDGs — that is, a separate JEL code for each of the 17 SDGs. However, currently we live in a second best world without this type of classification.⁸ In order to fill in this gap, we provide three simple ways to link

⁸ Note that JEL code “Q01 Sustainable Development” “covers studies about issues related to sustainable development in the broadest context. That is, studies should include agriculture, natural resources, energy sources, and the environment.”

JEL codes and SDGs. In principle, we could either link “each JEL code to the closest SDGs” or “each SDG to the closest JEL codes”. We chose the latter option that is much simpler and link 17 SDGs to the most similar 3rd level JEL codes. JEL code data was collected from the AEA’s webpage and SDGs were collected from United Nations’ webpage (see Section 2). Three alternative methods to establish links between SDGs and JEL codes are described next.

First, we extract keywords directly from the 17 SDGs (Section 2.1) and search over the keywords of 856 3rd level JEL codes (Table 1) to document the number of potentially related JEL codes. For instance, the keyword for Goal 1 “End poverty in all its forms everywhere” is “poverty”. Some SDGs are more broadly defined and are assigned more keywords correspondingly: For instance, the keywords for Goal 9 “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation” are “infrastructure”, “industrialization” and “innovation”. We provide examples of JEL codes that most closely relate to the selected keywords.

Second, we build on LaFleur (2019) who created an SDG classification system for DESA publications. LaFleur (2019) was among the first to analyze United Nations publications using machine-learning approach to compute how much each SDG is represented in individual publications.⁹ As part of his analysis, LaFleur (2019) used machine learning methods to identify keywords related to each SDG and we use a slightly modified version of his keyword list as a basis to match SDGs to JELs. For each SDG, we rank JEL codes according to the number of overlapping keywords. These keywords are presented in Table 2. We explore three different weightings for the keywords: 1) no weighting, 2) weight 1/1 for the 1st keyword, 1/2 for the 2nd, 1/3 for the 3rd and so forth, and 3) weight 1 for the first five keywords and 1/[number of order] for the rest.

Third, we select three most relevant keywords for each SDG from the LaFleur’s (2019) list based on elimination and discretion. First, we delete “general words” that clearly are not related solely to a specific SDG such as “change”, “impacts”, “patterns”, “rapid”, “added”, “policies”, “capita” and “nations”. Second, we eliminate pairs of words when the same word-pair occurs also separately in the list. Third, in most cases we delete plural forms if the same word is on the list also as singular. Finally, from the remaining set of words, we select three words that most closely relate to corresponding SDG based on discretion. For most SDGs, we are left with three singular nouns as shown in Table 2.

⁹ See also Körfgen et al. (2018).

Table 2. Keywords for SDGs

SDG	LaFleur (2019) keywords	Selected three
1	poverty social protection poor social_protection extreme disasters extreme_poverty poverty_line day_end_pov-erty line losses living disaster cash protection_systems person poor_vulnerable disaster_risk	poverty poor social_protection
2	food hunger agricultural agriculture children malnutrition production genetic prices export markets hungry food_production subsidies food_security nutrition undernourished breeds aid insecurity	food agriculture nutrition
3	health deaths diseases people mortality births live_births maternal children hiv age live care rate years_age reproductive deaths_live worldwide risk women	health disease mortality
4	education primary children school primary_education quality secondary schools learning quality_education skills secondary_education reading primary_school proficiency mathematics teachers minimum saharan basic	education school learning
5	women girls gender women_girls equality gender_equality violence sexual age marriage female married work rights genital_mutilation mutilation female_genital genital partner globally	women gender equality
6	water sanitation management water_sanitation people drinking_water drinking population improved hygiene facilities safely water_resources global_population wastewater freshwater water_scarcity scarcity resources water_stress	water sanitation hygiene
7	energy electricity renewable renewable_energy clean affordable modern cooking fuels access energy_efficiency energy_consumption energy_intensity intensity consumption access_electricity reliable efficiency technologies affordable_reliable	energy electricity renewable
8	growth labour employment unemployment work decent financial productivity decent_work financial_services productive men adults working youth economic_growth child labour_productivity jobs developed	labor employment productivity
9	manufacturing infrastructure developing added manufacturing_added industrialization innovation gdp developed employment industries industrial mobile research job research_development intensity resilient_infrastruc-ture resilient emissions	infrastructure industrialization innovation
10	inequality developed income developing duty exports oda money duty_free developing_states tariff remit-tances migration treatment reducing inequalities products migrant policies island	inequality income migration
11	cities urban waste air pollution slums urban_population solid_waste solid land urbanization management disas-ters air_pollution rapid safe resilient housing inclusive risk	cities urban housing
12	consumption production material consumption_production sustainable sustainable_consumption water conven-tion material_consumption food domestic_material domestic impacts patterns natural capita production_pat-terns environmental pollutants wastes	consumption production sustainable
13	climate change climate_change agreement paris paris_agreement action global parties emissions adaptation convention temperature framework nations framework_convention united_nations determined climate_action degrees	climate climate_change emission
14	marine oceans ocean coastal resources areas fisheries ecosystems pollution protected_areas marine_resources fish overfishing biodiversity protected management stocks eutrophication ocean_acidification acidification	marine ocean fish
15	biodiversity land species forests areas loss forest degradation wildlife desertification protected ecosystems ter-restrial conservation resources halt land_degradation management covered biodiversity_loss	biodiversity land forest
16	institutions rights justice violence inclusive victims access_justice children human_rights data human societies trafficking effective peaceful levels sexual forms birth_registration registration	institutions rights justice
17	developed development data oda developing capacity registration partnerships capacity_building building regions trade received agenda statistical enhance debt areas complete death_registration	development official_development_assistance trade

3.2 Results

Table 3 reports the results of the simple keyword search approach. We also provide an example of a relevant JEL code for each keyword if there is one. This very simple keyword search already indicates that economic research classification can be relatively easily linked to SDGs. Only for some keywords no matching JEL codes are found (e.g., “girl”, “sanitation”).

Table 3. Link between SDGs and JEL codes, simple keyword search

Sustainable Development Goal	Keywords	Number of 3rd level JEL codes	Example
Goal 1. End poverty in all its forms everywhere	Poverty	9	I32 Measurement and Analysis of Poverty
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Hunger	1	O15 Human Resources • Human Development • Income Distribution • Migration
	Food	12	Q18 Agricultural Policy • Food Policy
	Nutrition	4	I12 Health Behavior
Goal 3. Ensure healthy lives and promote well-being for all at all ages	Agriculture	17	O13 Agriculture • Natural Resources • Energy • Environment • Other Primary Products
	Health	21	I15 Health and Economic Development
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Well-being	3	I31 General Welfare, Well-Being
	Education	20	I25 Education and Economic Development
Goal 5. Achieve gender equality and empower all women and girls	Learning	5	J24 Human Capital • Skills • Occupational Choice • Labor Productivity
	Gender	7	K38 Human Rights Law • Gender Law
	Women	2	J16 Economics of Gender • Non-labor Discrimination
Goal 6. Ensure availability and sustainable management of water and sanitation for all	Girl	0	-
	Water	6	Q25 Water
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	Sanitation	0	-
	Energy	12	O13 Agriculture • Natural Resources • Energy • Environment • Other Primary Products
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Economic growth	5	O47 Empirical Studies of Economic Growth • Aggregate Productivity • Cross-Country Output Convergence
	Employment	24	E24 Employment • Unemployment • Wages • Intergenerational Income Distribution • Aggregate Human Capital • Aggregate Labor Productivity
	Work	29	J81 Working Conditions
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Infrastructure	9	H54 Infrastructures • Other Public Investment and Capital Stock
	Industrialization	3	L52 Industrial Policy • Sectoral Planning Methods
Goal 10. Reduce inequality within and among countries	Innovation	7	O32 Management of Technological Innovation and R&D
	Inequality	12	J15 Economics of Minorities, Races, Indigenous Peoples, and Immigrants • Non-labor Discrimination
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	Cities	6	R23 Regional Migration • Regional Labor Markets • Population • Neighborhood Characteristics
	Housing	11	R31 Housing Supply and Markets
	Transport	18	O18 Urban, Rural, Regional, and Transportation Analysis • Housing • Infrastructure
Goal 12. Ensure sustainable consumption and production patterns	Consumption	11	E21 Consumption • Saving • Wealth
	Production	28	D62 Externalities
Goal 13. Take urgent action to combat climate change and its impacts*	Climate	3	Q58 Government Policy
	Climate change	1	Q54 Climate • Natural Disasters and Their Management • Global Warming
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Ocean	2	Q25 Water
	Marine or maritime	2	Q22 Fishery • Aquaculture
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Ecosystem	2	Q57 Ecological Economics: Ecosystem Services • Biodiversity Conservation • Bioeconomics • Industrial Ecology
	Forest	3	Q23 Forestry
	Desertification	3	O13 Agriculture • Natural Resources • Energy • Environment • Other Primary Products
	Land	17	Q24 Land
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions	Biodiversity	1	Q57 Ecological Economics: Ecosystem Services • Biodiversity Conservation • Bioeconomics • Industrial Ecology
	Peace	2	D74 Conflict • Conflict Resolution • Alliances • Revolutions
	Justice	3	D63 Equity, Justice, Inequality, and Other Normative Criteria and Measurement
Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	Institution	22	D02 Institutions: Design, Formation, Operations, and Impact
	International	63	F02 International Economic Order and Integration

Table 4 lists for each SDG three 3rd level JEL codes that have the most overlap with keywords suggested by LaFleur (2019). We explored three different weightings based on the ranking of keywords and they produced relatively similar rankings for JEL codes. Table 4 reports the results for the third weighting option (see Section 3.1). For most SDGs, there are JEL codes that clearly have most keyword overlap with LaFleur’s keywords, whereas for some the best matching JEL codes are not so unambiguous. In other words, there are several JEL codes with equal amount of keyword overlap. Most of the identified JEL codes seem to match SDGs quite well. One example of an exception is Goal 13 where JEL code C22 “Time-series models” overlaps in keywords but is not actually related specifically to the substance of Goal 13.

Table 5 is otherwise similar to Table 4 except that there the number of keywords for each SDG is limited to three most relevant ones (see Table 2). The resulting JEL codes are in most cases the same as in Table 4 but for some there is less overlap. For instance, for SDG 17 the top three JEL codes are all different in Tables 4 and 5. To summarize, these very simple keyword similarity analyses suggest that it is possible to connect SDGs and JEL codes. Thus, economists may classify their research articles to JEL codes that are closely linked to SDGs.

SDG	Top three JEL codes	Covers studies about/related to	Overlapping keywords
Goal 1. End poverty in all its forms everywhere	I32 Measurement and Analysis of Poverty	issues related to poverty, its measurement and analysis.	poverty, poor, poverty line, line
	O15 Human Resources • Human Development • Income Distribution • Migration	issues related to labor, demography, health, education, and welfare in the context of economic development and developing economies. Includes studies on nutrition, health, education, fertility, household structure and formation, labor markets and social policy.	poverty, social, living
	H53* Government Expenditures and Welfare Programs	issues related to government expenditures on welfare and related policies, including food stamp programs and studies about HUD.	poverty, social
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	O13 Agriculture • Natural Resources • Energy • Environment • Other Primary Products	development issues related to agriculture, natural resources, other primary products, energy, and the environment.	food, agricultural, agriculture, production, food production, markets
	Q11 Aggregate Supply and Demand Analysis • Prices	issues related to aggregate agricultural market, including supply, demand, prices and sustainable agriculture.	food, agricultural, agriculture, production, food production
	Q13 Agricultural Markets and Marketing • Cooperatives • Agribusiness	issues related to agricultural markets and marketing, cooperatives, and agribusiness.	food, agricultural, agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages	I12 Health Behavior	issues related to health production and conditions and their consequences. Covers studies about the causes and effects of being healthy or unhealthy, including studies about quality-adjusted life years. Includes studies on nutrition, mortality, morbidity, suicide, substance abuse and addiction, and disability as related to economic behavior. Studies should be cross-classified here and under I11 if they cover topics in both categories.	health, deaths, mortality, rate
	I14 Health and Inequality	the impact of health on social and economic inequality, and the impact of inequality on health. May cross-list with O15.	deaths, mortality, births, age, rate
	I15* Health and Economic Development	the impact of health on economic development, and the impact of levels of development on health. May cross-list with O15.	health, mortality
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	I21 Analysis of Education	all the economic issues, including output, quality, and demand and supply, related to education, except for educational finance.	education, primary, school, quality, secondary, learning, primary school
	A21 Pre-college	issues related to teaching economics at a pre-college level. For example, it includes studies on how to teach economics, what to teach in economics, and the outcomes from economic education at the pre-college level. Also covers the economic knowledge of the public at large.	education, primary, school
	I24 Education and Inequality	the impact of education on social and economic inequality, and the impact of inequality on education. May cross-list with O15.	education, school, quality
Goal 5. Achieve gender equality and empower all women and girls	J16 Economics of Gender • Non-labor Discrimination	economic issues related to gender, except for labor market discrimination, which is classified under J71 or J78.	women, gender, equality, gender equality, sexual, female
	J71 Discrimination	issues related to labor discrimination, including wage discrimination and discrimination in hiring and firing.	women, gender, equality, sexual, age
	I24* Education and Inequality	the impact of education on social and economic inequality, and the impact of inequality on education. May cross-list with O15.	gender, equality
Goal 6. Ensure availability and sustainable management of water and sanitation for all	Q53 Air Pollution • Water Pollution • Noise • Hazardous Waste • Solid Waste • Recycling	issues related to environmental degradation, its impacts and its solution.	water, management
	R53 Public Facility Location Analysis • Public Investment and Capital Stock	issues related to public facility location and public investment, including infrastructure.	management, facilities
	Q25 Water	issues related to water as a renewable resource and its conservation.	water, wastewater
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	Q42 Alternative Energy Sources	issues related to alternative energy sources, for example non-hydrocarbon fuels or wind.	energy, renewable, renewable energy
	L94 Electric Utilities	issues related to the electric utility industry.	energy, electricity
	Q48 Government Policy	issues related to government policy on energy.	energy, clean
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	E24 Employment • Unemployment • Wages • Intergenerational Income Distribution • Aggregate Human Capital • Aggregate Labor Productivity	issues related to the aggregate labor market, including unemployment, wage level, wage indexation, intergenerational income distribution and aggregate labor productivity. Also covers studies about intergenerational income mobility.	employment, unemployment, work, productivity, men
	E31 Price Level • Inflation • Deflation	issues related to aggregate price levels, inflation, and deflation, including the CPI and the Phillips curve.	growth, employment, unemployment, men
	J68 Public Policy	public policy issues related to labor mobility and unemployment, including employment services.	employment, unemployment, work, men
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	O14 Industrialization • Manufacturing and Service Industries • Choice of Technology	issues related to industrialization and industries in developing countries, including manufacturing, service and transportation and the choice of technology.	manufacturing, industrialization, industrial
	O11 Macroeconomic Analyses of Economic Development	macroeconomic issues related to development, including economic growth of developing countries. These studies include both theoretical models and empirical studies (time series and cross-sectional).	developing, gdp
	F63 Economic Development	the impact of globalization on economic development, including poverty, labor markets, and gender issues.	developing, developed

Table 4. Link between SDGs and JEL codes, modified keywords of LaFleur (2019)

Table 4. Continued

Goal 10. Reduce inequality within and among countries	F63	Economic Development	the impact of globalization on economic development, including poverty, labor markets, and gender issues.	inequality, developed, developing
	F61*	Microeconomic Impacts	to the impact of globalization on various microeconomic issues, including income distribution, market structure and pricing, and the behavior of consumers and firms.	inequality, income
	I32*	Measurement and Analysis of Poverty	issues related to poverty, its measurement and analysis.	inequality, income
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	Q53	Air Pollution • Water Pollution • Noise • Hazardous Waste • Solid Waste • Recycling	issues related to environmental degradation, its impacts and its solution.	waste, air, pollution, solid waste, solid, land, management, air pollution
	K32	Energy, Environmental, Health, and Safety Law	the intersections of environmental, health and safety laws and economics or economics.	waste, air, pollution, management, safe
	R11	Regional Economic Activity: Growth, Development, Environmental Issues, and Changes	issues related to regional economic activity including growth, development, and changes. Studies may also include the effects of agglomeration economies and foreign linkages (for example foreign direct investment or foreign trade) on regional economic activities. Includes environmental aspects of regional economics, such as the regional effects of climate change.	cities, urban, slums, urbanization
Goal 12. Ensure sustainable consumption and production patterns	Q11	Aggregate Supply and Demand Analysis • Prices	issues related to aggregate agricultural market, including supply, demand, prices and sustainable agriculture.	production, sustainable, food
	E27*	Forecasting and Simulation: Models and Applications	issues related to forecasting or simulation of aggregate consumption, saving, production, employment and/or investment.	consumption, production
	D62*	Externalities	mostly theoretical studies about issues related to externalities and welfare analysis.	consumption, production
Goal 13. Take urgent action to combat climate change and its impacts*	Q54	Climate • Natural Disasters and Their Management • Global Warming	issues related to climate and natural disasters, including desertification and drought.	climate, change, climate change, global, emissinos
	C22	Time-Series Models • Dynamic Quantile Regressions • Dynamic Treatment Effect Models • Diffusion Processes	econometric issues related to a single time series variable or single-equation models using time-series variables. These studies include such subjects as: unit root tests, trend or difference stationarity, autocorrelated error terms, AR(D)MA models, switching regression models, single-equation error correction models, and spectral analysis.	change, action
	J52	Dispute Resolution: Strikes, Arbitration, and Mediation • Collective Bargaining	issues related to labor dispute resolution, including collective bargaining.	agreement, action
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Q25	Water	issues related to water as a renewable resource and its conservation.	oceans, ocean, pollution
	L92	Railroads and Other Surface Transportation	issues related to surface transportation, including trains, autos, buses, trucks, and water carries. Also covers studies related to ports as they influence the performance of the transportation industry.	marine, ocean
	K32	Energy, Environmental, Health, and Safety Law	the intersections of environmental, health and safety laws and economics or economics.	resources, pollution, management
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Q57	Ecological Economics: Ecosystem Services • Biodiversity Conservation • Bioeconomics • Industrial Ecology	issues related to topics in ecological economics including ecosystem services and biodiversity.	biodiversity, species, wildlife, conservation, management
	O13	Agriculture • Natural Resources • Energy • Environment • Other Primary Products	development issues related to agriculture, natural resources, other primary products, energy, and the environment.	land, forest, desertification, resources, management
	Q24	Land	issues related to land as a renewable resource and its conservation.	land, degradation, desertification, conservation
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	O17	Formal and Informal Sectors • Shadow Economy • Institutional Arrangements	development issues related to formal and informal sectors, shadow economy, and legal, social, economic, and political institutional arrangements, including privatization, property rights, and social unrest.	institutions, rights, human rights, human
	P48	Political Economy • Legal Institutions • Property Rights • Natural Resources • Energy • Environment • Regional Studies	issues related to political economy, legal institutions and property rights in economic systems other than capitalist, socialist, and transitional economic systems. This includes roles of government and/or power relationships in resource allocation.	institutions, rights
	F33	International Monetary Arrangements and Institutions	issues related to exchange rate regimes, including fixed or flexible exchange rate systems and their impacts. Also covers studies related to international financial organizations, for example the IMF or the World Bank, and their roles.	institutions, rights
Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	F63	Economic Development	the impact of globalization on economic development, including poverty, labor markets, and gender issues.	developed, development, developing
	O11	Macroeconomic Analyses of Economic Development	macroeconomic issues related to development, including economic growth of developing countries. These studies include both theoretical models and empirical studies (time series and cross-sectional).	development, data, developing
	I25	Education and Economic Development	the impact of education on economic development, and the impact of levels of development on education. May cross-list with O15.	development, developing, capacity

Notes: * refers to cases where there are also other JEL codes with equal keyword overlap and the choice of this specific JEL code among the top three is based on discretion. Ranking of the top3 JEL codes is based on the following weighing: weight 1 for the first five keywords and 1/[number of order] for the rest. Data available from the author upon request.

SDG	Top three JEL codes	Covers studies about/related to	Overlapping keywords
Goal 1. End poverty in all its forms everywhere	I32	Measurement and Analysis of Poverty	issues related to poverty, its measurement and analysis.
	O15*	Human Resources • Human Development • Income Distribution • Migration	issues related to labor, demography, health, education, and welfare in the context of economic development and developing economies. Includes studies on nutrition, health, education, fertility, household structure and formation, labor markets and social policy.
	H53*	Government Expenditures and Welfare Programs	issues related to government expenditures on welfare and related policies, including food stamp programs and studies about HUD.
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	O13	Agriculture • Natural Resources • Energy • Environment • Other Primary Products	development issues related to agriculture, natural resources, other primary products, energy, and the environment.
	Q11	Aggregate Supply and Demand Analysis • Prices	issues related to aggregate agricultural market, including supply, demand, prices and sustainable agriculture.
	Q10	General	general economic issues related to agriculture, including survey articles, textbooks, and data.
Goal 3. Ensure healthy lives and promote well-being for all at all ages	I12	Health Behavior	issues related to health production and conditions and their consequences. Covers studies about the causes and effects of being healthy or unhealthy, including studies about quality-adjusted life years. Includes studies on nutrition, mortality, morbidity, suicide, substance abuse and addiction, and disability as related to economic behavior. Studies should be cross-classified here and under I11 if they cover topics in both categories.
	I15	Health and Economic Development	the impact of health on economic development, and the impact of levels of development on health. May cross-list with O15.
	I14	Health and Inequality	the impact of health on social and economic inequality, and the impact of inequality on health. May cross-list with O15.
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	I21	Analysis of Education	all the economic issues, including output, quality, and demand and supply, related to education, except for educational finance.
	J24	Human Capital • Skills • Occupational Choice • Labor Productivity	issues related to labor quality. Includes studies about the effects of education as human capital (or the pecuniary return to schooling) as well as those about training programs (public or private) and occupational choices. Micro-studies about labor productivity are also classified here.
	A21*	Pre-college	issues related to teaching economics at a pre-college level. For example, it includes studies on how to teach economics, what to teach in economics, and the outcomes from economic education at the pre-college level. Also covers the economic knowledge of the public at large.
Goal 5. Achieve gender equality and empower all women and girls	J16	Economics of Gender • Non-labor Discrimination	economic issues related to gender, except for labor market discrimination, which is classified under J71 or J78.
	J71	Discrimination	issues related to labor discrimination, including wage discrimination and discrimination in hiring and firing.
	F63*	Economic Development	the impact of globalization on economic development, including poverty, labor markets, and gender issues.
Goal 6. Ensure availability and sustainable management of water and sanitation for all	Q53*	Air Pollution • Water Pollution • Noise • Hazardous Waste • Solid Waste • Recycling	issues related to environmental degradation, its impacts and its solution.
	Q25*	Water	issues related to water as a renewable resource and its conservation.
	L95*	Gas Utilities • Pipelines • Water Utilities	issues related to the gas and water utility industries, including studies about pipelines.
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	Q42	Alternative Energy Sources	issues related to alternative energy sources, for example non-hydrocarbon fuels or wind.
	L94	Electric Utilities	issues related to the electric utility industry.
	Q48*	Government Policy	issues related to government policy on energy.
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	E24	Employment • Unemployment • Wages • Intergenerational Income Distribution • Aggregate Human Capital • Aggregate Labor Productivity	issues related to the aggregate labor market, including unemployment, wage level, wage indexation, intergenerational income distribution and aggregate labor productivity. Also covers studies about intergenerational income mobility.
	J24	Human Capital • Skills • Occupational Choice • Labor Productivity	issues related to labor quality. Includes studies about the effects of education as human capital (or the pecuniary return to schooling) as well as those about training programs (public or private) and occupational choices. Micro-studies about labor productivity are also classified here.
	J68*	Public Policy	public policy issues related to labor mobility and unemployment, including employment services.
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	H54*	Infrastructures • Other Public Investment and Capital Stock	issues related to national expenditures on infrastructures and other public investment and their impacts on the performance of the national or local economy.
	R42*	Government and Private Investment Analysis • Road Maintenance • Transportation Planning	issues related to investment in transportation and transportation infrastructure.
	H52*	Government Expenditures and Education	issues related to government expenditures on education and related policies.

Table 5. Link between SDGs and JEL codes, selected three keywords

Table 5. Continued

Goal 10. Reduce inequality within and among countries	D31*	Personal Income, Wealth, and Their Distributions	issues related to personal income and wealth and their distributions, most of which are empirical. Studies about wage as a component of personal income should be classified here.	inequality, income
	F61*	Microeconomic Impacts	to the impact of globalization on various microeconomic issues, including income distribution, market structure and pricing, and the behavior of consumers and firms.	inequality, income
	I24*	Education and Inequality	the impact of education on social and economic inequality, and the impact of inequality on education. May cross-list with O15.	inequality, income
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	O18	Urban, Rural, Regional, and Transportation Analysis • Housing • Infrastructure	regional, urban, rural, and transportation issues related to economic development and developing economies, including urbanization.	cities, urban
	R11*	Regional Economic Activity: Growth, Development, Environmental Issues, and Changes	issues related to regional economic activity including growth, development, and changes. Studies may also include the effects of agglomeration economies and foreign linkages (for example foreign direct investment or foreign trade) on regional economic activities. Includes environmental aspects of regional economics, such as the regional effects of climate change.	cities, urban
	R12*	Size and Spatial Distributions of Regional Economic Activity	issues related to spatial distributions of economic activity including economic geography, interregional trade, and regional convergence.	urban, housing
Goal 12. Ensure sustainable consumption and production patterns	D62	Externalities	mostly theoretical studies about issues related to externalities and welfare analysis.	consumption, production
	E27	Forecasting and Simulation: Models and Applications	issues related to forecasting or simulation of aggregate consumption, saving, production, employment and/or investment.	consumption, production
	Q11	Aggregate Supply and Demand Analysis • Prices	issues related to aggregate agricultural market, including supply, demand, prices and sustainable agriculture.	production, sustainable
Goal 13. Take urgent action to combat climate change and its impacts*	Q54	Climate • Natural Disasters and Their Management • Global Warming	issues related to climate and natural disasters, including desertification and drought.	climate, climate change, emission
	Q15	Land Ownership and Tenure • Land Reform • Land Use • Irrigation • Agriculture and Environment	issues related to agricultural land, including ownership and tenure (for example, issues related to share cropping), irrigation and agricultural land valuation.	climate, emission
	Q58	Government Policy	issues related to both national and international government policy pertaining to the environment, including environmental taxes and tradable permits.	climate, emission
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	L92	Railroads and Other Surface Transportation	issues related to surface transportation, including trains, autos, buses, trucks, and water carries. Also covers studies related to ports as they influence the performance of the transportation industry.	marine, ocean
	Q25	Water	issues related to water as a renewable resource and its conservation.	ocean
	Q22*	Fishery • Aquaculture	issues related to fishery and aquaculture.	fish
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	O13	Agriculture • Natural Resources • Energy • Environment • Other Primary Products	development issues related to agriculture, natural resources, other primary products, energy, and the environment.	land, forest
	Q23	Forestry	issues related to forestry.	land, forest
	Q57*	Ecological Economics: Ecosystem Services • Biodiversity Conservation • Bioeconomics • Industrial Ecology	issues related to topics in ecological economics including ecosystem services and biodiversity.	biodiversity
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	O17	Formal and Informal Sectors • Shadow Economy • Institutional Arrangements	development issues related to formal and informal sectors, shadow economy, and legal, social, economic, and political institutional arrangements, including privatization, property rights, and social unrest.	institutions, human rights
	P48*	Political Economy • Legal Institutions • Property Rights • Natural Resources • Energy • Environment • Regional Studies	issues related to political economy, legal institutions and property rights in economic systems other than capitalist, socialist, and transitional economic systems. This includes roles of government and/or power relationships in resource allocation.	institutions
	F33*	International Monetary Arrangements and Institutions	issues related to exchange rate regimes, including fixed or flexible exchange rate systems and their impacts. Also covers studies related to international financial organizations, for example the IMF or the World Bank, and their roles.	institutions
Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	F35	Foreign Aid	issues related to foreign aid in general.	development, official development assistance
	O19	International Linkages to Development • Role of International Organizations	issues related to international linkages to development, including the role of international organizations, foreign aid, trade and financial flows, and topics such as IMF conditionality.	development, trade
	Q56	Environment and Development • Environment and Trade • Sustainability • Environmental Accounts and Accounting • Environmental Equity • Population Growth	issues related to the environment and development, the environment and trade, environmental accountability, environmental equity, and environmental sustainability.	development, trade

Notes: * refers to cases where there are also other JEL codes with equal keyword overlap and the choice of this specific JEL code among the top three is based on discretion. Data available from the author upon request.

The mappings presented in Tables 3, 4 and 5 are examples of very simple ways to link JEL codes and SDGs and there are naturally multiple other ways. In other words, they are necessarily imperfect and incomplete and have several limitations. It is worth noting that some JEL codes cannot be directly linked to specific SDGs. For instance, economic methods (e.g., JEL code class C “Mathematical and Quantitative Methods” with its subclasses) are “general purpose technologies” and are not SDG-specific but can be applied to study all of them. It should also be noted that for some JEL codes the guideline mentions that documents classified to that specific JEL code may, or in some cases should, be “cross-listed” or “cross-classified” to other JEL codes. For instance, the guideline for JEL code “I15 Health and Economic Development” notes that it “covers studies about the impact of health on economic development, and the impact of levels of development on health. May cross-list with O15” (see Goal 3 in Table 4). Similarly, the guideline for JEL code “J83 Workers' Rights” notes that it “covers studies about labor standard issues related to workers' rights. Studies should be cross-classified here and under the other appropriate categories in J, if they are relevant.” These nuances in JEL- code-specific guidelines were ignored in this article.

4 Discussion

As the sustainable development goals lack their corresponding JEL codes, this paper has suggested simple ways to connect SDGs and JEL codes. There are multiple ways to improve these linkages. For instance, one could use the corpus or keywords of economics articles that are tagged with a specific JEL code to establish the link to the closest SDGs. This would require much deeper bibliometric, topic modelling and science mapping analyses (cf. Aria & Cuccurullo 2017; Körfgen et al. 2018; Ambrosino et al. 2019; LaFleur 2019). These are left for future studies.

The correspondence between economic research topics and SDGs illustrates that economics is not after all so dismal science as some may think. Highlighting the fact that economists study research topics that are closely related to SDGs may encourage other researchers to allocate more attention on analysing how economic research can help in solving societal challenges and reaching all the SDGs by 2030.

References

- Ambrosino, A., Cedrini, M., Davis, J., Fiori, S., Guerzoni, M. & Nuccio, M. 2019. What topic modeling could reveal about the evolution of economics. *Journal of Economic Methodology* 25(4), 329–348.
- Aria, M. & Cuccurullo, C. 2017. *bibliometrix: An R-tool for comprehensive science mapping analysis*. *bibliometrix: An R-tool for comprehensive science mapping analysis*. *Journal of Informetrics* 11, 959–975.
- Cherrier, B. 2017. Classifying Economics: A History of the *JEL* Codes. *Journal of Economic Literature*, 55(2): 545-79.

Duflo, E. 2017. "Richard T. Ely Lecture: The Economist as Plumber." *American Economic Review*, 107(5): 1-26.

Kosnik, L. 2018 A survey of JEL codes: What do they mean and are they used consistently? *Journal of Economic Surveys* 32(1), 249-272.

Körfggen, A., Förster, K., Glatz, I., Maier, S., Becsi, B., Meyer, A., Kromp-Kolb, H. & Stötter, J. 2018. It's a Hit! Mapping Austrian Research Contributions to the Sustainable Development Goals. *Sustainability* 10(9).

LaFleur, M. 2019, Art is long, life is short: An SDG Classification System for DESA Publications. DESA Working Paper No. 159ST/ESA/2019/DWP/159, May 2019.

Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., & Fuller, G. 2019. Sustainable development report 2019. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN), New York.

United Nations. 2015a. *Transforming Our World: The 2030 Agenda for Sustainable Development*. United Nations, New York.

United Nations. 2015b. *The Millennium Development Goals Report 2015*. United Nations, New York.

United Nations. 2019. *The Sustainable Development Goals Report 2019*. United Nations, New York.