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Classifying economics for the common good:

A note on the links between sustainable development goals and JEL codes

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Abstract

Purpose – This brief note sheds light on the links between Journal of Economic Literature (JEL) codes and the Sustainable Development Goals (SDGs) of the United Nations.

Design/methodology/approach – Three alternative methods based on keyword overlap to establish links between SDGs and JEL codes are presented.

Findings – These simple linkages illustrate that the themes of SDGs have corresponding closely related JEL classification codes.

Research limitations/implications – The mappings presented in this note are based on simple keyword overlap and are therefore necessarily imperfect and incomplete. There is plenty of room for further development.

Originality/Value – The first and preliminary attempt to link SDGs and JEL codes.

Keywords JEL codes, sustainable development goals, Agenda 2030, keyword search

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1 Introduction

“Economics works toward the common good; its goal is to make the world a better place. To that end, its task is to identify the institutions and policies that will promote the common good.”

Jean Tirole (2017, p. 5)

Economists have played an increasingly important role in helping governments design new policies and regulations (Duflo 2017; Tirole 2017), but to which global challenges do academic economists allocate their limited attention? One way of addressing this question is to explore the link between economics research and the Sustainable Development Goals (SDGs; LaFleur 2019). In 2015, the member states of the United Nations adopted 17 SDGs, as part of the 2030 Agenda for Sustainable Development (United Nations 2015a). Great progress has been made toward the realization of these goals but plenty of work remains before these goals are fully achieved (United Nations 2019; Sachs et al. 2019).ⁱ Indexing and classification of research documents (books, articles, working papers, etc.) are important because these activities 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 economics research since the early 20th century (Cherrier 2017). However, there does not yet exist an explicit JEL coding for SDGs.

This brief note suggests that the existing classification systems of economics literature could be utilized to track the amount of attention within economics research that is allocated to topics related to global challenges. An important assumption of this approach is that the SDGs may act as a frame for conducting research on sustainable development (Meschede & Henkel, 2019). The contribution of this brief note to the existing literature is to connect SDGs to JEL codes. The remainder of this paper is organized as follows. Section 2 presents the SDGs and the JEL classification system. Section 3 links JEL codes with SDGs goal by goal and discusses limitations of the used methods. 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.”ⁱⁱ The 17 SDGs succeeded the United Nations’ eight Millennium Development Goals (MDGs) in 2015 (United Nations 2015a, 2015b).ⁱⁱⁱ The eight MDGs were international development goals for the year of 2015 that were established following the Millennium Summit of the United Nations and the adoption of the United Nations Millennium Declaration in September 2000.² In September 2015, 193 countries of the UN General Assembly adopted the 2030 Development Agenda (Agenda 2030), in which paragraph 59 outlines the 17 SDGs, the associated 169 targets,

² See <https://www.un.org/millenniumgoals/bkgd.shtml> (Accessed on 4 April 2020).

and 232 indicators (United Nations 2015a). Currently, the aim of Agenda 2030 is to achieve all SDGs by 2030, and progress towards this goal is monitored continuously (United Nations 2015, 2019; Sachs et al. 2019). The 17 SDGs are as follows:

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.

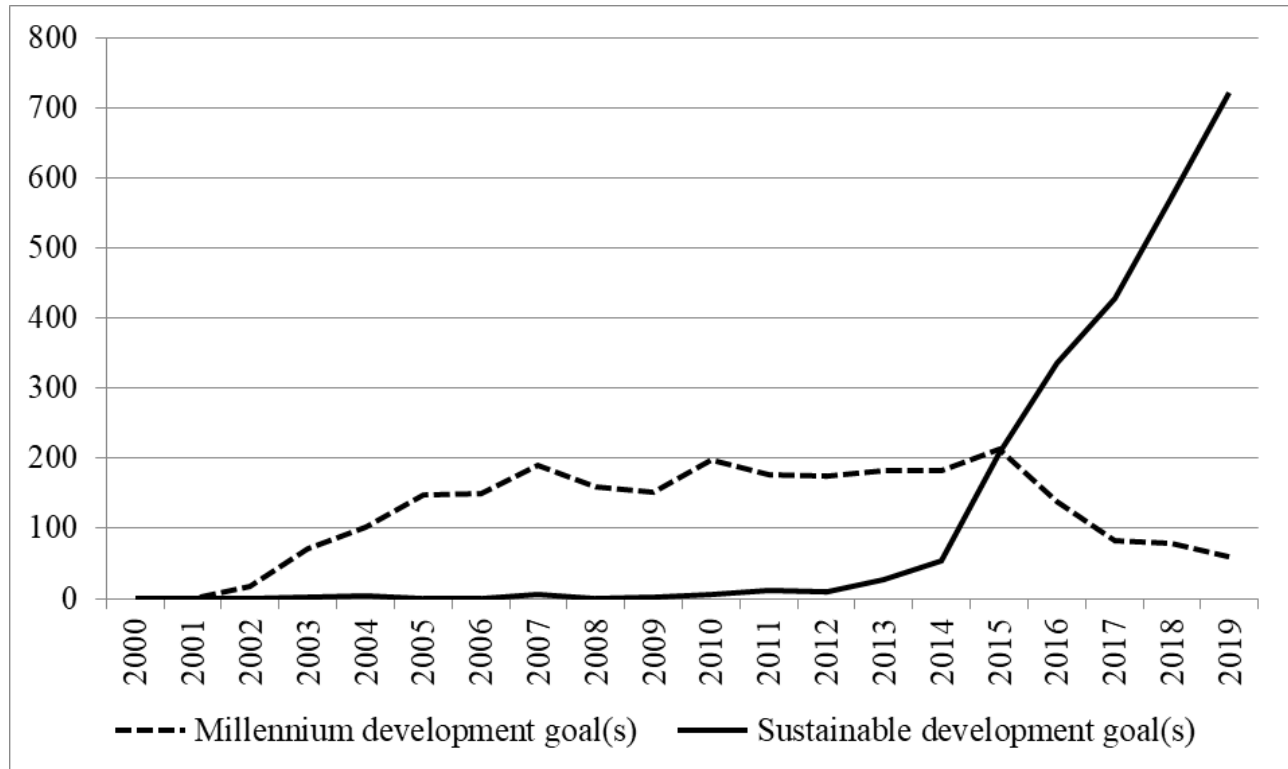
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

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 gain a rough overview of the occurrence of MDGs and SDGs in economics research over the past two decades, we conducted some very general keyword searches. Figure 1 shows the trends revealed by simple keyword searches in the IDEAS/RePEc bibliographic database^{iv} for the following search queries: “sustainable development goal” and “millennium development goal”. As expected, the trends in the numbers of publications mentioning SDGs and MDGs clearly showed that SDGs 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.

Figure 1. Publications mentioning MDGs or SDGs



Notes: The source of this data is IDEAS/RePEc, available at <https://ideas.repec.org/search.html>. SDG search queries: "sustainable development goal" OR "sustainable development goals". MDG search queries: "millennium development goal" OR "millennium development goals". No filters were 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, the JEL classification system is the *de facto* standard for classifying articles (Cherrier 2017; Kosnik 2018). The majority of economics journals require authors to choose the JEL codes that best describe their manuscripts during the submission process (Kosnik 2018). Bibliographic databases, such as IDEAS and SSRN, allow users to browse articles by their JEL codes. The first version of JEL codes (or EconLit subject descriptors) was published by the American Economic Association (AEA) in 1911 and has since been updated and extended on an occasional basis (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."

As of the beginning of 2020, there were 20 JEL categories with 122 second-level subcategories and 856 third-level subcategories. Table 1 shows that the number of sub-categories varies across the main JEL classes. Interestingly, despite the important role of JEL codes, they have received limited attention from researchers until recently (Cherrier 2017; Kosnik 2018).

Table 1. JEL codes

First-level JEL codes	Number of second-level codes	Number of third-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: JEL classes as of March 2020. "General" JEL classes under first-level codes with no second-level codes (e.g., B00 and C00) were counted as third-level codes.

3 Connecting SDGs with JEL codes

3.1 Methods and data

For those who search for economics research related to a specific SDG, search costs would be reduced if there were a JEL classification code for each SDG. However, currently this kind of classification is lacking. We acknowledge that the 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.” An alternative and often used strategy is to use keyword searches. For instance, Quental and Lourenco (2012) search for documents whose title, abstract or keywords contain the term “sustainable development” and Meschede and Henkel (2019) search for documents whose title or keywords

contain the string “sustainab*”. The downside of this approach is that such general search terms typically retrieve a very large number of documents which topics may vary widely.

In order to fill this gap, we provide three simple ways to link JEL codes with SDGs. In principle, we could either link each JEL code to the most closely related SDGs or each SDG to the most closely related JEL codes. We chose the latter option, as it is much simpler, and linked all 17 SDGs to the most similar third-level JEL codes. The JEL code data was collected from the AEA’s webpage, and the SDGs were collected from the United Nations’ webpage (see Section 2). Three alternative methods to establish links between SDGs and JEL codes are described below.

First, we extracted keywords directly from the 17 SDGs (Section 2.1) and searched the keywords of 856 third-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”) was “poverty”. Some SDGs are more broadly defined and were therefore assigned more keywords accordingly. For instance, the keywords for Goal 9 (“build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”) were “infrastructure”, “industrialization” and “innovation”. For Goal 17 (“strengthen the means of implementation and revitalize the global partnership for sustainable development”) there are no unambiguous keywords but we selected “international” since it is a recurring dimension and explicitly mentioned three times among the 19 targets associated with Goal 17 (United Nations 2015a, 30–32). We provide examples of the JEL codes that most closely relate to the selected keywords.

Second, we built on LaFleur (2019) who created an SDG classification system for DESA publications. LaFleur (2019) was among the first to analyze United Nations publications using a machine learning approach to compute the degree to which each SDG is represented in individual publications (see also Körffgen et al., 2018). As part of his analysis, LaFleur (2019) used machine learning methods to identify keywords related to each SDG, and we used a slightly modified version of his keyword list as a basis for matching SDGs to JELs. For each SDG, we ranked JEL codes according to the number of overlapping keywords. These keywords are presented in Table 2. We explored three different weightings for these keywords: 1) no weighting; 2) weight of 1/1 for the first keyword, 1/2 for the second, 1/3 for the third and so forth; and 3) weight of 1 for the first five keywords and 1/[number of order] for the remaining keywords.

Third, we selected the three most relevant keywords for each SDG from LaFleur’s (2019) list through elimination and discretion. First, we deleted “general words” that were clearly not solely related to any specific SDG, such as “change”, “impacts”, “patterns”, “rapid”, “added”, “policies”, “capita” and “nations”. Second, we eliminated word pairs consisting of words that also occurred separately in the list. Third, we deleted plural forms of words in cases where the singular forms were also on the list. Finally, we selected three words from the remaining set of words that were most closely related to each corresponding SDG according to discretion. For most SDGs, we were left with three singular nouns, as shown in Table 2.

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 management water_sanitation people drinking_water drinking population 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

Notes: Underscore between words indicates that the search term consists of a combination of those words, e.g., social_protection refers to “social protection”.

3.2 Results

Table 3 displays the results of the simple keyword search approach. The table also reports for each keyword the number of third-level JEL codes having that keyword and provides an example of a relevant JEL code for each keyword where there is one. This very simple keyword search indicated that economics research classification can be linked to SDGs relatively easily. Only some keywords (e.g., “girl”, “sanitation”) lacked any matching JEL codes.

Table 3. Links 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

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

Table 5 is similar to Table 4 except for the fact that the number of keywords listed for each SDG is limited to three most relevant keywords (see Table 2). In most cases, the JEL codes listed in Table 5 are the same as those listed in Table 4, but there is less overlap for some of these codes. For instance, all of the top three JEL codes listed for SDG 17 differ between Tables 4 and 5.

To summarize, these very simple keyword similarity analyses suggest that it is possible to connect SDGs with JEL codes. For instance, if one is interested in finding economics research related to SDG Goal 1 (“end poverty in all its forms everywhere”), then among the most closely linked JEL codes are probably “I32 Measurement and Analysis of Poverty”, “O15 Human Resources; Human Development; Income Distribution; Migration” and “H53 Government Expenditures and Welfare Programs”.

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

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 O15 Human Resources • Human Development • Income Distribution • Migration	issues related to poverty, its measurement and analysis. 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, poor, poverty line, line poverty, social, living
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	H53* Government Expenditures and Welfare Programs O13 Agriculture • Natural Resources • Energy • Environment • Other Primary Products	issues related to government expenditures on welfare and related policies, including food stamp programs and studies about HUD. development issues related to agriculture, natural resources, other primary products, energy, and the environment.	poverty, social food, agricultural, agriculture, production, food production, markets
Goal 3. Ensure healthy lives and promote well-being for all at all ages	Q11 Aggregate Supply and Demand Analysis • Prices Q13 Agricultural Markets and Marketing • Cooperatives • Agribusiness I12 Health Behavior	issues related to aggregate agricultural market, including supply, demand, prices and sustainable agriculture. issues related to agricultural markets and marketing, cooperatives, and agribusiness. 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.	food, agricultural, agriculture, production, food production food, agricultural, agriculture health, deaths, mortality, rate
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	I14 Health and Inequality I15* Health and Economic Development I21 Analysis of Education A21 Pre-college I24 Education and Inequality	the impact of health on social and economic inequality, and the impact of inequality on health. May cross-list with O15. the impact of health on economic development, and the impact of levels of development on health. May cross-list with O15. all the economic issues, including output, quality, and demand and supply, related to education, except for educational finance. 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.	deaths, mortality, births, age, rate health, mortality education, primary, school, quality, secondary, learning primary school education, primary, school
Goal 5. Achieve gender equality and empower all women and girls	J16 Economics of Gender • Non-labor Discrimination J71 Discrimination 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. economic issues related to gender, except for labor market discrimination, which is classified under J71 or J78. issues related to labor discrimination, including wage discrimination and discrimination in hiring and firing. the impact of education on social and economic inequality, and the impact of inequality on education. May cross-list with O15.	education, school, quality women, gender, equality, gender equality, sexual, female women, gender, equality, sexual, age 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 R53 Public Facility Location Analysis • Public Investment and Capital Stock	issues related to environmental degradation, its impacts and its solution. issues related to public facility location and public investment, including infrastructure.	water, management management, facilities
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	Q25 Water Q42 Alternative Energy Sources L94 Electric Utilities O48 Government Policy E24 Employment • Unemployment • Wages • Intergenerational Income Distribution • Aggregate Human Capital • Aggregate Labor Productivity E31 Price Level • Inflation • Deflation J68 Public Policy	issues related to water as a renewable resource and its conservation. issues related to alternative energy sources, for example non-hydrocarbon fuels or wind. issues related to the electric utility industry. issues related to government policy on energy. 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. issues related to aggregate price levels, inflation, and deflation, including the CPI and the Phillips curve.	water, wastewater energy, renewable, renewable energy energy, electricity energy, clean employment, unemployment, work, productivity, men growth, employment, unemployment, men
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	E31 Price Level • Inflation • Deflation 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 O11 Macroeconomic Analyses of Economic Development F63 Economic Development	issues related to industrialization and industries in developing countries, including manufacturing, service and transportation and the choice of technology. 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). the impact of globalization on economic development, including poverty, labor markets, and gender issues.	manufacturing, industrialization, industrial developing, gdp developing, developed

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
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	E2*	Measurement and Analysis of Poverty	issues related to poverty, its measurement and analysis.	inequality, income
	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, soil, 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 emissions
	C22	Time-Series Models • Dynamic Quantile Regressions • Dynamic Treatment Effect Models • Diffusion Processes	economic 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/DMA 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.	maritime, 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 capitalists, socialist, and transitional economic systems. This includes roles of government and/or power relationships in resource allocation.	institutions, rights
	F53	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 for which there are other JEL codes with equal keyword overlap and the choice of this specific JEL code among the top three was based on discretion. Rankings of the three JEL codes were based on the following weighting scheme: weight of 1 for the first five keywords and weight of 1/[number of order] for the other. Data available from the author upon request.

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

SDG	Top three JEL codes	Covers studies about/related to	Overlapping keywords
Goal 1. End poverty in all its forms everywhere	I32 O15* H53*	Measurement and Analysis of Poverty Human Resources • Human Development • Income Distribution • Migration Government Expenditures and Welfare Programs	poverty, poor poverty poverty
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	O13 Q11 Q10	Agriculture • Natural Resources • Energy • Environment • Other Primary Products Aggregate Supply and Demand Analysis • Prices General	food, agriculture food, agriculture food, agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages	I12 I15 I14	Health Behavior Health and Economic Development Health and Inequality	health, disease, mortality health, disease, mortality health, mortality
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	I21 J24 A21*	Analysis of Education Human Capital • Skills • Occupational Choice • Labor Productivity Pre-college	education, school, learning education, school, learning education, school
Goal 5. Achieve gender equality and empower all women and girls	J16 J71 F63*	Economics of Gender • Non-labor Discrimination Discrimination Economic Development	women, gender, equality women, gender, equality gender, equality
Goal 6. Ensure availability and sustainable management of water and sanitation for all	Q53* Q25* L95*	Air Pollution • Water Pollution • Noise • Hazardous Waste • Solid Waste • Recycling Water Gas Utilities • Pipelines • Water Utilities	water water water
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	Q42 L94 Q48*	Alternative Energy Sources Electric Utilities Government Policy	energy, renewal energy, electricity energy
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	E24 J24 J68*	Employment • Unemployment • Wages • Intergenerational Income Distribution • Aggregate Human Capital • Aggregate Labor Productivity Human Capital • Skills • Occupational Choice • Labor Productivity Public Policy	labor, employment, productivity labor, employment, productivity labor, employment
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	H54* R42* H52*	Infrastructures • Other Public Investment and Capital Stock Government and Private Investment Analysis • Road Maintenance • Transportation Planning Government Expenditures and Education	infrastructure infrastructure infrastructure

Table 5. Continued

Goal 10. Reduce inequality within and among countries	D31* F61* I24* O18 R11* R12* D62 E27 Q11 Q54 Q15 Q38 L92 Q25 Q22* O13 Q23 Q57* O17 P48* F33* F35 O19 Q56	Personal Income, Wealth, and Their Distributions Microeconomic Impacts Education and Inequality Urban, Rural, Regional, and Transportation Analysis • Housing • Infrastructure Regional Economic Activity, Growth, Development, Environmental Issues, and Changes Size and Spatial Distributions of Regional Economic Activity Externalities Forecasting and Simulation: Models and Applications Aggregate Supply and Demand Analysis • Prices Climate • Natural Disasters and Their Management • Global Warming Land Ownership and Tenure • Land Reform • Land Use • Irrigation • Agriculture and Environment Government Policy Railroads and Other Surface Transportation Water Fishery • Aquaculture Agriculture • Natural Resources • Energy • Environment • Other Primary Products Forestry Ecological Economics; Ecosystem Services • Biodiversity Conservation • Bioeconomics • Industrial Ecology Formal and Informal Sectors • Shadow Economy • Institutional Arrangements Political Economy • Legal Institutions • Property Rights • Natural Resources • Energy • Environment • Regional Studies International Monetary Arrangements and Institutions Foreign Aid International Linkages to Development • Role of International Organizations Environment and Development • Environment and Trade • Sustainability • Environmental Accounts and Accounting • Environmental Equity • Population Growth	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. to the impact of globalization on various microeconomic issues, including income distribution, market structure and pricing, and the behavior of consumers and firms. the impact of education on social and economic inequality, and the impact of inequality on education. May cross-list with O15. regional, urban, rural, and transportation issues related to economic development and developing economies, including urbanization. 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 economies, such as the regional effects of climate change. issues related to spatial distributions of economic activity including economic geography, interregional trade, and regional convergence. mostly theoretical studies about issues related to externalities and welfare analysis. issues related to forecasting or simulation of aggregate consumption, saving, production, employment and/or investment. issues related to aggregate agricultural market, including supply, demand, prices and sustainable agriculture. issues related to climate and natural disasters, including desertification and drought. issues related to agricultural land, including ownership and tenure (for example, issues related to share cropping), irrigation and agricultural land valuation. issues related to both national and international government policy pertaining to the environment, including environmental taxes and tradable permits. issues studied 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. issues related to water as a renewable resource and its conservation. issues related to fishery and aquaculture. development issues related to agriculture, natural resources, other primary products, energy, and the environment. issues related to forestry. issues related to topics in ecological economics including ecosystem services and biodiversity. 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. 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. 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. issues related to foreign aid in general 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. issues related to the environment and development, the environment and trade, environmental accountability, environmental equity, and environmental sustainability.	inequality, income inequality, income inequality, income cities, urban cities, urban urban, housing consumption, production consumption, production production, sustainable climate, climate change, emission climate, emission climate, emission marine, ocean ocean fish land, forest land, forest biodiversity institutions, human rights institutions institutions development, official development assistance development, trade development, trade development, trade
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Notes: * refers to cases for which there are other JEL codes with equal keyword overlap and the choice of this specific JEL code among the top three was based on discretion. Data available from the author upon request.

The mappings presented in Tables 3, 4, and 5 are only examples of very simple ways to link JEL codes with SDGs; naturally, there are many other ways to do this. In other words, these mappings 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” and its subclasses) are “general purpose technologies” and are therefore not SDG-specific but can, in principle, be applied to study any of 17 SDGs. It should also be noted that for some JEL codes, the guidelines mention that documents classified by a given 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 of JEL-code-specific guidelines were ignored herein.

4 Discussion

As the SDGs lack corresponding JEL codes, this paper proposed several simple ways to connect SDGs with JEL codes. There are multiple ways to improve these linkages. For instance, one could use the corpus or keywords of economics articles tagged with a specific JEL code to establish links with the closest SDGs. This would require in-depth 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.

Although it is possible to link SDGs with existing JEL codes, as demonstrated herein, introducing a specific JEL code for each SDG would reduce search costs for those searching for economics research related to specific SDGs and for those analyzing to which global challenges academic economists allocate their limited attention.

Finally, it should be noted that simple linkages between SDGs and JEL codes tell nothing about the substance of research papers or the perspectives taken by these articles on SDGs. Future studies could analyze the content of the articles classified to JEL codes related to specific SDGs in order to explore whether there are any systematic patterns in the perspectives taken by these articles. As the 17 SDGs have 169 associated targets and 232 indicators (United Nations 2015a), these additional analyses could in more detail document how economics research allocates attention between them, i.e., which targets and indicators receive majority of attention and which are less studied in the economics literature and across associated JEL codes. Such systematic content analysis would enable identifying research gaps related to SDGs in the economics literature as well as estimating the share of economics articles that take critical perspectives towards SDGs and associated targets and indicators (e.g., measurement of poverty (I32); inequality and discrimination (J15); environment and economic growth (O44)).

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ⁱ See the SDG Tracker of Our World in Data: <https://sdg-tracker.org/> (Accessed on 21 March 2020), the Sustainable Development Report: <https://www.sdindex.org/> (Accessed on 21 March 2020).

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

ⁱⁱⁱ The MDGs were as follows: 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. Combat HIV/AIDS, malaria, and other diseases; Goal 7. Ensure environmental sustainability; Goal 8. Develop a global partnership for development. See the Millennium Development Goals: <https://www.un.org/millenniumgoals/> and SDGs: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/> (Accessed on 21 March 2020).

^{iv} 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 the RePEc database; see <http://repec.org/>. (Accessed on 4 April 2020).

^v JEL Classification System / EconLit Subject Descriptors: <https://www.aeaweb.org/econlit/jelCodes.php?view=jel> (Accessed on 21 March 2020).