



Article

Economic models in German textbooks: An analysis of textbooks for teaching economics in upper secondary school

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- Using economic models in class should be accompanied by a reflection on the models.
- The embedding of economic models in textbooks for upper secondary school varies greatly.
- Most textbooks do not present the assumptions of economic models in a comprehensive way.
- The majority of textbooks hardly include the use of models as analytical tools.
- Central aspects of model reflection are not addressed in many textbooks.

Purpose: The study investigated how economic models are presented in textbooks for upper secondary school in Germany, and which forms of engagement are initiated by tasks related to the models.

Design/methodology/approach: The available textbooks for teaching economics in upper secondary school in Germany (n=47) were examined using a deductive qualitative content analysis according to Mayring (2015). The category scheme was developed on the basis of a target content concept for thinking in economic models in class.

Findings: On the one hand, central economic models are discussed in many textbooks. On the other hand, there are gaps in the presentations and tasks on models in many textbooks. This is especially true for the use of models as analytical tools, but also for model reflection.

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1 INITIAL SITUATION AND OBJECTIVES

A central educational goal in science education is to enable model-based thinking (cf. Oh/Oh 2011). In social sciences, however, it possesses a lesser relevance. Although models such as the policy cycle are used in politics education, models play a lesser role in these subject fields compared with the natural sciences. The teaching of economics has a somewhat unique position when it comes to using models: although economics as a subject falls into the field of social sciences, model-based thinking possesses considerable importance, both in the literature on subject teaching and in academic literature on the discipline.

Numerous contributions have established, for instance, the importance of homo economicus in understanding dilemma-structured problems (e.g. the climate crisis) (cf. Krol 2001). Economic models can also contribute to understanding economic processes and relationships, ones that cannot be observed directly, such as price formation in competitive markets, the development of an appropriate understanding of the discipline or an understanding of the nature of economics (cf. Friebel-Piechotta 2021, p. 31).

In-class engagement with economic models comes with its challenges. There is a risk that students overestimate the explanatory power of models and the results derived from model analyses carried out in class. Informed by these challenges alongside other factors, conditions for in-class use of economic models have been formulated in literature. Emphasis is placed above all on reflection on models (model reflection), ideally taking place in the context of teaching and learning (cf. Piller 2016, p. 83; Tafner 2018, p. 123).

Economic models in general and model reflection in particular are especially important in propaedeutic science education in upper secondary school. The aim is not only to undertake scientific work, but also to make science itself the subject and the object of reflection (cf. Huber 2009, p. 44). Thus, learners should get to know basic scientific methods; develop a science-oriented mindset; and deal with the limitations of scientific knowledge (cf. Dettmers et al. 2010, p. 243). Examining economic models contributes to scientific learning (cf. e.g. Müsche 2009). Thus, in the context of propaedeutic science teaching, students should firstly become familiar with key scientific ways to think and to proceed (cf. Müsche 2009, p. 76.). Accordingly, economic education should develop basic understanding of economic models alongside other scientific methods, such as experiments. Secondly, students should apply subject-specific methods and, for example, develop questions, generate and test hypotheses and compare different ways of knowledge acquisition. Independent use of economic models as analytical instruments can contribute to achieving this objective. Thirdly, teaching and learning should reflect on scientific ways to think and acquire knowledge within the framework of the propaedeutic science education. Projecting the propaedeutic teaching of science onto economic education, it would see the subject engage with limits, scope and purposes of economic models.

These subject-specific considerations of teaching are largely in tune with embedding economic models in the curricula for the key subjects of economic education in upper

secondary school. Thus, learners should know and apply models, such as the circular flow of income, the market model of perfect competition or homo economicus (cf. inter alia Ministry of Education, Science and Culture Mecklenburg Western Pomerania 2019, p. 11; Ministry of Education, Youth and Sports Baden-Wuerttemberg 2016, p. 3; Thuringia Ministry of Education, Science and Culture, 2012, pp.18). For example, students should “[...] analyze political and economic phenomena [...] with the help of subject-specific models and theories (e.g. [...] circular flow of income [...])” (Lower Saxony Ministry of Culture 2018, p. 14). Model reflection is also embedded in the curricula. For example, students are supposed to “reflect on the relationship between model and reality” (Ministry of Education, Youth and Sports Baden-Württemberg 2016, p. 3) or “relativize the meaningfulness of [...] models” (Senate Department for Education, Youth and Sport Berlin 2006, p. 14).

From a didactic point of view, the question arises as to how far and to what extent this in-class engagement and use of economic models embedded in the school curriculum actually happens in classroom practice. One way to determine how economic models are treated in the classroom is to analyze textbooks. Textbooks are used by teachers to prepare and structure lessons (structuring function) (cf. Detjen 2016, p. 166; Gräsel 2010; Hacker 1980; Pingel 2010), which is why they are also described as a “secret curriculum” (cf. Hacker 1980, pp. 14). Detjen (2016), for example, postulates that “the influence of textbooks on politics teaching in schools is de facto considerably more weighty than that of guidelines and curricula” (ibid., p. 166).

The importance of textbooks for teaching outlined here could be particularly relevant with regard to teaching economic models for at least two reasons. Firstly, economic models are core content in economics lessons, which can, therefore, be handled more effectively in textbooks than more (current) topics. Secondly, at least in large parts of Germany, a considerable proportion of economics lessons is taught by teaching professionals from outside the subject. As the assumption can be made that practitioners teaching outside the subject rely more heavily on textbooks than teachers with a teaching qualification in the subject (cf. Lewing/ Schneider 2018, p. 246), such teaching materials gain considerably in significance in economic education.

Based on the considerations made so far, the aim of this textbook analysis is to determine how the following three models are presented in German textbooks to teach economics in upper secondary school: ‘homo economicus’, ‘market model of perfect competition’ and ‘circular flow model’ - as well as economic models in general, all of which are important in teaching economics. The analysis goes on to determine which forms of engagement with these models are initiated by tasks in the textbooks. The focus on the three specific models mentioned is informed by a review of the curricula for teaching economics in Germany as well as of the literature on models in teaching economics. Since the use of economic models and especially model reflection are particularly important in upper secondary school, the analysis focuses on textbooks targeted at this particular school level.

A concept of target content for thinking in economic models in class is drawn upon as a theoretical subject-didactic frame of reference for the textbook analysis (see 3.). Selected textbooks are analyzed using a deductive qualitative content analysis (see 4.). Informed by the results (see 5.), initial action points are formulated to optimize representations of economic models; to optimize the tasks related to the models in the textbooks; and to determine implications for teacher education (see 6.). As model reflection constitutes a key part of the subject-didactic frame of reference of this study, economic models are initially examined from the perspectives of the philosophy of science and also sociology (see 2.).

2 ECONOMIC MODELS FROM A PHILOSOPHY OF ECONOMICS AND SOCIOLOGICAL PERSPECTIVE

Considering model reflection in class teaching and learning, the following questions arise: what are economic models and how do they relate to reality? How can (unrealistic) models be used to gain insights into real economic phenomena?

These questions may be answered differently depending on the underlying philosophical understanding of economic models (cf. for an overview Lisciandra/Korbmacher 2021, 188). Based on systematizations put forward in literature (cf. Grüne-Yanoff 2009, p. 1; Hardt 2017, pp. 133; Morgan/Knuuttila 2012, pp. 50), a distinction may be made between interpretations of economic models as idealizations and as fictions. This systematization is not a clear-cut classification (cf. Hardt 2017, p. 134); it is sufficient, though, to identify the main differences and similarities when it comes to understanding economic models for subject-didactic purposes.

Among isolationists, i.e. those pursuing the approach of “models as idealizations” (Morgan/Knuuttila 2012, p. 51) (cf. Grüne-Yanoff 2009, p. 1), economic models are recognized as the result of isolation, by which the relevant aspects of the target (to which the model refers) are isolated from its influences. These influences do not interest the model developer. The model then analyses the effects of those factors isolated (cf. Mäki 2005, p. 308). This isolation is done through various techniques. For instance, in the context of idealization, certain aspects of the target are set equal to zero (“nullifying idealization”) (Mäki 1994, p. 151). Presenting the market model of perfect competition, for example, makes the assumption that there are no transaction costs.

For fictionalists, i.e. those seeing the approach of models as fictions (cf. Grüne-Yanoff 2009, p. 1), economic models are not idealizations or simplifications of the targets, but pure constructs of the model developer. Robert Sugden, one of the best-known representatives of this position, concretizes this view with these words: “The model world is not constructed by starting with the real world and stripping out complicating factors: although the model world is simpler than the real world, the one is not a simplification of the other” (Sugden 2000, p. 25).

Differences in understanding economic models reflect different views of the (desirable) model-world relationship. Isolationists see economic models as representations of reality

(cf. Mäki 2005, p. 304). They assume that the effects of the isolated factors of the real world can and should be accurately described in the models (cf. Morgan/Knuuttila 2012, p. 63). Informed by the understanding of economic models as idealizations, assumptions should not be too far removed from reality or the target (cf. Kapeller 2012, p. 119). This is consistent with the de-idealization of economic models described by the isolationists, in the course of which the models' closeness to reality is increased (cf. *ibid.*, p. 111; Morgan/Knuuttila 2012, pp. 54).

Sugden, just like the other fictionalists, disagrees with the view that economic models represent something real. From his perspective, economic models are constructs of "parallel realities" (Sugden 2000, p. 25), which should, however, have a certain credibility (cf. Sugden 2009, p. 17). As a central dimension of a model's credibility, Sugden names its coherence with the target. Economic models should show a certain coherence with what is known or believed to be known about the real world (cf. Sugden 2000, p. 26). In Sugden's view, a similarity between model and target is to be aimed for: "The greater the similarity between the model world and the real world, the more confidence we can have in inferences from the former to the latter" (Sugden 2013, p. 241).

In terms of gaining knowledge aided by economic models, there is a broad consensus among the various approaches on two counts. First, this procedure is described by numerous authors as deductive (cf. Hausman 1992, p. 222; Morgan/Knuuttila 2012, p. 77). Moreover, and secondly, there is a consensus that accurate findings about reality or the target can be made with the help of models containing unrealistic assumptions. (cf. Kapeller 2012, p. 119). Considering economic models as idealizations, this is justified by the fact that the models would have an approximate character: "[...] the conclusions are sufficiently close to the truth because the assumptions are sufficiently close to the truth." (Gibbard/Varian 1978, p. 671). Sugden justifies the explanatory value of economic models with the similarity relationship between model and real phenomenon (cf. Sugden 2013, p. 241).

Considerations in philosophy of economics made so far can be classified in approaches related to scientific models in general. For example, models of other scientific disciplines are also described as representations of the target (cf. *inter alia* Giere 2010, 274). However, economic models, too, have some specific features, ones that concern the properties of economic laws, the determinacy of economic contexts and the performativity of economic models.

The model for numerous economic laws, such as the law of demand or Okun's law, were physical laws (cf. Kirchgässner 2000, pp. 258; Hardt 2017, pp. 11). Physical laws such as the three laws of motion and the law of gravity are said to have universal validity, at least with respect to physical phenomena perceived in everyday life. They are therefore valid in time and space without restriction. Thus, the apple that Newton (according to legend) saw fall from the tree would fall from the tree in the same way today. It would also be completely irrelevant whether Newton's laws were applied to explain this phenomenon (of the falling apple) in Europe or Asia. The claim of universality of physical laws (of

classical mechanics) is not tenable in relation to economic laws. Economic laws are rather historically determined, i.e. spatio-temporally limited. Accordingly, they can rather be described as “quasi laws” (Helmer/Rescher 1959, p. 29), which are lawlike on the one hand, but show a looseness on the other (cf. *ibid.*, p. 27). In this sense, sociological laws in general and economic laws in particular are not universal. Thus, an increase in the price of a good does not necessarily lead to lower demand for that good in every case. Accordingly, economic laws in the sense of natural laws do not exist. However, the assumption can be made that economic phenomena or events are also partially based on current ‘laws’ (cf. Meyer 2002, p. 127). These ‘laws’ only become relevant under certain conditions or social structures, which would, for example, characterize a certain form of market economy, and which are described in the assumptions. On this point, there is a structural commonality of natural and social science law statements. For example, the laws of classical mechanics (Newton) can be used to describe, explain and predict numerous physical phenomena, as long as the speeds involved, just to provide an example, are significantly lower than the speed of light.

Knowledge of economic laws and of the conditions of their application does not imply that all future states can be unambiguously predicted and all past states can be unambiguously reconstructed. The idea of strictly causal, deterministic relationships originating from classical physics, which with students engage in physics lessons, cannot be transferred to the subjects of the social sciences in general and economics in particular. This is due, not least, to the complexity of social and economic phenomena:

“Unlike the position that exists in the physical sciences, in economics and other disciplines that deal with essentially complex phenomena, the aspects of the events to be accounted for about which we can get quantitative data are necessarily limited and may not include the important ones. While in the physical sciences it is generally assumed, probably with good reason, that any important factor which determines the observed events will itself be directly observable and measurable, in the study of such complex phenomena as the market, which depend on the actions of many individuals, all the circumstances which will determine the outcome of a process [...] will hardly ever be fully known or measurable.” (v. Hayek 1989, p. 3).

Following on from von Hayek's considerations, an astronomer can calculate the trajectory of a planet exactly. An economist, on the other hand, cannot forecast the development of a price with such precision, but he can determine under which circumstances a certain development (e.g. an increase in the price of a particular good) would occur. Considering economic phenomena, then, no “explanations in detail” are possible, but ‘just’ “explanations in principle” (von Hayek 1967, p. 20). This circumstance described by von Hayek is also accompanied by the fact that economic models should not or cannot be used to make statements about the behavior of individual actors in specific (singular) situations. This, in turn, is also due to the fact that people have free will. Economic phenomena are thus not only more complex than those of classical physics, “they are also qualitatively different” (Brant 2015, p. 10).

Assuming previous explanations of economic 'laws', the author shares the view that economic phenomena are grounded on lawlike but not deterministic relationships, whereby the laws become relevant when their conditions of application are met (cf. Kirchgässner 2000, pp. 266). Flowing from this, it can be argued that the impact of economic regularities can lead to different results when there are different types of conditions, ones that can be shaped or influenced by humans (cf. Albert 2012, pp. 67). Consequently, the idea of being able (politically) to form society is consistent with the idea of the existence of economic rules and laws. Thus, the conditions can be shaped in such a way to achieve the desired social or economic states or processes. This design, in turn, presupposes knowledge of economic contexts and, included therein, knowledge of economic laws. Economic laws can thus provide assistance in shaping the framework conditions, though it must be emphasized that economic knowledge cannot and should not provide a sufficient basis for shaping these framework conditions. The fact that economic models and thus also economic laws have an influence on the design of economic reality is the central thesis of the performativity concept.

In terms of economics, performativity means that economic knowledge in general and economic models in particular not only serve to describe or explain and predict, but also play a role in constituting the economy: “[...] economics, in the broad sense of the term, performs, shapes and formats the economy, rather than observing how it functions” (Callon 1998, p. 2).

Callon elaborates performativity on the basis of an analysis of the strawberry market in Fontainess-en Sologne in France. He illustrates how a neoclassical market was constituted through the use of economic knowledge. According to Callon, this proximity between the real market and the model was intentional. The goal of the actors involved, who were supported by an economic advisor, was thus “the construction of a real market on the pure model of perfect competition” (Callon 1998, p. 22). Thus, the framework of the institutional design of the strawberry market ensured that the products (the strawberries) were as homogeneous as possible, or that market transparency was as high as possible (cf. Callon 1998, pp. 19). While these early works feature a description of homology between model and real-world phenomena, subsequent works establish economic reality as coming more into line with the model itself. MacKenzie (2006), for example, describes how financial markets have been shaped by the Black-Scholes-Merton model (cf. *ibid.*, p. 20). However, performativity of economic models and theories goes far beyond the formulation of norms for markets. Economists also have an influence on the design of (state) institutions, e.g. by advising politicians or at least providing the relevant “cognitive infrastructure” (Boldyrevand/Svetlova 2016, p. 3).

In summary, on the basis of the performativity thesis, economic knowledge in general and economic models in particular can have an influence on economic reality. Thus, the view underlying the model understanding presented above, i.e. economists only want to gain knowledge about the economy with the help of models, can be extended: “Economics is not simply about representing reality; it is also about shaping it” (Groß 2014, p. 1237).

This view also corresponds with the more fundamental insight that science has an impact on society (cf. Mäki 2012, p. 19). Yet, reality also influences theory, for example through statistical data or observations (cf. Boldyrevand/ Svetlova 2016, p. 4). Model and reality can, therefore, be described as mutually influencing each other.

3 ECONOMIC MODELS IN EDUCATION

Models play a role in numerous scientific disciplines and thus also in various school subjects. Despite all the differences between the models of the various disciplines, there are at least three commonalities in using models in class. Models can be used in class firstly to illustrate facts (medial perspective) and secondly as a subject-specific method to generate knowledge (methodological perspective) (cf. Krell/Krüger 2013, p. 10; Terzer 2012, pp. 32). In terms of a media perspective, models are mainly employed when teachers use them to explain or visualize something to students with the help of the model. But students can also use models to describe something. A model is used as a method for gaining knowledge when it is used by the students as a (subject-specific) analysis tool to investigate (economic) facts or phenomena independently. However, the use of (economic) models as analytical tools in class does not generally mean that students should generate entirely new findings; rather, it is more about an independent ‘rediscovery’ of existing insights, which are, however, new insights for the students. Third, the use of economic models should be accompanied by reflection on the models and on their application (cf. Brant 2015, p. 12). Model reflection should allow learners to develop an understanding of scientific and epistemological aspects of economic models, appropriate to their age. This understanding is referred hereinafter as understanding the nature of economic models and modelling, representing one aspect of a (subject-specific) understanding of science.

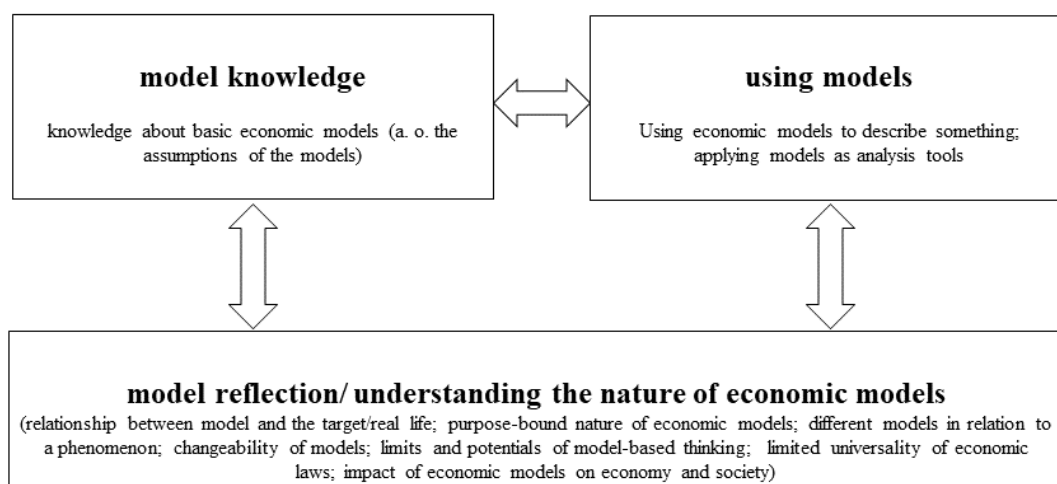
Some basic economic models play an important role in economics education, most notably the homo economicus model, the model of perfect competition and the circular flow model. Such economic models or model-based thinking are among several experience-based and science-based approaches to economic phenomena or facts in economic education. Pluralism of economic theory should be elaborated in the sense of a higher grade of pluralism (cf. Denis 2009, p. 7) in class. Thus, firstly, a lesson dealing with market phenomena should not be based exclusively on the model of perfect competition, but should also include addressing different market forms and market failures (science-based approach) or conducting market experiments (experience-based approach). Secondly, the plurality of economic theory or models should be made clear to the students within teaching and learning, moving beyond the mere inclusion of different approaches in lessons. This particular aspect falls under the category of model reflection in the concept of target content when thinking in economic models in class, as outlined in Figure 1 below.

In the context of the medial perspective described at the beginning, learners can use *economic models* to describe something (see using models in Fig. 1). They can, for instance, use the circular flow model to represent essential flows of money and goods between

actors in an economy. Examples of methodological use of economic models include investigating the effects of changes in supply and demand with the help of the model of perfect competition or the analysis of incentive effects of (economic policy) measures drawing on homo economicus. In terms of methodological use, the circular flow of income can be used to forecast possible direct and indirect macroeconomic consequences of circular flow model events and economic policy decisions. In terms of the circular flow model, however, it should be kept in mind that such analyses with the model require (behavioral) assumptions that are not part of the model. For example, if the impact of an economic upturn on private consumption is to be analyzed, consumption should be assumed to be income-dependent. Ideally, the models are not used as a one-off in class, but used repeatedly as an analytical tool across school year groups in broad variety of contexts.

The use of economic models in class as outlined here differs in parts from the use or function of these models in economics. This is particularly the case with the circular flow model. In economics, for instance, the circular flow model is the conceptual basis for national accounts. The model also has this function in economic education. However, as described above, it is also used as a heuristic analysis tool in economics teaching. In economics, homo economicus is also used less as a stand-alone analytical tool, as is the case with regard to economic education (cf. Loerwald/Stemmann 2012 for a practical teaching example), but rather represents a kind of set of basic assumptions for a variety of models.

Figure 1. Target content concept “Thinking in economic models” for teaching economics (Source: Friebel-Piechotta 2021, p. 53)



The basis for model use is *model knowledge* (see Figure 1). This includes knowledge about basic economic models. Among the tasks that they should be able to do, students should be able to name the assumptions of the models. From a didactic perspective, an emphasis should be placed on the necessity of explicitly addressing the assumptions of models in class. Knowledge of the assumptions of a model is the basis for understanding, applying and reflecting on the model. For example, learners would not be able to determine the scope of application of a model without knowledge of the model assumptions. However, knowledge of the scope of application provides, in turn, a basis to use the model (as an analytical tool) appropriately.

Model reflection focuses primarily on questions pertaining to the philosophy of science, such as: ‘What characteristics do economic models possess?’ Model reflection also includes an examination of the criticism of economic models, such as the empirical and normative criticism of homo economicus. The following aspects should be addressed in the context of model reflection in economic education (cf. Friebel-Piechotta 2021, pp. 54):

The *relationship between model and real life/ target* should feature at the early stages when initially engaging with economic models. It should be made clear to the learners that models and reality differ from each other, and this is something that is intentional. It should also be pointed out to learners that models are based on model developer’s subjective perceptions of real-world phenomena. At upper secondary school, learners can explore the relationship between a model’s closeness to reality and its explanatory power based on the empirical critique of homo economicus.

Linked to the examination of the relationship between model and real life, learners should also be taught that models are developed for a specific purpose. The *purpose-bound nature of models* can be made clear to the learners at the outset by using everyday models. Learners can see for themselves that a map of the city as a representation of a city only includes the information necessary to find one’s way and orientate oneself spatially in the urban space. Building on this insight, economic models should be presented to the students as a simplification of economic reality which have been developed to gain a better understanding of economic relationships. At an advanced level, learners may consider models on the one hand as an aid to communication or illustration and on the other hand to serve as instruments for gaining knowledge.

Teaching should, furthermore, engage with the purposes of economic models, addressing and understanding them not as a norm. In the specific context of engaging with homo economicus, teaching and learning should address the model not as a normative image of man or even as a guiding principle, but use it as a heuristic to analyze the incentive effects of the framework conditions.

Economic models are *changeable* and there may be *different models relating to a phenomenon*. A concrete model thus represents one of several possible perspectives on an economic issue. In addition to the neoclassical market model, for example, there are other models that relate to markets. These models can be attributed to different schools of thought and represent, at least in part, a variation of the basic neoclassical model. Take

for example the model of perfect competition: if the assumption of perfect information is replaced by the assumption that information is unequally distributed between supplier and consumer, then new models based on the idea of asymmetric information are created.

An understanding of models as one possible perspective on a phenomenon can also contribute to an elaborated (subject-specific) understanding of science, which should include the notion that economics is pluralistic and that economic theories or models, like scientific knowledge in general, are uncertain.

The fact that a model represents only one of several possible perspectives on an economic phenomenon runs alongside the fact that further insights into the phenomenon can be generated with the help of other approaches. The possibilities of gaining knowledge with a particular model are, therefore, limited. This limitation should be established in class in connection with the use of economic models as analytical instruments. In-class engagement should also address forecasts made with a model not necessarily occurring in the way laid out. However, students should not only recognize the *limits* but also the *potentials of model-based thinking*. This understanding should also include the use of economic models to generate viable explanations of real economic and social phenomena.

In science education in lower secondary school, students learn about different (natural) laws. In economics lessons, then, students should establish that *economic laws* are not universal as laws of nature are.

The example of the *potential impact of economic models on the economy and society* can be used to illustrate the influence of (economic) experts on society as a central dimension of the interaction between science and society. Furthermore, the possible performative effect of homo economicus should be addressed in economics classes: it can be assumed that such an examination could counteract a possible “unreflected appropriation of egoistic norms of thought and behavior” (Famulla 2014, 392).

Even if questions of the philosophy of science and epistemology are primarily addressed in the context of science education in upper secondary school, a fundamental examination of the properties of economic models as well as a reflection on the limits and potentials of economic models and on the limited universality of economic laws should be part of the teaching of these models from the very outset. In upper secondary school, on the other hand, engagement with questions of philosophy of science should be more explicit than in lower secondary school. Whereas teaching in lower secondary school, for example, should make clear that models are simplifications of reality and therefore have both limits and potentials, upper secondary school teaching should exemplify competing views on the nature of (economic) models.

4 RESEARCH QUESTIONS AND DESIGN

This textbook analysis presents economic models and model-related tasks in textbooks for teaching economics in upper secondary school [gymnasiale Oberstufe]. The analysis seeks to answer the following research questions:

- 1) To what extent are the basic economic models of homo economicus, model of perfect competition and circular flow of income and their application as analytical tools presented in textbooks?
- 2) To what extent should the tasks related to the models facilitate an application of the models as analytical tools?
- 3) To what extent are aspects in understanding the nature of economic models presented in textbooks?
- 4) To what extent should model reflection be facilitated by the tasks related to (economic) models?

The results of this analysis can, in turn, provide clues as to how economic models are treated in upper secondary school.

The textbooks are analyzed on the basis of subject content and subject didactic criteria. The category scheme was developed on the basis of the target-content concept for thinking in economic models in teaching and learning, which is relevant for economic education in all federal states of Germany:

(1) Model knowledge

- a. Assumptions and theorems (homo economicus, model of perfect competition, circular flow of income)
- b. Tasks (model knowledge)

(2) Using models/ model application

- a. Presentation of the use of economic models (homo economicus, model of perfect competition and circular flow of income) as analytical tools.
- b. Tasks (model use/ application)

(3) Model reflection

- a. Presentation of aspects in understanding the nature of economic models
- b. Tasks (model reflection)

Every textbook currently available in Germany (as of June 2021) for subject specialisms known as “anchor subjects”, including economic education in upper secondary school, was examined (n=47). Variations in content do exist across these “anchor subjects”. Often integrated into other subject areas, economic education may include the disciplines of politics and, in some cases, sociology. Stand-alone subjects for economic education tend to be the exception rather than the rule (cf. the OeBiX study at www.oebix.de).

Content analysis was carried out in line with Mayring (2015). In an initial review of a total of 47 textbooks, those identified considered at least one of the three models mentioned above or (economic) models in general. These pages of the textbooks were scanned and analyzed using MAXQDA 2020 software based on the category scheme.

Each textbook section identified in this way was selected as a unit for analysis. In examining the tasks, the individual unit of analysis comprised a single task. If a task

contained multiple tasks, each of them was considered as an individual unit for analysis. For example, the task “Describe the market model and discuss its limitations.” would be regarded as two tasks and therefore two units of analysis.

5 FINDINGS: ECONOMIC MODELS IN TEXTBOOKS FOR UPPER SECONDARY SCHOOL

In a total of 29 of the 47 textbooks analyzed, at least one of the three models (homo economicus, model of perfect competition, circular flow of income) or economic models in general is taken into account. The circular flow of income and the model of perfect competition are each included in 22 textbooks, and homo economicus in 19. Economic models in general are discussed in 12 textbooks. A very few textbooks present other economic models, such as the IS-LM model. However, these are not the subject of the analysis (see Chapter 4.) because they hardly play a role in the curricular and didactic concepts for economic education.

There is particular emphasis on describing the characteristics of economic models and the usefulness of models in gaining scientific knowledge. The scope of the representations of the models are wide in their range. This ranges from a textbook containing a single task applying a set model (cf. SB108) to textbooks detailing all three models as well as economic models more broadly, described extensively in parts across several pages (cf. inter alia SB100; SB101; SB115; SB120; SB130; SB132).

The results presented below are systematized in line with the fields of the target-content concept (see Chapter 3.): Model Knowledge (Chapter 5.1), Model Application/ using models (Chapter 5.2), Model Reflection (Chapter 5.3).

5.1 Presentation of economic models and tasks related to model knowledge

Assumptions of the respective economic models are an essential element of model knowledge. Their knowledge is a necessary prerequisite in understanding and applying the model as well as for model reflection. Thus, the assumptions define the scope of the model, something students should, in turn, know in order to be aware of the contexts in which they can use a particular model and where the limitations of the model lie. Against this backdrop, an analysis was conducted into the extent to which the assumptions of the models of homo economicus, model of perfect competition and circular flow of income, ones central to the teaching of economics, are presented in textbooks. The main finding of this analysis was that essential assumptions of the models are often not presented completely in textbooks. For example, the assumptions of the market model (many suppliers and consumers; homogeneity of goods; maximization of utility and rational behavior of suppliers and consumers; perfect transparency with respect to the characteristics of goods and prices; no personal and spatial preferences) are presented comprehensively in only four (cf. SB102; SB104; SB115; SB140) of the 47 textbooks

analyzed. In other textbooks, there is a representation of central assumptions of the perfect competition model, but the assumption that there are many suppliers and many consumers on the market is something that is not taken into account (cf. SB100; SB110; SB121; SB128; SB137; SB141). In these textbooks, however, emphasis is usually placed elsewhere when comparing different market forms (polypole; oligopoly; monopoly), i.e. many suppliers and consumers are active in a perfect market. Nevertheless, the lack of explicit consideration of this assumption is critical from a didactic point of view, not least because this assumption defines the scope of the model. Absence of this assumption could lead to an overestimation of the scope of the model in the sense that students could develop the idea that the model also applies to oligopolistic markets, for example.

A comprehensive presentation of the central assumptions of homo economicus (self-interest maximization, rational choice, attribution of behavioral changes to restrictions) is provided in five of the textbooks analyzed. In numerous other textbooks, the assumptions of self-interest maximization (cf. inter alia SB100; SB101; SB102; SB103; SB120; SB126; SB128; SB130; SB132; SB140; SB141) and rational choice (cf. inter alia SB100; SB101; SB116; SB120; SB126; SB128; SB130; SB132; SB135; SB137; SB141) are indeed described, but not the assumption that changes in behavior are due to changes in restrictions rather than changes in preferences. However, this assumption focusing on the macro level is a prerequisite for the use of the model as an instrument for the analysis of incentive effects of (political) framework conditions (see 5.2), which is why the absence of this assumption in the textbook representations can be criticized from a subject didactic point of view.

The circular flow of income is based on two design principles: First, the trading economic units are grouped into sectors and the similar transactions between two sectors are grouped into flows. Second, the monetary inflows of a sector correspond to its monetary outflows. It should be borne in mind that these principles are in turn accompanied by some implicit assumptions. Among other things, it is assumed that there is no production in private households. The aggregation of economic entities into sectors is explicitly stated in eight textbooks (cf. SB101; SB104; SB115; SB120; SB132; SB134; SB137; SB141) and that of monetary transactions into flows in two textbooks (cf. SB104; SB134). Thus, the construction principles are described extensively only in individual textbooks. Since knowledge of the construction principles is a prerequisite for the application of the model (see 5.2), this finding is problematic from a didactic perspective.

Graphical representations of the circular flow of income and the model of perfect competition as well as their use for the description of economic facts and as analytical tools are pivotal to the understanding of these two models. From perspective of teaching, it is, thus, positive that both the price-quantity diagram (model of perfect competition) (cf. e.g. SB100; SB101; SB102; SB104; SB120; SB121; SB124; SB127; SB128; SB130; SB132; SB145) and the circular flow of income (cf. SB100; SB 101; SB103; SB 115; SB120) are illustrated with a graphic (usually supplemented by explanatory text) in a large number of the textbooks analyzed.

However, the graphical representations of the two models do not only have didactic potential; yet the price-quantity diagram (model of perfect competition) in particular poses a challenge for students (cf. Jägerskog 2020). In this context, it seems sensible not simply to present the price-quantity diagram, but to introduce it in a systematic manner. Here, demand and supply curves should be explained one after the other, and then merged into one diagram. This approach is used in 13 of the textbooks analyzed (cf. inter alia SB100; SB114; SB115; SB121; SB128; SB137; SB140; SB141). In other textbooks, however, the price-quantity diagram is only depicted as a graph (cf. inter alia SB102; SB104; SB120). Even though a gradual introduction and development of the model should facilitate the understanding of the diagram, the simple presentation of the price-quantity diagram can also be regarded as appropriate for upper secondary school level, at least if the model has already been introduced in the lower secondary school.

In some textbooks, price formation is not only presented using a price-quantity diagram; but flowcharts are used to visualize the price mechanism (cf. SB100; SB110; SB120; SB130; SB136). This sort of presentation can promote basic understanding of the price mechanism (cf. Kern/ Birke 2018). However, these types of presentation are only suitable to a limited extent for a model-based analysis of price developments (see 5.2) because they do not allow for comparative-static analyses (curve shifts).

To develop model knowledge, the description of the models in textual and graphical form is necessary, though not sufficient; these representations should instead be complemented by model knowledge tasks. Typical examples for such tasks include:

“Describe the structure of the extended circular flow of income.” (SB110)

“Explain in your own words how the equilibrium price is established.” (SB130)

“Present the model of homo economicus.” (SB100)

Corresponding tasks, ones which are primarily reproduction tasks, can be found in 24 of the textbooks analyzed (cf. inter alia SB100; SB102; SB110; SB115). However, the number of these tasks differs depending on the model. While tasks on the model of perfect competition or on the circular flow of income, which fall into the area of model knowledge, feature in a total of 17 textbooks each (cf. e.g. SB100; SB102; SB103; SB114; SB120), corresponding tasks related to homo economicus could only be identified in ten of the textbooks analyzed.

5.2 Application of economic models as analytical tools

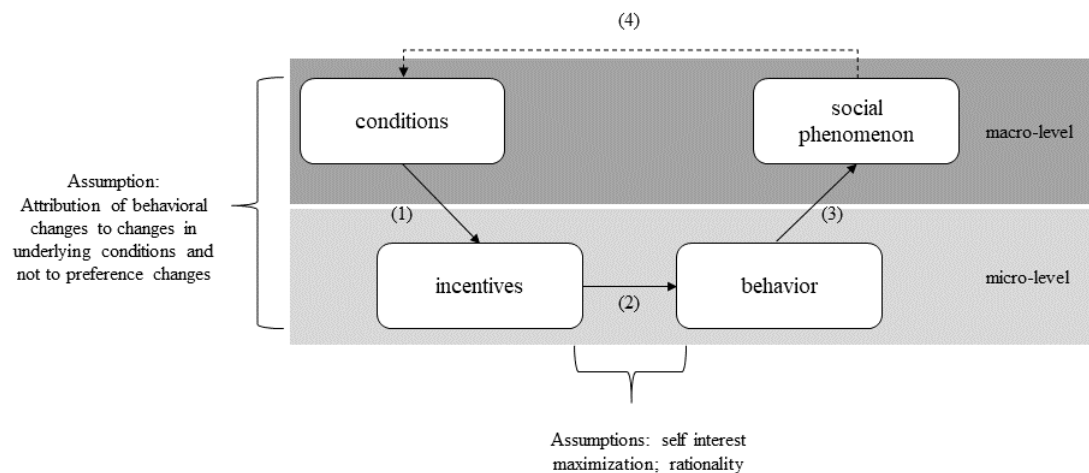
The basis for the application of economic models as analytical instruments is that the students know how the respective model can be used for economic investigations (methodological perspective). However, such explanations can only be found in some of

the textbooks analyzed and only in relation to the model of perfect competition. The model of perfect competition is particularly suitable for the analysis of the effects of changes in demand and supply as well as of economic policy measures. These effects can be determined in model theory by shifting the curves, and then described in terms of content. Understanding how the curves shift in certain cases is a prerequisite for corresponding analyses. Such explanations of curve shifts can be found in 13 of the 47 textbooks (cf. inter alia SB103; SB120; SB124; SB128; SB137; SB140; SB141; SB144; SB145). The model of perfect competition is thus the only one of the three models providing a systematic explanation on how it can be used as an analytical tool. Tasks aimed at using the model of perfect competition as a heuristic analysis technique in eleven textbooks (cf. SB101; SB110; SB113; SB121; SB12; SB132; SB136; SB137; SB140; SB144; SB145). However, there are only 19 textbook tasks in total. A typical example is the following task:

“Create a diagram showing how a particularly good apple harvest affects the market for domestic apple juice, and explain your representation (M3) [price-quantity diagram].” (SB128)

None of the textbooks analyzed systematically address how homo economicus can be used to analyze the incentive effects of framework conditions, even though its main educational value is actually derived from the application of the model. Based on the assumptions of self-interest maximization, (perfect) rationality, and the assumption that changes in behavior are due to changes in restrictions and not to changes in preferences, the model can be used as an analytical tool in class as follows (for this, see Coleman 1990, 8f.; Loerwald/ Stemann 2012, 15) (see Figure 2). Macro-level framework conditions (for example, certain laws) are accompanied by incentives (1) that influence people’s behavior (at the micro-level) (2). Corresponding behavior of many people results in a social phenomenon (3). If the aim is to influence a social phenomenon, then this can be achieved by changing the framework conditions (4).

Figure 2. Analysis grid (homo economicus) (Source: Friebe-Piechotta 2021, p. 159; based on Loerwald/ Stemmann 2012, p. 15)



Instead of such a systematic presentation, a few textbooks do explain the effect of incentives by means of a concrete example:

“Because people compare costs and benefits when making decisions, their behavior will often change as a result of the costs or benefits changing. This means that people respond to incentives. For example, if the price of an apple goes up, people will choose to eat more pears and fewer apples because the cost of an apple is higher. At the same time, apple orchards will want to hire more workers and harvest more apples because the unit profit from selling an apple is higher. The centrality of incentives on determining economic behavior is important to those who design our economic policies. Policies often alter the costs and benefits of private actions. If policymakers are unable to properly assess the behavioral changes triggered by government actions, the actions may have unintended consequences.” (SB114)

Although such illustrations can clarify to students how incentives work, it is questionable whether they will be able to analyze the incentive effects of economic policy measures systematically, for example, on this basis. Seen from a didactic perspective, then, such explanations of incentives are not sufficient.

Given the absence of the analytical grid, incentive analyses or the application of homo economicus as an analytical tool play a lesser role in the tasks. Corresponding tasks only feature in eight textbooks (cf. SB111; SB114; SB125; SB126; SB128; SB130; SB137; SB138), often involving only one task per textbook, an example:

“Discuss - taking economic theorizing into account - environmental policy instruments [...] in terms of their incentive effects, (environmental) effectiveness, (economic)

efficiency, and political enforceability.” (SB126)

Concentrating on the circular flow of income, there are relatively few tasks aiming to use the model as an analytical tool. This application, in turn, means that the model is used to forecast or explain possible consequences of (economic) policy measures or cyclical changes. Such tasks feature in eleven of the 47 textbooks examined, although there are only 19 tasks in total. A typical example is the following task:

“Using the extended circular flow of income as an example, describe what the effects on the model would be if: a) household demand for goods increases because of an economic upturn; b) business demand for labor decreases because of a decline in new orders.” (SB101)

Descriptions of how the circular flow of income can be used as an analytical tool are limited to rather basic descriptions such as the following:

“As an analytical tool, it helps uncover desirable and undesirable effects in economic issues and is further used to make projections about future economic development.” (SB134)

The extent to which such representations, which only feature in just a few textbooks (cf. inter alia SB110; SB113; SB134), are sufficient for students to apply the model as an analytical heuristic technique is questionable. For example, most textbooks do not make explicit that the model should be used to analyze macro-level phenomena (e.g., consequential effects of a tax increase) rather than micro-level events (e.g., consequences of a consumption decision by an individual private household). There is also something else missing from the textbooks: the important indication that the model can be used to forecast more or less likely consequences of specific events and economic policy measures that might occur under specific conditions.

5.3 Model reflection

Engagement with economic models as a subject-specific way of thinking and gaining knowledge plays a rather important role in propaedeutic economic teaching in upper secondary school, although not exclusively. In this context, the analysis focused on which model-specific and cross-model aspects to understanding the nature of economic models are presented in textbooks; and to what extent an examination of these aspects or a model reflection is actually facilitated by the tasks themselves.

Over half of the 47 textbooks feature illustrations and/or tasks that refer to model reflection or the understanding of the nature of economic models (cf. inter alia SB100;

SB102; SB104; SB110; SB120; SB135). However, these textbook presentations and the tasks differ considerably in terms of scope, depth of content and the aspects of understanding the nature of economic models and the models to which the presentations refer. For example, some textbooks contain only isolated tasks for model reflection (cf. inter alia SB109; SB135), while others contain detailed descriptions of aspects of the philosophy of science in economic models (cf. SB115; SB140; SB141).

With regard to the individual aspects in understanding the nature of economic models (see 3.), the analysis revealed that these are embedded with varying frequency and depth in the textbooks:

The *relationship between model and reality* is addressed in a total of 19 textbooks across all three models on which the analysis is based, as well as across economic models in general, although some textbooks deal with this aspect in relation to the three models focused upon in the study and economic models in general (cf. SB115; SB140) and in others only in relation to a specific model (cf. inter alia SB103; SB113; SB134; SB136). The depth of content of the representations varies between textbooks. For instance, some places simply state that models are simplifications of real facts (cf. inter alia SB 101; SB137; SB141), whereas other materials make it explicitly clear that certain aspects of reality are deliberately not taken into account in the model (cf. inter alia SB101; SB 110; SB115; SB140). Moreover, several textbooks present simplification as occurring with the help of assumptions (cf. inter alia SB107; SB110; SB115; SB140), such as in this example:

“You will notice that models are constructed with assumptions. Just as a scientist eliminates the existence of frictional resistance by assumption when setting out to analyze a falling marble, economists use assumptions to rule out many details that are irrelevant to the study of a particular question.” (SB115)

Looking at the relationship between model and reality, it is important for students to understand that simplification is intentional as it is useful for gaining (scientific) knowledge. If learners do not develop this understanding, there is a risk that they will reject economic models, often containing particularly unrealistic assumptions, as too unrealistic or ‘wrong’ and thus evaluate them as useless without recognizing their (heuristic) value as analytical tools. In this context, it is positive from a didactic point of view that numerous textbooks provide explanations stating that models are useful, precisely because they do not correspond to reality (cf. inter alia SB100; SB101; SB110; SB115; SB120; SB121; SB130). On the other hand, engagement with the empirical critique of homo economicus, as presented in numerous textbooks, could go hand in hand with precisely the risk described above. In textbooks, the model critique is often linked to the performance of experiments. Thus, students are often asked to deal with the empirical critique of the model on the basis of economic experiments such as the ultimatum game. Critical engagement of this criticism should, it should be stressed here, be the subject of economics lessons in the upper secondary school, because the students should also know

the limits of the homo economicus model. If, however, the heuristic potential of the model in the analysis of incentive effects is not made clear, there is a risk that students will reject the model as too unrealistic or outdated without taking its potential into account. Representations in some textbooks may carry this risk. For example, the usefulness of the unrealistic assumptions is only highlighted in a few of the books in which there is engagement with the empirical critique of homo economicus (cf. inter alia SB100; SB113; SB114; SB115; SB120; SB137; SB140). In addition, none of the textbooks explicitly juxtapose economic experimentation and homo economicus as two different scientific approaches that have their respective potentials, limitations, and purposes. Thus, although the model's remoteness from reality is emphasized, the fact that an experiment 'only' simulates reality and therefore cannot correspond to it is not addressed in the textbook presentations. Reflective engagement with the experiments as a method for gaining knowledge only plays a role in isolated cases and is also very general (cf. SB132; SB141). For example, one assignment asks students to "critically [evaluate] the ultimatum game as a laboratory experiment to capture the economic decision-making process" (SB132). Different purposes of behavioral economics experiments and of the model are not contrasted in the textbooks. Homo economicus (as a basic model) aims more at explaining macro-level phenomena, such as the consequential effects of an economic policy measure, while the ultimatum game refers to the micro-level. The application of homo economicus in class is thus concerned with the question of how, under the assumption of rational and self-interest-maximizing behavior, certain incentives work in general, and not, for example, with whether people behave rationally and self-interestedly or reciprocally in a particular situation—a question that is investigated in experiments in behavioral economics.

Viewed overall, it is noticeable that the explanations of the relationship between model and reality implicitly convey a realistic understanding of economic models, as described in the approaches to models as idealization (see Chapter 2). This is particularly clear from the fact that models are often referred to as simplifications of reality and techniques such as isolation are mentioned in parts (cf. e.g. SB110), something that can be assigned to an understanding of models as idealization. However, there is also occasional talk of models as "ideal types" in the sense of Max Weber (cf. above all SB115), which is rather close to a fictional understanding (cf. Morgan/ Knuuttila 2012, pp. 61). The fact that there are different scientific theoretical understandings of (economic) models is not made explicit in the textbook representations. However, the question of how far and to what extent this should be done in the sense of propaedeutic science teaching cannot be discussed conclusively here. One argument in favour of such engagement in upper secondary school is that various fundamental approaches to the theory of science are discussed in the context of science education.

Purposes or the purpose-relatedness of economic models are addressed in 20 of the 47 textbooks examined. Firstly, concrete purposes such as explaining and forecasting economic phenomena are provided (cf. inter alia SB100; SB101; SB102; SB103; SB107; SB120; SB132; SB140), which also makes it clear, at least implicitly, that economic models

are a means of gaining knowledge. However, what is specifically meant by economic explanations or forecasts with the help of models is not explained in most textbooks, as the following typical example shows:

“Using models, economists attempt to examine complex economic relationships and explain economic processes.” (SB141)

Students should not only know the purposes of economic models, but also understand the general purpose-bound nature of (economic) models as their characteristic. It should become clear, for example, that models are fundamentally purpose-bound and that the quality of models must be judged, above all, against the background of their purposes. In developing such an understanding, it can be helpful not only to name concrete purposes of economic models, but also to explicitly present the purpose-bound nature of models as a characteristic. Against this background, it should be emphasized that purpose-boundness is explicitly described in only six textbooks (cf. SB100; SB101; SB103; SB130; SB138; SB141).

Other aspects that should be addressed in the context of reflection on economic models are only covered sporadically, if at all, in textbooks. Apart from the empirical criticism of *homo economicus* (see above), *limitations of (economic) models as instruments of knowledge* are only mentioned in a few textbooks (cf. SB101; SB130; SB138). Additionally, the characteristics of models themselves are not made explicit in the textbooks, e.g. their changeability and subject dependency, which, in addition to being purpose-bound, are reasons why there can be several economic models for one phenomenon. However, an *understanding of a model as a perspective on an economic phenomenon* should be developed by students in economics classes, not least because this can contribute to an adequate understanding of the nature of economic science, which should include the idea that economics is pluralistic and that economic theories and models, like scientific knowledge in general, are uncertain.

The possible *effectiveness or performativity of economic models* do not largely play a role in textbook descriptions. The effectiveness of *homo economicus* is described in only one textbook (cf. SB100). However, in-class engagement centered around the possible influence of the model on real economic decisions could reduce the risk of the model being misunderstood as a norm amongst students, something which in turn could lead to the unreflective adoption of egoistic ways of thinking and behaving. The lack of an examination of the performativity of economic models also misses the opportunity to exemplarily elaborate the influence of economists on society as a central dimension of the interaction between science and society in class.

Students are familiar with models and the laws associated with them primarily from science lessons, in which an examination of natural laws and their generalizability already takes place in lower secondary school. Economics lessons should establish the fact that economic facts are also based on certain lawlike relationships, but that these are not

universal in the same sense as laws of nature. Corresponding representations could not be identified in the textbooks analyzed. Without drawing on the term 'law', some textbooks prefer to describe relationships between price and demand as hypotheses or as "human behavior not always [being] predictable" (SB132). The only explicit reference to the generalizability of economic laws features in three textbooks with the following task:

"Two statements: a) Economic laws are natural laws and b) Economic laws are psychological laws. Which statement would you rather agree with? Find evidence for both of these statements." (SB110; SB121; SB136)

This finding is problematic from the perspective of subject didactics, since the assumption suggests that the universality of these could be overestimated by the learners without explicit engagement with the limited generalizability of economic laws. This problem is exacerbated by the fact that several textbooks for economics teaching contain scientific models that are used in the presentation of the characteristics underpinning models (cf. inter alia SB100; SB110; SB115; SB140) without explicitly addressing the differences between economic and scientific models.

Tasks aimed at model reflection focus on the relationship between model and reality. Corresponding tasks related to all three models as well as to economic models in general are included in numerous textbooks (cf. e.g. SB101; SB102, SB115; SB116; SB124; SB141). Closely linked to this aspect is the empirical critique of homo economicus, references of which appear in turn in numerous textbooks (cf. inter alia SB100; SB101; SB113; SB115; SB116; SB126; SB141). This model critique is the clear focus of the homo economicus reflection tasks. A typical task in this category is the following:

"Elaborate on the stated criticisms of the "homo economicus" model." (SB141)

Limitations and potentials of the model, as outlined in the following task, play a role in significantly fewer tasks (cf. inter alia SB135, SB115; SB116):

"Discuss opportunities and limitations of the homo economicus model" (SB116).

Tasks aimed at reflecting on the limits and potentials (for gaining knowledge) of the circular flow of income or the model of perfect competition or economic models in general also feature in several textbooks (cf. e.g. SB101; SB137; SBSB141). Tasks on other aspects of an understanding of the nature of economic models related to several models or economic models in general are only embedded in some textbooks. These include tasks for reflection on the (un)suitable fields of application of the respective model (cf. e.g. SB115; SB128; SB140), on the necessity of economic models in economics (cf. e.g. SB100; SB110; S109) and on the universality of economic laws (cf. SB110; SB121; SB136). Tasks on the effectiveness/performativity of economic models could not be identified in the textbooks.

When it comes to embedding model reflection in textbook materials and in the tasks, it can be said, in summary, that most textbooks do not contain a sufficient basis for systematic model reflection as outlined in the third chapter. Exceptions are some books presenting help and guiding questions that can be used to reflect on different models (cf. especially SB103; SB104; SBSB116; SB130; SB138). These guiding questions are also taken up directly in tasks in some textbooks (cf. inter alia SB116; SB130; SB138), thus enabling, at least to some extent, systematic model reflection.

6 IMPLICATIONS AND OUTLOOK

On the one hand, this textbook analysis has shown that the models of homo economicus, model of perfect competition and circular flow of income, which are central to economic education, feature in many textbooks. On the other hand, the presentation of the models in the materials and also the tasks related to the models in numerous textbooks show gaps from a subject didactic point of view. In particular, the use of economic models as analytical tools, with which their main educational value is linked, is not embedded across the board in the textbooks. This is reflected, above all, in the tasks related to economic models. Thus, model knowledge and model reflection each account for more than twice as many tasks as the use of models as analytical tools. Above all, the use of homo economicus as an analytical heuristic technique is only marginally embedded in the textbooks. For example, no textbook systematically presents how the model can be used to analyze incentive effects. The assumption that changes in behavior are due to changes in framework conditions, which is necessary for such an analysis, is also only embedded in a few textbooks. The same applies to tasks aiming to analyze incentive effects. Educational potential linked to incentive analyses thus remain largely untapped.

Although model reflection is embedded more effectively in the textbooks than model application, especially with regard to the tasks, there are gaps in the textbooks here as well. For example, certain aspects in understanding the nature of economic models are hardly or not embedded in the textbooks. This applies, in particular, to the effectiveness/performativity of economic models and the question of the limited universality of economic laws. Additionally, approaches of a systematic model reflection only feature in a few textbooks.

Based on the results, the following implications can be formulated for (further) development of textbooks, teacher training and subject didactic research:

- The use of models as analytical tools should be given greater focus in the development of textbooks and other teaching materials. This is especially true with regard to homo economicus.
- With regard to model reflection, many textbooks lack a systematic approach that includes, for example, guiding questions for reflection. The basis for the development of appropriate textbook representations and tasks is, in turn, a subject didactic concept for model reflection. An initial proposal for this has been outlined in this article. This needs to be further developed, tested and implemented in

textbooks and teaching materials.

- This textbook analysis provides initial indications of how economic models are addressed in the upper secondary school. Further indications can be provided by analyses of other documents that play a role in lesson planning and design. These include the analysis of curricula, school-leaving examinations and materials available online. A further starting point for the generation of information on the examination of economic models in class is the investigation of teachers' beliefs. These beliefs have an influence on lesson planning and implementation (cf. Fives/ Buehl 2012). Some results of a first qualitative study on a teachers' beliefs about economic models in class match the results of the present textbook analysis. For example, only very few teachers expressed the idea that homo economicus could be used to analyze incentive effects (cf. Friebel-Piechotta, pp. 162f).

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Appendix: List of textbooks analyzed

SB100:

Baumann, J., Binke-Orth, B., Lindner, N. Orth, G. & Ott, S. (2020). *Sowi NRW Einführungsphase. Unterrichtswerk für Sozialwissenschaften in der gymnasialen Oberstufe in Nordrhein-Westfalen [Introductory Phase. Textbook for social sciences in the gymnasiale Oberstufe in North Rhine-Westphalia]*. Bamberg: C.C. Buchner.

SB101:

Jöckel, P. & Lange, D. (Eds.) (2016). *Politik und Wirtschaft. Sekundarstufe II [Politics and economics. Secondary level II]*. Berlin: Cornelsen.

SB102:

Gleichsner, W. (Ed.) (2014). *Politik im Fokus [Politics in focus]*. Braunschweig, Paderborn: Schöningh Westermann.

SB103:

Erdmann, M., Kabisch, P. O., Menzel, S. & Simon, A. (2019). *Politikwissenschaft/ Politische Bildung. Berlin/Brandenburg [Political Science/ Political Education. Berlin/Brandenburg]*. Braunschweig: Westermann.

SB104:

Becker, H., Benzmann, S., Große Hüttmann, M., Riedel, H., Ringe, K., Tessmar, K., Tschirner, M. & Weinmann, G. (2019). *Buchners Kompendium Politik [Buchners Compendium Politics] (2nd ed)*. Bamberg: C.C. Buchner.

SB105:

Kurz-Gieseler, S. (Ed.) (2013). *Grundkurs Geografie/Politik. Geozonen Wirtschaftsräume Globalisierung. Band 2 [Basic course Geography/Politics. Geozones Economic Areas Globalisation. Volume 2]*. Braunschweig, Paderborn: Schöningh Westermann.

SB106:

Müller, E. & Riedel, H. (2018). *Gemeinschaftskunde. Kursstufe zweistündig. Baden-Württemberg [Social studies. Two-hour course level. Baden-Württemberg]*. Bamberg: C. C. Buchner.

SB107:

Stiller, E. (Ed.) (2016). *dialog sowi. Unterrichtswerk für Sozialwissenschaften. Band 2 (Qualifikationsphase) [dialogue sowi. Textbook for Social Sciences. Volume 2 (Qualification Phase)]*. Bamberg: C.C. Buchner.

SB108:

Detjen, J., Knebel, D., Krämer, K., Raps, C., Schmidt, J., Voß, M. & Westphal, J. (2021). Blickpunkt Sozialwissenschaften. 2. Qualifikationsphase SII [Focus on Social Sciences. 2nd Qualification Phase SII]. Braunschweig: Westermann.

SB109:

Bauer, G., Bauer, M., Pfeil, G. & Podes, S. (2017). Buchners Kolleg Wirtschaft & Recht. Band 1 für die Oberstufe des Gymnasiums Jahrgangsstufe 11 [Buchners Kolleg Wirtschaft & Recht. Volume 1 for the upper school of the Gymnasium Year 11]. Bamberg: C.C. Buchner.

SB110:

Kurz-Gieseler, S. (Ed.) (2020). Sozialkunde. Politik in der Sekundarstufe II [Social studies. Politics in upper secondary school]. Braunschweig: Westermann.

SB111:

Ringe, K. & Weber, J. (Ed.) (2019). Politik – Wirtschaft. Qualifikationsphase 12 (grundlegendes Anforderungsniveau) [Politics - Economics. Qualification phase 12 (basic requirement level)]. Bamberg: C.C. Buchner.

SB112:

Ringe, K. & Weber, J. (Ed.) (2018). Politik – Wirtschaft. Einführungsphase mit Berufs- und Studienorientierung. Niedersachsen [Politics - Economics. Introductory phase with vocational and study orientation. Lower Saxony]. Bamberg: C.C. Buchner.

SB113:

Benzmann, S., Ringe, K., Tschirner, M. & Weber, J. (2021). Politik und Wirtschaft. Qualifikationsphase (Q1/Q2) Hessen [Politics and Economics. Qualification phase (Q1/Q2) Hessen]. Bamberg: C.C. Buchner.

SB114:

Giesendorf, S., Ringe, K. & Tschirner, M. (2018). Politik und Wirtschaft. Einführungsphase. Hessen [Politics and Economics. Introductory phase. Hessen]. Bamberg: C.C. Buchner.

SB115:

Floren, F. J. (2014). Politik Gesellschaft Wirtschaft. Sozialwissenschaften in der gymnasialen Oberstufe. Band 1 (Einführungsphase) [Politics Society Economy. Social sciences in the gymnasiale Oberstufe. Volume 1 (introductory phase)]. Braunschweig, Paderborn: Schöningh Westermann.

SB116:

Detjen, J., Glorius, M., Glorius, U., Heither, U., Henne, C., Lahme, S. & Quest, T. (2019). Mensch & Politik. Sekundarstufe II Qualifikationsphase. Politik – Wirtschaft 12. Schuljahr [Man & Politics. Secondary level II Qualification phase. Politics - Economics 12th school year]. Braunschweig: Westermann.

SB117:

Detjen, J., Goldmann, J., Heither, U., Puckhaber, A. & Quest, T. (2018). Mensch & Politik. Sekundarstufe II. Politik – Wirtschaft Einführungsphase [Man & Politics. Secondary level II. Politics - Economics Introductory Phase]. Braunschweig: Westermann.

SB118:

Becker, H., Benzmann, S., Brügel, P., Kailitz, S., Kailitz, S. & Riedel, H. (2013). Buchners Kompendium Politik. Politik und Wirtschaft für die Oberstufe. Ausgabe B für die 2-stündige Kursstufe in Baden-Württemberg [Buchners Kompendium Politik. Politics and economics for the upper school. Edition B for the 2-hour course level in Baden-Württemberg]. Bamberg: C.C. Buchner.

SB119:

Heither, D., Klöckner, E. & Wunderer, H. (2010). Mensch & Politik. Sekundarstufe II. Gesamtband Politik und Wirtschaft [Man & Politics. Secondary level II. Complete volume Politics and Economics.]. Braunschweig: Schroedel.

SB120:

Füchter, A., Heither, D., Hünlich, R., Klöckner, E., Pätzold, J. & Wunderer, H. (2016). Mensch & Politik. Sekundarstufe II. Einführungsphase Politik und Wirtschaft [Man & Politics. Secondary level II. Introductory Phase Politics and Economics.]. Braunschweig: Schroedel Westermann.

SB121:

Kurz-Gieseler, S. (Ed.) (2012). Grundkurs Politik/Geografie. Band 1. Gesellschaft Wirtschaft Politische Ordnung [Basic Course Politics/Geography. Volume 1. society economy political order]. Braunschweig, Paderborn: Schöningh Westermann.

SB122:

Herzig, K. (Ed.) (2016). Politik im Fokus. Kursstufe 1 [Politics in focus. Course level 1]. Braunschweig, Paderborn, Darmstadt: Schöningh.

SB123:

Benzmann, S., Meyer, G., Ringe, K., Tschirner, M. & Weber, J. (2019). Politik und Wirtschaft. Qualifikationsphase (Q3/Q4). Hessen [Politics and economics. Qualification phase (Q3/Q4). Hesse]. Bamberg: C.C. Buchner.

SB124:

Altmann, G., Dalljo, U., Schulz-Bode, B., Simon, A. & Simon, U. (2014): Mensch & Politik. Sekundarstufe II Klasse 11 / 12. Gesamtband Sachsen Gemeinschaftskunde Rechtserziehung Wirtschaft [Man & Politics. Secondary level II Grade 11 / 12. complete volume Saxony Social studies Legal education Economy]. Braunschweig: Schroedel Westermann.

SB125:

Bechthold-Frintrop, D. (2020). Politik Gesellschaft Wirtschaft. Sowi S II. Qualifikationsphase 2 [Politics Society Economy. Sowi S II. Qualification Phase 2]. Braunschweig: Westermann.

SB126:

Ringe, K. & Weber, J. (Eds.) (2019). Politik – Wirtschaft. Qualifikationsphase 12 (erhöhtes Ausbildungsniveau). Niedersachsen [Politics - Economics. Qualification phase 12 (increased level of education). Lower Saxony]. Bamberg: C.C. Buchner.

SB127:

Benzmann, S., Betz, C., Hamm-Reinöhl, A., Hecht, D., Hitzler, A., Krüger, M., Mühlentfels von, F., Müller, E., Podes, S., Reidel, H., Ringe, K., Straub, J., Tschirner, M. & Volkert, T. (2020). Wirtschaft/Politik. Qualifikationsphase. Schleswig-Holstein [Economics/Politics. Qualification phase. Schleswig-Holstein]. Bamberg: C.C. Buchner.

SB128:

Hamm-Reinöhl, A., Podes, S., Riedel, H. & Straub, J. (2020). Wirtschaft NEU. Märkte, Akteure und Institutionen. Unterrichtswerk für die Oberstufe [Economy NEW. Markets, actors and institutions. Textbook for the upper school]. Bamberg: C.C. Buchner.

SB129:

Ringe, K. & Weber, J. (Eds.) (2020). Politik – Wirtschaft. Qualifikationsphase 13 (erhöhtes und grundlegendes Anforderungsniveau). Niedersachsen [Politics - Economics. Qualification phase 13 (advanced and basic requirement level). Lower Saxony]. Bamberg: C.C. Buchner.

SB130:

Barheier, K., Comagic, S., Detjen, J., Krämer, K., Raps, C., Schug, D., Straßner, V. & Westphal, J. (2017). Mensch & Politik. Sekundarstufe II. Rheinland-Pfalz. Sozialkunde Grundfach 11 [Man & Politics. Secondary level II. Rhineland-Palatinate. Social studies basic subject 11]. Braunschweig: Schroedel Westermann.

SB131:

Hartleb, F., Raps, C. & Wilhelm, A. (2010). Mensch und Politik. Sozialkunden Bayern. Klasse 12 [Man and Politics. Social Studies Bavaria. Grade 12]. Braunschweig: Schroedel Westermann.

SB132:

Detjen, J., Knebel, D., Krämer, K., Raps, C., Schmidt, J., Voß, M. & Westphal, J. (2019). Blickpunkt Sozialwissenschaften. 1 Einführungsphase II [Focus on Social Sciences. 1 Introductory Phase II]. Braunschweig: Westermann.

SB133:

Füchter, A., Heiter, D., Hünlich, R., Klöckner, E. & Wunderer, H. (2016). Mensch & Politik. Sekundarstufe II. Qualifikationsphase Politik und Wirtschaft [Man & Politics. Secondary level II. Qualification Phase Politics and Economics]. Braunschweig: Schroedel Westermann.

SB134:

Freytag, T. & Heckl, F. (Eds.) (2010). Wirtschaft und Recht 11. 2. aktualisierte Auflage [Economics and Law 11. 2nd updated edition]. Stuttgart: Klett.

SB135:

Detjen, J., Henne, C., Lahme, S. & Quest, T. (2020). Mensch & Politik. Sekundarstufe II Qualifikationsphase. Politik – Wirtschaft 13. Schuljahr [Man & Politics. Secondary level II Qualification phase. Politics - Economics 13th school year]. Braunschweig: Westermann.

SB136:

Kurz-Gieseler, S. (Ed.) (2015). Sozialkunde. Politik in der Sekundarstufe II [Social studies. Politics in upper secondary school]. Braunschweig, Paderborn, Darmstadt: Schöningh Westermann.

SB137:

Apitz, J., Benzmann, S., Betz, C., Hamm-Reinöhl, A., Hecht, D., Hitzler, A., Müller, E., Podes, S., Riedel, H., Ringe, K., Straub, J., Tschirner, M. & Volkert, T. (2019). Wirtschaft/Politik. Einführungsphase. Unterrichtswerk für die Oberstufe. Schleswig-Holstein [Economics/Politics. Introductory phase. Textbook for the upper school. Schleswig-Holstein]. Bamberg: C.C. Buchner.

SB138:

Barheier, K., Comagic, S., Detjen, J., Krämer, K., Raps, C., Schug, D., Straßner, V. & Westphal, J. (2017). Mensch & Politik. Sekundarstufe II. Sozialkunde [Man & Politics. Secondary level II. Social studies]. Braunschweig: Schroedel Westermann.

SB139:

Raps, C. & Hartleb, F. (2014). Mensch und Politik. Sozialkunde Bayern. Klasse 11 [Man and Politics. Social Studies Bavaria. Grade 11]. Braunschweig: Schroedel Westermann.

SB140:

Frintrop-Bechthold, D. (Ed.) (2019). Politik Gesellschaft Wirtschaft. Sowi S II. Einführungsphase 1 [Politics Society Economy. Sowi S II. Introductory Phase 1]. Braunschweig: Westermann.

SB141:

Stiller, E. (Ed.) (2014). dialog sowi. Unterrichtswerk für Sozialwissenschaften. Band 1 (Einführungsphase) [dialogue sowi. Textbook for social sciences. Volume 1 (introductory phase)]. Bamberg: C.C. Buchner.

SB142:

Binke-Orth, B., Dieckmann, E., Lindner, N. & Orth, G. (2020). Sowi NRW. Unterrichtswerk für Sozialwissenschaften in der gymnasialen Oberstufe in Nordrhein-Westfalen. Qualifikationsphase [Sowi NRW. Textbook for social sciences in the gymnasiale Oberstufe in North Rhine-Westphalia. Qualification phase]. Bamberg: C.C. Buchner.

SB143:

Müller, E. (2021): Gemeinschaftskunde 11/12 – Gesellschaft und politisches System, Kursstufe fünfständig Baden-Württemberg [Civics 11/12 - Society and political system, course level five-hour Baden-Württemberg]. Bamberg: C.C. Buchner.

SB144:

Bauer, M., Pfeil, G., Podes, S. & Wombacher, U. (2016): Buchners Kolleg Wirtschaft & Recht Band 2 für die Oberstufe des Gymnasiums Jahrgangsstufe 12 [Buchners Kolleg economics & law Volume 2 for the upper school of the Gymnasium Year 12]. Bamberg: C.C. Buchner.

SB145:

Mehrer, U. & Voit, S. (2016): Wirtschaft und Recht Jahrgangsstufe 12 [economics and law Year 12] (2nd ed.). Stuttgart, Leipzig: Ernst Klett Verlag.

SB146:

Floren, F. (2016). Politik Gesellschaft Wirtschaft. Sozialwissenschaften in der gymnasialen Oberstufe. Band 2 (Qualifikationsphase) [Politics Society Economy. Social sciences in the gymnasiale Oberstufe. Volume 2 (Qualification Phase)]. Braunschweig, Paderborn, Darmstadt: Schöningh Westermann.

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