Some Notes on Instrumental Realism

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1. Introduction

This paper deals with some problems of instrumental realism, a position held by Ladislav Kvasz as it was presented in his papers *Mathematics and Experience* (2009) and *Mathematics and Reality* (2011). The main objective is to analyse the way instrumental realism provides justification for belief in realism about mathematical entities and to question whether this way of justification is sufficient for instrumental realism to be considered a form of realism.

Realism is often characterised as a position based on the existence thesis and on the independence thesis, or in other words: "[R]ealism [is] a claim about what entities exist and a claim about their independent nature" (Devitt 1997, 14). The aim of this paper is to examine the specific character of the existence and the independence dimensions of instrumental realism and to show that rules internal to the body of mathematics play a fundamental role for both of them. I will argue that there are significant similarities between instrumental realism and internal realism proposed by Hilary Putnam and therefore similar objections can be raised against realistic character of both of them. I hope this paper will contribute to the debate about the character of instrumental realism, as discussed by L. Kvasz (see Kvasz 2009; 2011), J. Peregrin (Peregrin 2010; 2012) and P. Labuda (Labuda 2013). I agree with Peregrin and Labuda that the position held by Kvasz contains theses that are much closer to anti-realism than to realism and I will attempt to provide some more arguments in support of this view.

2. Justification of instrumental realism as a form of realism

Search for patterns in the development of mathematics has been the main focus of work by Ladislav Kvasz. He has elaborated models that provide an explanation of mechanism of change from one developmental stage of language of mathematics to another. These comprehensive models provide valuable tools for understanding of history of mathematics. They are based on hierarchical order of instruments of representation (or mathematical languages) with the most basic and oldest ones (elementary arithmetic and synthetic geometry) at the bottom and the most complex and latest ones at the top (Set Theory, Theory of Algorithms) (see for instance Kvasz 2009, 153). Relations between successive levels, or transitions from one instrument of representation to the next one, take place in three steps and express three different roles of each language (descriptive, constitutive and foundational):

> At first, each instrument of representation serves as a tool of description of objects, which have their existence warranted by a different instrument. Afterwards, it brings about its own objects that enrich mathematics, and at the end it might take up a role of an ontological basis for another discipline. (Kvasz 2011, 317)

The rules concerning the development of new linguistic frameworks give an account of relations internal to the body of mathematics, however, for a realistic position one would expect also some solutions to the problem of how mathematics is anchored in the external world, or in Carnap's words, to answer the external questions. Kvasz offers several possible answers to this question. I will, though, focus on two of them, which I think are quite fundamental: relation to the natural world (it seems to refer to something real in the natural world) and historicity (long history and cumulative character of mathematics should count as an evidence for realism). The analysis of these bases for arguments in favour of realism about mathematical entities should provide us with a better understanding of the existence and the independence dimensions as they are present in instrumental realism.

2.1. Relation to the natural world

It is possible to interpret instrumental realism and the way it is connected to the world in at least three different ways – platonistic, naturalistic and through the use of conceptual/linguistic frameworks.

There are passages of text (both in Kvasz 2009; and 2011) that seem to support Platonistic view, claiming that there is an independent world of mathematical entities, which is being discovered by mathematicians (for an in-depth analysis of Platonistic as well as anti-realist tendencies of instrumental realism of L. Kvasz see Peregrin 2010). On the other hand, Kvasz is also in favour of naturalistic explanation of the origin of mathematics, as he agrees with P. Maddy and her approach and considers her explanation of cognition of small sets as a suitable foundation for our knowledge of arithmetic (Kvasz 2011, 326). It means that the basic mathematical instruments such as subitizing, perceptual grouping and shape recognition provide an ontological basis – enable an ontological language – for the two most fundamental mathematical linguistic frameworks of basic arithmetic and synthetic geometry, on which the whole body of mathematics is built. Mathematics then seems to be connected to the world by these tools with apparently modular character.

However, I am going to argue that it is possible to interpret instrumental realism and the way it attempts to connect mathematics to the world in a yet different way – as a position similar to internal realism of H. Putnam. The reason why I think this comparison is feasible is based on the statements (which can be found in texts by both Kvasz and Putnam) about "cutting the world" in order to construct and constitute objects:

> There is an infinite number of ways how to cut up reality and to pronounce certain blocks as being existent. Out of all the possible ways of how the reality can be cut, a language picks out one, which becomes ontologized. I use the term 'constitution' for the process of cutting up and ontologizing. I do not deny that what there is (in our world) really exists; my point is that it becomes real only as a result of the process of cutting up and positing of entities. (Kvasz 2011, 314)

Also for Putnam "'Objects' do not exist independently of conceptual schemes. We cut up the world into objects when we introduce one or another scheme of description" (Putnam 1981, 52).

As we can see, both Kvasz and Putnam use the same thesis of 'cut up, construct and constitute.' The point that it is possible to obtain objects in different ways can be demonstrated by the following example presented by Putnam, which shows that the kind of objects we get depends on the way we cut the reality, or on a specific conceptual framework, which brings a possibility to discriminate new entities.

Consider a world with the following individuals: x1, x2, x3. How many objects are there in this world?

World 1	World 2
x1, x2, x3	x1, x2, x3,
	x1+x2, x1+x3 , x2+ x3,
	x1+x2+x3,
[A world *à la* Carnap]	[A world *à la* Polish logician].
(Putnam 2008, 597)	

The consequence of the cookie cutter metaphor is that there might be two sentences, which contradict each other (such as "There are three objects" and "There are seven objects"), and yet each be true within their conceptual framework. Ontology becomes relative to the rules we choose for the ontological language. And since the ontological language provides the foundation for the whole system it seems that the whole structure is subject to relativism.

Putnam's cookie cutter metaphor stands in contrast to Plato's metaphor of carving nature at its joints (Plato 1925, Phaedrus 265e). The metaphor of "joints" is based on the idea of natural distinctions, which can be captured by language, while the pattern we get by cutting the "formless dough" depends on an instrument ("cookie cutter") we are using. However, it seems that the cookie cutter metaphor might be more acceptable for a mathematician than for a scientist who is in search of natural kinds. On the one hand the cookie cutter metaphor allows a set of two elements to contain any two elements, e.g., the two electrons someone has just detected, but also the egg and the fish in my fridge, or the egg and the Andromeda Galaxy. On the other hand the "butcher" metaphor wouldn't allow an object such as the last one, because it is not a product of cutting nature at any joint. I assume that this could be the reason why Kvasz, as a philosopher of mathematics, does not need to embrace the concept of pre-structured reality and, perhaps, this could be the answer to the question raised by Labuda (2013, 73) about what brings Kvasz to reject language independent structure of the world. Mathematics does not depend on the 'natural structure of the world' in terms of the way the world consists of natural kinds or distinctions. The ability to imagine and to do operations on sets containing random objects is a very basic one and independent from methodological evaluation and comparison of characteristic properties of the elements involved. For example we can consider a sentence such as

"Imagine a group consisting of a whale and a mouse," in a mathematical way as a group (one object) consisting of two elements; or in a biological way as an example of two instances of a natural kind (mammals). It is evident that different rules apply to the use of mathematical and scientific instruments in the process of cutting the reality.

There are several reasons why H. Putnam abandoned the position of metaphysical realism in the late 1970's and embraced internal realism, but probably the main one was the untenability of the correspondence theory. He argued that it is not possible to find a viewpoint from which we can compare the world as it is (independent of any description) and our theories; it is not possible to find the one and only function that provides correct mapping of the world by our theories, because we cannot step outside of our frameworks and look at the correspondence between the two domains. Therefore, it is impossible to find "one true and complete description of 'the way the world is'" (Putnam 1981, 49). If we abandon the idea of 'The Correspondence' and 'The Theory', then we are left with a number of frameworks instead of just one. The consequence of this thesis is that since we cannot expect to discover 'The Correct Description', we have to give up the idea of a fixed ontology and we are left with ontology, which depends on a framework we choose, just like in the case of Carnap's World and the World of Polish Logician. As a result: "…the logical primitives themselves, and in particular the notions of object and existence, have a multitude of different uses rather than one absolute 'meaning'" (Putnam 2008, 597). Consequently, Putnam's position is quite often considered to be a form of anti-realism due to existence being dependent on a given theory or a conceptual framework (Brock – Mares 2007, 72). I assume that the same could be said also about instrumental realism. I agree with Labuda, who considers the strategy of cutting the unstructured reality as a "standard for anti-realist" views and therefore regards the position held by Kvasz as a form of anti-realism (cf. Labuda 2013, 72).

Curtis Brown (1988) draws a conclusion that in case of internal realism we are dealing with a form of idealism, since from its perspective the concepts of 'existence' and 'object' depend on the framework we choose, and it is one of the main theses of idealism, that "what there is depends on our own mental structure and activity" (Brown 1988, 145). This claim is supported also by Putnam's "'objects' themselves are as much […] products of our conceptual invention as of the 'objective' factor in experience" (Putnam 1981, 54). I presume that Kvasz would give a similar answer to the question

whether the distinctions are discovered or invented, as he claims the following:

> On the one hand the instruments have to be "sharp" enough to enable certain way of cutting; on the other hand, posited entities have to correspond with experience, which is acquired through the use of the instruments. (Kvasz 2011, 314)

And also that "the experiential dimension of mathematics is the ability to develop an instrument, which enables a new type of experience to emerge" (Kvasz 2009, 164). It seems that the distinctions that are enabled by instruments have to correspond with experience, while the experience itself is enabled by the structuring power of instruments. Labuda disagrees with this view and finds the reasoning circular (Labuda 2013, 75). One could perhaps escape the apparent circularity by an additional note that the correspondence was meant to be between the distinctions of a new mathematical language and the experience acquired through the use of instruments of lower order. However, the problem still remains at the level of ontological language, which provides the basis for the whole structure, since at the bottom level it would just have to correspond with its own distinctions.

As mentioned above, the problem of correspondence led Putnam to abandon metaphysical realism. One of the consequences was that "other languages, and the world itself, can only be interpreted from the standpoint of some language" (Brock – Mares 2007, 76). I assume that this applies to instrumental realism as well, since instead of answering the question about the world-language correspondence it deals with the language-language relationship:

> Our task is to assess the extent to which there are objects in the world that correspond to the expressions of a language. Instead of following this idea I will try to present a view that also the world inhabited by elephants and bacteria is a world of a certain language. Therefore my aim is to consider realism as a relation between two languages instead of a relation between a language and the world. (Kvasz 2011, 314)

Apart from Putnam and Kvasz, similar way of reasoning was followed also by Carnap in his *Empiricism, Semantics and Ontology* (see Carnap 1950/1991), where he states that: "To accept the thing world means nothing more than to accept a certain form of language" (Carnap 1950/1991,

87). There is also another reason why I consider the comparison with Carnap's approach relevant in this context and it is the concept of linguistic framework, which is fundamental to his as well as to Kvasz's approach. I believe that the comparison of these two conceptions might be productive. According to Kvasz (2011, 314) entities "become real only as a result of the process of cutting up the reality" by the use of some instrument of representation and subsequent constitution and ontologization. For Carnap "[t]o be real [is] to be an element of the system" (Carnap 1950/1991, 86). In both statements the status of posited, constituted entities depends on a chosen framework. For Carnap there are two kinds of questions concerning the existence of entities: internal questions about the existence of entities within the framework and external questions concerning "the existence of the system of entities as a whole" (Carnap 1950/1991, 86). Since the reality of an entity depends on its being a part of the system, Carnap considers only the internal questions as proper ontological questions. The 'criterion of reality' cannot be applied externally to the system itself and thus the external question can be answered only on the basis of practical decision. As we saw earlier, Kvasz avoided the 'external question' by replacing the problem of language-world correspondence with the language-(ontological) language relation, a strategy quite similar to the one followed by Carnap. The external question devoid of metaphysical character becomes a practical question of convenience – another point common to Kvasz, Carnap and Putnam. Kvasz claims that "[w]e do not need the ontological language to grasp the reality in an absolute and definite way. It is sufficient if it provides a convenient basis for the interpretation of a specific theoretical language" (Kvasz 2011, 315). For Putnam "the question is one of the choices of language. On some days it may be convenient to use [antimereological language]; . . . on other days it may be convenient to use [mereological] language" (Putnam 1987, 75). For Carnap the answer to the question "Shall we introduce such and such forms into our language?" depends on "Are our experiences such that the use of the linguistic forms in question will be expedient and fruitful?" (Carnap 1950/1991, 90). Carnap considered the problem of realism, or the external question about the status of the thing language (counterpart to Kvasz's ontological language), as a practical question. The problem of justification of framework itself does not rely on a quest for some special metaphysical link, it is based on a practical decision, considering advantages and disadvantages and looking for the most convenient tool. Nevertheless, if the foundation on which the whole system is built is

a matter of convenience, one might question sufficiency of such a basis for realism and argue that it is rather closer to anti-realist position.

2.2. Historicity

Historicity, another form of justification of realism, is based on a statement that growth and apparent cumulative character of one of the oldest disciplines should provide a firm basis for the argument justifying realism about mathematical entities. One could even say 'it would be a miracle if mathematics did not refer to something real'. Rather than solving the 'global' problem of mathematics as a whole it is probably easier to start with a 'local' one. The questions then would be: 'How does something become a "real" part of mathematics?' As an answer to this, Kvasz offers the model of the process of ontologization. In the first stage a specific mathematical language works as an instrument of description of the entities that belong to a language of lower order, later on mathematicians start using it as a useful tool in order to constitute objects of a new kind, and finally after some period of time it takes on the role of a foundation for the language of the next level. The fact, that the founding instrument of representation had once had problematic character is somehow forgotten (Kvasz 2011, 317) as it becomes accepted as ontological language on which the next levels are built. As an example: "After a period of time we had become used to action at a distance to such an extent, that we started treating it as something real" (Kvasz 2011, 304). The same pattern could be applied to all the representational instruments of mathematics; the framework, which has proved useful and fruitful, gains reality. "Mathematical reality is composed of those parts of instrumental representations, which have become stable" (Kvasz 2011, 321). This seems to be in line with the thesis that the existence is justified by internal relations (an entity becomes a part of the system), while the external question is answered by means of practicality. The existence criterion seems to be synonymous with 'something that mathematicians become used to.' This view is close to Putnam's and Carnap's approach, as presented above. And yet, we need to question again if we find this criterion acceptable and suitable as a foundation of realism. While in the context of science it would be immediately confronted with the pessimistic meta-induction (in the history of science scientists have become used to a number of theories, which, as it turned out, do not refer, therefore, it is plausible to assume that also current theories will eventually face the same problem –

see for instance Laudan 1984), in mathematics the situation is different as it is not subject to falsification.

3. Conclusion

If we agree with the view that realism is a position based on the existence and independence thesis, and we want to characterise instrumental realism as a form of realism, then we need to examine the way the existence and independence theses are justified. In this paper I have focused especially on the arguments supporting realism by relation to the natural world and by historicity. I tried to argue that the relation to the natural world, the way linguistic frameworks or instruments refer to the world, is based on similar principles to those of internal realism and therefore the ontological language, which provides the basis for all the other instruments of representation, is subject to ontological relativity. Consequently even concepts such as 'object' and 'existence' depend on the framework, which is being used. Thus conceived position, based on the 'cut up and constitute' approach, does not seem to offer a firm basis for realism and is often labelled as anti-realist. This applies to internal as well as to instrumental realism. The main strength of instrumental realism is its historical approach. It offers a descriptive and explanatory model of development of mathematics through a succession of stages. The model is based on a small number of rules, which have helped to power the whole mechanism of change in the history of mathematics. It has already been mentioned that in this conception entities become considered real if mathematicians 'get used' to them 'after a period of time,' if they become stable part of the body of mathematics and become a foundation for a new language. In other words, they become real if they become an 'element of the system,' as Carnap put it. This position is in line with Carnap's and Putnam's views that ontology should be based on relations internal to the system and not on external questions, such as those that metaphysical realism is trying to answer. I suppose that this is the context in which the following statements could be considered as the expressions of existence and independence dimensions of instrumental realism:

> Existence thesis – "therefore structuralism as well as set theoretic realism describe something real, something with foundations in mathematics" (Kvasz 2011, 327).

Independence thesis – "For example algebra truly describes a certain re-
ality of numerical relations, which is independent from itself. There-
fore, I speak about realism" (Kvasz 2011, 321).

These formulations seem to address both dimensions of realism and it
looks like instrumental realism meets the criteria usually considered fun-
damental to any realist position. However, even though both of the theses
are answered, they are answered as internal questions. They provide justifi-
cation of reality and independence, but the meaning of both concepts is
conceived as relative to the domain of mathematics. Emphasis on the in-
ternalist justification in the realism debate, however, often leads to
a position, which is beyond the realism/anti-realism divide. Evidence for
that can be found in works by Putnam, Carnap as well as Kvasz. For Put-
nam "internal realism is a position [...] both realists and antirealists could
accept" (Putnam 1992, 352-353). Carnap in *Empiricism, Semantics and On-
tology* proposed a form of framework relative realism. The problem of real-
ism of the framework itself is a practical question, which depends on a de-
cision about what is convenient. In this context one could mention also A.
Fine (see Fine 1984), who adopted a position of non-realistic natural onto-
logical attitude, which could be shared both by realists and antirealists,
claiming that a realist does not add anything extra to the neutral position
apart from: "They really exist!"
      The question is whether instrumental realism is a form of realism. Does
it add anything extra to a neutral account of pure mathematics, which
could be accepted by both camps, apart from the word 'realism' in its
name? Kvasz is quite explicit about his aim to bridge the realism/anti-
realism divide and he even admits that what he "and Peregrin have in
common is the position of moderate anti-realism" (Kvasz 2011, 306). But
does it still make sense to call this position 'realism', even if it aims to neu-
tralize the distinction between realism and anti-realism? An answer to this
could be that 'realism' is a convenient and useful stance to mathematical
entities that is shaped by the way mathematics is pursued. Perhaps the po-
sition of instrumental realism simply aims to reflect on the practice of
mathematics and gives an account of working realism[1] in which mathemat-
ics comes first and that could be the reason why internal questions take
priority over the external ones. But should we expect more than that?

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[1]   The position of working realism is discussed for instance in Shapiro (1997).

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