‘Emerging Contrary Result’ Phenomenon and Scientific Realism[1]

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Summary: The article is aimed at reconsidering the question if the project of econometrics can be read in line with scientific realism. Previously, the methodological literature focused on the philosophy of econometrics, voices criticizing realist interpretations of econometrics were raised. The criticism was aimed at showing that econometric models lack robustness. The use of slightly different methods leads to obtaining different and often contrary models what supposedly undermine the project of econometrics. In this article, I aim at offering a new argument in defence of the current practice of the economists devoted to the empirical branch of macroeconomics. To do so, I apply Mäki’s (2009) model of representation to three case studies of contradictory pairs of econometric models and argue that contrary results are not necessarily a drawback of econometrics. Instead, the seemingly contradictory pairs of models are useful in various contexts constituted by their purpose and audience.

Keywords: econometrics, emerging contrary result phenomenon, ERR, minimal scientific realism, robustness checks, Reinhart-Rogoff controversy

JEL: B41; C18; C82

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1. Introduction

In his famous book, Tony Lawson (1997; 2016) argued that the project of econometrics is doomed because in social sciences, in contrary to physics, chemistry and, to a lesser degree, biology, there are no constant regularities. In other words, the results are ungeneralizable. Recently, voices criticising the project of econometrics were raised. Maziarz (2017) argued that the sound Reinhart-Rogoff controversy is misunderstood in the hitherto literature because (1) the spreadsheet error committed by Carmen Reinhart and Kenneth Rogoff (2010) did not influence the result in a significant way and (2) the alternative methods applied by Reinhart and Rogoff (2010), and Thomas Herndon,Michael Ash and Robert Pollin (2014) were justified to a similar degree. Therefore, the controversy perfectly suits the scheme of emerging contrary/recalcitrant result phenomenon (ERR) coined primarily by Robert Goldfarb (1995; 1997). Putting it differently, the contrary opinions on debt and growth resulted from varied methodological presuppositions. According to Goldfarb's (1997) rough estimate, approximately 10% of "American Economic Review" articles instantiate this phenomenon. The purpose of the article is to defend the realist interpretation of econometrics despite these flaws encountered by the practitioners.

2. Being a realist about econometrics

In general, there are two kinds of commitments connected to scientific realism: ontological and epistemic. First, scientific realists believe that entities postulated by theories and models exist mind-independently. Second, they believe that our best theories and their models rightly grasp reality (their *relata* in other words) (Leplin 1984, p. 1). Operationalizing these two commitments of scientific realism having in mind the project of econometrics leads to the conclusion that being a realist about econometric models entails (1) believing that econometric models describe causal laws between exogenic and endogenic variables and that (2) best econometric models rightly describe causal relations existent in the economy. Nancy Cartwright

(1989) employed this approach. For instance, she analysed a quantity-demand curve, also known as the law of demand and argued that such regressions should be interpreted in a realist way (p. 149).

Let me consider the example discussed by Nancy Cartwright (1989), i.e., the law of demand (cf. Equation 1). The realist interpretation of such a simple econometric model entails believing that *a* shows how a change in price *p* causes a change in price *q*. Also, considering the epistemic commitment, scientific realism also entails being optimistic about the verisimilitude of this model (i.e., assuming that if price *p* will change, then quantity *q* indeed changes by *a*).

Equation 1: An empirical law of demand:

$$q = a * p + \varepsilon$$

where:

q – quantity sold at price p

p – the price of a good

a - estimated coefficient showing how q changes when p increases by 1.

ε – error term

Hitherto, there are two main realist research programs in the philosophy of economics but, due to some difficulties, other philosophical positions were employed to defend the realist reading of the econometric models. For instance, Hoover (2010) employed perspectival realism. On the one hand, according to critical realism advocated by Lawson (1997), the project of econometrics is doomed because in economic systems, similarly to other complex social phenomena, there are no constant regularities or covering laws. His argument is best summarised by the following sentence: “outside of astronomy at least, most of the constant-event conjunctions

which are held to be significant in science, in fact, occur only under the restricted conditions of experimental control" (Lawson 1997, 27).

On the other hand, Hoover (1997) argued that "(e)conometrics is possible and compatible with realism because the argument for realism implied the existence of robust regularities. Econometrics aims to characterize those regularities" (Hoover 1997, 18). The American philosopher of econometrics vaguely suggested that econometric models resemble some aspects of reality. He seems to advocate the point of view held by Mäki (2009), who believed that theoretical models resemble idealised or isolated reality, where ε denotes the influence of variables excluded from regression. Ikka Niiniluoto (2013) argued that the relation between model and its relata should be called essesimilitude, i.e., resemblance to ontic bases or essences only. Cartwright (1989) seems to be optimistic about econometrics and holds a similar point of view. She argued that coefficients estimated by econometricians should be read out in a realist way, as probabilistic, causal laws. Cartwright (1989, p. 149-150) delivered two arguments for interpreting estimation of the law of demand in a realist way. First, she noted that such regressions (cf. Equation 1) represent causal relationship, and not a mere functional relationship of the kind Russell thinks typifies physics and grounded this viewpoint in the beginnings of economics and works of the Cowles Commission. Second, what seems to be circular reasoning, Cartwright (1989, p. 150) wrote: "But there is more contained in this equation, more to displease Hume or Russell, than just the assumption of causality. The equation does not just assume that from one occasion to another the price causes, or is a contributing cause to, the demand, in some haphazard or unsystematic way. Rather, it assumes that the price has a stable tendency to influence demand, and that that tendency has a fixed and measurable strength".

Facing the difficulties of interpreting econometrics in line with scientific realism, Hoover (2010) decided to employ perspectival realism coined by Giere (2006) who observed that today scientists use a set of differentiated models to deal with different aspects of the same reality. According to scientific perspectivism, models

resemble the same reality but focus on various aspects or parts of it due to varied interests and incentives of modellers. Hoover (2010) argued that econometric models are right (adequately resemble reality) as long as its use is beneficial and fruitful.

Methodological literature focused on the ontology of econometrics is usually based on case study analyses. For instance, Cartwright (1989) analysed the case of estimating coefficients of a price-demand curve and Hoover (1997) analysed a model coined by Anand and Kanbur (1995, 321) aimed at estimating a living standard and Pissarides's labour market model (1992). This feature of the philosophy of economics makes conclusions arrived at by methodologists sensitive to examples incorporated in case study analysis. The realist philosophers seem to analyse econometric models that are over-averagely successful. Further studies should be conductedto formulate a guess if they chose successful econometric models because they are realists or, on the contrary, they became realists because of good experiences with the models. Putting this question aside, below, I reconstruct the recent critique of being arealist about econometrics and, in Section 4 and 5, attempt to read the realistically reconstructed project of econometrics in a realist way.

3. The recent criticism of econometrics

There are two features of econometrics criticised recently: emerging contrary result phenomenon, i.e., aiming at arriving at the novel and publishable results leading to employing data-mining techniques to get new results and the sensitivity of results to small changes in method or sample. First, I previously (2017) argued in line with Goldfarb (1997), that institutional incentives at the supply side of econometric modelling and the desire for novel results at the demand side of the empirical macroeconomics expressed by editors and reviewers creates the following pattern of econometrical results: first, *a statistically significant result is first identified, then later evidence questions the existence of the positive result* (Goldfarb 1997, 232). In other words: on the one hand, econometricians aim at arriving at novel results to raise the

chance for a paper to be published; on the other hand, journal editors choose articles that present novel results. The pattern of the econometric literature where a previously established statistically significant relationship between two variables is subsequently refuted by novel results is quite widespread. According to Goldfarb's (1997) estimate, approximately 10% of articles published by "American Economic Review" suits this scheme. Moreover, several cases of the ERR phenomenon are connected to essential issues widely discussed by economists and, sometimes, the general public. For instance, the Reinhart-Rogoff affair is a case of the 'emerging contrary result' phenomenon (Maziarz 2017).

The emerging contrary result phenomenon does not necessarily undermine the project of econometrics, taking into consideration the results of the strong program of the sociology of knowledge, according to which results arrived at by scientists practising each branch of knowledge are partially determined by their presuppositions and institutional setting (cf., for instance, (Latour and Woolgar 2013).In fact, the term "publication bias" was coined by Theodore Sterling (1959), who referred to sciences (i.e. not the social sciences) and predicted that fields such as medicine, where publishing statistically significant results is way easier than reporting no relation between examined phenomena, might be based on false premises resulting from type-I errors.

However, the second approach to criticising econometrics, highlighting the lack of robustness in findings undermines the realist interpretation of the empirical macroeconomics do indeed undermine the empirical branch of economics. The criticism is based on discussing a feature of econometrics absent from the hitherto methodological literature, i.e., the sensitivity of econometric models to (1) small changes in data sets and (2) method and showing that none of the realist positions in the philosophy of economics appropriately interpret the empirical branch of macroeconomics. These two features of the realistically reconstructed project of

econometrics are difficult to agree with the two most widespread realist paradigms in the philosophy of economics, scientific realism and critical realism.

Whatever the motivation drove the philosophers of econometrics to choose the case studies they did, the view of the empirical branch of macroeconomics emerging from the methodological literature is biased and too optimistic. Econometric methods are not strict enough to determine decisions undertaken by those practising this field in everyday research, what lead modellers to arrive at contrary conclusions. This feature of econometric discourse was originally described by Goldfarb (1995; 1997) who coined the term 'emerging contrary result' phenomenon/emerging recalcitrant results (ERR).

According to his (Goldfarb 1997) rough estimate, approximately one in ten papers published in "American Economic Review" exemplify the emerging contrary results phenomenon. Such a phenomenon would be perfectly natural if it were caused by unsettled econometric methods or improvements in the process of running regressions. However, Goldfarb (1997) believed that one of the reasons of the contrary results obtained by econometricians is publication bias (defined as data mining aimed at getting new results on the supply side of econometric modelling and journal editors' preference for such conclusions. According to Goldfarb, emerging contrary results caused by publication bias creates the following pattern in the literature: "a statistically significant result is first identified, then later evidence questions the existence of the positive result" (Goldfarb 1997, 232). I (Maziarz 2017) argued that the recently widely discussed Reinhart-Rogoff controversy exemplifies the ERR phenomenon: after Reinhart and Rogoff (2010) sound publication, there were several replications published, and Herndon, Ash and Pollin (2014) were the first to question the result obtained by the Harvard cliometricians. Later, their results were also replicated.

The Reinhart-Rogoff controversy, or – widely – the emerging contrary result phenomenon, shows that econometric results are determined by the methods employed

and not data only what can be summarised with the Talmudic sentence: “We do not see things as they are. We see things as we are”. However, also data sample choice influences estimated coefficients. This feature of econometric modelling was first noticed by Sala-I-Martin (1997) who ran growth regressions. Development empirical macroeconomics aims at discovering growth determinants by running regressions and choosing variables, which are in highest correlation with thepace of economic growth, cf. Equation 2.

Equation 2: Growth determinants regression:

$$Y_i = A + a_i * X_i + \varepsilon$$

where:

Y_i–the pace of economic development

A – constant

a_i - estimated coefficients of X_i variables

ε – error term

Sala-I-Martin (1997), in his famous article titled “I Just Run Two Million Regressions”, described how model specification determines obtained results. In general, an empirical growth economist attempts at finding the variables that are most correlated with the pace of economic development by mining the dataset consisting of many variables. The Catalan economist mentioned gathering 60 variables in his dataset (Sala-I-Martin 1997). To indicate those variables that are indeed connected with economic development, one is to run regressions consisting of various permutations of variables included in their dataset. According to Sala-I-Martin’s (1997) experience, the same variables’ correlation coefficients can have different values or even different sign when one estimates models for different permutations (i.e., models including various sets) of variables. In other words, estimating a model with two variables (e.g.

X_1 and X_2) leads to obtaining, for instance, positive coefficients (i.e. $a_1; a_2 > 0$). However, adding a third variable (e.g. X_3) changes a sign of the previously estimated coefficients.

Therefore, according to the realist interpretation of econometrics (cf. Section 2), one of the estimated models justifies hypothesising a causal, probabilistic law according to which growth of, for example, X_1 is connected to a growth in Y_i and another regression justifies the opposite conclusion, that, a growth of X_1 is connected to a decrease of Y_i. In order to solve the contradiction, Sala-I-Martin first refuted the solution advised by Levine and Renalt (1992) and coined his own. Instead of demanding the lower and upper bounds of statistical significance of estimated coefficients to be both positive or negative (what excludes vast majority the of variables from being potential determinants of economic growth), the Catalan economists advised a method based on automated running all possible permutations and calculating what fraction of an estimate (a_1, for instance) is positive. Employing this solution, i.e., demanding for estimated coefficients to be statistically significant significantly limits the number of the econometric models what, to some degree, supports the point of view held by Tony Lawson and some of his followers working within the critical-realist framework. In contrary, other critical realists believe econometrics to be compatible with their philosophical viewpoint (cf. Bache 2003).

A detailed discussion of this approach seems to be too mathematical for this article (cf. Sala-I-Martin 1997, pp. 179-180). Therefore I will consider what this method entails. Assuming the realist interpretation of econometric models (cf. Section 2), each regression is interpreted in a realistic, causal way. For instance, a_1 is interpreted as a statistical law between X_1 and Y. Calculating the average value of $\hat{a}$ is not in line with the realist interpretation because realists believe that each model can be interpreted in this way. Therefore, such averaging coefficients across a set of models seem to assume that all these contrary models had the same *relata*, what implies that they were contradictory previously (i.e. before calculating the average coefficient).

However, I should highlight that this method was not previously discussed from the philosophy of economics perspective. Nevertheless, the method suggested by Sala-I-Martin (1997) helps in widening the set of variables robustly correlated with economic development if the realist interpretation is rejected and models are considered as tools.

Summing up, econometric results are sensitive to small changes in the data sample and estimation method, and often models equally justified from the viewpoint of econometric method support contrary conclusions about the relation between two variables. According to the ontological dimension of the above-discussed scientific stances, contrary models refer to the same economic reality, and therefore they are contradictory. In other words, if one accepts the versions of scientific realism present in the philosophy of econometrics literature (critical realism, scientific realism, and perspectival realism), one shall not interpret the models of data in a realist way because two contrary models fail at resembling the economic reality. However, there is a realist approach consistent with the unidealized view of econometrics. According to modal realism coined by Lewis (1986), there is an infinite number of parallel universes, and all possible worlds are as real as the actual one. Since there is an infinite number of worlds, there indeed are ones where there are both positive and negative relations between two variables under consideration. Therefore, accepting modal realism makes it possible for two contrary models to adequately resemble alternative but equally real economic universes. However, since modal realism is a counterintuitive and absurd philosophical position, then arguing in favour of reading econometrics in line with it as the only logically possible form of realism leads to absurd.

4. The model of modelling

The views of scientific realists devoted to the philosophy of economics on relations between model and its relata evolved from correspondence through idealisation or isolation (cf. (Mäki 2009)) and essesimilitude (Niiniluoto 2013) to resemblance (Mäki 2013). In fact, even though scientific realism was coined initially

with the aim of explaining the success of sciences, Mäki(in press) recently used his model of modelling to analyse possible sources of failure of modern economics. The evolution mentioned above of terminology corresponds, to some degree, with growing pessimism about the success of economics. If model isolates reality, it adequately represents a feature of a modelled phenomenon excluding the determinants being out of its scope (Mäki 1994). On the other hand, if a model idealises, it represents reality "extremely abstracted" (Smith 1976, 46), i.e., refine, abstruse, and generalise modelled phenomenon (Hamminga and De Marchi 1994). Similarly, the term "essesimilitude" popularised on the ground of the philosophy of economics by Niiniluoto (2013), meaning that econometric models resemble the most important features (essences or ontic bases) of reality, also highlights the growing divergence between map and territory, i.e., between economic models and reality. Recent voices of Mäki (2009; 2013; in press) rejected the received view of scientific realism for a model of modelling aimed at highlighting the pragmatic context of constructing models. Model of representation ((ModRep), in short) is put in words in the following way (Mäki in press, 6):

> Agent A
>
> uses multi-component object M as
>
> a representative of (actual or possible) target R
>
> for **purpose P,**
>
> addressing **audience E,**
>
> at least potentially prompting genuine **issues of relevant resemblance** between *M* and *R* to arise;

Describing *M* and drawing inferences about *M* and *R* in terms of one or more **model descriptions *D;***

Applies **commentary *C*** to identify and coordinate the other components;

and all this takes place within a **context X.**

According to the above model of modelling, it is not only "real world" what shapes an economic model, but also the pragmatics constituted by its purpose P, audience E, descriptions D, commentary C and context X. It should be underlined that (ModRep) was coined by Mäki (2009) to describe the process of theoretical modelling or, in other words, constructing models of phenomena. However, I believe, econometric modelling, i.e., constructing models of data, is a similar process (when it comes to its pragmatic context, at least) and can be adequately described by and analysed with the (ModRep).

In my opinion, the model of modelling coined by Mäki(2009) can be applied to the defence of the realist interpretation of econometric modelling. The criticism of econometrics highlighting the lack of robustness (Lawson 1997; 2016; Maziarz 2017; under review), i.e., the situation where minor modification of data sample or research method leads to obtaining two models (M_1 and M_2) indicating that the relation between A and B is positive (according to M_1) and negative (according to M_2) leads to rejecting scientific realism on the ground that both models cannot adequately resemble reality according to standard scientific realism or its 'liberalized' version labelled structural realism. However, accepting a subjectivised version of realism that considers the purpose of models leads to the conclusion that the differing pairs of models serve different purposes and therefore are not contradictory.

5. Contrary contexts, contrary results

Employing Mäki's (2009) model of modelling makes saving the realist interpretation possible. Below, I discuss two case studies aiming at arguing that the 'emerging contrary result' phenomenon harmonises with the realist interpretation of econometrics. First, I analysethe above-mentioned Sala-I-Martin's (1997) case. Second, I discuss the pragmatic context of choosing the method of calculating averaging schemes of the Reinhart-Rogoff controversy. Third, I analyse how the method of measuring austerity at the treasure depends on a purpose of conducting cliometric research.

Sala-I-Martin (1997) observed that estimated coefficients change their signs when other variables are incorporated into a model. However, he did not address the issue of the target R. Namely, models of growth macroeconomics are usually estimated in a pragmatic context instead of finding variables correlated to the highest degree with economic development. In the latter case, bizarre variables are likely to be identified and excluded. For instance, global warming is temporally connected to economic development, so average temperature probably correlates with economic development and, considering that both variables are cointegrated, both regression and correlation analysis and the prima-facie Granger-causality test would likely give a positive result (Maziarz 2015). However, if a growth regression is estimated in a defined context and purpose of economic policy setting, then running regressions based on all permutations of variables included in our databases is unlikely. For instance, if an economic policy-maker considers reforming the education system in a country, then they will rarely estimate every possible permutation of possessed variables and schooling. Instead, similarly to what Barro (1996) did, they, facing a defined research problem, will address the question under consideration by estimating a model consisting of the variable "schooling" (when average period of education is in question) and a few other, well-established growth determinants. In this case, the issue brought up by Xavier Sala-I-Martin (1997) is unlikely to occur.

Moreover, models based on two (e.g. X_1 and X_2) and three variables (e.g. X_1; X_2 and X_3) are aimed at resembling various targets R_1 and R_2. In this case, their contradictoriness is spurious. Additionally, it is highly unlikely for two such models to be equally right (i.e., equally good at resembling the two imagined worlds of two (R_1) and three (R_2) variables. For instance, comparing their determination coefficients or information criteria can give a hint of which of the two estimations of coefficient a_i should be preferred. Being more strict is a difficult task at this level of generality, therefore, below, I discuss two case studies in a greater detail.

Because of lack of space, I will not analyse the Reinhart-Rogoff controversy in detail (cf. (Maziarz 2016)). In short, Maziarz (2016) argued that (1) in contrary to popularly held belief, the controversy exploded because Herndon, Ash, and Pollin (2014) applied unweighted averaging scheme instead of the weighted one supported by Reinhart and Rogoff (2010) (cf. Equation 2 and Equation 3) and that (2) the spreadsheet error influenced the differing results in a marginal way.

Equation 3: Weighted averaging scheme:

$$\widehat{B_i} = \frac{\frac{\sum_{t=1}^{z_1} GDP_{t1}}{z_1} + \frac{\sum_{t=1}^{z_2} GDP_{t2}}{z_2} + \cdots + \frac{\sum_{t=1}^{z_n} GDP_{tn}}{z_n}}{n}$$

$\widehat{B_i}$ – average GDP growth of i-th basket;

GDP_{tX} – GDP growth in year t of country X;

z_n – number of periods n-th country is included in a considered basket;

n – the number of countries in a considered basket.

Equation 4: Unweighted averaging scheme:

$$\widehat{B_\iota} = \frac{\sum_{x=1}^{n} \sum_{t=1}^{z} GDP_{tx}}{n * z}$$

$\widehat{B_\iota}$ – average GDP growth of i-th basket;

GDP_{tx} – GDP growth in year t of country X;

z_n – number of periods n-th country is included in a considered basket;

n – the number of countries in a considered basket.

Therefore, the Reinhart-Rogoff controversy (neglecting the Excel miscoded formula) is a case of a situation where econometricians arrive at contrary conclusions drawn from the same data set. As the *reductio ad absurdum* argument (Maziarz under review) follows, it is impossible to interpret both results because of their contradictoriness realistically. Let me discuss two features of Mäki's (2009) model of modelling: audience E and commentary C.

First, what audiences are these two cliometric analyses aimed at? The difference caused by averaging scheme choice resulted from a various number of years each country was included in a basket of very high public debt. Considering the two ways of averaging GDP growth in each basket, it is justified to conclude that the weighted formula is well suited for countries which do not fall into a basket under consideration too often. On the other hand, the unweighted approach biases the result so that it describes the average economic development of countries suffering from high debts for longer periods of time. Therefore, the two approaches are aimed at differing audiences E. However, the recent analyses suggest that there are other factors (e.g., the strength of democratic regime) that shape how the economy responds to high indebtedness (Maziarz 2016).

Second, both Reinhart and Rogoff (2010), and Herndon Ash and Pollin (2014) failed at delivering appropriate commentary C. For instance; the original study was instrumentally used by advocates of austerity at the Treasure for implementing such policy. Most commentators have even drawn a causal conclusion from this strictly correlational research. Moreover, Reinhart and Rogoff (2010) did not mention excluding New Zealand and Spain from the sample due to lack of feasible estimations of their GDP, what additionally made the misunderstanding stronger (Maziarz 2017). In a similar vein, Herndon, Ash, and Pollin exaggerated the influence of the spreadsheet error. Summing up, the contrary results may be associated with different audiences E and inappropriate commentaries C of the two analyses what does not undermine their resemblance.

Also, results of cliometric research on the expansionary fiscal contraction hypothesis are divided because of methodological decisions what, bearing in mind Mäki's (2009) model, can be explained by different purposes P of the methods underlying contrary results. Guajardo, Leigh, and Pescatori (2010) refuted the positive short-term effects of cutting government spending. On the contrary, Alesina and Ardagdna (2009) delivered results supporting the expansionary fiscal contraction hypothesis. The results differed because the two teams of researchers indicated different years as moments of cutting spending. Only less than 30% of years of austerity was identified as such in both analyses (Maziarz in press) because the two teams applied various methods of deciding when governments cut their spending. Alesina and Ardagna (2009) analysed cyclically adjusted primary balance and defined spending cuts as $CAPB_t>1{,}015*CAPB_{t-1}$.On the contrary, Guajardo, Leigh, and Pescatori (2010) employed methodology coined by Romer and Romer (2007), i.e., analysed narrative records. Both methods have positive and negative sides. For instance, changes in CAPB can be caused by unexpected changes in GDP. On the contrary, narrative records can overestimate spending cuts because governments are likely to publish pro-austerity plans and not to realise them.

Since the expansionary fiscal contraction hypothesis cannot be true and false at the same time and about the same sample of countries, then the realist interpretation should be rejected (Maziarz under review) or, extending the criticism to the extreme, the lack of robustness undermines the whole project of econometrics (Lawson 1997; 2016). However, the realist approach can be defended by indicating that these two analyses serve different purposes P_1 and P_2. In detail, the CAPB-based approach will likely be more useful in economic policy setting when a government sets its goal regarding reducing CAPB. On the contrary, the method based on narrative records will help in predicting changes in GDP (for planning investments, instantiating) when a government announces spending cuts because the narrative-based approach inherently estimates the likelihood of succeeding, i.e., cutting government spending indeed.

6. Concluding remarks

Above, I applied Mäki's (2009) model of modelling to defending the realist interpretation of econometrics and showed that contrary results obtained by econometricians depend on the pragmatics of estimated models. In detail, I analysed three case studies: Sala-I-Martin' (1997) remarks on growth macroeconomics, Reinhart-Rogoff controversy, and two types of research focused on empirical verification of the expansionary fiscal contraction hypothesis. First, contrary results of the empirical growth macroeconomics resulted from resembling various aspects of reality, i.e., models M_1 and M_2, consisting of different sets of variables, aim at resembling divergent targets R_1 and R_2. Second, the Reinhart-Rogoff controversy exploded because, employing Mäki's (2009) terminology, the two contradictory analyses were aimed at divergent audiences E_1 and E_2 and Reinhart and Rogoff (2010), and Herndon Ash and Pollin (2014) failed at providing appropriate commentary C. Third, the two types of research focused on the expansionary fiscal contraction hypothesis were aimed at divergent purposes P_1 and P_2.

Applying Mäki's (2009) model of modelling to defending the realist interpretation of econometrics faces several difficulties. First, this approach seems to be similar to instrumentalist and pragmatist approaches and the differences (if they are significant) should be further elaborated on. Second, (ModRep) is very fruitful in defending any models and may be accused of being an invitation to relativism. However, the most critical area of further research for philosophers of econometrics is the emerging contrary results phenomenon, which is poorly understood today. In the hitherto literature, there are two articles focused on it (Goldfarb 1995; 1997) and, according to Google Scholar search engine, 22 mentions of it even though this phenomenon might be very influential on economic policy, what the Reinhart-Rogoff controversy showed. Finally, the question if the realist approach to econometrics defended above is indeed different from treating empirical models as tools helping in policy-making in line with instrumentalism needs to be addressed. If these two approaches are indifferent from theepistemic viewpoint, then, considering the Occam's razor, the realist reading of the econometric project should be abandoned.

Bibliography

Anand, Sudhir,and Kanbur, Ravi. 1995. Public Policy and Basic Needs Provision: Intervention and Achievement in Sri Lanka, in: Dreze J., Sen Am., Athar H. eds. *The Political Economy of Hunger*, Oxford: Clarendon Press.

Bache, Ida. 2003. Critical realism and econometrics, *Norges Bank Working Paper*, 2003/4.

Barro, Robert. 1996. *Determinants of economic growth: a cross-country empirical study*, Working Paper no. 5698, National Bureau of Economic Research. https://doi.org/10.3386/w5698

Giere Ronald. 2006. *Scientific Perspectivism*, Chicago: University of Chicago Press.

Goldfarb Robert, 1997, Now you see it, now you don't: emerging contrary results in economics.*Journal of Economic Methodology*, 42: 221-244. https://doi.org/10.1080/13501789700000016

Goldfarb Robert. 1995, The economist-as-audience needs a methodology of plausible inference, *Journal of Economic Methodology*, 22: 201-222. https://doi.org/10.1080/13501789500000015

Hamminga, Bert. De Marchi Neil, 1994. Idealization and the Defence of Economics: Notes Toward History, Hamminga B., De Marchi N. eds., *Idealization VI: Idealization in Economics*, Amsterdam: Rodopi, 11-42.

Herndon, Thomas. Ash, Micheal. Pollin, Robert. 2014. Does High Public Debt Consistently Stifle Economic Growth? A Critique of Reinhart and Rogoff, *Cambridge Journal of Economics*, 382: 257-279. https://doi.org/10.1093/cje/bet075

Hoover, Kevin 1997. Econometrics and reality in: Mäki, Uskali. ed. *Fact and Fiction in Economics*, Cambridge: Cambridge University Press, 152-177.

Hoover, Kevin. 2012. Pragmatism, perspectival realism, and econometrics. Lahtinen, Aki, Kuorikoski, Jakko, and Ylikoski, Petri (eds.). *Economics for real: Uskali Mäki and the place of truth in economics*, 223-240.

Latour, Bruno. Woolgar, Steve. 2013. *Laboratory Life: The Construction of Scientific Facts*, New Jersey, Princeton University Press.

Lawson T., 2016, Central Fallacies of Modern Economics, *Cambridge Realist Workshop*, 17th October 2016, Clare College, London.

Lawson, Tony. 1997. *Economics and Reality*. London: Psychology Press. https://doi.org/10.4324/9780203195390

Leplin, Jarett. 1984. *Scientific Realism*. Los Angeles: University of California Press.

Levine, Ross and Renelt, David. 1992. A Sensitivity Analysis of Cross-Country Growth Regressions, *American Economic Review*, 82(4): 942-963.

Lewis. David. 1986. *Counterfactuals*, Cambridge, Blackwell and Harvard University Press. https://doi.org/10.1007/BF02123381

Mäki, Uskali 1994. Isolation, idealisation and truth in economics, *Poznan studies in the philosophy of the sciences and the humanities*, 38: 147-168.

Mäki, Uskali. 2009. MISSing the World.Models as isolations and credible surrogate systems, *Erkenntnis*, 701: 29-43.

Mäki, Uskali. 2013. Contested Modeling: The Case of Economics, in:Gahde U. et al. eds., *Models, Simulations and the Reduction of Complexity*, Berlin: de Gruyter, 97-107.
Mäki, Uskali. in press. Modelling failure, in: Leitgeb H. et al., *Logic, Methodology and Philosophy of Science – Proceedings of the 15th International Congress*, Helsinki: College Publications, in press.
Maziarz, Mariusz. 2015. A review of the Granger-causality fallacy. *The Journal of Philosophical Economics: Reflections on economic and social issues.* 8(2):86-105.
Maziarz, Mariusz. 2016. Cięcia budżetowe. Przegląd najnowszych badań. *Ekonomia XXI Wieku.* 2(10): 9-21. https://doi.org/10.15611/e21.2016.2.0
Maziarz, Mariusz. 2017. The Reinhart-Rogoff controversy as an instance of the 'emerging contrary result' phenomenon. *Journal of Economic Methodology.* 24(3): 213-225. https://doi.org/10.1080/1350178X.2017.1302598
Maziarz, Mariusz. in press. It's All in the Eye of Beholder. *Argumenta Oeconomica.*
Maziarz, Mariusz. under review. The 'emerging recalcitrant result' phenomenon and realism about econometrics. *Philosophy of Science.*
Niiniluoto, Ilkka. 2013. The verisimilitude of economic models, Kuorikoski J. et al. eds., *Economics for Real: Uskali Mäki and the Place of Truth in Economics*, London: Routledge, 65-80.
Pissarides, Christopher. 1992. Loss of Skills During Unemployment and the Persistence of Employment Shocks, *Quarterly Journal of Economics*, 1, 64, 1371-1392. https://doi.org/10.2307/2118392
Reinhart, Carmen. Rogoff, Keneth. 2010. Growth in a Time of Debt, *American Economic Review*, 100, 2: 573-578. https://doi.org/*10.1257/aer.100.2.573*
Sala-I-Martin Xavier. 1997. I Just Run Two Million Regressions, *The American Economic Review*, 87, 2, 178-183.https://doi.org/10.3386/w6252
Smith, Adam. 1976, *An Inquiry into the Nature and Causes of the Wealth of Nations*, Glasgow: Oxford University Press.
Sterling, Thomas. 1959. Publication decisions and their possible effects on inferences drawn from tests of significance – or vice versa, *Journal of the American Statistical Association*, 54, 285: 30-34. https://doi.org/10.1080/01621459.1959.10501497