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Interrelation among Economic Growth, Income Inequality, and Fiscal Performance: Evidence from Anglo-Saxon Countries*

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Abstract

The interrelation among economic growth, income inequality, and fiscal performance is very complex. The objective of this paper is to analyze the dynamic interrelations among these variables using structural VAR models and to examine transmission channels among them. The empirical analysis is implemented for the UK, the USA, and Canada, using the longest possible consistently measured comparable data on income inequality. The obtained results show that inequality has a negative effect on growth in the case of the UK while the effect is positive for the USA and Canada. An increase in inequality worsens fiscal performance for all the considered countries.

Keywords: economic growth, income inequality, fiscal performance, VAR.

JEL Classification: C32, D31, E62, O47

1. Introduction

Since the pioneering contribution by Kuznets (1955), suggesting a non-linear relationship between inequality and growth (inequality first increases and later decreases during the process of economic development, being known as the Kuznets curve), there has been a growing interest in analyzing the relationship between both variables (Eicher and Turnovsky, 2003). However, theoretical papers as well as empirical applications have produced controversial results, and economic theory does not have a clear cut answer to the relation between inequality and growth.

The effect of inequality on growth also depends on the way fiscal policy responds to income inequality. Political debates evolve around decisions on spending and taxation, the

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channels of the redistribution of resources, which affect fiscal performance. Depending on the decision about government spending and taxation, fiscal policy has different impact on inequality and growth. Therefore, fiscal policy is an important transmission channel between income inequality and economic growth. In addition to fiscal policy channel, different transmission channels between inequality and growth are specified in the literature such as socio-political instability, which might affect investment. Thus, the interrelations among economic growth, income inequality, and fiscal performance are very complex, which are affected through different channels.

The validity of the transmission channels and the reduced form relations between inequality and growth are empirically tested, using mainly cross-section and panel data (Erhart, 2009; Neves and Silva, 2014). Especially, they are usually tested through single-equation analyses. The relationship between income inequality and fiscal performance, with the consideration of economic growth, is generally studied through single-equation approach too, as in the empirical analysis by Larch (2012). In the case of the usage of these variables in a single-equation analysis, it is highly likely to face the problem of the endogeneity of independent variables. This issue is usually overcome with the application of instrumental variables but it is quite challenging to find proper instruments.

The objective of the paper is to analyze the interrelations among economic growth, income inequality, and fiscal performance jointly in a system, examining also transmission channels among them. All the variables are considered as endogenous by applying the structural vector autoregression methodology. This approach allows exploring dynamic interactions among them and feedback effects on each other. For this area of the research, this approach has not been explored in the literature in a systematic way and there are only a few related works (Ramos and Roca-Sagales, 2008; Roca-Sagales and Sala, 2011).

The paper also tries to overcome another issue that has been found in the literature related to the estimation of the interrelations among economic growth, income inequality, and fiscal performance. In particular, because of the lack of comparable inequality data, researchers often have to mix different classifications of data together, which is inappropriate, according to Knowles (2005). The careful attention is payed to this issue. Thereby, the paper provides new evidence on interrelations among growth, inequality, and fiscal performance by using the longest possible consistently measured comparable data on income inequality on a country basis.

The empirical analysis is implemented for the Anglo-Saxon countries, the United Kingdom (UK), the United States of America (USA), and Canada. These developed countries implement relatively independent fiscal policies, which are not generally bounded by intergovernmental treaties, such as European Fiscal Compact. Their economies are generally characterized by comparatively low levels of government regulation and high levels of income inequality. In addition, considering these countries with similar backgrounds can provide further insights from comparing the results for each of them. The paper finds that income inequality has negative effect on economic growth in the case of the UK. The effect is positive in the cases of the USA and Canada. The increase in income inequality worsens fiscal performance for all the countries.

The rest of the paper is organized as follows: Section 2 discusses the interrelations and the channels among economic growth, income inequality, and fiscal performance; Section 3 presents the data while Section 4 describes the empirical methodology and provides the results and the Section 5 contains concluding remarks and policy implications.

2. Interrelations among Economic Growth, Income Inequality, and Fiscal Performance

In this section, the paper discusses each link of the interrelations among economic growth, income inequality, and fiscal performance by reviewing the related literature. First, the paper describes the literature on the relationship between income inequality and economic growth. Next, the literature on inequality and fiscal performance is discussed. The paper also describes the literature on fiscal performance and economic growth.

2.1. Income Inequality and Economic Growth

In this area of research, one of the mostly studied relations is between income inequality and economic growth. Barro (2000) brings evidence of a negative relationship between inequality and growth for poor countries and a positive relationship for rich countries. Analogously, Galor and Moav (2004) argue that while income inequality positively affects economic growth at the stages of physical capital accumulation, later the process is reversed at the stages of human capital accumulation. In addition, generally it is found that long-run relation between inequality and growth is negative while the short-run effect of inequality on growth is positive. In the case of the usage of nonparametric estimation methods, Banerjee and Duflo (2003) find that changes in inequality in any direction are associated with subsequent lower growth rates.

The meta-analysis by De Dominicis *et al.* (2008) permits to conclude that, although policy conclusions are clearly different, probably it is misleading to simply speak of a positive or negative relationship between income inequality and economic growth when looking at the available studies. Differences in estimation methods, data quality, sample coverage, and the initial level of income are some of the factors that could affect the estimated impact of income inequality on economic growth (Castells-Quintana and Royuela, 2014).

Exploring the relation between politics and growth through endogenous growth model, Alesina and Rodrik (1994) find that higher degree of inequality of wealth and income leads to the greater rate of taxation (redistribution) and to the lower economic growth. That is, the more unequal distribution of resources in society leads to lower rate of economic growth, and the link between them is given by redistributive policies. Their empirical results show that inequality in land and income is negatively correlated with subsequent economic growth. They indicate that the important line of research can be the study of dynamic interconnection between income distribution and growth since they are consecutively affect each other.

Alesina and Perotti (1996) explore another transmission channel for the negative relation between income inequality and economic growth. They state income inequality leads to socio-

political instability that creates uncertainty in the politico-economic environment, decreasing investment. That is, inequality and investment are negatively related whereas the latter is an important factor for growth. Alesina and Perotti (1996) test their hypotheses, using a bivariate simultaneous equation model in an index of socio-political instability and investment.

Persson and Tabellini (1994) theoretically model that unequal distribution of income in a democratic society produce redistributive economic policies that decrease investment and subsequently economic growth. Their empirical results indicate a negative relation between initial income inequality and subsequent economic growth. Thus, investment could be a link between inequality and growth. Persson and Tabellini (1994) assert that the transmission channel of fiscal policy should also be carefully investigated since government interventions caused by distributional conflicts lead to decrease in investment and consequently to decline in growth. That is, a link between a redistribution policy and economic growth should be further explored as well.

2.2. Income Inequality and Fiscal Performance

Economic recessions accompanied with high inequality lead to political pressure, which causes discretionary government spending. The various groups of a country may try to change established inequality through public spending during recessions. Lower income groups demand more transfers while groups with higher incomes want to obtain tax benefits through lighter taxation. The redistribution is influenced by the relative power of each group in the political decision making process Milanovic (1999). In the long run, this conflict can lead to excessive debt if the government pays for these transfers to certain groups without taxing others. In the short term, an economic boom increases government income, making easier to pay more transfers to all groups while in a recession the government with lower disposal income prefers to borrow or raise taxes to ease tensions in the groups.

Larch (2012) argues that fiscal performance is influenced by the different degrees of income inequality. In particular, he shows that countries with higher degree of income inequality are prone to run deficits and accumulate government debt. To explain fiscal performance, Larch (2012) uses econometric analyses with single-equation regression models through explanatory variables such as income inequality and economic growth, which is risky since they are not exogenous, and there is a problem of endogeneity.

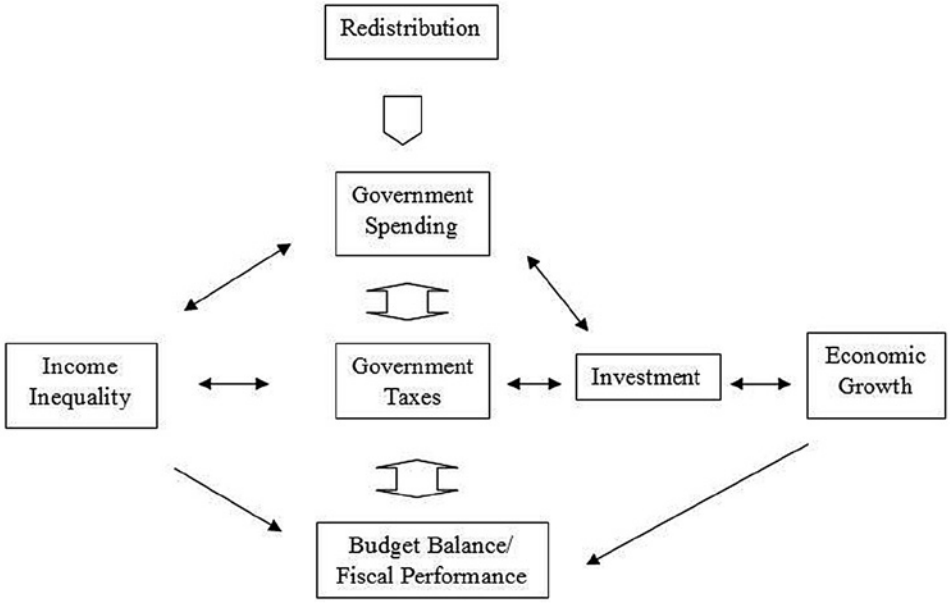
2.3. Fiscal Performance and Economic Growth

Fiscal performance reflects fiscal policy discipline, and it is significantly affected by the volatility of fiscal policy. As shown by Woo (2011), income inequality leads to the volatility of fiscal policy, which in turn dampens economic growth. That is, he discusses the fiscal policy volatility channel for the negative link between inequality and growth. Woo (2011) considers this channel by separately examining the links between income inequality and fiscal volatility, the latter and growth, and eventually inequality and growth. In the work the negative relation between macroeconomic volatility and growth has also been considered. The studies of the relations between income inequality and economic

growth through the fiscal policy volatility channel are conducted by single-equation econometric modeling techniques. However, by studying the isolated relations among them, important information is missed, and there is an endogeneity problem[1]. These concerns are addressed by Muinelo-Gallo and Roca-Sagales (2013) who examine mutually influential relationship between income inequality and economic growth via the fiscal policy channel by considering the systems of structural equations. They employ a system of seemingly unrelated regressions and a simultaneous regression model in their econometric analysis. The systems of structural equations approach to macroeconomic modeling is arguably fundamentally flawed whereas vector autoregression (VAR) models are generally less ambitions macroeconomic modeling approach that performs as good as or better than structural equation systems for analyzing macroeconomic activity (Green, 2002). In the context of the topic, VAR modeling approach is employed by Ramos and Roca-Sagales (2008), and Roca-Sagales and Sala (2011). However, they mainly focus on the examinations of the fiscal policy effects on GDP while the paper directly explores the interrelations among growth, inequality, and fiscal performance.

To show the interrelations among the discussed variables, Figure 1 is provided. It illustrates the complex mutual interrelations considered in the analysis. From the diagram, the complex mutual interrelations among the variables can be seen. Some of the isolated relations among them have extensively been studied in the literature. As previously mentioned, the objective is to study and analyze those interrelations jointly in a system, being the main contribution of the paper.

Figure 1: Interrelations among the Variables



3. Data

The empirical analysis is implemented for the Anglo-Saxon countries, the UK, the USA, and Canada. These countries are highly developed and they conduct relatively independent fiscal policies, which are not generally bounded by intergovernmental treaties, such as European Fiscal Compact. The economies of these countries are generally characterized by the low levels of the government regulation, the small shares of the public sector, and by free markets. They are among the most economically free countries of the world. Particularly, according to the latest annual report on Economic Freedom of the World (Gwartney *et al.*, 2014), the corresponding chain-linked indices[2] for the UK, the USA, and Canada are 7.92 (9), 7.81 (14), and 8.11 (4), respectively. Similarly, for instance, for 1990, these chain-linked indices of Economic Freedom of the World are 8.08 (6), 8.35 (3), and 8.09 (5) for the UK, the USA, and Canada, respectively.

The economically free Anglo-Saxon countries are characterized with the economic model that fosters innovations and competitive advantages, stimulating growth and creating jobs in a country. However, the impact of the economic model on the overall prosperity in the society might be ambiguous. In particular, it is asserted that this economic model is less redistributive and leads to higher income inequality and poverty in Anglo-Saxon countries compared to other developed countries that employ other economic models such as Nordic and Continental European models.

The UK, the USA, and Canada are relatively homogeneous and similar in backgrounds to compare the empirical results obtained for them. Each of the countries was under British rule, and they have a common law legal system. Migration and trade flows among them were high over the twentieth century (Atkinson and Leigh, 2013). Thus, the consideration of these countries in the analysis could give additional inferences from the comparison of the results for each of them. Nevertheless, the countries have their own specific features. Especially, the UK has comparatively higher level of taxation and it spends relatively more on the welfare state. Besides, the UK has adopted some social programs used within European continental economic models (Putten, 2005).

3.1. Income Inequality Data

In the empirical analysis, a lot of attention is payed to the usage of consistently measured comparable data on income inequality. This is very important because scarcity and diversity of the data on income inequality are one of the major difficulties for empirical analyses in this research area. First of all, income inequality datasets generally are not fully available for considered periods and shorter than time series usually used in macroeconomic analyses (e.g., for economic growth). In addition, income inequality can be measured based on gross or net (disposable) income, and the unit of measurement can be an individual or a household. Therefore, it is expectable to get quite different measures of income inequality, depending

on which of these classifications are used. Emphasizing this, Knowles (2005) stresses the importance of the usage of consistently measured inequality data.

Because of the lack of comparable inequality data, researchers often have to mix different classifications of data together, as indicated by Knowles (2005). However, he argues that this is inappropriate and shows that the empirical results found in these cases are not robust. He also points out that the estimates in the cross-country analysis on inequality and growth are highly sensitive to the sample of countries included. In addition, data on inequality usually come from different sources, and they are not automatically comparable since differences in underlying survey methodologies might impair the comparability. Taking all these arguments into account, the paper tries to use the longest possible consistently measured comparable data on income inequality on a country basis. Depending on their availability, the paper accordingly selects the same ranges for the other time series used in the empirical analysis. In line with all these objectives, the data sources are correspondingly chosen.

3.2. Dataset

All the data are annual and range over the period from 1960 to 2011. As an income inequality measure, Gini coefficient (GINI) is used in the empirical analysis since it provides the broadest coverage across time and countries. Gini coefficients are taken from the OECD dataset and UNU-WIDER, World Income Inequality Database (WIID 3.0b), September 2014. The paper uses these sources for Gini coefficients because by far they have the most comprehensive set of income inequality data. The paper employs the longest possible inequality data based on disposable income, which are the most appropriate to use in empirical analyses, as argued by Knowles (2005) based on theoretical considerations. Besides, Gini coefficients on disposable income are mainly the longest available series of income inequality data (available mainly in the OECD database). However, if they are from different sources or they are missing for the considered period, the paper correspondingly adjusts (shifts) Gini coefficients based on net income from different sources or the coefficients that are derived from gross income towards the longer series of Gini indices on disposable income from the OECD database. The shifting of the series towards the series from the OECD database is implemented based on the averages of the overlapping values of the series. The paper carries out these adjustments since the combined series generally have the same dynamics and trends, and that is simply shifting the series towards each other. Nevertheless, special care regarding this approach is taken to use possibly compatible data on Gini indices[3].

Data on economic growth (GRGDPC) are taken from the World Development Indicators of the WB and from the version 8.1 of Penn World Table (Feenstra *et al.*, 2015). The time series for economic growth are the annual growth rates of real GDP per capita. As a measure of fiscal performance[4], the paper uses general government net lending/borrowing expressed as a percentage of GDP (NLB). It is from Federal Reserve Bank of St. Louis (FRED) and OECD. Additionally, the paper also considers other variables to explore transmission channels among the main variables. Total investment (SI) and general government spending[5]

(SG) are expressed as shares of GDP and they are from the World Development Indicators of the WB. Total tax revenue is presented as a percentage of GDP (TAXES) and it is from Federal Reserve Bank of St. Louis (FRED) and OECD. The detailed definitions of the variables are provided in Table 1, and the general statistical characteristics of the variables are presented in Table 2. The evolution of the variables is depicted in Figure 2.

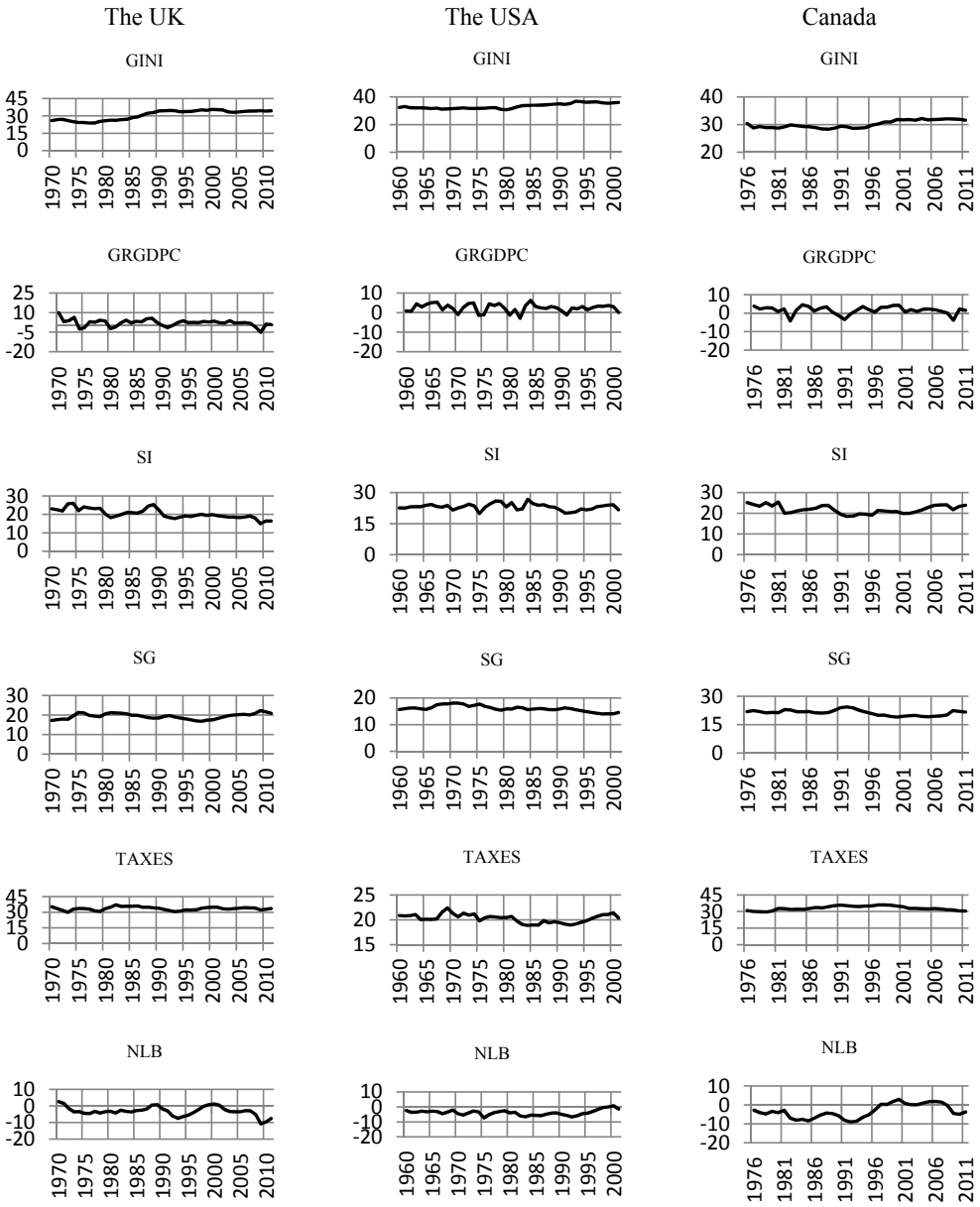
Table 1: The List of Abbreviations and Their Detailed Definitions [Insert Table 1 around here]

Abbreviations	**Definitions as Specified in the Source of the Data**
GINI	Gini coefficient of disposable income inequality (in percentages)
GRGDPC	Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2005 U.S. dollars.
SI	The percentage share of gross capital formation (private and public, total) in GDP
SG	The percentage share of general government final consumption expenditure (total) in GDP
TAXES	Total tax revenue as a percentage of GDP
NLB	General government net lending / borrowing as a percentage of GDP

Table 2: Descriptive Statistics

Aggregate Indices for the Observed Initial Series													
		GINI		**GRGDPC**		**SI**		**SG**		**TAXES**		**NLB**	
Countries	Range	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
UK	1970-2011	30.77	4.17	2.16	2.14	20.39	2.61	19.35	1.40	33.48	1.57	-3.18	2.81
USA	1960-2011	34.18	2.46	2.03	2.14	22.69	1.86	15.98	1.03	19.95	1.13	-4.46	2.54
Canada	1976-2011	30.14	1.36	1.55	2.12	21.88	1.98	21.28	1.44	32.97	1.91	-3.39	3.57

Figure 2: The Evolution of the Initial Variables



4. Empirical Analysis

Considering the current state of this research area, the paper explores the interrelations among economic growth, income inequality, and fiscal performance jointly through structural VAR modeling, taking also into account transmission channels among them. This approach allows tackling the endogeneity problem among the variables and to study them in a system. In addition, structural VAR models also allow recovering underlying economic shocks and to examine dynamic interactions among the variables and feedback effects on each other through impulse response functions.

In order to use structural VAR modeling approach properly, the order of integration of the time series should be checked first. If their order of integration is zero and the series are stationary, the empirical analysis can immediately be implemented. Otherwise, stationary transformation for the series should first be performed and, then, structural VAR modeling approach should be applied. Thus, in the empirical analysis, first, the order of integration of the time series is checked and depending on the obtained results, the further analysis is implemented.

4.1. Stationary Transformation

The paper checks the order of integration of the time series with the augmented Dickey-Fuller test[6]. The null hypothesis is tested that a series has a unit root against its stationarity. Depending on the characteristics of the series, the paper performs the test with an intercept or without any deterministic term. The results of the test are presented in Table 3. As can be seen, the time series of the variables are not stationary (they are integrated of order 1) except for the series of economic growth. In contrast to the variables, which are given at a point in time, economic growth relates to a previous period. Therefore, to provide maximal comparability for all of the data for the empirical analysis, the index for economic growth is brought to base (to its starting value for each of the series). That results in the nonstationary series, as can be observed from Table 3. Thus, all the time series are now nonstationary.

The paper makes stationary transformation for the time series before using them in the empirical analysis. Two common ways of stationary transformation are differencing and detrending, which can be implemented in different ways. One of the widely used detrending methods is Hodrick-Prescott (HP) filter[7] (Hodrick and Prescott, 1997), which is a smoothing method to obtain a long-term trend component of a series. The HP filter also renders stationary time series that are difference stationary and integrated of higher order (King and Rebelo, 1993). Taking also into account that all the variables are relative quantities, the paper de-trends the series by the HP filter to also provide economic meaning to the variables after their stationary transformation. In any cases, the stationary transformation is also implemented by the first order differencing but the obtained results generally show the same

dynamic behavior. Therefore, the series detrended by the HP filter are used in the empirical analysis.

For the ratio variables, the detrending is implemented by subtracting the HP filter from the actual series. These detrended series show percentage points deviations from their long-term means. For the base index of economic growth, detrending is carried out by dividing the series by the HP filter and subtracting one (all this expression is also multiplied by 100). In this case, the detrended series show percentage deviations from their long term means. Then, the augmented Dickey-Fuller test is again implemented to check whether the stationary transformation of the time series is successful. Since the series are detrended now, no deterministic term is used for the test. As indicated by the test results in Table 4, all the series are stationary now and the structural VAR analysis can already be implemented.

Table 3: The Augmented Dickey-Fuller Test for the Initial Time Series

THE UK

Variables	Test Values	Critical Values			P-Values
		1%	5%	10%	
SG	0.20	-2.62	-1.95	-1.61	0.74
SI	-2.03	-3.61	-2.94	-2.61	0.27
GRGDPC (initial index)	-4.06	-2.62	-1.95	-1.61	0.00
GRGDPC (base index)	-0.52	-3.61	-2.94	-2.61	0.88
GINI	-0.82	-3.60	-2.94	-2.61	0.80
TAXES	-0.34	-2.62	-1.95	-1.61	0.56
NLB	-1.71	-2.62	-1.95	-1.61	0.08

THE USA

Variables	Test Values	Critical Values			P-Values
		1%	5%	10%	
SG	0.11	-2.61	-1.95	-1.61	0.71
SI	-0.54	-2.61	-1.95	-1.61	0.48
GRGDPC (initial index)	-5.20	-3.57	-2.92	-2.60	0.00
GRGDPC (base index)	-0.79	-3.57	-2.92	-2.60	0.81
GINI	0.53	-3.57	-2.92	-2.60	0.99
TAXES	-0.79	-2.61	-1.95	-1.61	0.37
NLB	-0.88	-2.61	-1.95	-1.61	0.33

CANADA

Variables	Test Values	Critical Values			P-Values
		1%	5%	10%	
SG	-0.32	-2.63	-1.95	-1.61	0.56
SI	-0.37	-2.63	-1.95	-1.61	0.55
GRGDPC (initial index)	-3.37	-2.63	-1.95	-1.61	0.00
GRGDPC (base index)	-0.42	-3.64	-2.95	-2.61	0.90
GINI	-0.80	-3.63	-2.95	-2.61	0.81
TAXES	0.01	-2.63	-1.95	-1.61	0.68
NLB	-1.94	-3.64	-2.95	-2.61	0.31

Table 4: The Augmented Dickey-Fuller Test for Detrended Time Series

THE UK

Variables	Test Values	Critical Values			P-Values
		1%	5%	10%	
SG	-5.73	-2.62	-1.95	-1.61	0.00
SI	-5.37	-2.63	-1.95	-1.61	0.00
GRGDPC (base index)	-4.78	-2.62	-1.95	-1.61	0.00
GINI	-4.75	-2.63	-1.95	-1.61	0.00
TAXES	-3.83	-2.62	-1.95	-1.61	0.00
NLB	-4.54	-2.62	-1.95	-1.61	0.00

THE USA

Variables	Test Values	Critical Values			P-Values
		1%	5%	10%	
SG	-5.38	-2.61	-1.95	-1.61	0.00
SI	-5.37	-2.61	-1.95	-1.61	0.00
GRGDPC (base index)	-5.55	-2.61	-1.95	-1.61	0.00
GINI	-6.02	-2.61	-1.95	-1.61	0.00
TAXES	-6.48	-2.61	-1.95	-1.61	0.00
NLB	-6.67	-2.61	-1.95	-1.61	0.00

CANADA

Variables	Test Values	Critical Values			P-Values
		1%	5%	10%	
SG	-3.90	-2.63	-1.95	-1.61	0.00
SI	-3.57	-2.63	-1.95	-1.61	0.00
GRGDPC (base index)	-3.69	-2.63	-1.95	-1.61	0.00
GINI	-4.26	-2.63	-1.95	-1.61	0.00
TAXES	-4.89	-2.64	-1.95	-1.61	0.00
NLB	-4.03	-2.63	-1.95	-1.61	0.00

4.2. VAR Specification

For each country, the interrelation among economic growth, income inequality, and fiscal performance, measured by government net lending/borrowing, are examined by the structural VAR methodology. The VAR specification approach is conditioned on a compromise between a parsimonious model and the one that does not have omitted variable bias. Therefore, the paper considers benchmark and extended structural VAR specifications. The benchmark specification that is the most parsimonious and the basic one includes the main variables of this study: economic growth, income inequality, and fiscal performance (GRGDPC, GINI, NLB). The extended model also allows exploring transmission channels among them, and it additionally contains government spending, investment, and taxes (SG, SI, GRGDPC, GINI, TAXES, NLB).

In general, the VAR model of order p, denoted VAR(p), can be expressed as:

$$y_t = A_0 + A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + e_t \quad (1)$$

where y_t s $(n \times 1)$ vector containing each of the n variables included in the VAR; A_0 is an $(n \times 1)$ vector of intercept terms; A_i are $(n \times n)$ matrices of coefficients; and e_t is an $(n \times 1)$ vector of error terms[8]. In the case of the benchmark model, $n = 3$ and it contains $GRGDPC$, $GINI$, NLB variables. In the case of the extended model, $n = 6$ and it includes SG, SI, $GRGDPC$, $GINI$, $TAXES, NLB$ variables.

It is assumed that the vector of error terms is a n-dimensional white noise process, i.e., $E(e_t) = 0$, $E(e_t e_t') = \Omega$ and $E(e_t e_s') = 0$ for $s \neq t$ where Ω is a $(n \times n)$ symmetric positive definite matrix. Since error terms are serially uncorrelated with constant variances and the right hand side of the VAR(p) equation (2.1) contains only predetermined variables, each equation in the system can be estimated by ordinary least squares (OLS). Moreover, these estimates are consistent and asymptotically efficient (Enders, 2004). This is true not only in the case of stationary variables, but also in the case when some variables are integrated (Sims *et al.*, 1990). Based

on this, some researchers estimate VAR models in levels ignoring non-stationarity issues. A drawback of this approach is that, while the autoregressive coefficients are estimated consistently, this may not be true for other quantities derived from these estimates (Kamps, 2005). Especially, Phillips (1998) shows that impulse responses and forecast error variance decompositions based on the estimation of unrestricted VAR models are inconsistent at long horizons in the presence of non-stationary variables. Impulse response analysis is one of the main tools for policy analysis in the case of VAR models and it is widely used in the paper. Therefore, the paper employs only stationary series for estimations in the current research work.

4.3. Structural VAR Identification

Little can be learned about the underlying economic structure of the aforementioned VAR models in their standard forms unless identifying restrictions are imposed since these models are reduced form models. The shocks of this reduced form model are not generally economically meaningful because they are linear combinations of structural shocks. The underlying structural model is obtained by pre-multiplying both sides of the unrestricted VAR by the $(n \times n)B$ matrix:

$$By_t = \Gamma_0 + \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + \ldots + \Gamma_p y_{t-p} + \varepsilon_t \qquad (2)$$

where $\Gamma_i = BA_i$ for $i = 0, \ldots, p$ and $\varepsilon_t = Be_t$, which describes the relation between the structural disturbances ε_t and the reduced form disturbances e_t (for equivalently $e_t = B^{-1}\varepsilon_t$). It is assumed that the structural disturbances ε_t are white noise and uncorrelated with each other, i.e., their variance-covariance matrix is diagonal. The matrix B describes the contemporaneous relation among the variables contained in the vector y_t. That is, there are more parameters in the structural model (2) than in the reduced form VAR presented in (1). Therefore, without restrictions on the parameters of the structural model, it is not identified. There are number of alternative identification procedures proposed in the literature. In this empirical work, the paper applies the widely used recursive approach originally proposed by Sims (1980) that restricts B (and correspondingly B^{-1}) to a lower triangular matrix. That is, this identification scheme, also known as Cholesky decomposition, imposes a recursive causal structure from the top variables to the bottom variables. While this recursive approach enables uniquely identifying the structural VAR model, it has n! possible orderings in total. Though economic reasoning usually allows selecting an appropriate ordering, the sensitivity of the dynamic properties of the model to alternative orderings of the variables should be checked.

For the ordering of the variables in the benchmark specification (GRGDPC, GINI, NLB), it is natural to assume that contemporaneously government net lending/borrowing does not impact economic growth and income inequality but it is affected by them. The contemporaneous impact of economic growth is not usually distributionally neutral and it affects income inequality. On the other hand, growth likely responds to changes in inequality only in the long term due to the considerable transmission mechanisms, such as capital accumulation (Bena-

bou, 1996, Perotti, 2004, Ramos and Roca-Sagales, 2008). That is, economic growth should come first in the model. In any case, the paper also estimates the VAR model with the reverse order of growth and inequality, but the results do not change significantly. Thus, the ordering of the variables for the basic VAR model is as follows: GRGDPC, GINI, NLB.

The ordering of the variables in the case of the extended VAR model (SG, SI, GRGDPC, GINI, TAXES, NLB) is mainly in line with Ramos and Roca-Sagales (2008) since they use a similar VAR model. In addition to the basic variables, the paper also includes government spending, investment, and taxes in the model. As in the basic case, it is still reasonable to assume that contemporaneously government net lending/borrowing does not influence the considered variables but it is affected by them. Contemporaneously investment impact economic growth (Alesina and Perotti, 1996) and consequently the other variables except of government spending, which is planned in advance. Thus, the extended VAR model has the following ordering of the variables: SG, SI, GRGDPC, GINI, TAXES, NLB.

4.4. Impulse Response Functions

Impulse response functions (IRFs) are intuitive tools to analyze interactions among variables in the benchmark and the extended VAR models. To see this and keep things simple, VAR(1) can be considered for any case without loss of generality since any VAR(p) can be rewritten as a VAR(1). Firstly, it should be expressed in its vector moving average (VMA) representation by using recursive substitution:

$$y_t = A_0 + \sum_{i=0}^{\infty} A_1^i e_{t-i} \tag{3}$$

To trace the economic impact of an impulse to one of the variables on itself and on the rest of the variables in the system, it is required the VMA representation based on the orthogonal structural shocks instead of the reduced form disturbances, which are correlated with each other. Therefore, by using the expression for the reduced form disturbances e_t, (3) is rewritten as:

$$y_t = A_0 + \sum_{i=0}^{\infty} A_1^i B^{-1} \varepsilon_{t-i} \tag{4}$$

It can be written in a more compact form as:

$$y_t = A_0 + \sum_{i=0}^{\infty} \Phi_i \varepsilon_{t-i} \tag{5}$$

By updating this equation, the responses of y_{t+i} to one unit impulse at time *t* are obtained. If each element of Φ_i is graphed against *i* periods (these elements are called impact multipliers), it is possible to obtain the response of each variable in the system from the impulse to the different structural shocks. Thus, IRFs describe how the VAR system reacts

over time to one unit shock in a variable assuming that there is no other shock in the system during that period.

The structural shocks, which are considered as one-standard deviations to the variables, are recovered and they get their natural economic meaning. They are identified by the Cholesky decomposition, which requires imposing the ordering of the variables that describes the contemporaneous relations among them. The paper specifies the ordering of the variables based on economic reasoning. As mentioned above, the ordering of the variables in the benchmark VAR model is as follows: GRGDPC, GINI, NLB, while for the extended model is the following: SG, SI, GRGDPC, GINI, TAXES, NLB.

The paper studies the dynamic interrelations among the variables through the IRFs with one-standard error bands, which allows assessing the statistical significance of the results. The paper presents them as graphical representations of impact multipliers over 10 periods, during which they converge to 0, indicating that underlying time series are stationary. In tabulated format, accumulated impact multipliers (with corresponding standard errors) are also provided, which are viewed as long run multipliers when they are considered over long periods. The paper accumulates them over 2, 5, and 10 periods. Thus, the accumulated impact multipliers over 10 periods could be regarded as long run (total) effects whereas the graphical representation of impact multipliers might reveal the short term dynamic interrelations of the variables.

4.5. Empirical Results

As discussed, VAR methodology allows considering all the variables as endogenous and to refrain from such a strong assumption as the exogeneity of any of the variables (Lütkepohl and Krätzig, 2004). Therefore, the paper includes all the variables as endogenous in the VAR models. Besides, there is also a deterministic term in the models. The paper makes the stationary transformation of the data. Moreover, deterministic terms do not affect the IRFs (Lütkepohl and Krätzig, 2004), which are the empirical tools of the analysis. Taking into account the results of the information criteria (especially relying on Schwarz criterion) and the limitations of the available time series, the paper uses the first-order VAR models[9], which are estimated by OLS[10].

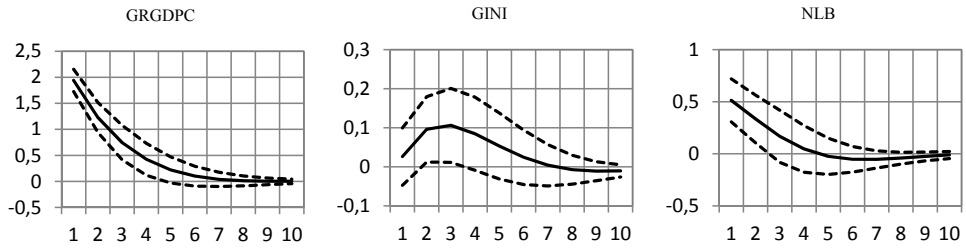
4.5.1. *Benchmark Specification*

From the IRFs presented in Figure 3, it can be seen that the structural shock of one standard deviation[11] in economic growth leads to approximately 0.1 percentage points increase in income inequality in the case of the UK and to around 0.15 and 0.07 percentage points declines in income inequality in the cases of the USA and Canada respectively. The shock in economic growth results in the rises of government net lending/borrowing by approximately 0.5, 1.0, and 1.2 percentage points for the UK, the USA, and Canada respectively. While the positive effect of the growth on government net lending/borrowing is ex-

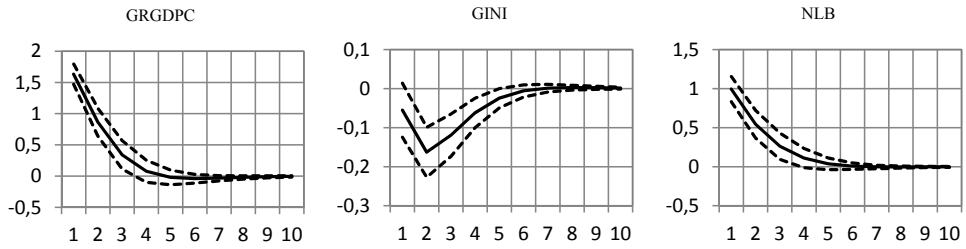
pectable because of the anticipated rise in government revenues, the effect of the growth shock on inequality is not unambiguous as indicated by the results[12].

Figure 3: IRFs to a Shock to Economic Growth

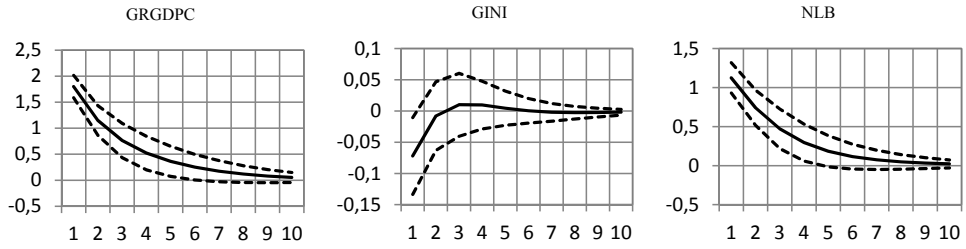
The UK



The USA



Canada



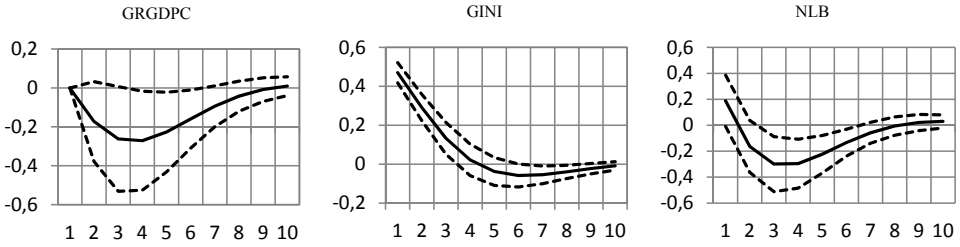
It would not be correct to view the IRFs of inequality to the growth shock in the countries through the concept of the Kuznets curve. That would require observing the relation between growth and inequality in a country for a longer term. Instead, the paper interprets

these IRFs through the disaggregation of economic growth. Based on the production function, economic growth could be generally attributable to the growth in technology, capital, and labor. So, the impact of the growth shock on inequality could depend on the structure of the increase in labor that contributes to the economic growth. For instance, if the increased labor consists of many people with low level of income, it can reduce inequality due to the earnings of these employees. Thus, for the considered countries, the differences in the IRFs of inequality to the growth shock might be due to the distinct structures in their labor increases.

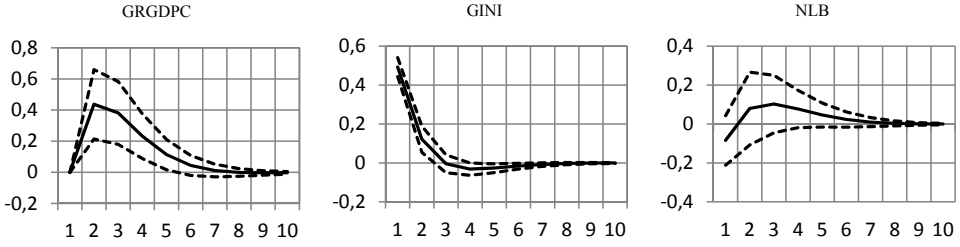
As can be observed from Figure 4 and Table 5, a structural shock to income inequality induces to the decline in economic growth by accumulated 0.17 percent over two periods for the UK and to the increases in growth by accumulated 0.44 and 0.32 percent over two periods for the USA and Canada respectively. These results underline that the relation between inequality and growth is not definite and that is outlined in the literature. The negative effect of inequality on growth is asserted in the works such as Alesina and Rodrik (1994) and Persson and Tabellini (1994). The positive effect of inequality on growth for the USA and Canada is in line with Barro's (2000) evidence that this relationship is positive for developed countries. In particular, Partridge (2005) shows that inequality are positively related to long run growth in the USA, and that is in line with the empirical results, which are obtained for the comparatively long time period. The differences in these effects for the Anglo-Saxon countries could be explained by the distinctions between the UK and Anglo-American economic models. In particular, the former probably shares some common features with European continental economic models and spends relatively more on the welfare state.

Figure 4: IRFs to a Shock to Income Inequality

The UK



The USA



Canada

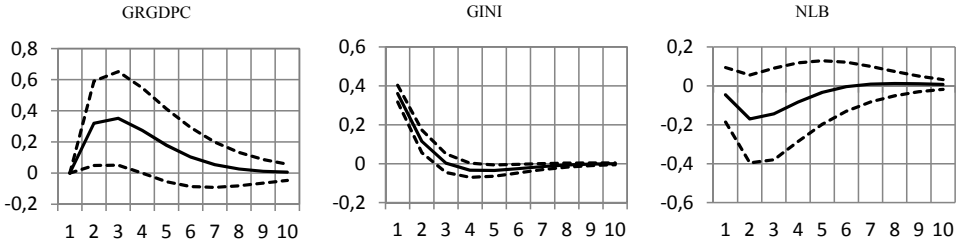


Table 5: Accumulated IRFs to Shocks to Economic Growth and Income Inequality

		Shock to Economic Growth			Shock to Income Inequality		
Countries	Periods / Variables	2	5	10	2	5	10
The UK	GRGDPC	3.170 (0.43)	4.561 (1.22)	4.715 (1.63)	-0.172 (0.20)	-0.932 (0.90)	-1.228 (1.08)
	GINI	0.122 (0.14)	0.366 (0.35)	0.366 (0.45)	0.761 (0.10)	0.879 (0.29)	0.695 (0.33)
	NLB	0.848 (0.39)	1.038 (0.91)	0.854 (0.99)	0.026 (0.37)	-0.794 (0.78)	-0.941 (0.72)
The USA	GRGDPC	2.498 (0.32)	2.895 (0.74)	2.783 (0.77)	0.437 (0.22)	1.164 (0.59)	1.213 (0.60)
	GINI	-0.218 (0.11)	-0.423 (0.18)	-0.421 (0.17)	0.615 (0.09)	0.553 (0.14)	0.525 (0.13)
	NLB	1.539 (0.28)	1.951 (0.57)	1.948 (0.60)	-0.004 (0.25)	0.223 (0.48)	0.260 (0.49)
Canada	GRGDPC	2.951 (0.43)	4.603 (1.28)	5.284 (2.06)	0.320 (0.27)	1.124 (1.01)	1.324 (1.44)
	GINI	-0.080 (0.10)	-0.056 (0.17)	-0.065 (0.19)	0.476 (0.08)	0.410 (0.15)	0.361 (0.14)
	NLB	1.867 (0.37)	2.819 (0.97)	3.114 (1.43)	-0.215 (0.31)	-0.476 (0.81)	-0.441 (1.02)

As can be seen from Figure 4 and Table 5, the rise in inequality generally leads to the reduction of government net lending/borrowing in all the countries. For Canada, it is clear government net lending/borrowing decreases over the all periods with around 0.2 percentage points minimal reduction. In the case of USA, it initially declines until approximately 0.1 percentage points and it increases afterwards. In contrast, the inequality shock initially increases government net lending/borrowing in the UK and then, the shock steeply reduces it until the lowest point of 0.3 percentage points in the third period, by preserving its negative impact over the subsequent periods. These negative effects of the inequality shock on government net lending/borrowing are much more obvious in the case of the extended specification for the UK

and the USA. These impacts are almost totally negative within it, and the total reductions over 10 periods are 0.7 and 0.18 percentage points in the UK and the USA respectively[13].

In general, the estimation results indicate that there are other variables that influence the dynamics and interrelations among economic growth, income inequality, and fiscal performance. Therefore, the VAR model is extended by the other variables and the empirical analysis is also implemented with it.

4.5.2. *Extended Specification*

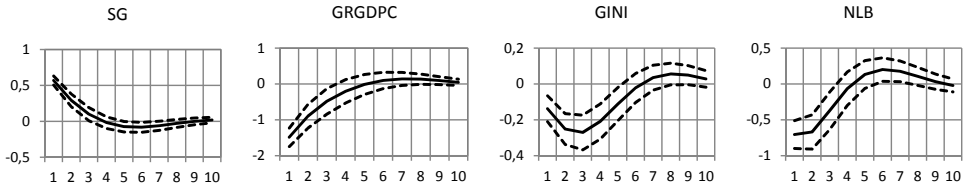
In the cases of shocks to economic growth and income inequality, the IRFs of the extended model have almost the same results as in the benchmark scenario. Therefore, the paper only provides the IRFs in the cases of shocks to government spending, investment, and taxes. Besides, in the graphical representation, only the relevant IRFs are provided. In case of the table representation, all the accumulated IRFs are provided.

As can be seen from Figure 5, a government spending shock decreases economic growth by around 1.5, 1.2, and 1.4 percent in the UK, the USA, and Canada, respectively. That is, it is possible to observe the crowding out effect for all the countries. Perotti (2004) finds similar effects (opposite for the USA) for the UK and Canada for the subsamples more closely related to the estimation periods. As can be seen from Table 6, over two periods the government spending shock decreases income inequality by accumulated 0.39 percentage points in the UK but it raises inequality by accumulated 0.17 and 0.06 percentage points in the USA and Canada. This result for the UK corroborates the corresponding finding provided by Ramos and Roca-Sagales (2008). In the case of Sweden, the similar effects of a government spending shock on growth and inequality are found by Roca-Sagales and Sala (2011). The results for the USA and Canada indicate that the impact of government spending on inequality depends on the composition of government spending, particularly on the proportion of transfer payments in it. On the contrary, the impact government spending shock on government net lending/borrowing is unambiguous. As expected, it reduces government net lending/borrowing in all the countries. Especially, as can be noticed from Figure 5, it reduces government net lending/borrowing by around 0.7, 0.9, and 1.0 percentage points in the UK, the USA, and Canada respectively.

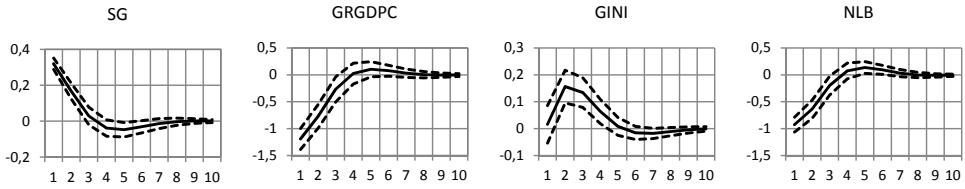
From Figure 6, it can be observed that as expected, an investment shock boosts economic growth by approximately 0.6, 0.7, and 0.4 percent in the UK, the USA, and Canada respectively. It decreases inequality by nearly 0.11 and 0.13 percentage points in the UK and Canada respectively. For the UK, Ramos and Roca-Sagales (2008) obtain similar results using public investment. In the case of the USA, the impact of the investment shock on inequality is slightly positive but it is highly insignificant to assess this effect. In all the countries, the investment shock similarly leads to around 0.4 percentage points rise in government net lending/borrowing. The economic interpretations of these effects of the investment shock are similar to the explanation of the impacts of the growth shock due to the direct positive effect of investment on economic growth.

Figure 5: IRFs to a Shock to Government Spending

The UK



The USA



Canada

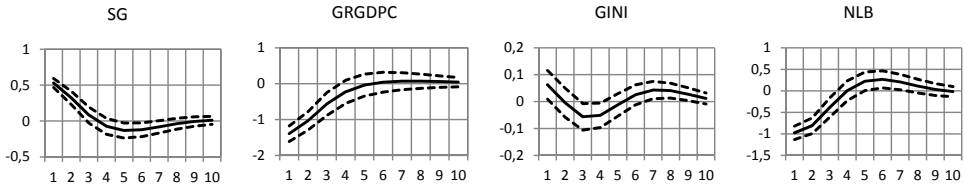
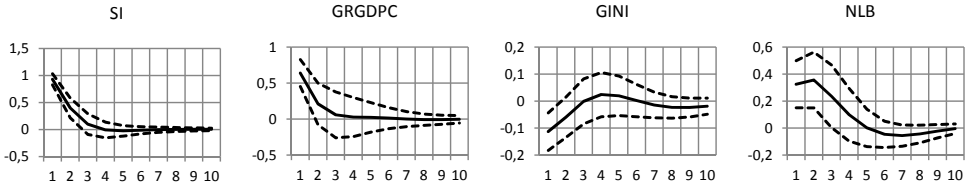
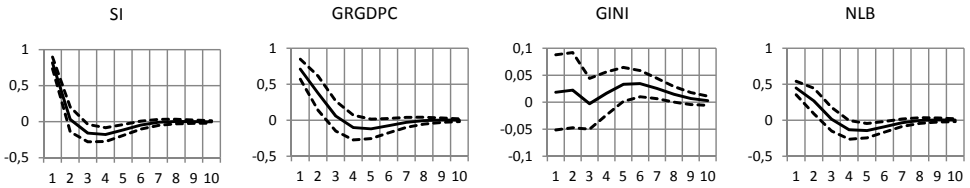


Figure 6: IRFs to a Shock to Investment

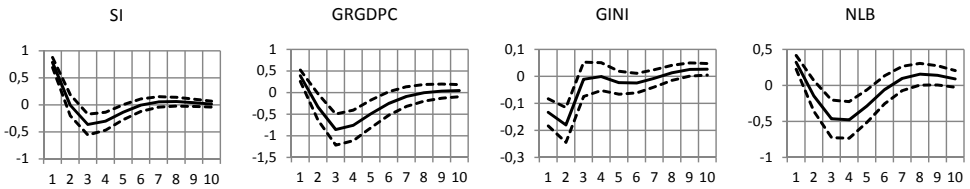
The UK



The USA



Canada



As can be seen from Table 2.6, over two periods a shock to taxes increases economic growth by accumulated 0.2 percent in the UK but it reduces growth by accumulated 0.3 and 0.4 percent in the USA and Canada. Blanchard and Perotti (2002) find a similar effect in the case of the USA. Since taxes include direct as well as indirect taxes, the relation between growth and taxes is not definite as it is indicated by the results. As can be observed from Figure 7, the shock to taxes leads up to nearly 0.14 percentage points rise in income inequality in the UK and Canada whereas the impact is very insignificant in the USA. That is, in general, the effect of indirect taxes, which increases inequality, prevails over the impact of the usually progressive direct taxes, which reduce inequality. For a large panel of countries, Martínez-Vázquez *et al.* (2012) find that direct taxes reduce income inequality while indirect

taxes increase it. Ramos and Roca-Sagales (2008) provide evidence that indirect taxes raise inequality in the UK whereas Roca-Sagales and Sala (2011) obtain analogous results for Sweden. From Figure 7, it can be also seen that the shock to taxes increases government net lending/borrowing by approximately 0.9, 0.5, and 0.2 percentage points in the UK, the USA, and Canada respectively. As expected, the increase in tax revenue raises government net lending/borrowing in all the countries.

5. Conclusion

In this paper, the interrelations among economic growth, income inequality, and fiscal performance are explored through structural VAR models. The transmission channels among the variables are also examined. The longest possible consistently measured comparable data on income inequality are used for the UK, the USA, and Canada, and new evidence on the interrelations among growth, inequality, and fiscal performance is provided.

The empirical analysis for the Anglo-Saxon countries reveals that there are generally some differences in the obtained results for the UK, and the USA and Canada. This could be explained by the differences between the UK and the Anglo-American economic models. With comparatively higher level of taxation and spending on the welfare state, the UK probably shares some common features with European continental economic models.

Income inequality has negative effect on economic growth in the case of the UK. The effect is positive in the cases of the USA and Canada. Income inequality generally reduces government net lending/borrowing for all the countries.

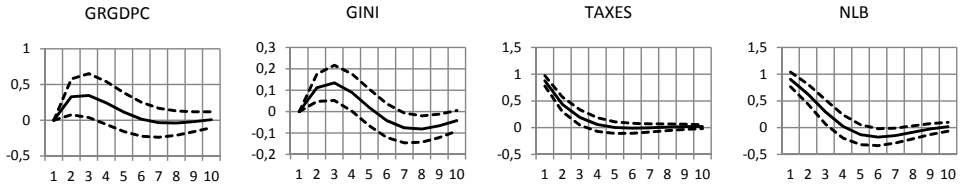
Economic growth leads to the increase of income inequality in the case of the UK and to the decline of inequality in the cases of the USA and Canada. At the same time, economic growth improves government net lending/borrowing in all the countries. Because of the direct positive effect of investment on economic growth, its impact on the other variables is mostly analogous.

Government spending leads to the decline in inequality in the UK but to its increase in the USA and Canada. In addition, government spending reduces growth through crowding out and worsens fiscal performance in all the countries. This distributional effect of government spending could depend on the proportion of the resources designed for the reduction of inequality.

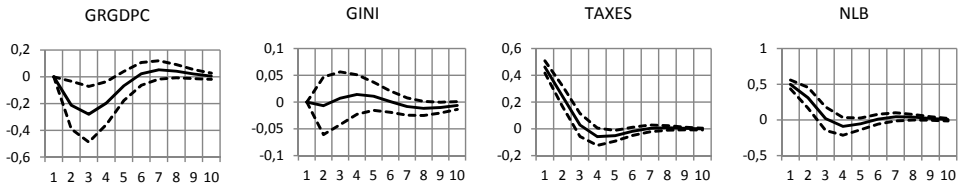
An increase in tax revenues generally raises income inequality in all the considered countries. Taking into account that taxes include direct taxation, which generally reduces inequality, and indirect taxation, which increases inequality, it can be inferred that the effect of indirect taxation outweighs. Therefore, this distributive impact of taxation should be considered during the design of fiscal policy measures aimed to reduce income inequality.

Figure 7: IRFs to a Shock to Taxes

The UK



The USA



Canada

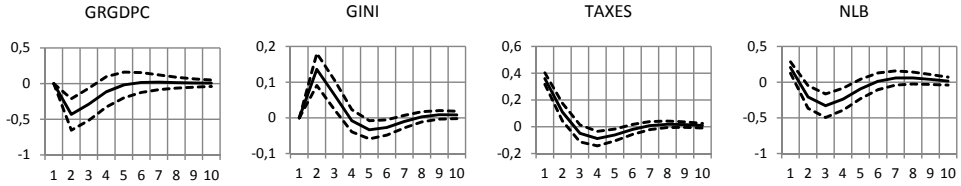


Table 6: Accumulated IRFs to Shocks to Government Spending, Investment, and Taxes

		Shock to Government Spending			Shock to Investment			Shock to Taxes		
Countries	Periods / Variables	2	5	10	2	5	10	2	5	10
The UK	SG	0.862 (0.13)	0.870 (0.30)	0.714 (0.34)	0.039 (0.07)	0.159 (0.24)	0.267 (0.30)	0.004 (0.07)	0.292 (0.26)	0.554 (0.35)
	SI	-1.561 (0.34)	-1.868 (0.72)	-1.744 (0.77)	1.331 (0.23)	1.400 (0.58)	1.395 (0.67)	0.095 (0.18)	0.265 (0.62)	0.322 (0.82)
	GRGDPC	-2.380 (0.51)	-3.077 (1.28)	-2.564 (1.49)	0.850 (0.41)	0.962 (1.09)	0.957 (1.34)	0.329 (0.25)	1.029 (1.06)	0.956 (1.53)
	GINI	-0.389 (0.14)	-0.979 (0.35)	-0.833 (0.43)	-0.173 (0.12)	-0.130 (0.29)	-0.209 (0.38)	0.112 (0.06)	0.355 (0.29)	0.048 (0.44)
	TAXES	0.337 (0.28)	0.481 (0.57)	0.568 (0.60)	0.421 (0.26)	0.657 (0.50)	0.659 (0.56)	1.311 (0.19)	1.563 (0.50)	1.596 (0.65)
	NLB	-1.372 (0.38)	-1.677 (0.86)	-1.180 (0.73)	0.681 (0.33)	1.017 (0.74)	0.845 (0.65)	1.529 (0.27)	1.715 (0.75)	1.303 (0.82)
The USA	SG	0.488 (0.06)	0.431 (0.15)	0.385 (0.18)	0.049 (0.05)	0.292 (0.14)	0.368 (0.20)	-0.014 (0.04)	-0.050 (0.12)	-0.131 (0.15)
	SI	-1.183 (0.22)	-0.849 (0.33)	-0.819 (0.25)	0.849 (0.19)	0.398 (0.31)	0.346 (0.32)	-0.100 (0.14)	-0.304 (0.27)	-0.157 (0.22)
	GRGDPC	-1.959 (0.36)	-2.097 (0.69)	-1.992 (0.56)	1.086 (0.31)	0.925 (0.63)	0.819 (0.70)	-0.212 (0.18)	-0.756 (0.56)	-0.615 (0.47)
	GINI	0.173 (0.10)	0.380 (0.17)	0.330 (0.16)	0.041 (0.11)	0.088 (0.16)	0.172 (0.19)	-0.007 (0.05)	0.026 (0.13)	-0.010 (0.13)
	TAXES	-0.447 (0.15)	-0.409 (0.26)	-0.401 (0.22)	0.392 (0.14)	0.421 (0.25)	0.431 (0.27)	0.707 (0.10)	0.627 (0.23)	0.622 (0.19)
	NLB	-1.562 (0.26)	-1.546 (0.48)	-1.441 (0.39)	0.716 (0.21)	0.454 (0.43)	0.333 (0.49)	0.809 (0.15)	0.684 (0.41)	0.804 (0.35)
Canada	SG	0.852 (0.13)	0.730 (0.36)	0.495 (0.35)	0.258 (0.10)	0.921 (0.37)	0.669 (0.39)	0.175 (0.07)	0.397 (0.21)	0.305 (0.14)
	SI	-1.142 (0.23)	-1.071 (0.42)	-0.942 (0.36)	0.780 (0.22)	-0.022 (0.45)	0.141 (0.41)	-0.350 (0.15)	-0.674 (0.26)	-0.562 (0.17)
	GRGDPC	-2.427 (0.41)	-3.256 (1.08)	-2.973 (1.33)	0.057 (0.36)	-2.045 (1.12)	-2.312 (1.44)	-0.431 (0.22)	-0.853 (0.64)	-0.789 (0.59)
	GINI	0.059 (0.09)	-0.060 (0.16)	0.088 (0.16)	-0.313 (0.09)	-0.347 (0.16)	-0.314 (0.18)	0.136 (0.05)	0.159 (0.09)	0.142 (0.07)
	TAXES	-0.043 (0.14)	-0.154 (0.25)	0.040 (0.28)	0.421 (0.14)	0.472 (0.27)	0.590 (0.31)	0.470 (0.09)	0.272 (0.15)	0.305 (0.13)
	NLB	-1.785 (0.29)	-1.941 (0.71)	-1.340 (0.70)	0.174 (0.24)	-1.056 (0.76)	-0.635 (0.77)	-0.003 (0.19)	-0.665 (0.44)	-0.482 (0.29)

Notes

1. Woo (2011) tries to address this endogeneity problem through instrumental variables regressions.
2. The index of Economic Freedom of the World measures the degree of the supportiveness of economic freedom by the policies and institutions of countries (Gwartney *et al.*, 2014). The values of the index range from 0 (the lowest) to 10 (the highest). That is, higher values denote greater degrees of economic freedom. Based on index values, country ranks are also provided. They are presented in parentheses next to index values.
3. As a robustness check for the inequality data, the empirical analysis is also implemented with imputed Gini coefficients for disposable income (analogous to the indices used in the rest of the paper) from Solt´s inequality database (Solt, 2009). The paper uses its latest available fifth version, SWIID. As a Gini index for disposable income, the paper considers a mean value of its 100 imputed coefficients. The obtained outcomes of the estimations are generally similar to the results of the paper.
4. In line with Larch (2012), the paper estimates the effect of income inequality on fiscal performance (discussed in Section 2.2) but in a multi-equation context. As a measure for fiscal performance, Larch (2012) uses budget balance. The paper actually employs the same index but it uses the term "general government net lending/ borrowing", following the OECD terminology, where these data mainly come from.
5. As government spending, the paper considers general government final consumption expenditure. The paper has also tried to use its augmented version with current transfer payments in the empirical analysis. However, the results do not generally change. Thus, the government final consumption, which includes social transfers in kind (OECD, 2010), generally reflects redistributive fiscal policies.
6. Along with the augmented Dickey-Fuller test (Dickey and Fuller, 1979), the paper also uses Phillips-Perron test (Phillips and Perron, 1988) to check the stationarity of the time series. In all the cases, it provides analogous results.
7. The usage of the Hodrick-Prescott filter can be found, for example, in the works by Ball and Mankiw (2002), Juillard *et al.* (2006), and Pytlarczyk (2005).
8. It should be noted that any VAR(p) can be rewritten as a VAR(1), which is known as the companion form of the VAR(p).
9. The first-order VAR models are also employed in the closely related works by Ramos and Roca-Sagales (2008), and Roca-Sagales and Sala (2011).
10. The paper implements the robustness check for the estimation results. It is carried out for the IRFs in different dimensions. First of all, the paper tries some other alternative orderings for the contemporaneous relations among the variables. The analysis is also implemented by using generalized impulse response functions, which are invariant to the orderings of the variables in VAR models (Pesaran and Shin, 1998). Besides, the paper uses different samples for the benchmark and extended specifications by employing rolling and recursive schemes, and by just excluding the last parts of the samples since the financial crisis of 2008. In all the cases, the results do not change significantly.
11. As described in Subsection 2.4.3, all deviations and changes in the variables (after their stationary transformation) are in relation to their long-term means.
12. The accumulated responses over 2, 5, and 10 periods are presented in Table 5.
13. The IRFs of these results are not provided in the paper to keep it compact.

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Resumen

La interrelación entre crecimiento económico, desigualdad de ingresos y desempeño fiscal es muy complejo. El objetivo de este trabajo es analizar las interrelaciones dinámicas entre estas variables utilizando modelos VAR estructurales y examinar los canales de transmisión entre ellos. El análisis empírico se implementa para el Reino Unido, EE.UU., y Canadá, utilizando los datos comparables más largos posibles, medidos consistentemente, sobre desigualdad de ingresos. Encontramos que la desigualdad tiene un efecto negativo sobre el crecimiento en el caso del Reino Unido, mientras que el efecto es positivo para los EE.UU. y Canadá. Un aumento en la desigualdad empeora el rendimiento fiscal para todos los países considerados.

Palabras clave: crecimiento económico, desigualdad de ingresos, desempeño fiscal, VAR.

Clasificación JEL: C32, D31, E62, O47.