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A Time-Series Analysis for a Set of OECD Countries

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Abstract

In this work, we study the short- and long-run properties of different inequality series vis-à-vis the most important macroeconomic series for a set of OECD countries. We employ standard tools of time series macro-econometrics (e.g. stationarity tests, detrending, comovements analysis, Granger-causality tests, etc.) in order to possible uncover some fresh stylized facts about inequality. The broad picture emerging from our empirical analysis is one where some common patterns coexist together with several country specificities. More specifically, most of inequality series are not stationary; long-run equilibrium relationships between share prices and inequality emerge in Canada, the U.S., and the U.K.; at the business cycle frequencies, most inequality series are counter-cyclical (with the exception of Germany), negatively correlated with inflation and positively correlated with unemployment; consumption inequality is pro-cyclical in English-speaking countries; the comovements between inequality series and government consumption appear to be heavily dependent on the institutions of the countries under analysis; Granger-causality tests suggest that in some cases inequality Granger-causes output.

1 Introduction

Inequality has recently regained a central role in the macroeconomic debate. In the last decades income inequality has increased in several OECD countries (OECD, 2008). Moreover, the construction of top income shares time series has shown a dramatic increase of the top percentiles in the last thirty years, especially in English-speaking countries (Atkinson et al., 2011). Several authors have argued that the increasing trend in inequality had a major role in nurturing the financial bubble that lead to the current crisis and they advance some policy proposals to put back economies on a more equal, stable and higher growth path (Fitoussi and Saraceno, 2010; Kumhof and Ranciere, 2010; Rajan, 2010; Stiglitz, 2011, 2012; Galbraith, 2012).

In this work, we take a step back and we study the short- and long-run properties of different inequality series vis-à-vis the most important macroeconomic series for a set of OECD countries. Our aim is to employ standard tools of time series macro-econometrics in order to possible uncover some fresh stylized facts about inequality which could allow economists and policy makers to improve their models and their policy recommendations. More generally, we would like to answer to questions such as: Do macroeconomic shocks have transitory or long lasting effects on inequality series? Are there long-run equilibrium relationships between inequality and macroeconomic series (e.g. output, inflation, unemployment, etc.)? What is the relationship between each source of inequality and business cycles? Which sources of inequality or which part of the income distribution are more affected by economic fluctuations? What is the causal nexus between inequality and macroeconomic series? Are there any common patterns across different countries?

Our study is grounded on different sources and measures of inequality series (income, earnings, wage, consumption) drawn from the new Review of Economic Dynamics (RED) database for the U.S., Canada, Germany, Sweden, the U.K and from the Central Bureau of Statistics for the Netherlands. Most of the inequality series start in the late seventies or beginning of the eighties. Note that while most of empirical studies about inequality focus on one source of inequality (mostly income or wage), considering several sources of inequality can provide precious information. For instance, business cycles impact on earnings inequality, but they do not necessarily affect wage inequality. At the same time, wage inequality provides a partial picture: since low skilled workers are disproportionately laid off during recessions, their earnings may not need to be reduced.

We start our empirical analysis testing the stationarity of the series, i.e. whether shocks have permanent effects. We then search for possible cointegration relationships between inequality and the most important macroeconomic series, namely GDP, inflation, unemployment, share prices, private and public consumption. We apply an HP-filter (Hodrick and Prescott, 1981) to study the volatility and comovements of inequality series at the business cycle frequencies. Finally, we perform a series of Granger causality test between each couple of inequality and macroeconomic series.

The broad picture emerging from our empirical analysis is one where some common patterns coexist together with several country specificities. Starting from a long-run perspective, we find that no matter the country under study, most of inequality series are not stationary. Transitory, business-cycle shocks could thus contributing to the the rising trend in inequality observed in the last three decades. At the same time, long-run equilibrium relationships between share prices and inequality emerge in Canada, the U.S., and the U.K., confirming the major role that financial markets play in English-speaking countries.

Moving more closely to the short-run behavior of the inequality series, the volatility analysis seems to suggest that changes in inequality occur mostly at the tails of the income distribution rather than around the mode. The cross-correlation analysis shows that most inequality series are counter-cyclical, negatively correlated with inflation and positively correlated with unemployment. However, in Germany most of the inequality variables are pro-cyclical. This could be an outcome of the process of reunification of the country. A different pattern emerges for consumption inequality, which is pro-cyclical in the the two English-speaking countries for which we have series of consumption inequality (US and UK). This result may be explained by the fact that households at the bottom of the income distribution try to keep constant their level of consumption through debt during recessions. This conjecture is reinforced by the correlation between disposable income inequality and private consumption, which is negative in Canada and the U.S. A different pattern emerges for European countries. Indeed, the correlation between disposable income inequality and private consumption is positive in the Netherlands and Sweden.The comovements between inequality series and government consumption appear to be heavily dependent on the institutions of the countries under analysis: higher government consumption is associated with lower disposable income inequality in Canada and the U.S. and with an higher one in European countries. Finally, the results of the causality tests suggest in some cases inequality Granger-causes output, thus implying that increases in inequality may be

conducive to recessions. Moreover, the evidence that unemployment is mostly Granger-caused by inequality series confirms the hypothesis that recessions are usually related to surges in inequality.

Our work is strictly related to several empirical studies focusing on inequality dynamics. At the business cycle frequencies, income inequality appeared to show a counter-cyclical pattern during the twenties and the thirties (Parker, 1999). For instance, Piketty and Saez (2007) employ corporate tax returns for the U.S. and they show that the richest part of the middle class benefited in relative terms from the Great Depression[1]. For the period following the second World War, the results are mixed (Parker, 1999). Hoover et al. (2009) find that gains and losses associated with business cycles are not uniform along the income distribution and that recessions and expansions have asymmetric effects on income inequality. In particular, recessions generally increase income inequality as they raise unemployment and increase the dispersion of hours worked (Krueger et al., 2010). The reason is that household earnings are procyclical at each percentile, but business cycle fluctuations are much more severe at the bottom of the distribution (Heathcote et al., 2010)[2].

Considering other sources of inequality, Krueger et al. (2010) find mild counter-cyclical effects of business cycles on consumption inequality. This result is probably due to the life-span smoothing of consumption and to the role of automatic stabilizers. Indeed, the cross-country variability in the relationship between business fluctuations and consumption inequality reflects the cross-country variability of automatic stabilizers (Krueger et al., 2010). Moving to wealth inequality, Krueger et al. (2010) report no effects of business cycles on wealth inequality in Italy and Sweden.

Inequality dynamics is also linked to unemployment and inflation. Studying the relationship between inequality and unemployment, Parker (1999) finds positive correlations between the cyclical fluctuations of unemployment and income inequality: the income share of the top quintile increases with respect to the share of the lowest one. The effect of inflation on economic inequality is less clearcut. Overall, the empirical evidence supports a modest inverse relationship between inflation and inequality (Parker, 1999): the lowest quintile tends to benefit more from inflation, while for the top ones results are more mixed.

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[1]For an opposite view, see Barlevy and Tsiddon (2006).

[2]On a country-specific base, the special issue "Cross sectional facts for macroeconomists" of the Review of Economic Dynamics (2010) provides descriptive analysis on the relationship between business cycle and inequality for a set of OECD countries, namely the UK (Blundell and Etheridge, 2010), Spain (Pijoan-Mas and Sanchez-Marcos, 2010), the U.S. (Heathcote et al., 2010), Italy (Jappelli and Pistaferri, 2010), Sweden (Domeij and Floden, 2010) , Canada (Brzozowski et al., 2010) and Germany (Fuchs-Schundeln and Sommer, 2010).

Moving to the long-run relationship between inequality and income growth, Herzer and Vollmer (2011) find a negative effect of income inequality on per-capita income for 46 countries. Voitchowsky (2005) underlies the importance of the shape of the income distribution as determinant of economic growth.

The rest of the paper is organized as follows: in Section 2 we present the statistical techniques we use in our study. Section 3 describe the data. We present the empirical results in Section 4. Finally, in Section 5 we conclude.

2   Methodology

The analysis of the statistical properties of inequality and more generally of macroeconomic series at business cycle frequencies requires the adoption of filters to remove trends and high frequency noise from the data. In this way, one can focus on the short-to-medium run frequencies which are usually associated to the business cycle component of the series. Many procedures have been developed to accomplish this task, such as linear trend removal, first differencing, the Hodrick-Prescot (HP) filter (Hodrick and Prescott, 1981), and the bandpass filter (BP) (Baxter and King, 1999). Given that in many cases the number of (annual) observations is not very big, we prefer to apply the HP filter instead of the bandpass one (for an application of the HP filter to the business cycle analysis see Kydland and Prescott, 1990).

Before filtering the series, we perform a battery of stationarity tests (i.e. Dickey-Fuller (1979) tests). In the macroeconomic literature, it is well know that GDP and many other macroeconomic series are difference stationarity, i.e. they possess a unit root, implying that shocks have permanent effects. The results of such tests could have important consequences for understanding the properties of inequality series. For instance, if inequality series have a unit root, they could possess an increasing trend which changes the first moment of the process.

The possible presence of non-stationary series suggests to test also for cointegrating relationships between each pair of inequality and macroeconomic series. Even if an inequality and a macroeconomic series (e.g. GDP) could be integrated of order one, there could exist some linear combination of the two which is stationary. In this case, the two series are cointegrated and there exists a long-run equilibrium relationships between the two. In what follows, we search for cointegration performing Engle-Granger (1987) tests.

We measure the amplitudes of fluctuations of (filtered) inequality series comparing their

standard deviations with the ones of the GDP. In this way, one can classify inequality indexes according to whether they are more or less volatile than the business cycle.

We then study the comovements at business cycle frequencies between inequality and other macroeconomic time series (e.g. output, inflation, unemployment, etc.) computing cross-correlations. More specifically, we compute correlations between inequality series at time t and macroeconomic variables from time t-3 to time t+3. The cross-correlations between inequality and output are particularly important: the sign of the highest correlation determines whether inequality is pro-cyclical or counter-cyclical, while the timing of the highest correlation indicates whether inequality leads, follow or is perfectly synchronized with the cycle (e.g. if the highest correlation is at time $t - 1$, the inequality index is said to follow the business cycle).

Finally, we try to shed some light on the causal relationships between inequality and macroeconomic series by performing Granger causality test (Granger, 1969). An inequality series is said to Granger-cause a macroeconomic one, if the past and current data on inequality contribute to better predict the future value of the macroeconomic variable given its current and past values. More formally, given two generic time series X and Y, we regress ΔX on its lagged values and then we add the lags of ΔY. Then, we use F-tests to assess whether the inclusion of lags of ΔY adds explanatory power to the model. The null hypothesis of no Granger causality is rejected if lagged values of ΔY are retained in the regression. Then the same exercise is repeated using ΔY as dependent variable and ΔX as candidate series. Note that in this way one could find that both variables Granger-cause each other. In order to have more precise results, we also compare the two marginal R2 obtained by regressing ΔX on ΔY and vice-versa (more on that in Stock and Watson, 1999). The marginal R2 is the difference between the R2 of the regression of a variable on its lagged values and on the lagged values of the candidate series minus the R2 of the regression of the same variable on just its lagged values. The highest marginal R2 suggests which of the two variable is more likely to Granger-cause the other. Note finally that Granger causality does not necessarily mean economic causality. For instance, a variable might help to predict GDP growth not because it drives GDP growth, but just because it embeds some information on a third variable which is the "real" determinant of GDP growth.

3 Data

We use secondary data of inequality collected by the authors of the special issue "Cross-sectional facts for macroeconomists" of the Review of Economic Dynamics (RED database)[3]. We think that the RED database overcomes some of the main pitfalls of secondary data. For instance, Atkinsons and Brandolini (2001) warn about the shortcomings of secondary data on inequality such as the World Income Inequality Database (WIID), which is an assembly of inequality indexes from different sources without an agreed basis of definitions.

The RED database has several advantages with respect to other secondary data such as WIID. First, the RED database contains measures of different sources and indexes of inequality. Second, the authors of the RED database followed the same guidelines for the construction of inequality indicators, although these inequality indicators are based on national surveys. Note that for the empirical analysis (cross-correlations, Granger causality tests, etc.) carried out in this paper, we need data consistency within countries and not necessarily across countries. Moreover, national surveys allow to have considerable long series of inequality based on reliable data.

The sources of inequality includes: hours of work, hourly wages, earnings, market income, disposable income, consumption and wealth[4]. Business cycles and, more generally, macroeconomic variables, may have different effects on different sources of inequality. For instance, consumption is known to adjust more smoothly than income. It is also interesting to see whether and where recessions have a stronger relationship with hours of work or with hourly wages[5].

As for the sample considered, we selected RED indicators based on male individuals for hours of work and hourly wages (with the exceptionf of Canada for which it was not available) and based on the household for earnings, gross and net income and consumption.

The indexes of inequality covered by the RED database are: the well-know Gini coefficient, the ratio between the $90th$ and $50th$ percentile (P90/P50), the ratio between the $50th$ and the $10th$ percentiles (P50/P10) and the variance of logs (varlog). Note that different indexes of inequality are not a mere refinements of one another, but they allow to grasp inequality at different parts of the income distribution. For instance, the Gini coefficient is more sensitive to changes around the mode whereas the variance of logs to changes at the bottom of the

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[3]The data from the RED database can be downloaded from http://www.economicdynamics.org/RED-cross-sectional-facts.htm.

[4]Wealth series in the RED database are too short to be considered in a time-series analysis.

[5]Hourly wages in RED are imputed dividing earnings by hours of work (Krueger et al., 2010).

distribution. The P-ratios clearly measure the relationship between two specific parts of the distribution. A detailed description of the inequality indexes is provided in the Appendix.

The advantages of a richer dataset such as the RED come at the expenses of a dramatically smaller set of countries covered with respect to other databases such as WIID. The RED database covers the U.K., Canada, Germany, Italy, Mexico, Russia, Spain, Sweden and the U.S. We selected the European countries plus the U.S., which provide continuous series of inequality for at least 20 years. This choice leads to the exclusion of Italy, as the RED series are discontinuous[6] and Spain, as the series are too short. Therefore, the inequality measures used in this work cover Canada[7] (CAN), Germany (GER), the United Kingdom (GBR), Sweden (SWE) and the United States (US). We also add data from the Netherlands (NED) obtained from the Central Bureau of Statistics[8]. In Table 1, we provide a detailed list of the RED inequality series employed in this study.

As far as the macroeconomic variables are concerned, we employ the OECD Main Economic Indicators database, apart for the GDP of Sweden that was collected from Eurostat. The macro-economic variables considered in this study are GDP, inflation, unemployment, stock prices, private and government consumption[9].

4 Empirical findings

In this Section we present the results of our econometric analyses. We first test the stationarity of the inequality and macroeconomic series (cf. Section 4.1). We then study the presence of possible cointegrating relationships between inequality and macroeconomic series in Section 4.2. We consider descriptive statistics in Section 4.3. The comovements between inequality and macroeconomic series are commented in Section 4.4. Finally, in Section 4.5 we present the Granger-causality analysis.

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[6]The RED data are based on the Survey of Household Income and Wealth for Italy, that is collected approximately every two years.

[7]The inequality series for Canada stem from two different surveys: SCF for 1977-1997 and SLID for 1996-2005.

[8]Atkinsons and Brandolini (2001) warn about the change in the grossing-up method and in the income concept (now including imputed rent and health insurance premia) between 1985 and 1990 for the Dutch CBS data on the Gini coefficient. This explains the rise in inequality in that period.

[9]We do not include private consumption for Germany in the analysis as the corresponding series starts only from 1991

4.1 Stationarity tests

We start checking the stationarity of macroeconomic and inequality series. Note that non-stationarity indicates that the moments of the stochastic process underlying the series change over time. We apply a battery of Dickey-Fuller tests to the macro and inequality series of each country. More specifically, for every time series (in logs with the exception of unemployment) we perform both simple and augmented (one lag) Dickey-Fuller tests including also the drift and linear trend in the model specification.

Not surprisingly, in line with the macroeconomic empirical literature (e.g. Stock, 1994), the results of the Dickey-Fuller tests show that most macroeconomic series have a unit root (Table 2).

Turning to inequality series, different specifications of the Dickey-Fuller test show that most of the series are non-stationary (Table 2). The non-stationarity of inequality series support the qualitative evidence about the growing of inequality in the last decades in all the countries considered. It also suggests that shocks have permanent effects on inequality series.

The hypothesis of permanent effects of shocks to inequality has serious implications. On the one hand, macroeconomic factors deemed to have a temporary impact on inequality may, instead, have long-lasting effects. A possible interpretation of the increasing inequality in the last decades is that downturns have adverse permanent effects on the level of inequality. This hypothesis is supported by the analysis of Hoover et al. (2009), in which they study the asymmetric effects of the cycle on inequality. They find that a positive shock to unemployment increases income inequality for three years longer than the reduction of inequality following a negative shock. Nonetheless, this finding is in contrast with Jacobson and Giles (2006) who find Gini series in the US to be stationarity in post-war years. On the other hand, monetary and fiscal policy shocks could have long-lasting effects. For instance, strong disinflationary monetary policies (e.g. the Volcker one) or temporary tax rebates[10] could permanently change inequality dynamics.

4.2 Cointegration analysis

The Engle-Granger (1987) two-step method tests the null hypothesis of no cointegration between two time series. The results are reported in Table 3.

The results show that most of the inequality series are not cointegrated with macroeconomic ones. A common observed pattern in Anglo-Saxon countries is the presence of some cointe-

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[10]See Piketty and Saez (2011) for a study of the progressivity of the U.S. tax system since 1960.

grating relationships between share prices and inequality indexes (earnings-Gini in Canada and in the U.K, consumption-p90-50, earnings-varlog, hourly-wage-Gini in the U.S.), reflecting the prominent role that financial markets have in these countries. Moving to GDP and private consumption, the null hyphotesis of no cointegration cannot be rejected for disposable income in the Netherlands, hourly wage (varlog) in the U.K., and earnings (varlog) in the U.S.

Some interesting country specificities are also present. First, there appears to be no cointegrating relationship in Germany. This results may be the outcome of the shorter time span of the inequality series for this country. Second, in line with the strong importance that the "welfare state" has in the Swedish economy, government consumption appear to be cointegrated with disposable income inequality (varlog). Interestingly, also in the U.S. there seems to be a long-run equilibrium relationship between government consumption and consumption inequality (Gini and p5010) and earnings inequality (varlog). Finally, the social division within the U.S. society is reflected in consumption inequality, with the upper part of distribution (P90-50) being cointegrated with share prices, whereas the bottom part (P5010) with government consumption.

4.3 Descriptive statistics

We compute the volatility of different sources and measures of inequality series. Table 4 reports the standard deviations of HP-filtered inequality series.

As a general pattern across-countries (with the exception of Germany), we notice that the cyclical fluctuations of earnings is more volatile than gross income inequality which in turn is more volatile than those of disposable income and consumption inequality. As expected, inequality measured at the individual level (hours of work, hourly wage, earnings) tend to be more volatile that inequality measured at the household level (income, consumption).

At the individual level, earnings inequality is generally more volatile than hours of work and wage inequality. Since earnings is the product of hours of work and hourly wage, this might be due to a positive correlation between low wages and few hours of work. Earnings inequality displays a high level of volatility, especially in the U.K. and U.S. On the other hand, consumption inequality has a low degree of volatility. In the U.K., hourly wage inequality has the lowest degree of volatility compared to the other income sources. Conversely, in the U.S. the Gini index points to hourly wage inequality as the most volatile form of inequality. This result shows that in the U.S. hourly wages have a larger dispersion around the mode.

The general conclusions about the relative volatility of income sources are somewhat different

if we consider differ parts of the distribution. This fact shows that changes in inequality of different sources of income occur at different points of the distribution. For instance, in Canada market income is the most volatile, while disposable income is the least volatile among the income sources. By measuring inequality with the variance of logarithms, earnings inequality turns out to be as volatile as market income. However, according to the Gini coefficient earnings inequality is as volatile as disposable income. This result suggests that changes in earnings inequality are more pronounced at the bottom than around the mode of the distribution. Inequality measured by the Pratios shows a high degree of volatility with respect to the other indexes. This may be due to the noise of "extreme" values of the distribution such as those of the 10th and 90th percentiles, or it may stem from the high income volatility accruing to the tails of the distribution. Among all the indexes of inequality and across all sources of economic inequality, inequality measured with the Gini coefficient is more stable than inequality measures with varlog and much more stable than inequality measured with the Pratios. This finding may be due to the fact that changes in inequality occur mostly around the tails than around the mode of the distribution.

Finally, in Germany the volatility of inequality series does not follow the general pattern found for the other countries. For example, the volatility of disposable income inequality is high and superior to the one of earnings inequality.

4.4 Cross-correlations

In what follows we present the analysis of the comovements between inequality indexes and a set of relevant macroeconomic series, namely, output, unemployment, inflation rate, share prices, government consumption, and private consumption. The results are presented in Tables 4-38.

Output. Let us start observing the correlations between output and inequality series in order to study the behavior of inequality during business cycles. Inequalities in hours of work, earnings, gross and net income are generally counter-cyclical, with the exception of Germany and of the P9050 ratio in the U.K.

Hourly wage inequality appear to be pro-cyclical in Germany and the U.K. whereas in Canada it seems counter-cyclical.

Consumption inequality is pro-cyclical both in the U.K. and U.S. Therefore, expansions are associated with a reduction in income inequality and, at the same time, an increase in consumption inequality. An interpretation of this finding is that increases in income generated by

economic expansions translate more into a higher propensity to save at the bottom of the income distribution. Conversely, the reduced income resulting from recessions may not directly show off into a higher consumption inequality, as households at the bottom of the income distribution may try to maintain a constant level of consumption through debt. The latter interpretation fits particularly well the U.K. and U.S. cases, whose highly developed and deregulated financial markets supported the surge of households' debts through home equity financing (see e,g. Celasun et al., 2012).

Business cycles generally have a stronger correlation with hours of work inequality than with hourly wage inequality, once again with the exception of Germany. Indeed, for Germany the cross-correlations between GDP fluctuations and inequality follow a different pattern: inequality in hours of work, hourly wages, earnings and gross income are pro-cyclical. Moreover, contrary to the other countries the correlations with business cycles are stronger for hourly wages than for hours of work. Note that the inequality series for Germany are based on West Germany until 1989 and on East and West Germany afterward. This fact could contribute to explain the pro-cyclical inequality puzzle.

Inflation. There are many ways according to which inflation could affect inequality series. For instance, one may expect inflation to affect wage or income inequality through income indexization: people at the top of the distribution may have a stronger power to protect their income from inflation than employees. We may also expect an effect of inflation on consumption inequality as it may affect more goods representing a larger share of the consumption bundle of households at the bottom of the income distribution.

When we consider the empirical correlation between inflation and inequality series, the emerging picture is blurred. Inequality in hours of work, earnings and market income have generally a negative correlation with inflation. Nonetheless, inequality in hours of work in the U.S., inequality in earnings and market income in Germany display a positive correlation with inflation. Also the evidence for inequality in hourly wages and net income is mixed. Inequality in hourly wages is negatively correlated with inflation in Canada and positively correlated in the U.K. (with the exception of the P9050). In the US, the correlation between inequality in hourly wages and inflation is not clear as different inequality indexes give contrasting results. Inequality in net income is negatively correlated with inflation in Canada and positively in Germany, Sweden and the U.S. Consumption inequality has a positive correlation with inflation in UK and a negative correlation with the P9050 in the U.S.

Unemployment. The correlations between inequality and unemployment are more clear. As expected, the correlations between inequality in hours of work, hourly wages, earnings, net and gross income are positive. Indeed, as unemployment is not proportionally distributed along the income distribution, during recessions people at the bottom are disproportionately laid-off, thus increasing income inequality.

More surprisingly, the correlations between unemployment and consumption inequality are negative both in the U.K. and the U.S. A possible explanation is that during recessions people at the bottom of the income distribution compensate their income losses increase their indebtedness. This happens to be the case for U.K. and the U.S. (see e.g. Celasun et al., 2012). This finding is in line with the literature suggesting that an increasing level of inequality contributed to the current crisis (Fitoussi and Saraceno, 2010; Kumhof and Ranciere, 2010; Stiglitz, 2011).

Share prices. The general findings for share prices parallel those for GDP, though share price fluctuations seem to slightly anticipate GDP ones. Indeed, the correlations between share prices and different forms of inequality are strong and mostly negative. The negative correlation between share prices and earnings inequality is mostly due to the negative correlation between share prices and hours of work inequality[11], as the correlations with hourly wages are not very significant.

In some cases, we find a positive association between share price fluctuations and inequality. Share prices are positively and strongly correlated with hourly wage inequality in the U.K. and with hours of work in Germany. In the U.S., an increase in share prices widens the earnings gap between the 90th and 50th percentile, thus augmenting consumption inequality. This is not surprising as shareholders are overrepresented at the top of the income distribution.

Government consumption. An increase in government consumption is generally associated with reductions in inequality, as government expenditures are expected to have redistributive effects. Nonetheless, we find some evidence that higher government consumption is associated with higher income inequality in some European countries (Germany, Netherlands, Sweden). Note that an increase in publicly provided services corresponds to an increase in government consumption. Since most of these services are provided in-kind (health, education, housing), their inequality-reducing effect could not be fully captured by standard measures of (cash) income inequality. The different patterns of government consumption and inequality between continen-

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[11]Note that earnings is given by the product of hours of work and hourly wages.

tal European and Anglo-Saxon countries may be explained by institutional differences, which in turn affect the size, composition and dynamics of government consumption. For instance, in the three European countries included in this study, automatic stabilizers are stronger than in the U.S. and U.K., where discretionary fiscal policies have a stronger role (see e.g. Fatas and Mihov, 2009).

Private consumption. Results in the tables show a general negative correlation between private consumption and inequality in hours of work, earnings and market income. A European versus Anglo-Saxon pattern seems to emerge once again for private consumption and net income inequality. Indeed, private consumption is negatively correlated with disposable income inequality in Canada and the U.S. and positively in the Netherlands and Sweden. In line with the results we obtained for output, private consumption is found to be positively correlated with higher levels of consumption inequality[12].

4.5   Granger causality tests

As the last step of our empirical analysis we investigate the direction of causation between inequality series and macroeconomic variables (i.e. output, unemployment, inflation rate, share prices, government consumption, and private consumption). We do so by performing Granger-causality tests. We report the results in Table 40.

GDP. The results of Granger tests point to a mutual causal relationship between GDP and inequality in most of the countries considered. A one way causation from inequality to GDP is found for disposable income inequality in the Netherlands and Sweden, earnings inequality in the U.S. (in particular the ratio between the 50th and 10th percentile), and all sources of inequality in Canada. In these countries, an increase in disposable income inequality may contribute to induce a recession. In few other cases, Granger tests point to a one way causation from GDP to inequality. For example, in Sweden GDP fluctuations seem to determine earnings inequality.

Inflation. We find a mutual relationship between inflation and inequality. However, in many cases it seems that inequality Granger causes inflation. We find this pattern for all the countries considered except from Canada and for disposable income. Indeed, Canada shows specific causation patterns: inflation dynamics shows a large explanatory power on inequality series. In

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[12]The analysis of consumption inequality is available only for the US and the UK.

general, inflation seems to Granger cause disposable income inequality (with the exception of the Netherlands).

Unemployment. In most of the cases, unemployment Granger-causes inequality as during recession people at the bottom of the earning distribution are disproportionately laid off. Interestingly, the results of the Granger tests suggest that in some cases inequality causes unemployment.

Share prices. Empirical results show a two way relationship between share prices and inequality. Exceptions are Canada, the Netherlands and Sweden, where we mostly find a one way causation from inequality to share prices. In the U.S., inequality seems overall to Granger cause share prices, but with two notable exceptions: share prices Granger cause consumption inequality and the earning gap between the 90th and 50th percentile.

In Germany and the UK we find causations in both ways. For Germany, Granger tests show that share prices cause inequality, though inequality in hours of work and, in particular, the earnings ratio between the 90th and 50th percentile, determine share prices. Similarly, in the U.K., share prices explain inequality better than inequality explains share prices, with the exception of the P5010 earnings ratio.

Government consumption. Government consumption causes disposable income inequality in the Netherlands (strongly) and earnings inequality in Canada. For the U.K. there is a general but not very strong evidence that government consumption causes earnings inequality.

In the U.S., the evidence is more mixed. On the one hand, the hourly wage ratio between the 50th and 10th percentile Granger causes government consumption. On the other hand, government consumption seems to determine an increase in the earnings gap between the 90th and the 50th percentile and a slight reduction in consumption inequality.

Private consumption and inequality. For private consumption Granger tests confirm the two way causality, except for the U.K., where consumption seems to univocally determine inequality.

5 Conclusions

In this work we have studied the time series properties of several inequality series for some OECD countries, namely the U.S., the U.K., Germany, Sweden, the Netherlands, and Canada. First, we analyzed the long-run behavior of inequality series by controlling for the presence of stochastic trends and by testing the existence of possible cointegration relationships between each

pair of inequality and macroeconomic series. Second, we detrended the inequality series with an HP filter in order study their behavior at the business cycle frequencies. More specifically, we compared the amplitude of fluctuations of inequality series; we studied the comovements of inequality series as to many important macroeconomic series (i.e. output, private and public consumption, inflation, unemployment, and share prices); we performed Granger-causality tests between inequality and macroeconomic series. Here, we resume our main empirical findings providing possible interpretations by way of conclusion.

Our analysis shows that business cycles — measured as filtered GDP fluctuations — have different effects on different sources of inequality. For instance, we find that hours of work, hourly wages, earnings and income inequality are most of the time counter-cyclical (with the exception of Germany), while consumption inequality is pro-cyclical (especially in English-speaking countries). We conjecture that the latter result is driven by the surge of debt of (relatively) poor households trying to stabilizing their consumption patterns in a framework of rising income inequality. Moreover, we find that hours of works appear to be more sensitive to the business cycles than hourly wages.

Unemployment is confirmed to be an important channel for the transmission of business cycles to inequality, although we find that is negatively correlated with consumption inequality. This result may be the outcome of households at the lower bottom of income distribution trying to reduce their indebtedness during expansions, when they are more likely to be employed. We also find a negative correlation between inflation, share prices, on the one side, and most sources of inequality. An exception is private consumption, which is positively correlated with higher levels of consumption inequality.

Considering the amplitude of fluctuations of inequality series, we find that filtered series of earnings and gross income inequality are more volatile than those of disposable income and consumption inequality, confirming the smoothing effect of households' debt and of automatic stabilizers. The volatility and the relative magnitude of cross-correlations suggest that changes occur more at the tails than around the mode of the income or expenditure distributions. Indeed, the volatility and cross-correlations of economic inequality measured with the Pratios are often larger than when measured with the Gini coefficients.

Granger-causality tests suggest that in most of the cases there are mutual causal relationships between inequality and macroeconomic series. However, in some cases inequality series help to predict output fluctuations. On the contrary, most of the times unemployment appears

to Granger-cause inequality, confirming the negative role that layoffs exerted on inequality dynamics.

Moving to a long-run perspective, our empirical results suggest that most inequality series are not stationary. Given the increasing positive trend observed for most sources of inequality, it appears that negative business-cycle shocks had long-lasting effects on inequality. At the same time, the cointegration analysis shows that there are no long-run equilibrium relationships between inequality and most macroeconomic variables. The only significant exception is represented by share prices in English-speaking countries, confirming the fundamental role that financial markets have assumed in these countries.

The common patterns described above coexist with some country specificities. Cross-country differences in the responsiveness of economic inequality to business cycles hint to the importance of institutional factors (composition of public consumption, labour and financial market regulation, etc.) in smoothing macroeconomic shocks. For instance, an expansion of government consumption is associated with a reduction in disposable income inequality in Canada and the U.S. and with an increase in European countries (Germany, Netherlands, Sweden), as different institutions affect the size, composition and dynamics of government consumption. A European versus English-speaking countries pattern emerges for private consumption, which is negatively correlated with disposable income inequality in Canada and the U.S. and positively in the Netherlands and Sweden. In the U.S., an increase in share prices widens the gap between the top and the middle of the earnings distribution. The pro-cyclical behavior of most inequality variables in Germany is likely determined by the process of reunification of the country.

The results of the paper are a snapshot on the relationships between inequality and macroeconomic series. Future research efforts should be devoted to better explain the observed country-specific patterns and to deeply study the asymmetric impact of business cycles on inequality series. Moreover, the use of the Top-Income database (Atkinson et al., 2011) would allow us to enrich our analysis by considering new sources of inequality series for a larger set of countries over a longer period of time.

Acknowledgements

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A   Inequality indexes

Gini coefficient measures the ratio of the area that lies between the line of perfect equality and the Lorenz curve of the actual distribution of income. The line of perfect equality corresponds to the 45 degrees line, where each percentile of the income distribution receive an equal share of total income. The Lorenz curve plots the proportion of total income of the population (on the y axis) that is cumulatively earned by the bottom x% of the population. If the Lorenz curve is approximated on each interval as a line between consecutive points, the Gini coefficient can be calculated as follows:

$$G = \frac{1}{2} - \sum_{k=1}^{n}(X_k - X_{k-1})(Y_k - Y_{k-1}),$$

where X is is the cumulated proportion of the population variable, Y is the cumulated proportion of the income variable and individuals are ranked in ascending order of Y. The Gini coefficient ranges between 0 and 1, where 0 defines a situation of perfect equality and 1 of perfect inequality.

Percentile ratios (Pratios) correspond to the upper bound or mean income of percentile $p + n$ over the upper bound or mean income of percentile p:

$$P_{p+n}P_p = \frac{\mu_{p+n}}{\mu_p}$$

$$P_{p+n}P_p = \frac{max(Y_{1,p+n}, ..., Y_{N,p+n})}{max(Y_{1,p}, ..., Y_{N,p})}$$

where μ is mean income of percentile p and Y is income of individual i in percentile p. The minimum value of P-ratios is 1 and they have an unbounded maximum. A P-ratio of 1 corresponds to a situation of equality between the two income percentiles considered.

Variance of logarithms is the variance of the logarithm of incomes. The variance of logarithms may assume values between 0 and infinity. A value equal to 0 defines a situation of perfect equality.

(Wolfson) Polarization index is defined as:

$$P = 2\frac{\mu}{m}(1 - G - 2L_{1/2})$$

where μ is mean income, m median income, G the Gini coefficient and $L_{1/2}$ the income share of the lower half of the population. The polarization index may assume values between 0 and 1. The higher the value of P is, the fewer individuals or households with middle level incomes are, so the higher the polarization is.

Theil index is equal to the average of the logarithm of all relative income shares weighted by income share:

$$T = \frac{1}{N} \sum_{k=1}^{n} (\frac{x_i}{\mu} ln \frac{x_i}{\mu})$$

where x_i is the income of the i person and μ is mean income. The Theil index belongs to the generalized entropy indexes and it is sensitive to the middle of the distribution. It ranges between 0 and $ln(N)$. A value of 0 corresponds to perfect equality.

Table 1: Selected indicators from the RED database. ($*$): inequality data not part of the RED database

Country	Inequality	Source	Start	End	Gini	Var log	P9050	P5010	Unit	Sample	Type
CAN	wage	SCF	1977	1997	x	x	x	x	individual	universe	hourly
CAN	wage	SLID	1996	2005	x	x	x	x	individual	universe	hourly
CAN	hours	SCF	1977	1997		x			individual	male	
CAN	hours	SLID	1996	2005		x			individual	male	
CAN	earnings	SCF	1977	1997	x	x	x	x	household	universe	gross
CAN	earnings	SLID	1996	2005	x	x	x	x	household	universe	gross
CAN	income	SCF	1977	1997		x			household	universe	gross
CAN	income	SLID	1996	2005		x			household	universe	gross
CAN	income	SCF	1977	1997		x			household	universe	dispos.
CAN	income	SLID	1996	2005		x			household	universe	dispos.
GER	wage	GSOEP	1983	2004		x			individual	male	hourly
GER	hours	GSOEP	1983	2004	x	x	x	x	individual	male	
GER	earnings	GSOEP	1983	2004	x	x	x	x	household	universe	gross
GER	income	GSOEP	1984	2004	x	x	x	x	household	universe	dispos.
GER	income	GSOEP	1983	2004	x						gross
GBR	wage	FES	1978	2005	x	x	x	x	individual	male	hourly
GBR	hours	FES	1978	2005		x			individual	male	
GBR	earnings	FES	1978	2005	x	x	x	x	household	universe	gross
GBR	consumpt.	FES	1978	2005		x			household	universe	
SWE	wage	HINK	1975	1992		x			individual	male	hourly
SWE	hours	HINK	1975	1992		x			individual	male	
SWE	earnings	LINDA	1978	2004	x	x	x	x	household	universe	gross
SWE	income	LINDA	1978	2004		x			household	universe	dispos.
USA	wage	CPS	1967	2005	x	x	x	x	individual	male	hourly
USA	hours	CPS	1967	2005		x			individual	male	
USA	earnings	CPS	1967	2005	x	x	x	x	household	universe	gross
USA	income	CPS	1967	2005	x	x			household	universe	gross
USA	income	CPS	1979	2004	x	x			household	universe	dispos.
USA	consumpt.	CEX	1980	2006	x	x	x	x	household	universe	non-dur.
NLD*	income	CBS	1989	2008	x	Theil	polarization		household	universe	dispos.

Table 2: Dickey-Fuller (DF) Stationarity tests. DDF: inclusion of drift; TSDF: inclusion of drift and linear trend. Number of lags in parentheses. "0" acceptance of the unit-root null hypothesis; "1" rejection of the unit-root null hypothesis.

Country	Type	Index	DF(0)	DDF(0)	TSDF(0)	DF(1)	DDF(1)	TSDF(1)
CAN	earnings	gini	0	0	0	0	0	0
CAN	earnings	p5010	0	0	0	0	0	0
CAN	earnings	p9050	0	0	0	0	0	0
CAN	earnings	varlog	0	0	0	0	0	0
CAN	hours work	varlog	0	0	0	0	0	0
CAN	hourly wage	varlog	0	0	0	0	0	0
CAN	gross y	varlog	0	0	0	0	0	0
CAN	diposable y	varlog	0	0	0	0	0	0
GER	earnings	gini	0	0	0	0	0	1
GER	earnings	p5010	0	0	0	0	0	0
GER	earnings	p9050	0	0	1	0	0	1
GER	earnings	varlog	0	0	0	0	0	0
GER	hours work	gini	0	0	0	0	0	0
GER	hours work	p5010	0	0	0	0	0	0
GER	hours work	p9050	0	1	0	0	0	0
GER	hours work	varlog	0	0	0	0	0	0
GER	hourly wage	varlog	0	0	0	0	0	0
GER	gross y	gini	0	0	0	0	0	1
GER	diposable y	gini	0	0	0	0	0	0
GER	diposable y	p5010	0	0	0	0	0	0
GER	diposable y	p9050	0	0	1	0	0	1
GER	diposable y	varlog	0	0	0	0	0	0
GBR	consumption	varlog	0	0	1	0	0	0
GBR	earnings	gini	0	1	0	0	1	0
GBR	earnings	p5010	0	0	0	0	0	0
GBR	earnings	p9050	0	0	0	0	0	0
GBR	earnings	varlog	0	0	0	0	0	0
GBR	hours work	varlog	0	0	0	0	0	0
GBR	hourly wage	gini	0	0	0	0	0	0
GBR	hourly wage	p5010	0	0	0	0	0	0
GBR	hourly wage	p9050	0	0	0	0	0	0
GBR	hourly wage	varlog	0	0	0	0	0	0
NLD	diposable y	Theil	0	0	0	0	0	0
NLD	diposable y	Gini	0	0	0	0	0	0
NLD	diposable y	Pola	0	0	1	0	0	0
SWE	earnings	gini	0	0	0	0	0	0
SWE	earnings	p9050	0	0	0	0	0	0
SWE	earnings	varlog	0	0	0	0	0	0
SWE	diposable y	varlog	0	0	0	0	0	0
USA	consumption	gini	0	0	0	0	0	0
USA	consumption	p5010	0	0	0	0	0	0
USA	consumption	p9050	0	0	1	0	0	0
USA	consumption	varlog	0	0	0	0	0	0
USA	earnings	gini	0	0	0	0	0	0
USA	earnings	p5010	0	0	0	0	1	0
USA	earnings	p9050	0	0	1	0	0	0
USA	earnings	varlog	0	0	0	0	1	0
USA	hours work	varlog	0	0	0	0	0	0
USA	hourly wage	gini	0	0	0	0	0	0
USA	hourly wage	p5010	0	0	0	0	0	0
USA	hourly wage	p9050	0	0	0	0	0	0
USA	hourly wage	varlog	0	0	0	0	0	0
USA	gross y	gini	0	0	1	0	0	0
USA	gross y	varlog	0	0	0	0	0	0
USA	diposable y	gini	0	0	0	0	0	0
USA	diposable y	varlog	0	0	0	0	1	0

Table 3: Engle-Granger cointegration tests: p-values.

Country	inequality	Index	CPI	GDP	Priv. cons.	Gov. cons.	Share pr.	Unempl.
CAN	earnings	gini	0.4338	0.3865	0.4439	0.6722	0.0320	0.6194
CAN	earnings	p5010	0.5011	0.9694	0.9748	0.9477	0.8040	0.7088
CAN	earnings	p9050	0.3372	0.4913	0.4818	0.4582	0.1438	0.6835
CAN	earnings	varlog	0.3533	0.9079	0.9151	0.8097	0.6017	0.8006
CAN	hours work	varlog	0.4709	0.6406	0.6456	0.5349	0.4169	0.8104
CAN	hourly wage	varlog	0.2472	0.6591	0.6839	0.6064	0.2926	0.7356
CAN	gross y	varlog	0.3996	0.9366	0.9468	0.9089	0.6754	0.7844
CAN	disposable y	varlog	0.6099	0.5093	0.5663	0.5375	0.2481	0.6663
GER	earnings	gini	0.5848	0.1697		0.0627	0.3741	0.5757
GER	earnings	p5010	0.5839	0.6173		0.5822	0.2902	0.6951
GER	earnings	p9050	0.5132	0.6907		0.9407	0.5351	0.9135
GER	earnings	varlog	0.4155	0.8063		0.8809	0.3167	0.8890
GER	hours work	gini	0.5866	0.5244		0.3814	0.3504	0.4204
GER	hours work	p5010	0.5772	0.2344		0.3508	0.3943	0.6486
GER	hours work	p9050	0.5765	0.9421		0.9031	0.7225	0.6012
GER	hours work	varlog	0.5672	0.1098		0.1357	0.3705	0.6022
GER	hourly wage	varlog	0.5841	0.7173		0.8384	0.5762	0.5730
GER	gross y	gini	0.5762	0.3174		0.2837	0.4785	0.5632
GER	disposable y	gini	0.6578	0.1378		0.4497	0.3788	0.8373
GER	disposable y	p5010	0.6362	0.1891		0.5062	0.4184	0.8567
GER	disposable y	p9050	0.6487	0.1024		0.3360	0.3731	0.7783
GER	disposable y	varlog	0.6507	0.5805		0.6288	0.5506	0.6423
GBR	consumption	varlog	0.0956	0.6891	0.6931	0.9861	0.0799	0.4951
GBR	earnings	gini	0.0657	0.9247	0.9194	0.9967	0.0191	0.6012
GBR	earnings	p5010	0.0628	0.4632	0.4604	0.9481	0.0758	0.5123
GBR	earnings	p9050	0.2915	0.9990	0.9990	0.9990	0.9872	0.8889
GBR	earnings	varlog	0.0153	0.9497	0.9306	0.9928	0.3512	0.8674
GBR	hours work	varlog	0.0423	0.9813	0.9817	0.9990	0.6627	0.7921
GBR	hourly wage	gini	0.3067	0.9923	0.9911	0.9990	0.8608	0.8643
GBR	hourly wage	p5010	0.1352	0.8427	0.8289	0.9830	0.4028	0.7183
GBR	hourly wage	p9050	0.2334	0.9858	0.9822	0.9990	0.7698	0.7835
GBR	hourly wage	varlog	0.1711	0.0096	0.0064	0.5022	0.4982	0.2892
NLD	disposable y	theil	0.2573	0.5960	0.7315	0.2029	0.8396	0.7212
NLD	disposable y	gini	0.1895	0.4899	0.6433	0.0968	0.8340	0.6978
NLD	disposable y	pola	0.1946	0.0147	0.0031	0.1534	0.1882	0.5266
SWE	earnings	gini	0.0863	0.9273	0.9571	0.2593	0.5286	0.6817
SWE	earnings	p9050	0.0739	0.9696	0.9781	0.5422	0.6575	0.5980
SWE	earnings	varlog	0.0899	0.8816	0.9342	0.1482	0.4681	0.7302
SWE	disposable y	varlog	0.3028	0.3128	0.4565	0.0222	0.2749	0.6607
USA	consumption	gini	0.1749	0.0829	0.0899	0.0187	0.0903	0.3960
USA	consumption	p5010	0.1925	0.2088	0.2077	0.0139	0.5152	0.4298
USA	consumption	p9050	0.1593	0.2543	0.2945	0.1034	0.0339	0.3789
USA	consumption	varlog	0.3787	0.9118	0.9099	0.8755	0.9489	0.4428
USA	earnings	gini	0.5102	0.9797	0.9782	0.9779	0.9852	0.0767
USA	earnings	p5010	0.2434	0.2096	0.2320	0.4811	0.5292	0.4684
USA	earnings	p9050	0.4281	0.9617	0.9660	0.9749	0.9625	0.4877
USA	earnings	varlog	0.1692	0.0113	0.0129	0.0031	0.0318	0.4134
USA	hours work	varlog	0.4469	0.9784	0.9809	0.9859	0.9736	0.4898
USA	hourly wage	gini	0.1705	0.0466	0.0645	0.0995	0.0434	0.4130
USA	hourly wage	p5010	0.3365	0.9003	0.9111	0.9230	0.9017	0.5077
USA	hourly wage	p9050	0.2949	0.2569	0.2891	0.1366	0.1570	0.4736
USA	hourly wage	varlog	0.2344	0.9479	0.9567	0.8995	0.8853	0.6889
USA	gross y	gini	0.3463	0.1311	0.1393	0.0788	0.1694	0.3017
USA	gross y	varlog	0.4062	0.1782	0.1687	0.2103	0.2516	0.4229
USA	disposable y	gini	0.1196	0.2800	0.3151	0.1391	0.1825	0.2129
USA	disposable y	varlog	0.3198	0.1940	0.1856	0.3618	0.2981	0.4787

Table 4: Standard deviations of hp-filtered inequality series.

Type	Index	CAN	GER	GBR	NLD	SWE	USA
consumption	gini						0.004
consumption	p5010						0.025
consumption	p9050						0.029
consumption	varlog			0.012			0.007
earnings	gini	0.007	0.007	0.006		0.008	0.004
earnings	p5010	0.118	0.131	0.064			0.063
earnings	p9050	0.038	0.029	0.023		0.032	0.024
earnings	varlog	0.036	0.035	0.021		0.078	0.024
hours work	varlog			0.009			
hours work	gini		0.005				
hours work	p5010		0.080				
hours work	p9050		0.034				
hours work	varlog	0.023	0.018				0.009
hourly wage	gini			0.004			0.004
hourly wage	p5010			0.018			0.025
hourly wage	p9050			0.030			0.026
hourly wage	varlog	0.014	0.018	0.008			0.008
gross y	gini		0.007				0.004
gross y	varlog	0.041					0.023
diposable y	gini		0.008		0.004		0.006
diposable y	p5010		0.041				
diposable y	p9050		0.027				
diposable y	varlog	0.009	0.021			0.034	0.015
diposable y	theil				0.006		
diposable y	pola				0.003		

Table 5: Cross-correlations between GDP and inequality, Canada. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.288	0.117	-0.168	-0.683***	-0.813***	-0.457**	0.050
earnings	p5010	0.184	0.066	-0.257	-0.699***	-0.652***	-0.236	0.204
earnings	p9050	0.251	0.009	-0.333	-0.828***	-0.807***	-0.424*	0.022
earnings	varlog	0.295	-0.037	-0.435**	-0.835***	-0.762***	-0.395*	0.040
hours work	varlog	0.396*	0.257	-0.129	-0.692***	-0.778***	-0.470**	-0.173
hourly wage	varlog	0.135	0.005	-0.035	-0.302	-0.387*	-0.212	0.230
gross y	varlog	0.186	-0.074	-0.519**	-0.834***	-0.702***	-0.316	0.033
disposable y	varlog	0.114	-0.0801	-0.329	-.718***	-0.684***	-0.279	0.197

Table 6: Cross-correlations between between CPI and inequality, Canada. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.228	0.346	0.565***	0.300	-0.278	-0.718***	-0.683***
earnings	p5010	0.054	0.237	0.510**	0.142	-0.378*	-0.524**	-0.423*
earnings	p9050	0.320	0.381*	0.391*	0.076	-0.449**	-0.732***	-0.600***
earnings	varlog	0.311	0.433**	0.487**	-0.008	-0.451**	-0.723***	-0.477**
hours work	varlog	0.229	0.405*	0.689***	0.263	-0.249	-0.726***	-0.615***
hourly wage	varlog	0.412*	0.308	0.372*	0.171	-0.156	-0.530**	-0.531**
gross y	varlog	0.361	0.505**	0.462**	-0.080	-0.425*	-0.671***	-0.531**
disposable y	varlog	0.395*	0.357	0.415*	-0.030	-0.397*	-0.675***	-0.578***

Table 7: Cross-correlations between unemployment and inequality, Canada. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	-0.458**	-0.329	-0.011	0.530**	0.830***	0.635***	0.158
earnings	p5010	-0.255	-0.228	0.068	0.520**	0.618***	0.349	-0.070
earnings	p9050	-0.387*	-0.103	0.248	0.725***	0.852***	0.494**	0.018
earnings	varlog	-0.423*	-0.155	0.275	0.725***	0.783***	0.473**	0.028
hours work	varlog	-0.532**	-0.442**	-0.047	0.542**	0.826***	0.635***	0.309
hourly wage	varlog	-0.372*	-0.207	-0.052	0.313	0.526**	0.435**	0.095
gross y	varlog	-0.425*	-0.150	0.349	0.733***	0.768***	0.452**	0.031
disposable y	varlog	-0.339	-0.087	0.264	0.660***	0.752***	0.438**	-0.071

Table 8: Cross-correlations between share prices and inequality, Canada. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.010	-0.005	-0.155	-0.496**	-0.318	0.030	0.193
earnings	p5010	-0.070	-0.103	-0.250	-0.342	-0.226	0.147	0.431*
earnings	p9050	-0.103	-0.189	-0.332	-0.740***	-0.402*	0.030	0.285
earnings	varlog	0.031	-0.245	-0.402*	-0.672***	-0.223	-0.024	0.375*
hours work	varlog	0.109	0.166	-0.293	-0.574***	-0.333	-0.091	-0.096
hourly wage	varlog	0.162	0.132	0.076	-0.195	0.037	0.121	0.114
gross y	varlog	-0.050	-0.127	-0.407*	-0.569***	-0.275	0.171	0.276
disposable y	varlog	-0.012	-0.141	-0.219	-0.531**	-0.294	0.194	0.409*

Table 9: Cross-correlations between government consumption and inequality, Canada. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.244	0.267	0.295	0.120	-0.096	-0.363	-0.488**
earnings	p5010	0.349	0.276	0.168	-0.107	-0.306	-0.420*	-0.455**
earnings	p9050	0.546**	0.614***	0.554***	0.293	-0.139	-0.480**	-0.660***
earnings	varlog	0.544**	0.533**	0.470**	0.108	-0.223	-0.506**	-0.672***
hours work	varlog	0.304	0.392*	0.440**	0.337	-0.014	-0.238	-0.391*
hourly wage	varlog	-0.189	-0.229	-0.180	-0.120	-0.051	-0.088	-0.105
gross y	varlog	0.475**	0.421*	0.351	0.092	-0.278	-0.523**	-0.661***
disposable y	varlog	0.328	0.310	0.246	0.049	-0.211	-0.458**	-0.539**

Table 10: Cross-correlations between private consumption and inequality, Canada. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.430*	0.215	-0.136	-0.665***	-0.812***	-0.654***	-0.245
earnings	p5010	0.268	0.073	-0.238	-0.5889***	-0.590***	-0.452**	-0.108
earnings	p9050	0.394*	0.097	-0.286	-0.775***	-0.787***	-0.555***	-0.187
earnings	varlog	0.442**	0.073	-0.390*	-0.762***	-0.739***	-0.588***	-0.220
hours work	varlog	0.568***	0.371*	-0.087	-0.630***	-0.750***	-0.653***	-0.421*
hourly wage	varlog	0.145	-0.013	-0.122	-0.410*	-0.456**	-0.370*	0.026
gross y	varlog	0.358	0.052	-0.460**	-0.800***	-0.785***	-0.559***	-0.215
disposable y	varlog	0.214	-0.039	-0.347	-0.721***	-0.730***	-0.468**	-0.009

Table 11: Cross-correlations between GDP and inequality, Germany. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	-0.075	-0.043	0.165	0.334	0.372	0.341	0.253
earnings	p5010	0.539**	0.673***	0.565**	0.171	-0.253	-0.405	-0.290
earnings	p9050	-0.039	0.135	0.248	0.265	0.157	-0.025	0.055
earnings	varlog	0.119	0.249	0.446*	0.418	0.162	-0.065	-0.079
hours work	gini	0.703***	0.542**	-0.020	-0.266	-0.391	-0.447*	-0.190
hours work	p5010	0.709***	0.437*	-0.039	-0.295	-0.390	-0.353	-0.099
hours work	p9050	-0.087	0.013	-0.099	-0.020	0.096	0.028	-0.164
hours work	varlog	0.684***	0.451*	0.093	-0.180	-0.528**	-0.566**	-0.230
hourly wage	varlog	0.153	0.419	0.772***	0.606**	-0.037	-0.557**	-0.566**
gross y	gini	0.199	0.104	0.294	0.377	0.336	0.237	0.006
disposable y	gini	0.073	0.186	0.101	0.320	0.377	0.158	-0.103
disposable y	p5010	0.378	0.597**	0.407	0.133	-0.015	-0.246	-0.357
disposable y	p9050	0.037	0.125	0.150	-0.034	-0.035	-0.284	-0.201
disposable y	varlog	0.272	0.335	0.110	0.241	0.177	0.050	-0.061

Table 12: Cross-correlations between CPI and inequality, Germany. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	-0.261	-0.177	0.140	0.645***	0.593**	0.279	0.190
earnings	p5010	0.682***	0.810***	0.638***	0.268	0.017	-0.332	-0.668***
earnings	p9050	-0.314	0.031	0.280	0.480*	0.228	0.105	0.199
earnings	varlog	0.252	0.489*	0.538**	0.505**	0.373	0.137	-0.306
hours work	gini	0.663***	0.462*	0.113	-0.212	-0.471*	-0.715***	-0.582**
hours work	p5010	0.613**	0.500**	0.168	-0.218	-0.558**	-0.597**	-0.503**
hours work	p9050	-0.106	-0.201	-0.238	-0.178	0.035	-0.040	-0.019
hours work	varlog	0.641***	0.497*	0.025	-0.196	-0.508**	-0.654***	-0.539**
hourly wage	varlog	0.261	0.522**	0.525**	0.378	0.190	-0.174	-0.528**
gross y	gini	0.029	0.215	0.411	0.586**	0.399	0.135	-0.098
disposable y	gini	-0.121	0.189	0.495*	0.458*	0.417	0.279	0.295
disposable y	p5010	0.374	0.564**	0.663***	0.418	0.074	-0.234	-0.322
disposable y	p9050	0.011	0.300	0.038	-0.079	0.043	0.229	-0.009
disposable y	varlog	0.061	0.293	0.517**	0.473*	0.184	-0.091	0.105

Table 13: Cross-correlations between unemployment and inequality, Germany. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	-0.146	-0.362	-0.438*	-0.338	-0.183	-0.020	0.219
earnings	p5010	-0.758***	-0.556**	-0.227	0.170	0.636***	0.727***	0.478*
earnings	p9050	-0.277	-0.481*	-0.360	-0.150	-0.005	0.081	0.215
earnings	varlog	-0.557**	-0.521**	-0.388	-0.061	0.338	0.572**	0.419
hours work	gini	-0.288	-0.033	0.420	0.648***	0.596**	0.406	0.165
hours work	p5010	-0.387	-0.057	0.516**	0.704***	0.604**	0.386	0.096
hours work	p9050	0.374	0.320	0.052	-0.165	-0.362	-0.295	-0.034
hours work	varlog	-0.268	-0.028	0.285	0.425	0.557**	0.432*	0.173
hourly wage	varlog	-0.262	-0.410	-0.452*	-0.376	0.228	0.622**	0.530**
gross y	gini	-0.402	-0.335	-0.240	-0.204	0.055	0.266	0.468*
disposable y	gini	-0.490*	-0.503*	-0.402	-0.296	-0.253	0.179	0.506*
disposable y	p5010	-0.650***	-0.634**	-0.338	0.177	0.436	0.594**	0.575**
disposable y	p9050	-0.228	-0.147	-0.298	-0.198	-0.010	0.175	0.200
disposable y	varlog	-0.546**	-0.497*	-0.211	0.024	0.061	0.269	0.479*

Table 14: Cross-correlations between share prices and inequality, Germany. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.671***	0.442*	-0.240	-0.555**	-0.293	-0.302	-0.351
earnings	p5010	-0.370	-0.398	-0.564**	-0.669***	-0.519**	-0.067	0.210
earnings	p9050	0.329	-0.056	-0.031	-0.236	-0.442*	-0.340	0.027
earnings	varlog	-0.190	-0.518**	-0.592**	-0.707***	-0.572**	-0.110	0.288
hours work	gini	-0.410	-0.333	-0.339	-0.139	0.015	0.383	0.528**
hours work	p5010	-0.534**	-0.625***	-0.440*	-0.130	-0.027	0.472*	0.706***
hours work	p9050	0.132	0.638***	0.543**	0.404	0.368	-0.044	-0.519**
hours work	varlog	-0.337	-0.163	-0.156	0.011	-0.091	0.189	0.352
hourly wage	varlog	-0.216	0.022	0.166	-0.094	-0.376	-0.360	-0.192
gross y	gini	0.342	-0.005	-0.542**	-0.598**	-0.290	-0.145	-0.140
disposable y	gini	0.464*	-0.042	-0.271	-0.477*	-0.519**	-0.624**	-0.256
disposable y	p5010	0.105	-0.509*	-0.595**	-0.664***	-0.554**	-0.368	0.243
disposable y	p9050	-0.053	0.029	0.362	-0.178	-0.462*	-0.407	-0.019
disposable y	varlog	0.344	-0.262	-0.510**	-0.482*	-0.351	-0.375	0.020

Table 15: Cross-correlations between government consumption and inequality, Germany. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	-0.303	-0.372	-0.171	-0.276	-0.322	-0.053	0.574**
earnings	p5010	-0.535**	-0.386	0.062	0.453*	0.478*	0.325	0.270
earnings	p9050	-0.309	-0.199	-0.265	-0.269	0.098	0.065	0.114
earnings	varlog	-0.420	-0.558**	-0.440*	-0.031	0.335	0.427*	0.448*
hours work	gini	0.007	0.502**	0.581**	0.614**	0.416	0.202	0.057
hours work	p5010	0.067	0.424	0.467*	0.467*	0.473*	0.252	0.086
hours work	p9050	0.089	0.228	0.242	0.253	-0.128	-0.177	-0.179
hours work	varlog	-0.011	0.341	0.566**	0.607**	0.436*	0.001	-0.069
hourly wage	varlog	-0.325	-0.537**	-0.065	0.413	0.682***	0.301	0.017
gross y	gini	-0.276	-0.337	-0.069	-0.126	0.021	0.300	0.772***
disposable y	gini	-0.372	-0.202	-0.461*	-0.374	-0.214	0.257	0.242
disposable y	p5010	-0.501*	-0.119	-0.038	0.033	0.236	0.503*	0.311
disposable y	p9050	-0.065	-0.169	-0.205	-0.112	0.166	-0.229	-0.455*
disposable y	varlog	-0.407	-0.030	-0.180	-0.166	-0.063	0.389	0.478*

Table 16: Cross-correlations between GDP and inequality, the U.K. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	varlog	0.021	0.199	0.437**	0.518**	0.435**	0.318	0.149
earnings	gini	-0.225	-0.611***	-0.776***	-0.527**	-0.116	0.314	0.542***
earnings	p5010	-0.173	-0.184	-0.264	-0.241	-0.050	0.199	0.317
earnings	p9050	0.494**	0.261	0.058	0.002	-0.069	-0.215	-0.414*
earnings	varlog	-0.094	-0.125	-0.254	-0.262	-0.126	0.105	0.186
hours work	varlog	-0.650***	-0.746***	-0.451**	-0.019	0.222	0.332	0.457**
hourly wage	gini	0.045	0.228	0.361*	0.444**	0.436**	0.375*	0.118
hourly wage	p5010	0.088	-0.006	0.005	0.119	0.047	-0.182	-0.279
hourly wage	p9050	-0.208	0.080	0.294	0.420*	0.447**	0.479**	0.394*
hourly wage	varlog	0.103	0.243	0.334	0.368*	0.281	0.172	0.032

Table 17: Cross-correlations between CPI and inequality, the U.K. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	varlog	-0.183	-0.246	-0.232	0.013	0.160	0.291	0.379*
earnings	gini	0.396*	0.304	-0.068	-0.543***	-0.700***	-0.483**	-0.202
earnings	p5010	-0.162	0.026	0.126	0.027	-0.153	-0.338	-0.203
earnings	p9050	0.211	0.397*	0.279	0.084	0.118	0.097	0.077
earnings	varlog	-0.097	0.048	0.232	0.049	-0.075	-0.372*	-0.262
hours work	varlog	0.385*	-0.212	-0.587***	-0.515**	-0.371*	-0.014	0.066
hourly wage	gini	-0.282	-0.190	-0.055	-0.029	0.037	0.132	0.369*
hourly wage	p5010	0.161	0.249	-0.039	-0.082	0.024	0.267	0.058
hourly wage	p9050	-0.386*	-0.354	-0.177	-0.069	0.027	-0.021	0.206
hourly wage	varlog	-0.143	-0.071	-0.048	0.018	0.048	0.067	0.206

Table 18: Cross-correlations between unemployment and inequality, the U.K. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	varlog	0.211	-0.017	-0.241	-0.417*	-0.413*	-0.341	-0.202
earnings	gini	-0.117	0.261	0.604***	0.680***	0.458**	-0.001	-0.375*
earnings	p5010	0.175	0.083	0.076	0.123	0.082	-0.111	-0.330
earnings	p9050	-0.413*	-0.344	-0.221	-0.043	0.033	0.073	0.242
earnings	varlog	0.078	0.034	0.033	0.132	0.125	-0.0302	-0.192
hours work	varlog	0.299	0.625***	0.661***	0.311	0.002	-0.202	-0.379*
hourly wage	gini	0.055	-0.115	-0.255	-0.312	-0.319	-0.347	-0.214
hourly wage	p5010	-0.180	-0.027	0.024	-0.133	-0.137	0.009	0.199
hourly wage	p9050	0.352	0.092	-0.132	-0.262	-0.305	-0.348	-0.368*
hourly wage	varlog	-0.052	-0.224	-0.291	-0.289	-0.208	-0.164	-0.057

Table 19: Cross-correlations between share prices and inequality, the U.K. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	varlog	0.043	0.250	0.492**	0.459**	0.367*	0.023	-0.262
earnings	gini	-0.632***	-0.579***	-0.133	0.297	0.479**	0.382*	0.209
earnings	p5010	-0.626***	-0.541***	-0.172	0.384*	0.669***	0.644***	0.285
earnings	p9050	0.131	-0.115	0.011	0.016	-0.215	-0.360*	-0.341
earnings	varlog	-0.524**	-0.540***	-0.155	0.263	0.474**	0.509**	0.281
hours work	varlog	-0.509**	-0.122	0.161	0.210	0.268	0.301	0.179
hourly wage	gini	0.314	0.542***	0.811***	0.644***	0.193	-0.324	-0.658***
hourly wage	p5010	0.353	0.226	0.089	-0.019	-0.269	-0.330	-0.209
hourly wage	p9050	0.092	0.291	0.645***	0.692***	0.422*	0.039	-0.289
hourly wage	varlog	0.318	0.468**	0.751***	0.625***	0.139	-0.343	-0.675***

Table 20: Cross-correlations between government consumption and inequality, the U.K. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	varlog	-0.327	-0.347	-0.303	-0.200	-0.076	0.154	0.434**
earnings	gini	0.306	0.281	0.112	-0.136	-0.281	-0.470**	-0.458**
earnings	p5010	0.353	0.050	-0.189	-0.411*	-0.506**	-0.540***	-0.487**
earnings	p9050	0.141	0.093	0.011	0.107	0.318	0.244	0.175
earnings	varlog	0.372*	0.120	-0.156	-0.385*	-0.384*	-0.405*	-0.400*
hours work	varlog	0.252	0.043	-0.077	-0.173	-0.260	-0.366*	-0.356
hourly wage	gini	-0.539***	-0.512**	-0.357	-0.252	0.035	0.263	0.537**
hourly wage	p5010	-0.198	-0.040	0.032	-0.196	-0.007	0.201	0.226
hourly wage	p9050	-0.396*	-0.470**	-0.370*	-0.314	-0.177	0.058	0.338
hourly wage	varlog	-0.605***	-0.669***	-0.328	-0.111	0.116	0.283	0.516**

Table 21: Cross-correlations between private consumption and inequality, the U.K. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	varlog	-0.127	0.051	0.303	0.454**	0.518**	0.501**	0.302
earnings	gini	-0.163	-0.565***	-0.796***	-0.639***	-0.281	0.063	0.366*
earnings	p5010	-0.196	-0.296	-0.371*	-0.362*	-0.140	0.123	0.258
earnings	p9050	0.380*	0.329	0.242	0.204	0.039	-0.159	-0.357
earnings	varlog	-0.165	-0.205	-0.296	-0.320	-0.202	0.049	0.123
hours work	varlog	-0.564***	-0.683***	-0.524**	-0.282	-0.001	0.162	0.369*
hourly wage	gini	-0.237	0.053	0.260	0.447**	0.560***	0.527**	0.273
hourly wage	p5010	0.004	0.030	0.108	0.160	0.075	-0.210	-0.242
hourly wage	p9050	-0.432**	-0.155	0.122	0.308	0.457**	0.640***	0.540***
hourly wage	varlog	-0.119	0.122	0.292	0.369*	0.403*	0.339	0.168

Table 22: Cross-correlations between GDP and inequality, the Netherlands. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
disposable y	Theil	0.555**	0.725***	0.541**	0.013	-0.492*	-0.694***	-0.637**
disposable y	gini	0.551**	0.533**	0.209	-0.278	-0.689***	-0.831***	-0.570**
disposable y	pola	-0.312	-0.467*	-0.464*	-0.308	-0.175	-0.119	0.090

Table 23: Cross-correlations between CPI and inequality, the Netherlands. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
disposable y	Theil	-0.138	0.145	0.529*	0.739***	0.186	-0.447	-0.519*
disposable y	gini	0.091	0.455	0.469*	0.546**	0.087	-0.548**	-0.699***
disposable y	pola	0.255	0.106	-0.194	-0.215	0.011	0.001	-0.299

Table 24: Cross-correlations between unemployment and inequality, the Netherlands. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
disposable y	Theil	-0.532*	-0.642**	-0.547**	-0.324	0.095	0.552**	0.760***
disposable y	gini	-0.675***	-0.672***	-0.346	0.005	0.447	0.734***	0.749***
disposable y	pola	-0.087	0.144	0.446	0.507*	0.362	0.118	-0.043

Table 25: Cross-correlations between share prices and inequality, the Netherlands. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
disposable y	Theil	0.652**	0.438	0.109	-0.300	-0.667***	-0.762***	-0.498*
disposable y	gini	0.478*	0.216	-0.191	-0.544**	-0.737***	-0.719***	-0.264
disposable y	pola	-0.458*	-0.355	-0.346	-0.183	0.025	0.128	0.274

Table 26: Cross-correlations between government consumption and inequality, the Netherlands. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
disposable y	Theil	-0.293	-0.128	0.156	0.218	0.412	0.123	-0.486*
disposable y	gini	-0.173	0.170	0.544**	0.333	0.243	0.075	-0.423
disposable y	pola	0.215	0.439	0.436	0.089	0.054	0.032	-0.117

Table 27: Cross-correlations between private consumption and inequality, the Netherlands. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
disposable y	Theil	0.583**	0.766***	0.627**	0.276	-0.190	-0.453	-0.517*
disposable y	gini	0.611**	0.603**	0.291	-0.100	-0.504*	-0.702***	-0.593**
disposable y	pola	-0.191	-0.478*	-0.595**	-0.570**	-0.499*	-0.307	0.026

Table 28: Cross-correlations between GDP and inequality, Sweden. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	-0.205	-0.540**	-0.834***	-0.850***	-0.570***	-0.196	0.143
earnings	p9050	-0.182	-0.511**	-0.798***	-0.862***	-0.624***	-0.308	0.030
earnings	varlog	-0.374*	-0.636***	-0.845***	-0.785***	-0.438**	-0.016	0.290
disposable y	varlog	0.541**	0.549***	0.189	-0.223	-0.627***	-0.753***	-0.473**

Table 29: Cross-correlations between CPI and inequality, Sweden. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.531**	0.180	-0.040	-0.348	-0.567***	-0.491**	-0.269
earnings	p9050	0.475**	0.204	0.012	-0.214	-0.552***	-0.532**	-0.352
earnings	varlog	0.443**	0.115	-0.139	-0.446**	-0.610***	-0.482**	-0.214
disposable y	varlog	0.108	0.277	0.752***	0.267	-0.112	-0.065	-0.118

Table 30: Cross-correlations between unemployment and inequality, Sweden. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.046	0.419*	0.786***	0.901***	0.735***	0.413*	0.016
earnings	p9050	0.012	0.397*	0.756***	0.904***	0.769***	0.514**	0.134
earnings	varlog	0.240	0.569***	0.847***	0.897***	0.657***	0.243	-0.189
disposable y	varlog	-0.543**	-0.575***	-0.351	0.027	0.490**	0.717***	0.590***

Table 31: Cross-correlations between share prices and inequality, Sweden. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	-0.455**	-0.689***	-0.593***	-0.413*	-0.067	0.375*	0.571***
earnings	p9050	-0.479**	-0.698***	-0.655***	-0.464**	-0.131	0.296	0.589***
earnings	varlog	-0.571***	-0.686***	-0.593***	-0.342	0.134	0.582***	0.695***
disposable y	varlog	0.337	0.088	-0.274	-0.600***	-0.652***	-0.303	-0.142

Table 32: Cross-correlations between government consumption and inequality, Sweden. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.504**	0.542**	0.375*	0.073	-0.331	-0.615***	-0.732***
earnings	p9050	0.538**	0.554***	0.392*	0.073	-0.266	-0.547**	-0.672***
earnings	varlog	0.512**	0.332	0.152	-0.077	-0.402*	-0.585***	-0.620***
disposable y	varlog	-0.174	0.178	0.510**	0.702***	0.580***	0.266	-0.206

Table 33: Cross-correlations between private consumption inequality, Sweden. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
earnings	gini	0.004	-0.335	-0.680***	-0.763***	-0.649***	-0.448**	-0.164
earnings	p9050	0.098	-0.267	-0.643***	-0.776***	-0.677***	-0.528**	-0.260
earnings	varlog	-0.164	-0.470**	-0.760***	-0.766***	-0.569***	-0.297	0.006
disposable y	varlog	0.647***	0.556***	0.302	0.128	-0.262	-0.566***	-0.591***

Table 34: Cross-correlations between GDP inequality, the U.S. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	gini	-0.199	-0.133	-0.333	-0.113	0.203	0.401*	0.299
consumption	p5010	-0.369	-0.390*	-0.293	-0.405*	-0.145	0.151	0.564***
consumption	p9050	-0.184	-0.141	-0.275	-0.035	0.191	0.405*	0.173
consumption	varlog	-0.385*	-0.323	-0.462**	-0.245	0.113	0.504**	0.558**
earnings	gini	0.220	-0.010	-0.258	-0.443***	-0.419**	-0.039	0.092
earnings	p5010	0.409**	0.314*	-0.046	-0.581***	-0.787***	-0.375**	0.079
earnings	p9050	0.314*	0.149	0.141	-0.042	-0.346**	-0.230	-0.337*
earnings	varlog	0.272	0.082	-0.231	-0.611***	-0.689***	-0.215	0.167
hours work	varlog	0.479***	0.410**	0.045	-0.507***	-0.838***	-0.534***	-0.049
hourly wage	gini	0.196	-0.010	-0.173	-0.072	0.029	0.086	-0.0836
hourly wage	p5010	0.060	0.010	0.015	0.214	0.108	0.030	-0.180
hourly wage	p9050	0.249	-0.057	-0.239	-0.280	-0.145	-0.029	-0.016
hourly wage	varlog	0.172	-0.052	-0.199	-0.004	0.135	0.117	-0.115
gross y	gini	0.328*	0.041	-0.355**	-0.441**	-0.308*	0.136	0.215
gross y	varlog	0.286	0.065	-0.218	-0.615***	-0.681***	-0.223	0.160
disposable y	gini	0.327	0.043	-0.477**	-0.475**	-0.330	-0.145	-0.068
disposable y	varlog	0.386*	0.014	-0.391*	-0.596***	-0.560**	-0.409*	-0.112

Table 35: Cross-correlations between CPI inequality, the U.S. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	gini	0.108	0.024	-0.134	-0.238	0.089	0.100	-0.231
consumption	p5010	0.220	0.127	-0.014	-0.284	-0.529**	-0.484**	-0.352
consumption	p9050	0.074	0.011	-0.030	-0.263	-0.002	0.196	-0.081
consumption	varlog	0.206	0.039	-0.156	-0.365	-0.202	-0.197	-0.310
earnings	gini	0.215	0.243	0.205	-0.098	-0.435**	-0.298*	-0.002
earnings	p5010	0.016	0.403**	0.553***	0.240	-0.354**	-0.562***	-0.353**
earnings	p9050	0.224	0.121	0.0397	0.164	0.0113	-0.233	-0.266
earnings	varlog	0.156	0.339*	0.308*	0.017	-0.415**	-0.506***	-0.246
hours work	varlog	0.044	0.403**	0.592***	0.285	-0.265	-0.550***	-0.420**
hourly wage	gini	0.096	0.089	-0.009	-0.221	-0.288	0.023	0.292*
hourly wage	p5010	0.090	-0.158	-0.321*	-0.063	0.043	0.007	0.086
hourly wage	p9050	0.274	0.302*	0.058	-0.289	-0.313*	-0.104	-0.061
hourly wage	varlog	0.130	0.020	-0.174	-0.372**	-0.310*	0.030	0.257
gross y	gini	0.179	0.320*	0.277	-0.095	-0.447***	-0.351**	0.008
gross y	varlog	0.142	0.336*	0.314*	0.059	-0.351**	-0.470***	-0.231
disposable y	gini	0.410*	0.366	0.289	0.092	-0.149	-0.259	-0.406*
disposable y	varlog	0.397*	0.441*	0.318	0.070	-0.309	-0.419*	-0.327

Table 36: Cross-correlations between unemployment inequality, the U.S. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	gini	0.261	0.083	0.128	0.020	-0.370	-0.395*	-0.115
consumption	p5010	0.353	0.389*	0.215	0.321	0.229	-0.211	-0.512**
consumption	p9050	0.173	0.057	0.079	0.030	-0.271	-0.350	-0.105
consumption	varlog	0.410*	0.262	0.230	0.147	-0.223	-0.452**	-0.403*
earnings	gini	-0.246	0.062	0.248	0.458***	0.473***	0.009	-0.279
earnings	p5010	-0.387**	-0.324*	-0.003	0.533***	0.840***	0.4289**	-0.117
earnings	p9050	-0.402**	-0.154	-0.098	0.014	0.365**	0.291*	0.296*
earnings	varlog	-0.247	-0.055	0.227	0.587***	0.712***	0.201	-0.270
hours work	varlog	-0.429**	-0.418**	-0.057	0.470***	0.888***	0.598***	0.008
hourly wage	gini	-0.218	0.072	0.194	0.131	0.009	-0.173	-0.113
hourly wage	p5010	-0.161	0.101	0.089	-0.143	-0.133	0.034	0.117
hourly wage	p9050	-0.272	-0.028	0.262	0.353**	0.152	-0.067	-0.060
hourly wage	varlog	-0.236	0.081	0.267	0.129	-0.068	-0.185	-0.055
gross y	gini	-0.324*	-0.074	0.210	0.374**	0.335*	-0.104	-0.297*
gross y	varlog	-0.246	-0.058	0.224	0.546***	0.684***	0.176	-0.257
disposable y	gini	-0.277	0.008	0.313	0.402*	0.293	0.103	-0.031
disposable y	varlog	-0.304	0.034	0.441*	0.617***	0.559**	0.253	-0.110

Table 37: Cross-correlations between share prices inequality, the U.S. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	gini	-0.423*	-0.366	-0.444**	0.036	0.375	0.580***	0.407*
consumption	p5010	-0.456**	-0.223	-0.445**	-0.164	0.203	0.413*	0.289
consumption	p9050	-0.407*	-0.337	-0.277	0.051	0.435*	0.485**	0.258
consumption	varlog	-0.555**	-0.538**	-0.553**	-0.032	0.498**	0.743***	0.525**
earnings	gini	0.008	0.102	-0.025	-0.280	-0.303*	-0.094	-0.081
earnings	p5010	0.142	-0.025	-0.142	-0.352**	-0.291	-0.123	-0.075
earnings	p9050	0.217	0.402**	0.474***	-0.048	-0.246	-0.242	-0.342*
earnings	varlog	0.126	-0.090	-0.187	-0.410**	-0.347**	-0.136	0.041
hours work	varlog	0.253	0.151	-0.097	-0.342*	-0.433**	-0.298*	-0.217
hourly wage	gini	0.124	0.148	0.159	-0.0311	-0.196	-0.183	-0.179
hourly wage	p5010	0.115	0.032	0.276	0.142	-0.234	-0.143	-0.180
hourly wage	p9050	-0.006	0.142	0.077	0.043	-0.043	-0.215	-0.200
hourly wage	varlog	0.214	0.217	0.268	0.126	-0.144	-0.284	-0.281
gross y	gini	0.059	0.002	-0.034	-0.169	-0.096	0.122	0.089
gross y	varlog	0.079	-0.119	-0.192	-0.448***	-0.348**	-0.096	0.077
disposable y	gini	-0.220	-0.302	-0.341	-0.401*	-0.318	0.099	0.251
disposable y	varlog	-0.059	-0.304	-0.425*	-0.551**	-0.575***	-0.292	0.044

Table 38: Cross-correlations between government consumption inequality, the U.S. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	gini	0.122	0.007	-0.055	-0.077	-0.282	-0.171	0.074
consumption	p5010	-0.276	-0.424*	-0.463**	-0.425*	-0.292	-0.265	-0.060
consumption	p9050	0.131	0.041	-0.074	0.024	-0.136	-0.138	-0.010
consumption	varlog	-0.070	-0.233	-0.289	-0.261	-0.364	-0.228	0.038
earnings	gini	0.136	0.263	0.098	-0.014	-0.034	-0.240	-0.244
earnings	p5010	0.282	0.186	0.085	0.031	-0.061	-0.264	-0.347**
earnings	p9050	0.008	0.309*	0.248	0.074	0.103	0.068	0.094
earnings	varlog	0.193	0.202	0.129	0.036	-0.080	-0.276	-0.305*
hours work	varlog	0.249	0.232	0.133	0.090	0.041	-0.184	-0.278
hourly wage	gini	0.158	0.441**	0.315*	0.185	0.164	0.025	-0.041
hourly wage	p5010	0.028	0.268	0.312*	0.299*	0.305*	0.415**	0.335*
hourly wage	p9050	0.038	0.262	0.307*	0.161	0.024	-0.084	0.035
hourly wage	varlog	0.159	0.457***	0.415**	0.333*	0.309*	0.249	0.207
gross y	gini	0.064	0.205	0.026	-0.140	-0.156	-0.218	-0.147
gross y	varlog	0.255	0.255	0.151	-0.002	-0.159	-0.385**	-0.407**
disposable y	gini	0.179	0.229	-0.049	-0.301	-0.359	-0.360	-0.249
disposable y	varlog	0.328	0.305	0.154	-0.093	-0.200	-0.359	-0.395*

Table 39: Cross-correlations between private consumption inequality, the U.S. (***): significant at 1% level; (**): significant at 5% level; (*): significant at 10% level.

inequality	index	t-3	t-2	t-1	t	t+1	t+2	t+3
consumption	gini	-0.066	-0.119	-0.329	-0.143	-0.033	0.197	0.319
consumption	p5010	-0.438*	-0.432*	-0.372	-0.414*	-0.148	0.113	0.528**
consumption	p9050	-0.024	-0.093	-0.325	-0.097	0.014	0.261	0.258
consumption	varlog	-0.309	-0.314	-0.483**	-0.297	-0.099	0.316	0.580***
earnings	gini	0.072	-0.070	-0.328*	-0.394**	-0.200	0.053	0.035
earnings	p5010	0.385**	0.236	-0.245	-0.679***	-0.642***	-0.218	0.168
earnings	p9050	0.117	0.050	0.043	-0.061	-0.183	-0.132	-0.214
earnings	varlog	0.178	0.006	-0.332*	-0.602***	-0.497***	-0.101	0.186
hours work	varlog	0.474***	0.291	-0.136	-0.574***	-0.693***	-0.355**	0.037
hourly wage	gini	0.032	-0.019	-0.089	0.065	0.206	0.110	-0.217
hourly wage	p5010	-0.056	0.066	0.208	0.279	0.174	0.107	-0.130
hourly wage	p9050	0.110	-0.219	-0.332*	-0.147	0.030	0.019	-0.004
hourly wage	varlog	-0.012	-0.082	-0.064	0.200	0.352**	0.207	-0.166
gross y	gini	0.169	-0.059	-0.436**	-0.411**	-0.153	0.195	0.177
gross y	varlog	0.229	0.001	-0.329*	-0.618***	-0.523***	-0.135	0.156
disposable y	gini	0.255	-0.001	-0.514**	-0.508**	-0.421*	-0.241	-0.108
disposable y	varlog	0.321	-0.031	-0.430*	-0.550**	-0.533**	-0.422*	-0.204

Table 40: Granger-causality (GC) tests. Legend: "ALL", all inequality series; "ALL (...)" all inequality series but the ones in parenthesis; "n.a." not available; "yd" disposable income; "hw" hours of work; "e" earnings; "c" consumption; "w" wages.

Country	CPI GCs inequality	Inequality GCs CPI
CAN	ALL	ALL (varlog yd)
GER	P5010, P9050 yd	ALL (yd)
GBR	varlog hw, gini e, varlog e, P5010 e	ALL (P5010 e)
NED		ALL
SWE	yd	e
USA	hw, P9050 e	yd, c

Country	GDP GCs inequality	Inequality GCs GDP
CAN		ALL
GER	gini y, gini hw, wages	wages, varlog hw
GBR	hw, e	
NED		ALL
SWE	ALL	yd
USA	yd, c (P5010)	ALL (w, gini y)

Country	Priv. consumption GCs inequality	Inequality GCs priv. consumption
CAN	varlog y and varlog earnings	ALL (varlog earnings)
GER	n.a	n.a
GBR	hw, gini e	
NED	pola yd and gini yd	ALL (pola yd)
SWE	e	yd
USA	hw, gini y, yd, P5010 e, c (P5010)	hw, P5010 e

Country	Gov. consumption GCs inequality	Inequality GCs gov. consumption
CAN	e	varlog y, varlog hw
GER	wages, gini hw, gini y and gini yd	wages
GBR	varlog w, varlog e	
NED	ALL	gini yd, theil yd
SWE		
USA	gini e, yd	gini e, c (P5010)

Country	Share prices GCs inequality	Inequality GCs share prices
CAN		ALL
GER	varlog e, gini y, varlog yd, P9050 yd	varlog hw P5010 hw, P9050 e
GBR	ALL (P5010 e)	gini e, P5010 e
NED	gini yd, theil yd	
SWE		yd
USA	P9050 e, gini c	P5010 w, varlog c

Country	Unemployment GCs inequality	Inequality GCs unemployment
CAN		ALL
GER	gini hw, P5010 hw, P9050 yd, P5010 yd	ALL (gini hw, P9050 yd, P5010 yd)
GBR	hw, gini e, varlog e	ALL
NED		gini yd, theil yd
SWE	e	yd
USA	varlog hw, varlog yd	ALL (w)