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Inequality and the finance you know: does economic literacy matter?

Anna Lo Prete*

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Abstract

This paper documents that income inequality grows less where economic literacy is higher. In a sample of advanced and developing countries, people's ability to use financial markets and their instruments is robustly and significantly associated to a reduction in income across countries and over time. The direct association between financial development and inequality usually referred to as the "finance-inequality nexus", instead, is not significant, suggesting that a dimension of access to financial markets that matters to the reduction of income inequality, and is not captured by quantitative measures of financial development, is the one related to the ability to use financial instruments and to deal with financial market complexity that indicators of *economic literacy* proxy for.

Keywords: income inequality, financial development, economic literacy.

JEL Classification: A2, I3, O1.

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1. Introduction

Understanding whether people are able to reap the benefits of a wide range of investment opportunities and improve their economic situation is an issue of obvious political and economic relevance. Earlier discussion on the importance of financial market improvements for income distribution focused on whether finance was good for the poor and explored the possibility that financial sector developments might help reduce income inequality by offering diversification opportunities to a larger group of people (Demirgüç-Kunt and Levine, 2009; Claessens and Perotti, 2007).

This paper documents that in a world where an increasing number of more or less complicated financial instruments is available, and where decisions about private savings' investment are increasingly demanded to individuals as a consequence of government retrenchment from economic activity, a dimension of access to financial markets that matters to the reduction of income inequality, and that seems not to be captured by quantitative measures of financial market development, is the one related to the ability to use financial instruments and to deal with financial market complexity that indicators of *economic literacy* proxy for.

The analysis proposed creates a bridge between the literature on the so-called "financeinequality nexus" and those studies that stress the relevance of economic literacy to financial market decisions. Its contribution is twofold. First, this paper builds a dataset that allows exploiting both cross-sectional and time series information on inequality data. In this respect, it differs from earlier studies on the relationship between finance and inequality that, following Dollar and Kraay (2002) to by Beck et al. (2007) who first offered a systematic study on the finance-inequality nexus, focused on cross-sectional information mainly, and restricted the use of panel data to annual analyses where business cycle effects were not controlled for, or to robustness checks where it was not possible to exploit the time dimension of the data. Here, the inclusion of time effects and the use of data averaged over four-year non-overlapping sub-periods allow controlling for any common trend in the variables of interest while eliminating the confounding effect of short-term fluctuations. Second, although the profession has recently recognized the potential effect of economic literacy as a source of unequal access to finance (Lusardi et al., 2013), the study of the impact of economic literacy on inequality is

a field yet amenable to research. This paper offers a broad analysis of the association between economic literacy, inequality, and financial development. It documents that financial development is not robustly associated to a reduction in income inequality in specifications that include economic literacy as an explanatory variable, nor in panel regressions where time effects control for common trends in the variables of interest. In a sample of advanced and developing countries observed over the 1980-2007 period, the ability to use financial instruments and deal with financial market complexity, measured by indicators of economic-specific competences, instead, is significantly and robustly associated to the variation in income inequality.

The paper is organized as follows. Section 2 reviews the literature. Section 3 describes the dataset and the empirical strategy. Section 4 presents descriptive evidence from the 1980-2007 cross-section. Section 5 reports the main findings from sub-period panel regressions, discusses their robustness, and considers alternative indicators of competence. Section 6 concludes.

2. Literature review

The study of the finance-inequality nexus has attracted significant interest in the literature. In theory, the effect of financial development on income inequality is ambiguous. On the one hand, the degree of income inequality related to the initial distribution of wealth may decrease if financial market deepening increases the economic opportunities available to the most disadvantaged groups of the society (Galor and Zeira, 1993). On the other hand, financial development can lead to an increase in income inequality if it benefits those who are already active in the market. As in Greenwood and Jovanovic (1990) who show that formal financial sector's improvements help the rich at early stage of development, and thus cause a widening of the wealth distribution across income groups (see also Summers et al., 1984, and Paukert, 1973). From an empirical point of view, in the 1990s empirical studies identified the variables responsible for inequality variation in a set of country-specific factors that vary slowly over time but are quite different across countries (Deininger and Squire, 1998; Li et al., 1998). Among the others, financial market imperfections are listed as factors that may

prevent the poor from investing in education and, hence, may contribute to make inequalities persistent as in Banerjee and Newman (1993).

Since the mid-2000s, empirical works have investigated more systematically the relation between inequality and finance. If in theory the effect of finance on inequality is ambiguous, at the aggregate level empirical findings are unanimous in suggesting that inequality decreases where financial systems deepen (Demirgüç-Kunt and Levine, 2009). The influential paper by Beck et al. (2007) shows that financial market development and the growth of income inequality are negatively associated when the data are averaged over the 1960-2005 cross-section. This empirical finding is consistent with the growth model by Galor and Moav (2004) whereby changes in inequality depend on human capital accumulation that in turn is affected by credit constraints. Complementary evidence in Clarke et al. (2006) points to a negative association between finance and inequality, indicating that the level of income inequality is lower in countries where private credit is higher between the 1960s and the mid-1990s.

The literature on the finance-inequality nexus reviewed so far suggests that financial sector's frictions can contribute to the persistence of inequality when people face constraints in investing in human and physical capital. This makes it important to understand why access to finance may be unequal.

As summarized by Claessens and Perotti (2007), limited participation in financial markets may arise because of several reasons: fixed transaction costs, entry regulations, political channels whereby elites exercise their influence over a country's institutional environment and oppose reforms and financial market deepening (see also Honohan, 2006; Rajan and Zingales, 2003). To add to this literature, this paper focuses on another potential source of unequal access to finance, *economic literacy*, defined as the ability to understand basic economic concepts about individual financial decisions and the functioning of a modern economy, and argues that economic literacy may be an important dimension of access to financial markets that quantitative measures of financial market development do not capture.

The importance of economic literacy as a determinant of the willingness to participate in financial markets has been recognized by a recent set of works focusing on the role of economic-specific competences. In these papers, the lack of knowledge of basic

economic principles prevents people from taking proper financial decisions and from reaping the benefits of financial markets' development (Lusardi and Mitchell, 2014).

The evidence from country studies indicates that people with low economic competence are less likely to access financial markets and invest in stocks. For instance, Guiso and Jappelli (2008) show that in Italy the degree of portfolio diversification is higher among individual investors that have a better understanding of basic economic subjects. Van Rooij et al. (2011) document that in the Netherlands financial sophistication is associated to higher participation in stock markets. Lusardi and Mitchell (2007) and Caliendo and Findley (2013) find that people with higher levels of financial literacy are able to accumulate more wealth and plan for retirement. Cross-country evidence conveys a similar message. As financial products become more complex, and governments enact policies that favor financial market liberalization and that demand decisions about the allocation of private savings to individuals, people need specific knowledge of financial instruments to benefit from investment opportunities and address financial difficulty in terms of, for example, taking on loans with excessive interest rates in mortgage and consumer credit markets (see Jappelli, 2010, and the references therein).

Although the profession has recently recognized the potential effect of economic literacy as a source of unequal access to finance, the study of the impact of economic literacy on inequality is a field yet amenable to research.

The idea that economic-specific competence may be relevant to income distribution finds theoretical support in Lusardi et al. (2013) who demonstrate in a calibrated model that endogenous accumulation of financial knowledge over the life cycle can generate wealth inequality in a stochastic environment. Preliminary evidence on the relevance of this topic at the macroeconomic level is provided by Lo Prete (2013) who shows that economic literacy might have been a relevant omitted variable in Beck et al. (2007) study on the finance-inequality nexus by performing cross-country regressions on their data.

As discusses in the introduction, this paper offers a broad investigation on the relationship between financial development, income inequality growth, and economic competence across countries. It tests empirically if economic literacy is relevant to the finance-inequality nexus, and shows that the finding of a negative association between financial development and income inequality, that previous empirical studies established

as an empirical fact, is not robust to the inclusion of indicators of economic-specific competence.

3. Data and empirical strategy

The empirical analysis is run using a dataset that allows exploiting both cross-sectional and time series information on inequality data, financial development, and economic literacy. Differently from previous studies on the relationship between finance and inequality that focused on cross-sectional information mainly (Dollar and Kraay, 2002; Beck et al., 2007; Lo Prete 2013), in this paper the inclusion of time effects and the use of data averaged over four-year non-overlapping sub-periods will allow controlling for any common trend in the variables of interest and eliminating the confounding effect of short-term fluctuations. This section describes the dataset, defining the compilation strategy and the variables, and presents the empirical strategy.

3.1. Data on inequality, finance, and literacy

To perform the empirical analysis, this paper compiles a dataset that allows exploiting both cross-sectional and time series information on inequality data, and that includes countries for which information on income inequality, financial development, and economic competences is available. To characterize the variation in the relevant variables that is not related to business cycles effects or temporary shocks, data are in averages over the 1980-2007 period for the cross-sectional analysis, and over seven nonoverlapping sub-periods of 4 years each for the panel analysis. The compilation strategy and the variables are defined as follows.

Data on income distribution are drawn from the UNU-WIDER World Income Inequality Database (version 2.0c, May 2008), a source of information which updates the World Bank database by Deininger and Squire (1996), and which includes new estimates from the Luxembourg Income Study and from the TransMONEE. The data in the World Income Inequality Database differ in many respects: coverage of the survey, quality of the data, unit of analysis, income definition. The sample analyzed in this paper is restricted according to the following compilation strategy. First, preference is accorded to the most recently updated data and to data of high quality (i.e. to the "reliable" or "most reliable" category). Next, following the recommendations of the Canberra Group, that developed

international guidelines to improve comparability of national income statistics, the basic statistical unit of analysis considered is the household.¹ To arrive to a set of distributional measures referring to income net of taxes and transfers, preference is given to disposable income data; where these data are not available, to gross income; to consumption welfare measures, otherwise. The resulting sample includes 1087 observations for 119 countries. Table 1 shows their distribution by income definition and by unit of analysis, a category that indicates whether the household is considered independently of its size or if person weights are applied. To account for differences in measurement between various welfare definitions, the adjustment procedure by Dollar and Kraay (2002), that involves regressing the Gini coefficients on a series of area dummy variables and then subtracting the mean difference between groups, is applied (results are in Table 2).

The "growth of Gini" variable is then defined as the growth rate of the Gini coefficient. In the cross-sectional analysis this variable is computed following Beck et al. (2007) as the log difference between the last and the first observation available in the 1980-2007 sample, divided by the number of years between the two. For the sub-period panel analysis, yearly data are interpolated if missing, and income inequality growth is the log difference between the last and the first observation in each four-year sub-period for which the information is available. Countries are included in the dataset if there are more than 10 years between the first and last observation for the Gini coefficient, thus excluding countries for which only one country-level observation is available. With respect to previous empirical works on the finance-inequality nexus, this procedure has the non-negligible advantage of considering equal length non-overlapping sub-periods. Since the seminal paper by Dollar and Kraay (2002) up to Beck et al. (2007), indeed, sparse income observations were included in the sample if distant at least five years from each other. As discussed in the Introduction, this choice, while motivated by a focus on cross-sectional information mainly, implied using panel datasets where uneven and

¹ The unit of analysis indicates if income inequality data are based on actual observation of individual units, drawn from household surveys ("household"), or on national statistics ("person"). The choice of the "household" statistical unit of analysis is preferred in international comparisons because estimates drawn from national statistics rely on strong assumption regarding patterns of inequality across countries or over time that cannot be tested if such information is included in the data set, and that are normally used only when household surveys are not available (for a detailed discussion, see e.g. Deiniger and Squire, 1996).

across-countries overlapping sup-periods did not allow studying the effect of common trends in the variables of interest.

"Financial development" is measured by the ratio of private credit by deposit money banks and other intermediaries to GDP, provided by the World Bank. This variable accounts for the amount of financial resources that savers provide to the private sector through domestic money banks, that is commercial banks and other financial institutions that accept transferable deposits, and excludes credit to the public sector and stateowned firms, as well as central bank assets. As discussed in Beck et al. (2007), the private credit to GDP ratio is the best proxy of the amount of resources made available by savers to the private sector and, thus, captures the cross-country variations in financial development that matter while studying access to finance by individual investors.

"Economic literacy", defined as the ability to understand basic economic concepts about individual financial decisions and the functioning of a modern economy, is a well-defined concept, and is measured by indexes that differ from more general indicators of human capital (such as general schooling). Economic literacy indexes are indeed based on the evaluation of the ability to solve problems that involve simple questions about interest rates on a saving accounts and risk-diversification. The measure of economic competence used in the main specifications is the indicator of "economic literacy among the population" compiled by the IMD World Competitiveness Yearbook. This summary indicator of economic knowledge measures economic literacy in 55 countries over the 1995-2008 period on the basis of interviews to senior representatives of the national business community who are asked to evaluate whether the level of economic literacy among the population is high on a 1-10 scale. The so-built indicator of economic literacy allows to measure economic-specific competences. Indicators of other dimensions of competence, which refer to narrower sets of skills, such as financial literacy, as well as to educational achievement on mathematics and to general schooling, will be introduced in Section 5.

Once data on income inequality, financial development, and economic literacy, are merged, the sub-period panel dataset used in this paper includes a total of 154 observations covering the 34 countries listed in Table A.1.

3.2. Empirical strategy

Turning to the empirical specification, the relationship between finance, inequality, and literacy, is examined using reduced-form models similar to the ones considered in the seminal paper by Beck et al. (2007), to allow for a comparison of previous and new results. In regressions that read

$$y_{i,t} = \alpha y_{i,t-1} + \beta F D_{i,t} + \gamma E C_i + \delta X_{i,t} + \varepsilon_{i,t} , \qquad (1)$$

and that can be written as

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta F D_{i,t} + \gamma E C_i + \delta X_{i,t} + \varepsilon_{i,t} , \qquad (2)$$

where $y_{i,t}$ is the logarithm of the Gini coefficient in country *i* over period *t*, the growth rate of the Gini coefficient (i.e. $y_{i,t} - y_{i,t-1}$) is regressed on its initial value, $y_{i,t-1}$, the level of financial development, $FD_{i,t}$, the level of economic competence, EC_i , and a set of control variables, $X_{i,t}$. Explanatory variables are in averages over the period that is covered by the dependent variable, except for the initial level of the Gini coefficient that measures the level of inequality at the beginning of the period, and in logarithm when expressed in levels.

Since economic competence is measured by indicators that have little or none time variation, economic literacy and other indicators of competence are time-invariant in the main specifications of the analysis to follow.² The results in Section 5 show that empirical specifications with time-invariant competence indicators capture most of the information in the data because the relative position of countries has not changed much over the period considered. The time-varying version of this indicator will be introduced, anyway, as a robustness check later on in the paper.

The next section presents descriptive evidence from estimating model (2) by running OLS regressions on the 1980-2007 cross-section. Next, the sub-period panel analyses in Section 5 considers if the same results hold when accounting for common trends in the variables of interest, and addresses potential endogeneity issues by means of instrumental variables (IV) techniques.

² The indicator of economic literacy among the population was compiled for the first time in 1995 for 45 countries. Afterwards, the number of countries included in the survey increased up to 55 in 2008. The choice of using the country-level 1995-2007 average (as in Jappelli, 2010) allows to use the maximum number of observations available for the cross-sectional analysis. The results presented in Sections 4 and 5 are robust to measuring economic literacy as the value in the last year of the sample (i.e. 2007).

4. Descriptive evidence from the 1980-2007 cross-section

Before showing the results from sub-period panel regressions, this section examines the long-term properties of the sample. Over the 1980-2007 period, income inequality has increased more in transition economies and in countries where volumes of private credit were higher on average, such as Japan and some Anglo-Saxon countries, than in developing economies and in many Continental European countries. The downward sloping regression fit line in Figure 1 suggests that there is a negative and significant relationship between financial development and income inequality growth, consistently with what found in previous studies by Beck et al. (2007) and other authors.

Figure 1 also includes information on economic literacy, by weighting country markers by the level of economic literacy, a bigger circle indicating a higher value of economic literacy among the population. Interestingly, financial development and economic literacy seem to capture different dimensions of the "finance" side of the financeinequality nexus under analysis. For instance, advanced countries where economic literacy is high may display low income inequality growth even if they have on average a lower level of financial development with respect to similar economies, as it is the case of Denmark and Finland. And vice versa, it is possible to find examples of economies where high inequality growth is associated with high financial market development but low economic literacy, as it is the case of Portugal and Great Britain - both countries record levels of economic literacy below the sample average.

The descriptive evidence in Figure 1 may be suggestive of more general empirical regularities that go beyond the finance-inequality nexus in what may be considered its "narrower" definition, that is, beyond the association between financial market development and income inequality growth. It is interesting to recall that while in the period before the 2007-08 financial crisis financial market volumes grew considerably and credit constraints eased within countries (Bertola and Lo Prete, 2009), inequality growth and the level of economic literacy differed quite substantially across both developed and developing countries (Jappelli, 2010).

The empirical analysis to follow will test whether the heterogeneity in the level of economic-specific competences, as a proxy for the heterogeneity in the ability to access and use financial markets, might provide insights on the theoretically ambiguous but

empirically well-established finance-inequality nexus, also controlling for the possibility that the relationships under analysis could be driven by several underlying factors. As additional descriptive evidence, Table 3 presents results from estimating model (2) by running OLS regressions on the 1980-2007 cross-section, leaving to the time series analyses in Section 5 the task to control for common trends in the variables of interest and for potential endogeneity issues.

The results in Table 3 indicate that the negative and significant association between income inequality growth and financial development found in previous studies holds in empirical models that control for a few conditioning factors like the specification in column 1. But it is not robust to other specification changes. The coefficient of financial development is not precisely estimated in column 2, where indicators of trade openness, inflation, and GDP per capita growth account for the effect of macroeconomic conditions, and where demographic variables allow income inequality to depend on the age structure of the population.

This descriptive evidence suggests that in the sample under analysis the variation in financial development does not suffice in characterizing the variation in income inequality growth across countries. Interestingly, the same is not true for economic literacy. In column 3 of Table 3, the level of economic literacy is negatively and significantly associated to the growth of income inequality. Consistently with the evidence in Lo Prete (2013) and with the theoretical insights in Lusardi et al. (2013), these findings suggest that a relevant dimension of the finance-inequality nexus is the one related to the ability to access financial markets and use their instruments. Inequality growth is lower in countries where economic literacy is on average higher and allows people to benefit from more developed financial markets. In column 4, the same regression is run on the second half of the sample, that is, on the shorter 1996-2007 period. The results from this regression and from a variety of robustness checks (not reported) that control for the potential relevance of outliers, confirm the importance of the association between economic literacy and income inequality growth.³

³ Economic literacy is a significant determinant of income inequality also when the analysis is performed on a sample modified not to include Romania, or to include a dummy variable for transitions economies that in Figure 1 seem to be outliers, as well as in regressions run on the larger sample that include four countries that have less than 10 observations, namely, Colombia, Lithuania, Russia, and Turkey.

As regards other control variables, income inequality growth is lower in countries where the distribution of income is more skewed at the beginning of the period, as indicated by the negative and significant coefficient in front of the initial Gini level variable, and once the effect of economic literacy is controlled for in countries where there are more people aged below 15 or above 65 as a percentage of total population (column 3), and where prices grow more rapidly (column 4).

5. Empirical results from sub-period panel regressions

To consider the time series dimension of the phenomena under analysis, this section moves to a medium-term perspective and presents results from models where time dummies will control for common trends in the variables of interest, and that account for potential endogeneity issues. In all the panel analyses, annual data are averaged over seven non-overlapping sub-periods of four years each, to control for the effect, if any, of business cycle fluctuations and temporary shocks.

Pooled-OLS estimates in column 1 of Table 4 indicate that financial development is not significantly associated to income inequality growth when the specification includes the same set of control variables considered in Table 3. Income inequality grow is lower in countries that record a higher level of inequality at the beginning of each sub-period, and the positive association with the dependency ratio indicates that, once we consider the time dimension of inequality growth, the higher the percentage of people that are not included in the labor force, the higher the growth of the Gini coefficient. Turning to empirical models that include the indicator of economic literacy, the estimates of column 2 confirm the finding of a negative association between economic literacy and the variation of income inequality, and show that the association of financial development with income inequality growth is small and not precisely estimated.

The results may be biased by reverse causation if financial development responds endogenously to income inequality growth. To address the issue, financial development is instrumented following Jappelli (2010) and related literature, by the "legal origin" dummies defined by La Porta et al. (1999) and by the "strength of investor protection index" compiled by the Doing Business Project, that measures the strength of regulations meant to shelter minority shareholders against self-dealing and misuse of corporate

assets by directors. Second-stage results from IV estimation in column 3 of Table 4 are consistent with previous findings from the baseline model.⁴ Finally, to control for any potential bias which might arise from the inclusion of the level of Gini at the beginning of each sub-period among the explanatory variables in regressions where the dependent variable is the growth of the Gini level, in the last column of Table 4 the set of instruments includes the earlier two lags of the initial Gini level and the lagged dependent variable. Despite the loss of information due to the reduction of the sample size due to the inclusion of the lags of some variables, the results from the IV specification confirm the main findings from the empirical model in column 2: in all specifications economic literacy is significantly associated to the medium term variation in income inequality, and financial development is not directly associated to the growth of the Gini coefficient. Test statistics reported at the bottom of Table 4 indicate that the power of the instruments is high in both the IV models, the weak identification test recording a value higher than 10, and that the instruments are not correlated with the residuals.

While the identifying assumptions underlying each of the empirical model presented are of course debatable, it is interesting to find that the coefficients are not strongly affected by the estimation method, and formal tests fail to reject exogeneity. So, the next table report pooled-OLS estimates of models that consider further robustness checks.

The first two columns of Table 5 report results from specifications that include dummy variables that allow countries belonging to different groups to have different intercepts. Being an advanced country (column 1) or a transition economy (column 2) does not change the main results from previous analyses. The negative and significant association between economic literacy and inequality holds also in regressions including the interaction between financial development and economic literacy (column 3), and when an interaction term between the initial level of income inequality and the growth of GDP per capita over each sub-period accounts for the possibility that the initial distribution of income matters to aggregate income growth (column 4).

⁴ The strength of investor protection might have a direct impact on the dynamics of the income distribution if protection existed only for small groups of well-connected people (see Pagano and Volpin, 2005, and related literature). Results from IV regressions where the set of instruments includes legal origin dummies only confirm the findings on the relations of interest, as historical differences in legal systems may arguably capture well cross-country differences in legal protection (La Porta et al., 1997).

The results presented so far suggest that economic literacy, as an indicator of people's ability to use financial markets and their instruments, is negatively associated to a reduction of income inequality. The direct association between financial development and inequality usually referred to as the "finance-inequality nexus", instead, is not significant in the medium term nor in cross-sectional regressions controlling for the level of economic literacy. With such evidence at hand, the last section of the paper will consider alternative measures of "competence".

5.1. Alternative indicators of competence

The indicator of economic literacy allows to measure economic-specific competences. Of course, this might not be the only dimension of education relevant while assessing the relationship between inequality and finance. This section considers indicators that account for narrower sets of competence as well as for general schooling.

A more specific indicator of competence is the index of "education in finance". This measure, compiled by the IMD World Competitiveness Yearbook, refers to the (narrower) set of abilities needed to master financial subjects to the degree requested to work in private enterprises. Estimation results in the first column of Table 6 show that education in finance is negatively associated to inequality growth, but not significantly so at conventional levels. This might suggest that what matter most to the variation of income inequality at the aggregate level is the ability to understand basic economic concepts of the population in general, rather than the level of skills needed to perform more specific tasks while working in enterprises. Table 6 reports also results on the association between income inequality growth and more general and less subjective indicators of human capital, such as the level of schooling attainment. Using the data by Barro and Lee (2013) on secondary schooling attainment, the estimates in column 2 suggest that the level of human capital might not be crucial when it comes to operate on financial markets for consumption smoothing or households' portfolio diversification purposes. Next, the specification in column 3 of Table 6 considers the PISA test scores for mathematics, an OECD measure that records 15 years old pupils' educational achievement on mathematics. This variable is significantly and negatively associated to income inequality growth, maybe indicating that also being mathematically literate and

able to perform sums, subtractions, and more complex mathematics helps making wellfounded decisions in financial markets increasing people ability to benefit from them. The indicators of competence considered in this section refer to more or less specific sets of competence. Of course, their information content is to some extent overlapping. For instance, it may well be the case that countries where people can apply basic economic concepts years later school enrollment, also record high PISA scores, as suggested by the correlations reported in Table A.3 of the Data Appendix. Interestingly, results from the empirical models considered in Table 6, that include one indicator of competence at a time to avoid collinearity, indicate that they capture different dimensions of human capital accumulation with respect to economic literacy.

The last column of Table 6 reports results from the shorter sample for which time series information on the economic literacy indicator is available. Since the indicator of economic literacy was computed starting in 1995, regressions are run on the three subperiods for which full data are available (i.e. 1996-99, 2000-03, 2004-07). As discussed in Section 4, time series information on economic literacy does not to add much to the analysis, because the relative position of countries has not changed much over the period considered. Despite the loss of information due to the shorter time-span, the association between economic literacy and income inequality growth is still negative and significant in all specification, while the coefficient of financial development is not precisely estimated.⁵

In summary, the estimates in Table 6 may be interpreted as supportive of the argument that economic literacy plays a crucial role as a factor relevant to access to financial markets: people seem to need economic-specific knowledge to take advantage from the wide range of opportunities that increasingly complex financial markets are offering. Also being able to master mathematics may help increase the awareness needed to make everyday decisions correctly, and in turn play a role in explaining the variation of aggregate income distributions, while general education, as measured by schooling attainment, has not a significant explanatory power.

⁵ Results are robust to alternative ways of measuring time-varying economic-specific competences, e.g. as the last value of economic literacy in each sub-period, that would allow to run regressions on four sub-periods.

6. Conclusions

This paper contributes to the existing policy-oriented debate on the relationship between finance and inequality. Finding no correlation between financial development and income inequality growth conditional on controlling for economic literacy is an important finding. It suggests that economic-specific competences are a relevant dimension of access to financial markets that quantitative measures of financial market development do not capture.

Interestingly, the paper also tests in the role of indicators of competence more general measures of human capital, and shows that it's not general schooling but economic literacy and, to a lower extent, the ability to perform mathematical computations that matters for the mechanisms under analysis. This is consistent with the idea that to understand and exploit financial market's opportunities people need to acquire economic-specific competences (Lusardi and Mitchell, 2014).

The macroeconomic analysis of the determinants of the finance-inequality nexus proposed in this work may offer food for thought to the recent debate on the relevance of policies meant to improve economic literacy among the population. Over the last decades, the data suggest that income inequality has decreased in countries where the level of economic literacy was higher, while its association with financial market development seems more ambiguous. Thus, finance is important to understand the variation in income distribution along a dimension that goes beyond the quantitative aspect of financial deepening, and that is related to what people know about economics and finance.

The analysis has interesting normative implications. If aggregate income inequality does not decline in the availability of more complex and sophisticated financial instruments per se, but in the ability to understand and use them, for education policies to help reduce inequality, financial markets deepening should be accompanied by an increase of economic competence among the population. This is all the more true in a world where households are exposed to risk taking behavior by banks and financial intermediaries, and government finds it increasingly difficult to protect individual investor (Eichengreen, 2015). In future work, as new data will became available, it would be interesting to further qualify these findings and assess the effect of economic literacy on a larger

sample of countries at different stages of financial development, and to investigate the effect, if any, of the recent 2008 financial turmoil on the relationships between finance, inequality, and economic literacy uncovered in this paper.

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Data Appendix

Inequality. Data on inequality are drawn from the UNU-WIDER World Income Inequality Database (version 2.0c, May 2008).

Finance. Financial development is the "Private Credit by Deposit Money Banks and Other Financial Institutions to GDP" from the World Bank "Financial Development and Structure Database" (Beck and Demirgüç-Kunt, 2009).

Competence. The World Competitiveness Yearbook compiles indexes of economic competence on the basis of interviews with senior business leaders. The "economic literacy among the population" index ranges from 0 to 10, lower values indicating that the level of competence in economics subjects is low. It is available for 55 countries over the 1995-2008 period. The "education in finance" index ranges from 0 to 10, lower values indicating that the level of competence in financial subjects does not meet the needs of the enterprises. It is available for 55 countries over the 1999-2008 period. Data on "schooling" are drawn from the "Education Attainment for Total Population, 1950-2010" database by Barro and Lee (2013), and refer to the percentage of people with secondary school attainment over the population aged 15 years-old or later. "PISA score" is the mean value of the PISA indicator that assesses 15-year-olds' performance in mathematics in 2006, compiled by the OECD.

Control variables. "Trade openness" is the ratio of export plus imports to GDP by the Penn World Tables (issue: June 3, 2011). "Inflation" is the annual percentage growth of the GDP deflator from the World Bank's World Development Indicators online (issue: April 17, 2012). "GDP per capita growth" is the annual growth rate of GDP per capita from the IMF online database. "Population growth" is the annual growth of population, computed using data from the Penn World Tables, Version 6.3 (Heston et al., 2009)."Dependency ratio" measures the number of people aged below 15 and above 65 as a percentage of the total population, and is drawn from the World Bank's World Development Indicators.

Instrumental variables. Investor protection is measured by the "strength of investor protection index" compiled by the Doing Business Project. It includes information on the extent of disclosure, the extent of director liability, and ease of shareholder suits indices, and ranges from 0 to 10, a higher value indicating stronger investor protection. Dummy

variables for "legal origin" define five legal-origin groups as in La Porta et al. (1999): English Common Law; French Commercial Code; German Commercial Code; Scandinavian Commercial Code; Social/Communist Laws.

Country	Obs.	Country	Obs.
Austria	3	Luxembourg	5
Belgium	7	Malaysia	2
Brazil	2	Mexico	5
Bulgaria	4	Netherlands	4
Czech Republic	4	New Zealand	4
Denmark	7	Norway	4
Finland	7	Philippines	3
France	7	Poland	5
Germany	4	Portugal	3
Greece	3	Romania	3
Hungary	7	Slovak Republic	4
India	5	Slovenia	4
Indonesia	3	Spain	6
Ireland	7	Sweden	4
Israel	5	Thailand	5
Italy	5	United Kingdom	7
Japan	2	United States	4

Table A.1Information, by country

Table A.2

Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Мах
Growth of Gini	154	0.01	0.07	-0.26	0.23
Financial development	154	68.69	39.64	8.03	178.37
Economic literacy	154	5.10	1.22	2.93	7.11
Trade openness	154	79.78	46.68	12.26	297.39
Inflation	154	20.44	110.42	0.30	1328.69
GDP per capita growth	154	2.56	2.20	-7.34	9.65
Population growth	154	53.07	8.85	39.58	84.22
Dependency ratio	154	0.01	0.16	-1.04	1.07
Education in finance	154	5.93	1.21	3.93	8.02
Schooling	154	44.74	12.13	18.31	68.38
PISA score	132	489.98	35.86	370.50	548.50
Investor protection index	154	6.15	1.45	3.30	9.70

Notes: This table shows descriptive statistics for the variables used in the analysis. They refer to the underlying 4-year average of the data (not to the transformations used in the regressions, namely the log of financial development, trade openness, and indicators of competence).

Table A.3

	Economic literacy	Education in finance	Schooling	PISA score
Economic iteracy	1			
Education in finance	0.86	1		
Schooling	0.30	0.15	1	
PISA score	0.63	0.50	0.50	1

Correlations between indicators of competence

Descriptive statistics on sources of income inequality data					
		Unit o	of analysis		
		Person	Household	Total	
	Disposable income	474	168	642	

			200	• · =
Income definition	Gross income	104	120	224
	Consumption	210	11	221
	Total	788	299	1087

Adjustments to Gini coefficients

Dependent variable: Gini coefficient		
	Coefficient	Standard error
Gross income dummy	5.870***	(1.242)
Consumption dummy	-0.861	(1.118)
East Asia	10.915***	(1.269)
East Europe and Central Asia	2.514***	(0.816)
Middle East and Nord Africa	7.631***	(1.616)
Latin America and Caribbean	23.508***	(0.821)
South Asia	4.730***	(1.614)
Sub-Saharan Africa	15.657***	(2.661)
Constant	29.381***	(0.251)

Notes: Robust standard errors from pooled OLS regressions in parenthesis, (*) (**) (***) denote significance at the (10) (5) and (1) percent level.

Cross-sectional evidence

	Dependent variable: Growth of Gini			
	(1)	(2)	(3)	(4)
Cross-section:	1980-2007	1980-2007	1980-2007	1996-2007
Economic literacy			-0.010*	-0.009**
			(0.005)	(0.004)
Financial development	-0.005**	-0.004	-0.001	-0.000
	(0.002)	(0.002)	(0.003)	(0.003)
Initial Gini level	-0.013***	-0.022***	-0.027***	-0.028***
	(0.004)	(0.007)	(0.007)	(0.006)
Trade openness		-0.003	-0.003	-0.001
		(0.002)	(0.003)	(0.003)
Inflation		0.000	0.000	0.000*
		(0.000)	(0.000)	(0.000)
Dependency ratio		0.000	0.000*	0.000*
		(0.000)	(0.000)	(0.000)
Population growth		-0.018	-0.023	0.012
		(0.021)	(0.020)	(0.018)
GDP per capita growth		0.000	0.000	0.000
		(0.001)	(0.001)	(0.001)
R-squared	0.353	0.449	0.490	0.486
Observations	34	34	34	34

Notes: Robust standard errors from OLS regressions in parenthesis, (*) (**) (***) denote significance at the (10) (5) and (1) percent level.

Main results

	Dependent variable: Growth of Gini			
	(1)	(2)	(3)	(4)
	P-OLS	P-OLS	IV	IV
Economic literacy		-0.078**	-0.102**	-0.102*
		(0.038)	(0.048)	(0.057)
Financial development	0.001	0.017	0.030	0.007
	(0.010)	(0.012)	(0.020)	(0.024)
Initial Gini level	-0.137***	-0.182***	-0.199***	-0.239***
	(0.034)	(0.039)	(0.046)	(0.054)
Trade openness	-0.014	-0.007	-0.005	(0.014
	(0.010)	(0.011)	(0.011)	(0.018)
Inflation	0.000	0.000*	0.000**	-0.001
	(0.000)	(0.000)	(0.000)	(0.003)
Dependency ratio	0.002***	0.003***	0.003***	0.002
	(0.001)	(0.001)	(0.001)	(0.002)
Population growth	0.013	-0.003	-0.009	2.332*
	(0.029)	(0.028)	(0.026)	(1.366)
GDP per capita growth	0.004	0.005*	0.005*	0.003
	(0.003)	(0.003)	(0.003)	(0.004)
R-squared	0.123	0.151		
Over-ident. restrictions			2.193	4.608
			[0.70]	[0.10]
Endogeneity test			0.586	0.001
			[0.44]	[0.97]
Weak identification test			20.87	400.52
Observations	154	154	154	84

Notes: All specifications include time effects. Robust standard errors in parenthesis, (*) (**) (***) denote significance at the (10) (5) and (1) percent level. Statistics (p-values in square brackets) computed by the ivreg2 (Baum et al. 2007) Stata module: test of over-identifying restrictions, under the null that all instrumental variables are orthogonal to the second-stage error term; endogeneity test, under the null that the specified endogenous regressors can actually be treated as exogenous; the weak identification test refers to the Kleibergen–Paap Wald rk F statistic, robust to non-i.i.d. errors.

Table 5Robustness checks

	Dependent variable: Growth of Gini			
	(1)	(2)	(3)	(4)
Economic literacy	-0.073*	-0.076**	-0.264*	-0.267*
	(0.039)	(0.037)	(0.155)	(0.155)
Financial development	0.020	0.019	-0.048	-0.044
	(0.013)	(0.016)	0.048	(0.047)
Initial Gini level	-0.192***	-0.181***	-0.190***	-0.139***
	(0.041)	(0.042)	(0.040)	(0.042)
Trade openness	-0.007	-0.008	-0.005	-0.003
	(0.011)	(0.011)	(0.011)	(0.011)
Inflation	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Dependency ratio	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Population growth	-0.005	-0.003	-0.006	-0.006
	(0.029)	(0.028)	(0.028)	(0.027)
GDP per capita growth	0.004	0.005*	0.005*	0.094**
	(0.003)	(0.003)	(0.003)	(0.037)
Advanced	-0.017			
	(0.021)			
Transition		0.004		
		(0.026)		
Financial dev.*Economic literacy			0.045	0.044
			(0.034)	(0.034)
Initial Gini * GDP per capita growth				-0.026**
				(0.011)
R-squared	0.154	0.151	0.161	0.187
Observations	154	154	154	154

Notes: All specifications include time effects. Robust standard errors from pooled OLS regressions in parenthesis, (*) (**) (***) denote significance at the (10) (5) and (1) percent level.

Table 6Alternative measures of competence

	Dependent variable: Growth of Gini			
	(1)	(2)	(3)	(4)
	Education in finance	Schooling	PISA score	Time varying economic literacy
Competence indicator	-0.063	-0.034	-0.281*	-0.115**
	(0.043)	(0.023)	(0.158)	(0.050)
Financial development	0.010	-0.000	0.014	0.006
	(0.012)	(0.010)	(0.013)	(0.018)
Initial Gini level	-0.173***	-0.154***	-0.210***	-0.309***
	(0.040)	(0.037)	(0.048)	(0.074)
Trade openness	-0.011	-0.010	-0.020	-0.018
	(0.010)	(0.010)	(0.015)	(0.022)
Inflation	0.000*	0.000	0.000	0.004*
	(0.000)	(0.000)	(0.000)	(0.002)
Dependency ratio	0.003***	0.002**	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.002)
Population	0.008	0.012	0.020	4.468**
	(0.026)	(0.032)	(0.034)	(1.910)
GDP per capita growth	0.004	0.003	0.005	0.001
	(0.003)	(0.003)	(0.004)	(0.005)
R-squared	0.141	0.136	0.155	0.280
Observations	154	154	132	71

Notes: All specifications include time effects. Robust standard errors from pooled OLS regressions in parenthesis, (*) (**) (***) denote significance at the (10) (5) and (1) percent level.

Figure 1 Financial development and inequality growth



Notes: Linear regression fit: partial correlation coefficient = -0.005, standard error = 0.003, t-statistic = -2.04. Country markers are weighted by the level of economic literacy, a bigger circle indicating a higher level of economic literacy.