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Income Inequality, Finance, and Space: A Cross-Country Analysis

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To extend the controversial literature on the finance-inequality nexus, we examine the determinants of income inequality in 131 developed and developing economies, in the period 1991–2017. We consider a wide range of variables associated with domestic financial development, banking crises, and financial globalization, including financial secrecy and offshore wealth. In addition, we examine whether the spatial centralization of the financial sector is associated in any way with income inequality. The results show that the larger the size of the financial sector in a country, the higher the level of inequality. Financial globalization, in all its facets, also appears to contribute to inequality. These findings are particularly robust for developed economies. Our analysis also shows that aspects of finance aggravating inequality are positively associated with the degree of geographical centralization of the financial sector.

1. INTRODUCTION

Income inequality has emerged as one of the most important economic topics of the last decade, and one that has sparked much controversy. While critical appraisals of inequality have long been central to the agenda of political economy and philosophy, it is mainly since the 1990s, and particularly since the global financial crisis, that the topic has attracted a wider academic interest (Atkinson 1997). In their review of literature on the spatial dimensions of income inequality, Cavanaugh and Breau (2017) show that in 2014 there were fifteen times more peer-reviewed articles published on income inequality than in 1990. The financial system, sector, or markets, however, do not feature among the top twenty topics covered in the literature on the drivers of inequality.

This paper investigates the finance and inequality nexus. Understanding the relationship is crucial for understanding the economy, and yet the existing literature is far from reaching a consensus about the sign and strength of the relationship or the underlying causal mechanisms. While mainstream economics tends to argue that finance reduces income inequality, heterodox approaches stress how finance can aggravate inequality, and empirical studies, even those within mainstream economics, show mixed results. We contribute to this literature by examining the determinants of household income inequality in 131 developed and developing economies, in the period 1991–2017.

Traditional econometric studies tend to focus on the overall size of the financial sector, typically measured as ratio of credit to GDP (e.g., Beck, Demirgüç-Kunt, and Levine 2007). Our study goes beyond this approach, treating finance as a multifaceted and complex system. To this end, we consider a coherent package of variables, accounting for domestic financial development; episodes of financial crises; cross-border inflows of short term–oriented capital; financial deregulation; degree of financial secrecy; and volume of offshore-held wealth.

The latter four variables are associated with financial globalization. We consider cross-border capital flows and financial deregulation as proxies for de facto and de jure financial globalization, respectively (distinction originally drawn by Jaumotte, Lall, and Papageorgiou 2013). Financial secrecy and offshore-held wealth are also inherently linked with de facto financial globalization, given the international nexus that ties together financial and advanced business services (FABS) firms, financial centers, and offshore jurisdictions (Wójcik 2012).

Building on the above analysis, we also reflect on the spatial structure of the financial system and the possible implications for income inequality. Finance has long been documented as a sector with a strong tendency for spatial concentration, as shown by a large literature on financial center development (e.g., Hall 2018; Wójcik, Knight, and Pažitka 2017; Pumain and Rozenblat 2018; Cook et al. 2007). An open, and largely underinvestigated, question is

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whether this observation impacts the relationship between finance and inequality. Our discussion follows an interdisciplinary approach, blending together insights from financial and economic geography and economics.

Our results, obtained through panel data analysis, show a positive and statistically significant relationship between the size of the financial sector and income inequality, measured with market-income Gini coefficient. All else the same, the larger the size of the financial sector in a country, the higher the level of inequality. In the case of developed economies, we also find significant and positive results for net inflows of short term–oriented capital, the latter approximated by flows classified as "portfolio investment" and "other investment" by the International Monetary Fund (IMF). For these countries, episodes of banking crises also appear with a positive sign and are statistically significant. This is to be expected given the inclusion of the US and Eurozone crises of circa 2007–2012 in our sample. Our index of financial deregulation is positive and significant, both for developed and developing economies, in line with earlier evidence provided by de Haan and Sturm (2017). The financial secrecy index, as measured by the Tax Justice Network, is significant too, suggesting that opaque financial systems tend to relate to high levels of inequality. Offshore-held wealth, measured as a share of GDP, is insignificant for our full sample but significant at a 10 percent level for developed economies.

Our analysis further suggests that the spatial structure of a country's financial system relates indirectly to income inequality. Specifically, the degree of geographical centralization of the financial sector appears to be positively associated with the overall size of the financial sector, the level of financial openness, the volume of offshore-held wealth, and the extent of financial deregulation. While exploratory, such findings seem to suggest that financial geography ties together several significant aspects of the finance-inequality nexus.

Our paper proceeds as follows: in the next section, we introduce literature on finance and inequality. Section 3 discusses data and methodology, and section 4 presents our results. Section 5 provides a set of reflections on the relevance of spatial centralization of finance, before conclusions in section 6.

2. FINANCE AND INCOME INEQUALITY

Research on finance and inequality is part of the broader literature on finance and development. In general, it is expected that financial development enhances economic growth by improving access to financial resources and their allocation (Demirguc-Kunt and Levine 2008). However, more recent studies indicate that at high levels of financial development, its further increase may harm economic growth through inefficient rent seeking (Arcand, Berkes, and Panizza 2015). The inverted U–shaped relationship between finance and growth has been documented at both the national and the subnational level (Ioannou and Wójcik 2020).

As finance affects growth, the question is how it affects the distribution of income in society. Here, Kuznets (1955) also proposes an inverted U–shaped relationship, whereby an increase in inequality accompanying economic growth, and early urbanization associated with it, is followed by a decline in inequality. As incomes and urbanization advance, migrants from rural to urban areas and their descendants obtain better access to economic opportunities, including access to finance. Piketty (2014), on the other side, observes an S-shaped relationship in historical data for the United States, with inequality initially rising and falling, as suggested by Kuznets, but then rising again since the 1980s.

The logic of finance as a resource with positive impact on development underpins mainstream economic theory linking finance and inequality. Banerjee and Newman (1993) and Galor and Zeira (1993) predict that financial development reduces inequality, as better credit availability makes households less dependent on inherited wealth and gives them opportunities to develop human capital—for example, through education and a chance to start a business. Greenwood and Jovanovic (1990), however, suggest an inverted U–shaped relationship, as access to finance comes at a fixed cost, and so a certain level of development is needed for access to finance to widen and have its impact on reducing inequality. In related research, Demirguc-Kunt and Levine (2008) highlight two opposing forces at work. On the one hand, availability of credit to those without prior access should reduce inequality, but on the other hand, the development of financial services catering to the needs of those who already had access to finance can aggravate inequality.

Further arguments against a positive impact of financial development on reducing inequality can be found in heterodox economics and interdisciplinary studies of financialization, including contributions by geographers (e.g., Epstein 2005; Aalbers 2008; Harvey 2010). From this point of view, financialization, a phenomenon involving the growing size and profitability of the financial sector, the prioritization of shareholders over other stakeholders, the rise in financial profits for nonfinancial corporations, and the soaring of household debt, increases inequality.

The growth in the size and profitability of the financial sector has been matched with record-high salaries and executive pay for professionals employed in the sector. According to Philippon and Reshef (2012), by 2006 the education-adjusted salary of the average professional employed in the financial sector in the United States was 50 percent higher than that of the average professional employed elsewhere in the private sector, not counting the farm sector. Even more so, executives employed in finance were found to earn 250 percent more compared to executives elsewhere in the private sector (Philippon and Reshef 2012).

In the case of nonfinancial corporations (NFCs), the prioritization of shareholders meant that firms' strategies shifted away from long-term investment and growth and toward short-term profits and dividend payments (Lazonick and O'Sullivan 2000; Stockhammer 2004; Orhangazi 2008). A result of this strategic shift was the decline in the labor share of income, first, for the sake of compensating for the higher revenue share going toward shareholders, and sec-

ond, as a response to financial markets' pressure to "rationalize" production. Meanwhile, NFCs' increase in financial investments relative to their real investments meant that workers lost negotiating power vis-à-vis shareholders and managers as they became less needed for generating revenue (Lin and Tomaskovic-Devey 2013).

The uneven accumulation of household debt was another way in which financialization increased income inequality. In the United States, households at the bottom 40 percent of the income distribution experienced the fastest increase in indebtedness prior to the crisis (Hanna Karolina Szymborska 2021). Matched with the widespread use of securitization in subprime mortgage lending, high indebtedness for low- and middle-income households led to an increase in the share of household income extracted by banks and other financial institutions, as well as an increase in the overall fragility of the US economy (Lapavitsas 2009; Dymski 2010).

The interplay between financialization, income inequality, and financial fragility is stressed further by Lysandrou (2011a, 2011b), who argues that the rise in top income shares gave a significant boost to the demand for the complex financial products that triggered the 2007–2008 crisis. Azzimonti, de Francisco, and Quadrini (2014) also point out that increased income inequality in developed economies, combined with financial liberalization, provided a fertile ground for the growth of public debt, thereby making those countries more susceptible to sovereign debt crises.

In line with tensions in the above literatures, cross-country econometric studies on finance and inequality bring mixed results. While the precrisis research in mainstream economics demonstrates much confidence about the capacity of finance to tackle inequality (e.g., Beck, Demirgüç-Kunt, and Levine 2007), recent publications cast doubt on such claims (e.g., Jaumotte, Lall, and Papageorgiou 2013; Jauch and Watzka 2015; Seven and Coskun 2016; de Haan and Sturm 2017). These studies find that financial development, typically defined as the amount of bank credit to private sector divided by GDP, is positively related to income inequality. In addition, Jaumotte, Lall, and Papageorgiou (2013) indicate a positive relationship between income inequality and financial globalization, particularly with regard to the flows of foreign direct investment (FDI). De Haan and Sturm (2017) add banking crisis as a factor that increases income inequality. Other econometric studies with similar results include Kus (2012), Hanna K. Szymborska (2016), and Tridico (2018). On the other hand, Hamori and Hashiguchi (2012) show how financial development reduces income inequality, while Li and Yu (2014) show the positive impact of financial liberalization on reducing income inequality in Asia.

One of the aims of our paper is to create a dialogue between econometrically based literature on the finance-inequality nexus on one side and the financial and economic geography on the other. To date, there are no econometric studies on finance and inequality in geography, while econometric studies in economics pay little attention to the spatiality of economy and finance. Thus, econometric studies on the finance-inequality nexus ignore urbanization and the relationship between spatial and social inequality. As financial and economic geography shows, however, access to finance is a matter of location, in both developed and developing countries, creating persistent gaps and often self-reinforcing inequalities (e.g., Dymski and Veitch 1996; Leyshon et al. 2004; Coppock 2013; Lee and Luca 2018).

2.1. INCOME INEQUALITY AND THE SPATIAL STRUCTURE OF THE FINANCIAL SECTOR

An important spatial feature of any financial system, and one we focus on, is financial sector centralization, defined as the extent to which the financial sector is concentrated in the largest financial center (LFC) of a country. There is a rich literature discussing differences between centralized and decentralized financial systems, with the United Kingdom and France as examples of the former, and the United States and Germany of the latter (Wójcik and MacDonald-Korth 2015; Verdier 2002; Klagge and Martin 2005; Grote 2007). Beyond advanced economies, research shows relatively centralized financial systems in Central and Eastern Europe (Brülhart 2006) and Latin America (Aroca and Atienza 2016; Contel and Wójcik 2019; Ioannou and Wójcik 2022), and a more decentralized system in China (Wang 2018). Of course, the relative centralization or decentralization is a matter of degree, not a dichotomy, and is related intrinsically to the urban structure of a given country and economic, social, and political factors that have shaped this structure. For the rest of this section, we discuss several reasons why financial sector centralization might aggravate income inequality.

To begin with, a common feature of financial centers is that they host not just banks and other financial firms but also other advanced business services, including law, accounting, and consulting, as well as corporate headquarters (Sassen 2001; Wójcik 2012, 2013). This complex of financial and business services is often referred to as FABS and is related to the concepts of global and world city, in addition to financial centers (Coe, Lai, and Wójcik 2014). Important terminological and conceptual differences notwithstanding, what is crucial for our analysis is that the centralization of FABS activity increases the demand for highly skilled and remunerated occupations, while at the same time raising the demand for precarious, low-paid jobs (Sassen 2001; Massey 2007). In that sense, a more centralized financial and by extension FABS sector might increase income inequality by propelling the parallel growth of jobs at the two ends of income distribution.

In addition, the spatial centralization of finance can have an adverse effect on financial services outside of the LFC. This effect can be either direct or indirect. One direct channel can be the takeover of small regional and local banks by banks located in the LFC. Another can be what Verdier (2002) calls "liability side haemorrhage," referring to the flow of savings from peripheral regions toward the LFC of the country, thus bypassing local and regional banks (Chick and Dow (1988) make a similar point, indicating the possibility of a loop between this hemorrhage, regional instability, and the liquidity preference of regional wealth holders). An indirect channel of influence could be the creation

and spread of a more aggressive money culture, with regional banks lowering creditworthiness standards and expanding credit to previously unbanked households, in order to compete with the banks of the LFC. All these factors can in various ways augment income inequality—for instance, by increasing the extraction of financial profits out of low-income households.

In the context of the United Kingdom, for example, Marshall et al. (2012) and Marshall (2013) comment on how the erosion of the community-based banking model of building societies since the 1980s led surviving regional banks to enter into an aggressive model of banking, with large exposures to international money markets and large revenues from securitized lending. The case of Northern Rock is the most representative example of such type of financial development (Marshall et al. 2012). Wójcik and MacDonald-Korth (2015) show how these fragilities led to an even more centralized financial landscape in the United Kingdom since the crisis, with financial employment in London fully recovering within three years after the crisis, and that of peripheral financial centers exhibiting steep and persistent declines.

A key feature of centralized financial systems is their strong global orientation (Verdier 2002). This leads to four additional considerations regarding the capacity of financial sector centralization to influence the impact of finance on inequality. First, global orientation facilitates the cross-border movement of short term–oriented capital. Short-term, or else non-FDI, capital flows can augment financial instability in hosting economies, and thus aggravate income inequality, due to their capricious nature and their susceptibility to sudden reversals, especially when domestic economic fundamentals are weak (Agosin and Huaita 2010; Ioannou 2017).

Secondly, globally oriented financial centers tend to detach themselves from the rest of the economy in which they operate and form networks of their own in what has sometimes been described as an "archipelago economy" (Veltz 1996; Sassen 2001; for recent evidence, also see Degl'Innocenti, Matousek, and Tzeremes 2017). Financial sector centralization might thus lead to a dysfunctional financial system with regard to the financing needs of the households and firms of noncentral regions (Verdier 2002; Klagge and Martin 2005). Additionally, the remoteness in financial decision-making is likely to generate bias against the economic prospects and stability of these regions and thereby contribute to financial instability, at times by providing excessive volumes of credit, and at others by causing an excessive withdrawal of credit (Chick and Dow 1988). All these factors can augment inequality by making regional and local economies more vulnerable, raising their borrowing costs, as well as their probability of experiencing asset foreclosures and bankruptcies.

Thirdly, in their capacity to act as gateways to the rest of the world, globally oriented financial centers can make it easier, particularly for top-income households, to channel their wealth toward offshore jurisdictions. According to Wójcik (2012), the rise of offshore jurisdictions over the last thirty years is deeply interlinked with the development of FABS, with the latter acting as orchestrators of offshore finance. If anything, the drive of wealth toward offshore destinations deeply deprives national governments of taxable resources that could otherwise be channeled toward welfare support, education, and other needs. Although the precise calculation of the assets held in offshore jurisdictions is by nature hard to conduct, Larudee (2009) indicates that at the time of her writing, the total wealth held by top-income households in offshore jurisdictions was more than $10 trillion. More recently, Alstadsæter, Johannesen, and Zucman (2018) estimate total offshore wealth to amount to 10 percent of the world's GDP. According to their calculations, about 80 percent of offshore wealth is concentrated in the hands of the top 0.1 percent richest households, and about 50 percent in the hands of the top 0.01 percent (Alstadsæter, Johannesen, and Zucman 2018, 97).

Fourth, inasmuch as the creation of leading, globally oriented financial centers is deliberately pursued as a developmental strategy, it can also be linked with financial deregulation, especially when countries are in competition with one another for attracting foreign capital. Often, deregulation and reform in this context include not just the financial sector but also the economy more broadly, including labor market deregulation and the lowering of tax rates, both aspects related closely to income inequality. Flexible labor markets and low tax rates, for example, are two of the basic criteria used for establishing rankings of global financial centers (Wardle and Mainelli 2021). A recent empirical exercise confirms the significance of flexible labor markets for attracting investment banking activity, while also highlighting the importance of low personal income taxation (Wójcik, Knight, and Pažitka 2017). Financial center development is commonly part of world and global city strategies pursued by governments in both developed and developing countries (Hoyler, Parnreiter, and Watson 2018; Leitner, Peck, and Sheppard 2007).

3. DATA AND METHODOLOGY

We use data for 131 developed and developing countries, for the period 1991–2017. To compose our dataset, we consider annual data from a number of different resources, including Penn World Table, World Bank Financial Development and Structure Database (WBFDS), International Financial Statistics of the International Monetary Fund (IMF IFS), Standardized World Income Inequality Database (SWIID), and World Governance Indicators (WGI).[1] Other datasets considered in our analysis include Porta et al. (1998), Abiad,

1 Feenstra, Inklaar, and Timmer (2015), Cihák et al. (2012), IMF (2018), Solt (2016), and Kaufmann, Kraay, and Mastruzzi (2010), respectively.

Detragiache, and Tressel (2008), Laeven and Valencia (2018), Tax Justice Network (2015), and Alstadsæter, Johannesen, and Zucman (2018).

In our selection of countries, we start by including all countries for which data is available from all of the above-mentioned sources. We then exclude very small countries and city-states, such as Singapore, Luxembourg, and Monaco (this is for consistency with our discussion on financial sector centralization in section 5). This leaves us with 131 countries, all listed in appendix A.

For our baseline analysis, we consider our time-varying variables in three-year nonoverlapping averages. This is for achieving an optimal balance between the exploitation of available data and the removal of short-term noise. As a robustness check, we also run our baseline model using data with annual frequency. For our econometric analysis, we apply the following panel data model:

$$\begin{aligned} \text{Ineq}_{it} = \alpha + \beta\varphi_{it-1} + \gamma X_{it-1} + \delta y_{it} + \lambda Z_i \\ + c_{it} + u_i + \varepsilon_{it} \end{aligned} \quad (1)$$

where i and t are the subscripts for countries and time respectively; $Ineq_{it}$ stands for our income inequality measure; φ_{it} is the proxy for the size of the financial sector; X_{it} is a vector of control variables; y_{it} denotes the natural logarithm of the GDP per capita of country i at the beginning of period t; Z_i is a vector that represents the time-invariant variables included in the model (if any); and c_{it} is a dummy that captures episodes of banking crises.[2] Furthermore, α, β, δ, and the vectors γ and λ describe time-invariant parameters, u_i is the country-specific effect, and ε_{it} is the random error of our specification. To tackle simultaneous endogeneity, we lag all our time-varying variables by one time period. As additional tests, we also consider a model with institutional and legal variables used for instrumenting domestic financial development, as well as a dynamic model based on the two-step system generalized method of moments (GMM) estimator of Blundell and Bond (1998).

Our results obtained from the Hausman test suggest the use of fixed effects for capturing the country-specific effect. A limitation in using fixed effects, however, is the impossibility of including time-invariant regressors in the model. This is a particularly relevant concern in our analysis as some of the finance-related variables in our dataset are available only in a time-invariant form (e.g., financial secrecy index). To tackle the conundrum, we use the following approach: first, we employ the fixed effects panel estimator for our baseline model, and for the models in which the full set of tested variables varies across time (table 2). Second, we use the modified-random effects model, originally suggested by Mundlak (1978), for running those regressions in which we want to test time-invariant variables (table 3). As discussed in Mundlak (1978), Hajivassiliou (2011), and Ioannou and Wójcik (2021), among others, the benefit of modified-random effects is that it yields close to identical results with fixed effects, while also preserving the space for time-invariant variables. In effect, the key difference between the two estimators concerns the way in which country heterogeneity is modeled. In modified-random effects, this is typically done by incorporating the full-time averages of all time-varying variables of the model as additional regressors.[3] To show the consistency between the two estimation techniques, table 3 starts by reporting the modified-random effects of our baseline model from table 2, before proceeding to consider any additional variables.

3.1. MEASURING INCOME INEQUALITY

Our basic measure of inequality is the market-income Gini index provided by SWIID. This captures the degree of household income inequality prior to taxation, and as such, it is informative of the raw inequality outcomes produced in an economy. The index value ranges from 0 (total equality) to 100 (total inequality). To add robustness to our main findings, we also complement them with a regression for the post-tax, disposable-income Gini index, also available in SWIID.

A notable feature of inequality studies has been the long debate over the most suitable measurement (for discussion, see Galbraith 2012, 2019). Among other aspects, this debate involves critical remarks on the use of Gini indices, pointing out, for instance, the potential inconsistencies in the construction of bottom-up Gini data across different countries, and the amalgamation of different types of income in it (e.g., salaries put together with dividend payouts). In this study, we choose to work with Gini due to its wide coverage, and the comparability with previous studies it affords. Besides coverage, another merit of Gini is that it offers a measurement of inequality that pays attention not just to the tails of the income distribution (for instance, the 90/10 ratio or the share of income of the richest X percent), but to the entire distribution. Additionally, the standardization of incomes in the construction of the SWIID Gini indices should be expected to deal to some extent with the issue of cross-country comparability (for discussion, see Solt 2016). In this spirit, we treat Gini as an appropriate rather than a perfect variable.

Figure 1 provides an indicative illustration of our data on income inequality, by contrasting the development of pre-tax Gini from 1991 to 2017, between Europe and North

2 The GDP per capita is not lagged because it already describes the level of the variable at the start of each three-year period. The crisis dummy is not lagged because due to the three-year average formatting of our data, crisis episodes already enter into the model with a time delay on most occasions. In Germany, for example, we record the crisis of 2008–2009 by setting the dummy equal to 1 for Germany and for the period 2009–2011. Likewise, in Argentina, for example, we record the 2001–2003 crisis by setting the crisis dummy equal to 1 for Argentina, for the period 2003–2005.

3 In themselves, the full-time averages of the time-varying regressors are often insignificant, despite their usefulness in ensuring consistency. For this reason, and to save space, we use them but do not report them in the econometric tables below (a full set of results is available on request).

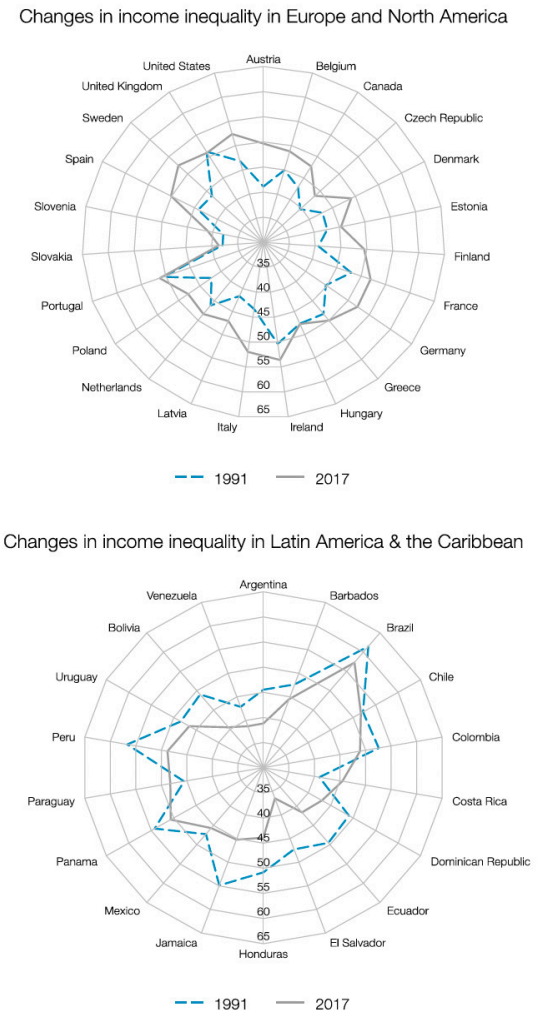

Figure 1. Changes in income inequality in Europe and the Americas.

Notes: income inequality measured by pre-tax Gini index. Source: SWIID

America, on the one hand, and Latin America on the other (values between 0 and 100). As seen in the upper graph, most European economies experienced an increase in income inequality. Greece's pre-tax Gini index, for example, went from 48.33 in 1991 to 50.01 in 2017. In France, pre-tax Gini went from 47.98 to 51.93. On the contrary, income inequality recorded notable declines in Latin America (also see Galbraith 2019). Pre-tax Gini in Brazil, for example, dropped from 61.46 in 1991 to 57.31 in 2017. In Ecuador it dropped from 49.51 to 41.59, while in Argentina it went from 45.52 in 1991 down to 38.82 in 2017.

3.2. VARIABLES ASSOCIATED WITH THE FINANCIAL SECTOR

To capture the size of the domestic financial sector, we use the total stock of credit provided by domestic banks and other financial institutions, divided by GDP. Although not without weaknesses (e.g., omission of fee-based financial activities), this is one of the most conventional proxies used in literature. To support our findings, we also run our model with other proxies used for capturing the size of the financial sector. These include the narrower version of credit to GDP, where only bank credit is considered; the stocks of bank assets to GDP; the stock of financial assets to GDP (which puts together the assets of banks with these of other financial institutions); the credit to deposit ratio; and the stock market capitalization to GDP.

Secondly, we analyze the impacts of financial globalization. Methodologically, we follow Jaumotte, Lall, and Papageorgiou (2013) in distinguishing between de facto and de jure financial globalization. For capturing the former, we examine the impact of non-FDI capital flows.[4] As per IMF's classification, non-FDI capital flows (corresponding to the "portfolio investment" and "other investment" categories) predominantly include cross-border secondary market trading of equity and debt securities, money market instruments, and financial derivatives. The primary focus of these flows on short-term gains and their susceptibility to sudden reversals make them a potential threat for the financial stability of recipient economies (Agosin and Huaita 2010; Ioannou 2017). Given the inherently destabilizing nature of these flows, one could expect them to aggravate income inequality.

In order to approximate de jure financial globalization, we consider the financial liberalization index constructed by Abiad, Detragiache, and Tressel (2008). This is a composite index, based on interest rate controls, capital entry barriers, banking supervision, and other metrics. For inserting into our model, we use the time average of the index for the period of overlap (1991–2005) as our independent variable.

Our analysis also accounts for offshore-held wealth, considered as an important parameter of financial globalization, and taken as a share of GDP for each country. We use the data provided by Alstadsæter, Johannesen, and Zucman (2018), which is, to the best of our knowledge, the richest available cross-country data on offshore wealth. Offshore wealth could be expected to impact both ends of the income distribution. On the one side, the drive of wealth toward offshore destinations deprives governments of taxable resources that could otherwise be channeled toward welfare support, education, and other social needs. At the same time, it accelerates the accumulation of wealth at the top of the income hierarchy. Larudee (2009) estimates the total wealth held by top-income households in offshore jurisdictions at over $10 trillion. According to Alstadsæter, Johan-

4 We also tested FDI flows, which, however, we found to be insignificant, contrary to the results of Jaumotte and her colleagues.

nesen, and Zucman (2018, 97), about 80 percent of offshore wealth is concentrated in the hands of the top 0.1 percent richest households, and about 50 percent in the hands of the top 0.01 percent. They note that many of the countries with the highest ratio of offshore-held wealth to GDP are found in the developing world.

To approximate financial secrecy, we employ the Financial Secrecy Index, constructed by the Tax Justice Network (Tax Justice Network 2015). This is a composite metric, informed, among other factors, by the degree to which a country provides banking secrecy, requires companies to submit ownership information to public authorities, avoids promoting tax evasion, has an effective anti–money laundering regime in place, and engages with the international community in transparency standards and judicial cooperation.[5] As with offshore wealth, a financially secretive jurisdiction can deprive governments of tax resources and facilitate wealth accumulation at the top of the income distribution. Additionally, a secretive jurisdiction can become an attractive destination for foreign wealth, thus raising domestic income inequality even further.

The inclusion of the dummy for banking crises is based on the data provided in table 2 of Laeven and Valencia (2018, 34). There are plenty of reasons why banking crises might have an independent effect on income inequality. As, for instance, discussed in Dymski, Kaltenbrunner, and Szymborska (2015), crises entail a sizable fiscal cost for taxpayers, most notably for rescuing too-big-to-fail banks. Furthermore, the sudden stop in bank lending increases the financial vulnerability of households and small firms, leading to asset-stripping and bankruptcies, and exposing them to predatory lending. Low-income households employed under precarious conditions are also the most likely to be faced with the prospect of unemployment as a result of a crisis. To account for the possible endurance of the impact of banking crises, we allow the value of 1 not only for the three-year period that contains a crisis episode but also for the one that follows.

3.3. CONTROL VARIABLES

In order to decide which control variables to include in our model, we run a number of econometric trials, based on standard economic intuition, past literature, and data availability. Out of these, we keep variables for which at least some conditional significance is recorded. This leaves us with a set of four variables: the natural logarithm of each country's GDP per capita at the beginning of each time period, a proxy for education, the rate of unemployment, and trade openness.[6] The analytical definition and data source of each of these variables is provided in table 1.

Education has been routinely reported as a determinant of income inequality (e.g., Beck, Demirgüç-Kunt, and Levine 2007; Bourguignon 2017). All else the same, a higher level of education should be expected to lower inequality. On the other hand, the rate of unemployment could be seen as a factor capable of augmenting inequality. From a Kaleckian perspective, for example (Kalecki 1943), a link between unemployment, the bargaining power of wage earners, and inequality could be anticipated. The impact of trade openness is ambiguous. Whereas traditional trade theory expects openness to reduce inequality in developing countries via an increase in wages of unskilled labor, openness could as well increase inequality due to the pressure of international competition on workers and the threat of domestic firms to relocate abroad (ILO 2008; Onaran 2009).

4. RESULTS

Table 1 presents the summary statistics of all the variables considered in our study, while in the appendix we also present the corresponding correlation matrix. As expected, post-tax (disposable) Gini is lower than the market-income Gini. The average level of financial development, as proxied by credit to GDP, is 46 percent. Notable cases at the two extremes include, on the one side, the United States and Japan, with credit to GDP equal to 160 percent and 171 percent, respectively; and, on the other, Sierra Leone and Guinea-Bissau with 3.3 percent and 4.6 percent, respectively.

Table 2 presents our basic fixed-effects econometric models. For each specification, we report our full-sample results, followed by a separation between developed and developing economies (separation based on OECD membership). We consider domestic financial development, together with our key set of control variables, first, and then add other finance-related variables, one at a time.

Domestic financial development, captured by credit to GDP, turns out to be positive and highly significant in all econometric trials. Other things being equal, high levels of domestic financial development are associated with high income inequality, as also predicted by recent econometric literature (e.g., de Haan and Sturm 2017). The relationship holds for both developed and developing economies.

5 Financial Secrecy Index data is available for 2009, 2011, 2013, 2015, 2018, and 2020, every report with an increased coverage compared to the previous one. For maximizing our coverage while preserving tangency to the time span of our sample, we employ the index values for 2015.

6 Other variables that we tested include inflation rate, government consumption, population growth, employment growth, and trade openness from PWT; age dependency, life expectancy, population density, and the value-added shares of agriculture, services, and industry from the World Development Indicators; speed of currency depreciation from IMF IFS; and the aggregate index of institutional quality from the World Governance Indicators of the World Bank. To be sure, the lack of statistical significance for these variables does not necessarily imply that these are unimportant for shaping inequality. First, some variables might require a longer time horizon than what is used here. Second, the impact of some variables, such as institutional quality, might be indirect and manifest itself through other controls, such as the level of education.

Table 1. Summary statistics and variable specifications.

Variable	Description and source	Obs.	Mean	Std. Dev.	Min	Max	Variable	Description and source	Obs.	Mean	Std. Dev.	Min	Max
market-income (pre-tax) Gini	index value, [0,100], SWIID	1090	46.66	6.58	28.06	72.35	**offshore wealth**	offshore wealth to GDP, %, 2007, Alstadsæter, Johannesen, and Zucman (2018)	570	12.99	22.20	0.20	211.01
disposable (post-tax) Gini	index value, [0,100], SWIID	1090	38.41	8.52	19.14	63.71	**education**	human capital index based on years of schooling and returns to education, PWT	1071	2.42	0.72	1.04	3.77
credit to GDP	credit by banks and other financial institutions to GDP, %, WBFDS	1146	46.01	43.94	0.43	268.20	**unemployment**	unemployment, %, PWT	1179	8.24	6.53	0.15	37.30
narrow credit	credit by banks to GDP, %, WBFDS	1143	42.67	39.15	0.43	268.20	**trade openness**	sum of exports and imports (abs. values) to GDP, %, PWT	1179	51.71	39.96	1.76	309.05
assets of banks & other fin. institutions	assets of banks and other financial institutions to GDP, %, WBFDS	1146	57.06	51.99	0.50	333.60	**banking crisis**	banking crisis dummy, 1 for crisis episodes, 0 otherwise, LV	1179	0.13	0.34	0.00	1.00
assets of banks	bank assets to GDP, %, WBFDS	1146	52.34	44.84	0.50	333.60	**financial secrecy**	index score; Tax Justice Network (2015)	260	187.23	151.64	19.43	760.21

Variable	Description and source	Obs.	Mean	Std. Dev.	Min	Max	Variable	Description and source	Obs.	Mean	Std. Dev.	Min	Max
stock market cap.	stock market capitalization to GDP, %, WBFDS	742	40.62	43.61	0.01	280.57	**shareholders' rights**	composite index, La Porta et al. (1998)	405	2.93	1.31	0.00	5.00
credit to deposits	credit to deposit ratio, %, WBFDS	1135	98.54	54.73	6.50	531.32	**legal origins**	dummy variable, 1 if country's legal system is of English origin	405	0.33	0.47	0.00	1.00
ln (GDP per capita)	natural logarithm of GDP per capita, PWT (based on constant 2011 national prices, in USD mn)	1179	8.99	1.23	5.74	11.67	**financial deregulation**	financial reform index, 2000-05 average, Abiad, Detragiache, and Tressel (2008)	774	14.03	3.85	4.63	20.56
net non-FDI inflows	net non-FDI flows to GDP, %, IMF IFS	980	0.53	6.46	-42.93	33.26	**FABS primacy**	primacy ratio of FABS employment, OE	650	37.39	17.85	3.38	80.71
financial openness	sum of gross capital inflows and outflows to GDP, %, 2000-14 average, IMF IFS	970	15.32	37.75	-112.39	682.75							

Notes: All variables in three-year averages unless state otherwise (period of coverage: 1991–2017); as used here, FABS primacy ratio describes the share of FABS employment located in the country's largest city (ranked in terms of FABS employment) out of the country total; FABS employment includes employment in financial and insurance activities, real estate activities, professional, scientific, and technical activities and administrative support service sectors; extreme outliers removed in financial variables from WBFDS (data on Liberia), Financial Secrecy Index (values greater than 1,000) and non-FDI capital flows (values greater than 50 and less than -50); SWIID for Standardised World Income Inequality Database; WBFDS for World Bank Financial Development and Structure Database; PWT for Penn World Table; IMF IFS for International Monetary Fund, International Financial Statistics; OE for Oxford Economics; LV for Laeven and Valencia (2018).

Table 2. Models with fixed effects.

	basic model			models with additional financial variables					
	full sample	*developed economies*	*developing economies*	full sample	developed economies	developing economies	full sample	developed economies	developing economies
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
credit to GDP	**0.029*** **	**0.023*** **	**0.028*** **	**0.032*** **	**0.025*** **	**0.034*** **	**0.031*** **	**0.019*** **	**0.035*** **
	(5.563)	**(3.885)**	**(3.487)**	**(5.178)**	**(3.434)**	**(3.813)**	**(4.942)**	**(3.191)**	**(4.025)**
ln (GDP per capita)	-0.494	-3.861**	-0.424	-0.820	-4.200**	-0.701	-0.810	-3.067*	-0.691
	(-0.419)	(-2.277)	(-0.332)	(-0.589)	(-2.454)	(-0.450)	(-0.580)	(-1.982)	(-0.442)
education	-4.037***	2.173	-4.348***	-4.119***	1.463	-4.619***	-4.050***	1.265	-4.761***
	(-2.974)	(0.961)	(-3.061)	(-2.705)	(0.608)	(-2.865)	(-2.704)	(0.555)	(-2.967)
unemployment	0.105**	0.054	0.116**	0.107**	0.107**	0.114*	0.107**	0.100**	0.113*
	(2.530)	(1.291)	(2.132)	(2.233)	(2.475)	(1.697)	(2.232)	(2.195)	(1.678)
trade openness	0.016*	0.007	0.015	0.018**	0.012	0.017	0.018**	0.006	0.016
	(1.975)	(0.692)	(1.527)	(2.088)	(1.154)	(1.554)	(2.095)	(0.692)	(1.504)
net non-FDI inflows				**-0.007**	**0.049*** **	**-0.030**	**-0.007**	**0.046****	**-0.030**
				(-0.376)	**(3.007)**	**(-1.402)**	**(-0.386)**	**(2.539)**	**(-1.388)**
banking crises							**0.105**	**0.700****	**-0.204**
							(0.390)	**(2.392)**	**(-0.585)**
constant	58.247***	77.350***	57.910***	61.493***	82.184***	60.983***	61.242***	71.854***	61.216***
	(6.581)	(4.774)	(6.149)	(5.857)	(5.017)	(5.291)	(5.796)	(4.916)	(5.322)
r2_within	0.127	0.287	0.119	0.144	0.340	0.146	0.145	0.376	0.146
N	886	169	717	781	164	617	781	164	617

Notes: Sample: 131 countries, 1991–2017; dependent variable: market-income (pre-tax) Gini index; separation between developed and developing countries on the basis of OECD membership; *, **, and *** denote significance at the 10%, 5% and 1% levels respectively; t-statistics in parentheses; fixed effects used for country heterogeneity; time-varying variables in three-year nonoverlapping averages, except for GDP per capita; heteroskedasticity robust errors used; right hand variables lagged by one time period, except for starting GDP per capita; decline in sample size in columns 4 to 9 due to data gaps in net non-FDI flows series; sources: SWIID, WBFDS, PWT, IMF IFS, OE, LV, and authors' elaboration.

Table 3. Additional models with modified-random effects.

	baseline model with FE (model 1) and modified-RE (model 2)		models with time-invariant financial variables								
	full sample		full sample	developed economies	developing economies	full sample	developed economies	developing economies	full sample	developed economies	developing economies
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
credit to GDP	0.031***	0.031***	0.027***	0.014**	0.034***	0.019***	0.019***	0.021	0.029***	0.020***	0.037**
	(4.942)	(4.923)	(4.089)	(2.083)	(2.911)	(3.204)	(3.126)	(0.971)	(4.209)	(3.166)	(2.257)
ln (GDP per capita)	-0.810	-0.874	1.077	-3.519**	1.522	-0.349	-3.146**	-0.370	-2.645**	-3.254**	-2.042
	(-0.580)	(-0.630)	(0.697)	(-2.085)	(0.859)	(-0.168)	(-2.011)	(-0.084)	(-2.123)	(-2.132)	(-1.293)
education	-4.050***	-4.020***	-5.711***	3.021	-6.835***	-2.283	1.186	-1.304	-2.847	1.419	-4.247**
	(-2.704)	(-2.687)	(-3.572)	(1.289)	(-3.897)	(-0.884)	(0.501)	(-0.201)	(-1.638)	(0.610)	(-1.963)
unemployment	0.107**	0.105**	0.168***	0.094*	0.213**	0.141***	0.089*	0.284	0.133**	0.091*	0.160*
	(2.232)	(2.192)	(2.942)	(1.895)	(2.293)	(2.623)	(1.800)	(0.912)	(2.498)	(1.871)	(1.849)
trade openness	0.018**	0.018**	0.026***	0.007	0.027**	0.003	0.006	0.012	0.015*	0.006	0.010
	(2.095)	(2.123)	(2.911)	(0.795)	(2.285)	(0.362)	(0.670)	(0.217)	(1.783)	(0.672)	(0.592)
net non-FDI inflows	-0.007	-0.010	-0.004	0.035*	-0.020	0.046**	0.039**	-0.268	0.015	0.034*	-0.001
	(-0.386)	(-0.525)	(-0.141)	(1.703)	(-0.668)	(2.294)	(2.043)	(-1.238)	(0.798)	(1.893)	(-0.045)
banking crises	0.105	0.097	0.139	0.483*	-0.092	0.916***	0.704**	0.043	0.207	0.708**	-0.602
	(0.390)	(0.361)	(0.512)	(1.950)	(-0.241)	(2.727)	(2.097)	(0.027)	(0.664)	(2.290)	(-1.107)
financial deregulation			0.659***	0.973*	0.643***						
			(3.009)	(1.699)	(2.910)						
financial secrecy						0.011**	0.008*	0.014			
						(2.389)	(1.938)	(1.068)			
ln (offshore wealth)									0.496	1.803*	0.299
									(0.853)	(1.739)	(0.433)
constant	61.242***	43.993***	40.039***	42.693*	40.690***	42.497***	25.796	32.049*	44.065***	31.517	45.449***
	(5.796)	(9.310)	(6.437)	(1.851)	(6.507)	(4.309)	(0.975)	(1.798)	(8.166)	(1.189)	(6.621)

	baseline model with FE (model 1) and modified-RE (model 2)		models with time-invariant financial variables								
r2_overall	0.042	0.284	0.270	0.370	0.272	0.497	0.234	0.815	0.316	0.299	0.347
N	781	781	580	151	429	231	154	77	475	159	316

Notes: Sample: 131 countries, 1991–2017; dependent variable: market-income (pre-tax) Gini index; baseline model refers to model 7 of table 2; separation between developed and developing countries on the basis of OECD membership; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively; t-statistics in parentheses; random effects used for country heterogeneity in all regressions but column 1; full-time averages of time-varying regressors used for consistency of random effects estimation (Mundlak 1978) but not reported; time-varying variables in three-year nonoverlapping averages, except for GDP per capita; heteroskedasticity robust errors used; right hand variables lagged by one time period, except for starting GDP per capita; financial deregulation takes values from 0 to 21, with higher values corresponding to greater degree of deregulation; decline in sample size from columns 3 to 11 due to the partial country coverage of data on financial deregulation, financial secrecy, and offshore wealth; sources: SWIID, WBFDS, PWT, IMF IFS, LV, TJN, Abiad, Detragiache, and Tressel (2008), Alstadsæter, Johannesen, and Zucman (2018), and authors' elaboration.

Table 4. Robustness checks.

	alternative proxies for size of financial sector					baseline model for disposable income (post-tax) Gini index	baseline model with annual data	IV model for credit to GDP (instruments: shareholders' rights, institutional quality, legal origins)	two-step system GMM model
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
credit to GDP						0.019***	0.022***	0.098***	0.031**
						(3.495)	(3.890)	(5.032)	(2.152)
ln (GDP per capita)	-0.901	0.242	-0.822	-0.786	-0.724	-0.009	-0.101	-0.319	-0.027
	(-0.645)	(0.142)	(-0.585)	(-0.558)	(-0.499)	(-0.009)	(-0.072)	(-0.649)	(-0.024)
education	-3.680**	-3.136**	-3.338**	-3.383**	-2.567*	-3.979***	-3.090**	-5.007***	-3.313*
	(-2.364)	(-2.085)	(-2.086)	(-2.128)	(-1.692)	(-3.093)	(-2.237)	(-4.445)	(-1.804)
unemployment	0.114**	0.194***	0.122**	0.126**	0.127**	0.075	0.128***	0.510***	0.298***
	(2.302)	(3.813)	(2.438)	(2.509)	(2.578)	(1.624)	(2.636)	(7.936)	(3.087)
trade openness	0.018**	0.023**	0.019**	0.020**	0.020**	0.013**	0.018**	-0.011	0.023*
	(2.037)	(2.328)	(2.135)	(2.217)	(2.221)	(2.045)	(2.430)	(-1.163)	(1.646)
net non-FDI inflows	-0.004	0.012	-0.001	-0.001	-0.006	-0.008	-0.010**	-0.075	-0.143
	(-0.225)	(0.633)	(-0.029)	(-0.066)	(-0.320)	(-0.484)	(-2.484)	(-0.952)	(-1.635)
banking crises	0.163	0.781**	0.435	0.496	0.479*	0.122	0.196	0.390	-0.345
	(0.594)	(2.566)	(1.418)	(1.622)	(1.712)	(0.517)	(0.762)	(0.457)	(-0.752)
narrow credit	0.030***								
	(3.938)								
stock market cap.		0.008							
		(1.408)							
assets of banks			0.021**						
			(2.614)						
assets of banks & other fin. institutions				0.018**					
				(2.266)					
credit to deposits					0.010**				
					(2.353)				

	alternative proxies for size of financial sector					baseline model for disposable income (post-tax) Gini index	baseline model with annual data	IV model for credit to GDP (instruments: shareholders' rights, institutional quality, legal origins)	two-step system GMM model
constant	61.280***	49.847***	59.769***	59.495***	56.858***	46.315***	52.684***	53.633***	50.452***
	(5.799)	(3.629)	(5.623)	(5.562)	(5.219)	(6.144)	(4.913)	(12.579)	(6.570)
AR(2)									0.872
overidentification								0.7235	0.333
underidentification								0.0000	
weak identification								36.144	
Number of instruments								3	76
r2_within	0.137	0.125	0.118	0.114	0.112	0.113	0.110		
N	779	598	781	781	768	781	2,318	328	871

Notes: 131 countries, 1991–2017; dependent variable: market-income (pre-tax) Gini index in all columns but column 6; all models based on full sample; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively; t-statistics in parentheses; time-varying variables in three-year nonoverlapping averages, except for GDP per capita, in all columns but column 7; heteroskedasticity robust errors used; right hand variables lagged by one time period, except for starting GDP per capita; fixed effects used for capturing country heterogeneity in columns 1 to 7; column 8: pooled IV GMM method used; Kleibergen-Paap rk LM and Hansen J for underidentification and overidentification tests, respectively (p-values reported); Kleibergen-Paap rk Wald F statistic reported for the weak identification test; column 9: p-value for Hansen test reported for overidentification (null hypothesis: model is not overidentified); AR(2) refers to the Arellano-Bond test for second order autocorrelation; null hypothesis is that the residuals of the model do not exhibit second order autocorrelation; Windmeijer-corrected robust standard errors; xtabond2 routine used in Stata, with laglimits(2 2) as an option; sources: SWIID, WBFDS, PWT, IMF IFS, LV, WGI, La Porta et al. (1998), and authors' elaboration.

Out of our control variables, unemployment is significant at 5 percent and positive in most specifications in both developed and developing economies. Education is highly significant and accompanied by a negative sign in developing countries, while insignificant in developed ones. This finding seems to suggest that education matters mostly when its starting level is low (average value for our education index is about 3.2 for developed economies and 2.26 for developing ones). Trade openness also exhibits some conditional significance and a positive sign, corroborating previous research coming up with mixed results (e.g., Onaran 2009).

With regard to other variables related to the financial sector, net non-FDI capital inflows are robustly significant for developed economies, while also registering with a positive sign. The same holds for the dummy accounting for banking crises. These findings highlight how crucial it is to treat finance as a multidimensional sector. On the one side, the statistical significance of net non-FDI inflows confirms the impact of de facto financial globalization on income inequality, likely to be ignored if one focuses solely on domestic financial development. Similarly, the significance of the banking crisis dummy indicates that financial instability exercises a direct effect on income inequality. The fact that the two variables are primarily significant for developed economies is likely to be due to the repercussions of the US and Eurozone crises of circa 2007–2012.

We consider the full-sample models 7 to 9 as our baseline specifications, on the basis of inclusion of all significant variables, and proceed to table 3. The table starts by contrasting the fixed effects and modified-random effects varieties of model 7. The comparison aims at confirming the close alignment of the parameters obtained by the two estimation methods. Columns 3 to 11 expand the modified-random effects variety of model 7 by considering the time-invariant variables of our dataset that connect with finance. These include financial deregulation, taken as a proxy of de jure financial globalization, financial secrecy, and offshore-held wealth.

Financial deregulation turns out to be positive and statistically significant for developed and developing countries alike. Such result is a useful reminder of the fact that financial development does not advance in a vacuum but is guided by specific regulation and barriers, themselves significant in shaping the ways in which finance impacts the broader economy, including income inequality. Financial secrecy is also significant and positively associated with inequality, particularly in developed economies. Offshore-held wealth to GDP exhibits a 10 percent significance and a positive sign, but only for developed economies. Taken together, the significance of financial secrecy and offshore wealth highlight additional and often overlooked channels via which financial globalization impacts inequality.

Table 4 provides a comprehensive package of robustness checks for our key results, based on a full-sample analysis. First, we approximate domestic financial development using alternative variables provided by the World Bank's Financial Development and Structure Database. These include a narrower version of credit to GDP, with only bank credit considered, stock market capitalization, volume of assets of banks and other financial institutions, and credit to deposits ratio. With the exception of stock market capitalization, all other proxies for financial development are supportive of our baseline findings.

Column 6 reports a variety of our baseline model with disposable income (i.e., post-tax) Gini index considered as our dependent variable. Relevant results are affirmative of the significance of financial development in shaping income inequality regardless of taxation. On the other hand, the impact of banking crises grows weaker, potentially suggesting the effectiveness of progressive taxation as an offsetting mechanism in periods of financial turbulence. Column 7 confirms robustness of our key results via another angle, by rerunning our baseline model using annual data.

4.1. TACKLING ENDOGENEITY

Column 8 of table 4 documents the results of a simple instrumental-variable (IV) exercise, wherein domestic financial development is instrumented on legal origins and a composite index of shareholders' rights (Porta et al. 1998) and the World Bank's composite index of institutional quality (Kaufmann, Kraay, and Mastruzzi 2010). Despite the partial coverage in terms of countries (data available for 45 of the 131 countries of our sample), the use of legal and institutional variables for instrumenting financial development is well established, particularly in macroeconomic studies investigating the impact of finance on economic growth (e.g., Levine 1999; Levine, Loayza, and Beck 2000). We would reasonably expect all three instruments to be exogenous to income inequality, while relevant in approximating financial development. Our results are affirmative, indicating persistence in the significance of financial development, rejection of the underidentification hypothesis, and nonrejection of the hypothesis that the instruments are rightfully excluded from the main regression (respectively, p-value equals 0 in Kleibergen-Paap rk LM underidentification test and 0.7235 in Hansen J overidentification test).

While useful as an exercise, the IV approach has also received critique on the basis of inability of conventional tests to properly detect weak instrumentation and overidentification (Andrews, Stock, and Sun 2019; Lal et al. 2021). Considering this, we also report a specification of our model based on the two-step system generalized method of moments (GMM) estimator of Blundell and Bond (1998) (for discussion, see Roodman 2009). This is a system estimator designed for "small-T large-N" panels. It consists of two stacked regressions, one in differences and one in levels, wherein the lagged levels and differences of variables are respectively utilized as their own instruments. For our regressions, we utilize Windmeijer-corrected robust standard errors (Windmeijer 2005). We also limit the number of

lags in our instruments to 2, to avoid instrument proliferation (Roodman 2009).[7]

Column 9 of table 4 presents the results of this model. According to the table, credit to GDP remains statistically significant at 5 percent with a parameter value of 0.031, consistent with the parameter values for credit to GDP reported in table 2. The Hansen-J test for overidentification returns a p-value of 0.333, therefore allowing us not to reject the null hypothesis that the model is not overidentified. The p-value for AR(2) is 0.872, allowing us not to reject the null hypothesis of no second order autocorrelation.

5. FINANCIAL SECTOR CENTRALIZATION AND INCOME INEQUALITY

Building on the preceding econometric analysis, we discuss here ways in which the spatial centralization of the financial sector can be associated with significant factors impacting income inequality. For our purposes, we use city-level data from the Global Cities database of Oxford Economics (OE), a proprietary database with city-level macroeconomic, sectoral, and demographic data (Oxford Economics 2014).[8]

Specifically, we measure the spatial centralization of the financial sector by the share of employment in financial and advanced business services (FABS) located in the country's leading financial center (i.e., that with the largest FABS employment), out of the total FABS employment of that country. We hereafter refer to this variable as "FABS primacy ratio," or, in short, "FABS primacy." Formally defined:

$$FABS\_\text{Primacy}_{\ it} \equiv \frac{FABS\_Emp_{Lt}}{FABS\_Emp_{it}} \qquad (2)$$

where, as before, i and t are the subscripts for countries and time, and L denotes the largest city of a country in terms of FABS employment ($FABS\_Emp$). Although FABS primacy is a simple variable, it does capture a fundamental spatial feature of a financial system, and to the best of our knowledge, this is the first study to consider it.

In its construction, this is a measurement similar to the urban agglomeration primacy ratios often employed in urban and regional studies (for discussion and an indicative empirical exercise, see Henderson 2003 and Castells-Quintana 2017, respectively). The use of FABS instead of a narrower proxy for finance is necessary due to constraints in data availability. This is the category closest to finance available in Oxford Economics, the source from which we extract all of our city-level data.[9] Nonetheless, as discussed in section 2.1, FABS describes an industrial complex, and as such, it is a highly useful conceptual and analytical category for analyzing the activity, size, and interconnectedness involved in contemporary financial centers.

5.1. EMPIRICAL FINDINGS

Our analysis shows that the geographical centralization of the financial sector connects with several variables found significant in relation to income inequality. Notably, it appears that spatially centralized financial systems are positively associated with the size of the financial sector, the degree of financial openness, the volume of the offshore-held wealth of a country, and the level of financial deregulation.

Figure 2 displays our findings in detail. To start with, the spatial centralization of the financial sector is related closely to the overall size of the financial sector, as illustrated in figure 2a. This is to be expected given the advantageous ground for financial development in large financial centers thanks to localization and agglomeration economies (Davis 1990).

Ioannou and Wójcik (2020) show that financial development in leading financial centers does not just affect local economic conditions but also exercises a significant extralocal effect on the financial development and economic growth of the rest of their countries. The article shows that such impact resembles an inverted-U pattern. While initially the extralocal effects stemming from financial development in leading financial centers feed positively into the growth of the periphery, there comes a point beyond which its impact turns negative. As pointed out in section 2.1, the adverse impact of financial development in leading financial centers on other areas of their host countries can be due to the takeover of small local and regional banks by megabanks located in leading financial centers, and due to the increase in the flow of savings and human capital away from peripheral regions and toward leading financial centers (Verdier 2002).

According to figure 2b, there is also a positive correlation between FABS primacy and a country's financial openness, defined as the sum of gross capital inflows and outflows in relation to GDP. This finding is in line with the hypothesis that spatially centralized financial systems tend to have a strong global orientation. Financial openness can drive and be driven by financial-sector centralization. Notably, financial-sector centralization can create self-reinforcing centripetal dynamics, wherein FABS are attracted to large financial centers for improving their global connectiv-

7 According to Roodman (2009), too many lags can weaken the power of the Hansen test for overidentification and thus give misleading results. To test the sensitivity of our results to instrument selection, we also run additional iterations of the model with fewer lags, for either the level or the first difference equation, or both. In all cases, the parameter value of credit to GDP remains positive and close to 0.03, while its statistical significance either stays at 5 percent or goes down to 10 percent (results available upon request).

8 OE defines cities on the basis of urban agglomerations and metropolitan areas, incorporating the built-up areas outside the historical and administrative core of each city. One constraint in our analysis in this section is the availability of data solely for the period 2000–2014 from Oxford Economics.

9 The same holds for the consideration of employment instead of a variable based on credit or financial assets.

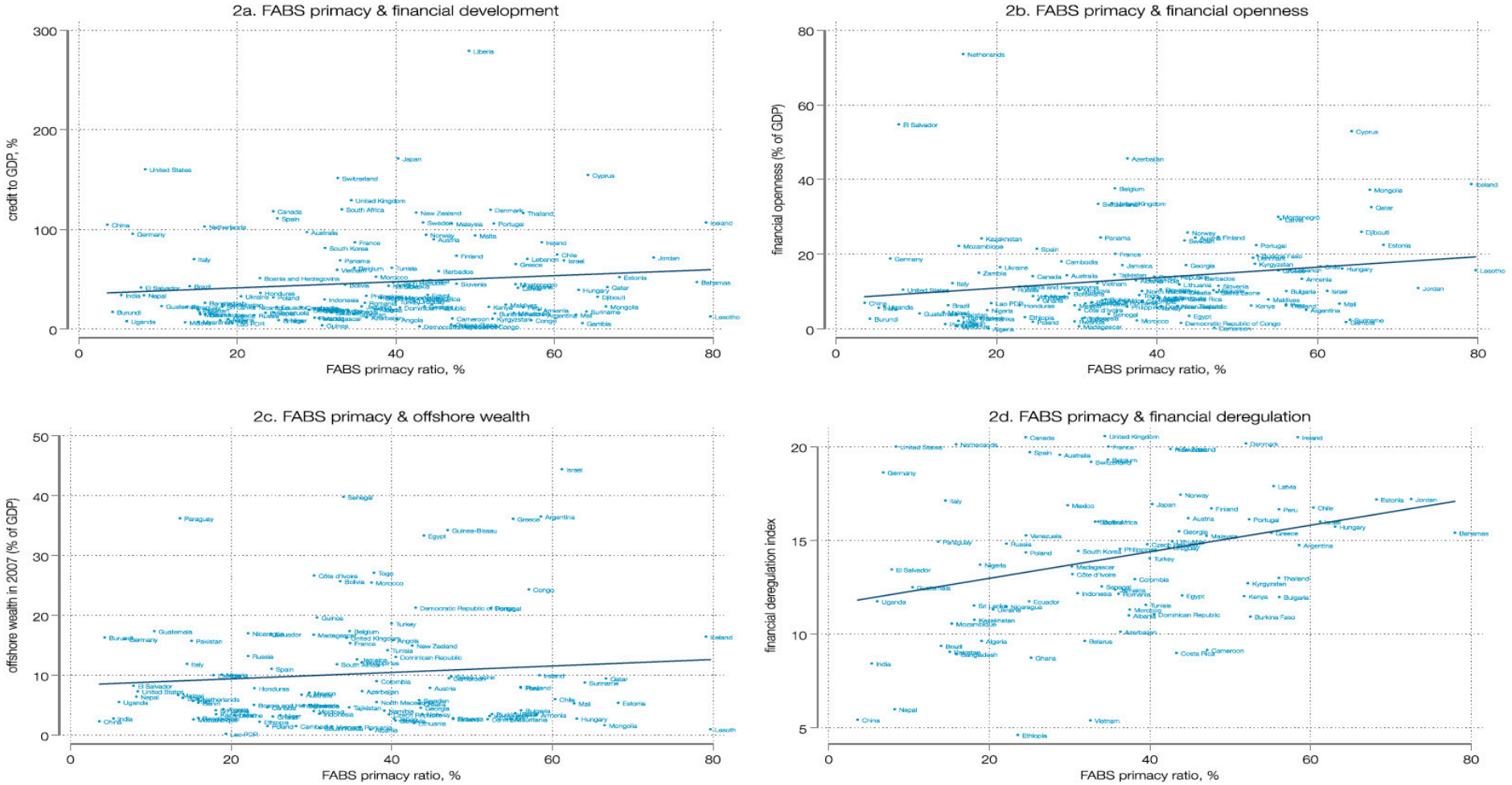

Figure 2. Correlation between FABS primacy and selected financial variables.

Notes: FABS primacy defined as the share of the city with the largest FABS employment in the country in the total FABS employment of that country; financial development measured by credit to GDP; financial openness calculated as sum of gross capital inflows and outflows (include foreign direct investment, portfolio investment and other investment); financial deregulation (FD) index takes values from 0 to 21; the higher the FD index, the more deregulated the economy; all timevarying variables considered in full-time averages; 6 outliers have been removed in 2b and 3 in 2c for facilitating visual elaboration. Sources: OE, WBFDS, IMF IFS, Abiad, Detragiache, and Tressel (2008), Alstadsæter, Johannesen, and Zucman (2018), and authors' elaboration.

ity while in turn contributing to localization and agglomeration economies, thus enhancing the connectivity of the host financial center even further.

Furthermore, consistent with the hypothesis that internationally oriented financial centers can make it easier for high-income residents of a country to channel their wealth toward offshore jurisdictions, figure 2c indicates a positive correlation between financial-sector centralization and a country's offshore-held wealth as a share of GDP. What connects wealth in countries in which it is created to tax havens and offshore jurisdictions to which it is siphoned off are leading financial centers, the primary localities in which FABS are clustered (Coe, Lai, and Wójcik 2014; Sarre 2007).

Lastly, figure 2d suggests a positive relationship between the spatial centralization of the financial sector and financial deregulation. This finding is compatible with the hypothesis that countries that aim to develop large financial centers might embrace financial deregulation as a deliberate strategy in order to compete with other countries and attract foreign capital. Related to income inequality, financial deregulation can be accompanied by the broader deregulation of the economy, including labor markets.

6. CONCLUSION

In this paper, we embarked on investigating the finance-inequality nexus, an important relationship surrounded by much controversy in theoretical research and mixed empirical results. To this end, we used panel data on 131 developed and developing countries, for the period 1991–2017.

Our results show that domestic financial development contributes to income inequality. Banking crises and financial globalization (measured by net inflows of short-term capital flows, financial deregulation, financial secrecy, and offshore-held wealth) are also significant contributors to inequality. Our results are particularly robust for developed economies. This is likely to be due to the impacts of the US and Eurozone crises during the time period of our sample, and the fact that in recent decades, income inequality has been in a persistently rising trajectory in most of Europe and North America.

The spatial structure of the financial system also matters to the finance-inequality nexus. Our results indicate that several factors aggravating inequality are positively associated to the degree of financial-sector centralization. First, financial-sector centralization can affect the domestic level of financial development thanks to the localization and agglomeration economies typically found in large financial centers. The experience of the United Kingdom, however, also shows how centralization can contribute to an unsustainable model of regional financial development, with regional banks taking excessive risks to compete with large London-based banks. The international orientation of large financial centers can facilitate the cross-border movement of destabilizing capital flows and assist tax evasion of corporations and top-income households, depriving national governments of valuable resources necessary to maintain social cohesion. It can also push countries to aim at gaining a competitive advantage by means of financial deregulation. Although exploratory, such findings seem to suggest that financial geography ties together several significant aspects of the finance-inequality nexus.

Our research could be extended in several directions. Subject to data availability, future studies could test the strength of our findings for a longer time horizon and use more sophisticated measures of spatial inequality and the structure of the financial sector. A particularly interesting exercise would be to reconsider the finance and inequality nexus in light of the COVID-19 pandemic, once data allows. While this paper applied a quantitative methodology, mixed-methods research could focus on comparative case studies covering countries with a similar level of economic development but different degrees of financial-sector centralization in both developed and developing countries. We hope that our paper will provoke more research on inequality as one of the defining challenges of our times.

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COMPETING INTERESTS

None to declare.

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APPENDICES

APPENDIX A. LIST OF COUNTRIES

Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bangladesh, Barbados, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chile, China, Colombia, Congo, Costa Rica, Croatia, Cyprus, Czech Republic, Côte d'Ivoire, Democratic Republic of Congo, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Senegal, Sierra Leone, South Korea, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Tajikistan, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, Zambia, Venezuela, Vietnam.

APPENDIX B. CORRELATION MATRIX