Three Essays on Growth Econometrics

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Introduction

This thesis consists of three chapters related to growth econometrics. We explore the macroeconomic determinants of economic growth by focusing on three specific topics. Namely, i) Finance, ii) Tourism and iii) Exports. In all chapters, we operate within alternative econometric techniques, including panel quantile regression approaches. We account for unobserved heterogeneity and we also address endogeneity concerns.

In **chapter one**, we investigate the effect of financial development and financial reforms on economic growth across different levels of the conditional distribution of the growth rates. We examine this by using panel data for 81 countries for more than 30 years. The findings indicate that financial reforms are important determinants of growth, especially when a country faces relatively low levels of economic growth. Financial development does matter for growth, however, the size and significance of the effect vary. Financial reforms affect economic growth more than financial development. We reveal that the components of financial reforms, which are more important for economic growth, are the supervision of banks and the regulation of securities markets.

In **chapter two**, we revisit the tourism-led growth hypothesis by utilizing a panel set of 108 countries over the period 1995-2017. We employ a panel quantile regression approach that can quantify the effects of tourism on the entire conditional distribution of economic growth for both relatively poor and relatively rich countries. We reveal that the lower the conditional growth rate a country experiences the more important tourism development for the conditional growth distribution for both developing and developed countries is. The size of the effect in developed countries is twice as high as in developing ones. On the other hand, tourism specialization is beneficial only at higher quantiles of the conditional growth distribution and only for the developed countries. On the contrary, it brings about an undesirable effect in developing countries.

In **chapter three**, we examine the export-led growth hypothesis for a panel of 81 coun-

tries over the period 1980-2019. Total exports are disaggregated into primary, manufacturing and services exports. We follow a panel quantile regression approach and we pin down the heterogeneous effects of exports on different parts of the entire conditional growth distribution. Our findings suggest that the effect of manufacturing and services exports varies along the conditional growth distribution. The findings suggest that manufacturing exports are important determinants of growth for countries facing relatively low growth rates. Services exports matter for growth especially for countries facing relatively higher growth rates. Despite the fact that the export sector overall is an important driver of growth, our findings on exports' components encourage policy formulations.

Chapter one was jointly co-authored with Prof. Spyridon Boikos and Prof. Theodore Panagiotidis. This chapter has been published in *Economic Modelling* as "Boikos, S., Panagiotidis, T., Voucharas, G. (2022). Financial development, reforms and growth. *Economic Modelling, 108*, 105734". **Chapter two** was jointly co-authored with Prof. Maurizio Mussoni and Prof. Theodore Panagiotidis. **Chapter three** was jointly co-authored with Prof. Theodore Panagiotidis. Part of the thesis has been presented at various international conferences, such as the European Economics and Finance Society Annual Conferences (EEFS) in 2019, 2021 and 2022, the International Network For Economic Research (INFER) in 2021, the International Conference on Computational and Financial Econometrics (CFE) in 2019 and the International PhD meeting in Economics in 2019.

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Chapter 1

Financial Development, Reforms and Growth

Abstract

Is there any specific structure of the financial system which promotes economic growth or does this structure depend on the level of economic growth itself? Financial development and financial reforms affect economic growth, but less is known on how this effect varies across different levels of the conditional distribution of the growth rates. We examine this by using panel data for 81 countries for more than 30 years. We account for unobserved heterogeneity and operate within alternative econometric approaches. The findings indicate that financial reforms are important determinants of growth, especially when a country faces relatively low levels of economic growth. Financial development does matter for growth, however, the size and significance of the effect vary. Financial reforms affect economic growth more than financial development. We reveal that the components of financial reforms, which are more important for economic growth, are the supervision of banks and the regulation of securities markets.

Keywords: Financial Development; Financial Reforms; Economic Growth; Quantile Regression; Panel Data

JEL classification codes: O16; O40; G10; G20; C21; C23

1.1 Introduction

Since Schumpeter (1912) linked the expansion of the financial sector to economic growth, a considerable number of influential studies such as King & Levine (1993a), King & Levine (1993b), Rajan & Zingales (1998), Levine et al. (2000), Beck et al. (2000), Levine (2005), have thoroughly investigated this topic. In view of new data and advanced econometric specifications, recent contributions challenge the conventional idea that financial development spurs economic growth (Arcand et al., 2015; Capelle-Blancard & Labonne, 2016; Demetriades & Rousseau, 2016; Fajeau, 2021, among others). For instance, Rousseau & Wachtel (2011) suggest that the finance-growth relationship has been curbed over time, while a more recent study by Capelle-Blancard & Labonne (2016) fail to find a positive association for the OECD countries. Sahay et al. (2015) have further encouraged the debate on the finance-growth nexus for countries at different stages of development. They show that although financial development stimulates growth, the effect cancels out when higher levels of financial development are taken into account, and becomes negative.

While the importance of financial development on growth has weakened, another strand of the literature is seeking to address the role of financial reforms on growth. It is believed that financial reforms make the financial system more liberalized which arises the following question: Does the liberalization of the financial sector lead to better financial outcomes and in turn to economic growth? McKinnon (1973) and Shaw (1973) were the first to point out that the liberalization of the financial sector is crucial for overcoming financial repression and, hence, can lead to economic growth. In particular, liberalization policies could improve government's supervision of banks which leads to higher stability of the banking system. They increase the degree of privatization in the banking system which reduces bureaucracy in providing loans. They reduce capital controls and reserve requirements. They facilitate the security markets as an alternative source of financing relative to the banking sector. All the previous components of financial liberalization could promote investments, leading to higher efficiency in the allocation of capital and risk, and thus, could result in

economic growth.[1] Many empirical attempts have been made in this direction. For instance, Bekaert et al. (2005) and, more recently, Quinn & Toyoda (2008) argue that equity market and capital account liberalizations are positively associated with economic growth. Also, Gehringer (2013) shows that financial openness contributes to economic growth for the European Union countries. Demetriades & Rousseau (2016) argue that financial reforms, such as banks' regulations and supervisions, can be beneficial for economic growth.[2] On the other hand, a plethora of studies advocate that financial liberalization could be disadvantageous for growth, lead to immoderate risk-taking in financial markets and trigger financial crises (e.g., Demirgüç-Kunt & Detragiache, 1998; Kaminsky & Reinhart, 1999, Stiglitz, 2000; Joyce, 2011). Ranciere et al. (2006) demonstrate that although financial liberalization is linked to long-run growth, it could also lead to occasional crises. Ahmed (2013) report a negative relationship between financial liberalization and growth in Sub-Saharan Countries.[3,4] Within the literature of economic growth, there is theoretical and empirical justification that different economies belong to different convergence clubs which contain economies with similar characteristics. The economies that belong to the same group react in a similar way in any policy implementation and reform.[5]

The inconclusive results regarding the role of financial development and financial reforms on economic growth together with the fact that the economies may belong to specific types of groups underline the exigency of revisiting the finance-growth nexus from a different point of view. The empirical studies on the finance-growth nexus mainly abound with traditional regression techniques that focus on conditional mean responses. Hence, most of these studies

[1] See Cho (1986), Fry (1989), Fry (1997), Auerbach & Siddiki (2004).

[2] In addition, they show that financial depth is beneficial for growth over the period 1975-1989, while this is not the case for the period 1990-2004.

[3] For a discussion, see also Andersen & Tarp (2003), Kose et al. (2009), Bumann et al. (2013) and Arestis & Sawyer (2016).

[4] At the same time, several studies investigate the role of financial reforms across different dimensions. For instance, Agnello et al. (2012) show that financial reforms reduce income inequality, Jha (2020) finds that liberalization policies reduce corruption, while Jha & Bhuyan (2020) suggest that financial reforms promote entrepreneurship.

[5] Important representative literature, which provides theoretical and empirical justification regarding the convergence clubs, can be represented by the following papers: Baumol (1986), Chatterji (1992), Durlauf & Johnson (1995), Galor (1996) and Beylunioğlu et al. (2020), among others.

might fail to capture the potential heterogeneous effect of finance on growth across different levels of economic growth. Quantile regression methods "relax" the assumptions of symmetric distributions and, in our case, can quantify the effects of the financial sector on growth by modeling the entire conditional growth distribution. These approaches can be more informative than the "traditional" ones, as they can shed further light on the behaviour of the financial system on the tails (low or high levels) of growth. To the best of our knowledge, only Andini & Andini (2014) employed a quantile regression approach to investigate the role of financial development on growth.

We contribute to the literature in the following ways: (a) we explore the effect of financial reforms across different quantiles of the conditional distribution of economic growth. As far as we are concerned, this is the first study to include both financial development and financial reforms in a growth model under a panel quantile regression framework and (b) we employ two recent panel quantile regression approaches and thus we address concerns of potentially biased estimations in prior studies. Hence, we employ (i) the panel quantile estimator of Canay (2011) which considers fixed effects as "location shifter" and (ii) the "quantiles via moments" estimator of Machado & Silva (2019) that allows fixed effects to affect the entire growth distribution.

Using annual data for 81 countries over the period 1973-2005, we find evidence supporting that financial reforms are important determinants of growth, especially at lower levels of the conditional distribution of income growth. Hence, countries facing conditional low growth rates could benefit more from financial reforms. Financial development matters for growth, however, the size and significance of the effect are subject to different specifications. In particular, our findings indicate that when we employ the estimator of Canay (2011), financial development is positively associated with economic growth and its effect diminishes as far as higher levels of the conditional growth distribution are concerned. In terms of sign, similar patterns are observed when we apply the estimator of Machado & Silva (2019), however, the corresponding effect is not statistically significant. We proxy the financial development with the ratio of credit to private sector. Financial reforms are measured by a graded index

provided by Abiad et al. (2010). The results remain robust when we use the extensive and more recent dataset of financial reforms provided by Denk & Gomes (2017).[6]

In addition, we decompose financial reforms into seven relative dimensions and we show that liberalization policies on credit controls and reserve requirements, banking supervision, banking privatization, easing restrictions on capital account flows and securities markets' regulations are important for growth and in most cases, their effect is heterogeneous across the conditional distribution of growth. In contrast, we did not find strong evidence in favor of liberalization policies on interest rate controls and banking entry restrictions. Finally, we split the sample into two groups of countries based on their income and we find that financial development is important at lower levels of the conditional growth distribution in high-income countries, while it turns negative in higher quantiles in low-income countries. Financial reforms are found to have a greater impact on low-income countries rather than on high-income ones. The components of financial reforms react heterogeneously across the conditional distribution of economic growth in both income groups. While the majority of the reforms' components are positively associated with economic growth, this is not happening with the easing of banking entry restrictions, which in high-income countries can lead to negative effects on growth. Our findings provide additional insights in the finance-growth literature.

The paper is organized as follows: Section 2 describes the quantile regression methodology. Section 3 presents the model and analyzes the data. Section 4 contains the empirical findings and Section 5 includes the robustness analysis. The last section concludes.

1.2 Methodology

1.2.1 Quantile regression with fixed effects

Since the seminal work of Koenker & Bassett (1978), literature has documented considerable advances in the field of quantile regression (see for example, Koenker, 2004; Chernozhukov

[6]We describe this in Section 3.

& Hansen, 2005; Harding & Lamarche, 2009; Canay, 2011; Galvao Jr, 2011; Galvao & Kato, 2016; Powell, 2016; Machado & Silva, 2019). Quantile regression methods offer a more comprehensive picture of the effects of the covariates on the outcome variable as they allow one to model the entire conditional distribution of the latter rather than only focusing on the conditional means. In addition, these approaches can handle non-normally distributed data and can provide robust results even in the presence of outliers, unobserved heterogeneity and endogeneity. In this paper, we operate within two panel quantile regression approaches with fixed effects: the well-established "two-step" estimator, henceforth FEQR, proposed by Canay (2011) and the novel "Methods of Moments" QR , henceforth "MMQR", proposed by Machado & Silva (2019).

More concisely, the FEQR approach involves the following steps: first, we estimate the equation of interest ($Y_{it} = \beta_0 + \beta X'_{it} + \alpha_i + \epsilon_{it}$, where Y is the dependent variable and X is a vector of covariates) by using a fixed-effects regression technique. Second, we obtain the fixed effects ($\hat{\alpha}_i = Y_{it} - \beta_0 - \hat{\beta}_j X'_{it}$) and we subtract them from the dependent variable ($\hat{Y_{it}} = Y_{it} - \hat{\alpha_i}$). Given that $\hat{\alpha_i}$ is a "location-shifter" (i.e., it remains constant across all quantiles), the FEQR estimator is obtained after estimating equation (1) but with the dependent variable being the $\hat{Y_{it}}$, using a standard quantile regression approach.[7]

We also implement the "Method of Moments-Quantile Regression". The MMQR estimator is built on a location-scale model of the form: $Y_{it} = \alpha_i + X'_{it}\beta + (\delta_i + Z'_{it}\gamma)U_{it}$, where, X is a vector of covariates, α_i and δ_i denote the individual effects, Z is a vector of known differentiable transformations of the components of X, U_{it} are $i.i.d.$ (across i and t), statistically independent of X_{it}, and normalized to satisfy the moment conditions as presented in detail in Machado & Silva (2019). This approach, allows the individual effects to affect the entire distribution of economic growth and thus could provide additional support for the

[7]Although the FEQR methodology is widely used in the empirical literature, the estimator has not escaped criticism regarding its reliability in some cases. Besstremyannaya & Golovan (2019) state that studies with a large ratio of cross-sectional to time dimension (i.e., large N/T) could lead to incorrect results when applying the FEQR estimator. However, this is not the case for our analysis, given the structure of our sample. Andini & Andini (2014) use data in 5-year intervals for a sample of 78 countries and thus, the short time dimension of the data ($T = 7$) could arise the previously mentioned criticism.

investigation of our research question.[8]

1.3 The model and data

We follow the traditional finance-growth literature (e.g., King & Levine, 1993a) and we estimate a panel model that is very much in line with the specification of Demetriades & Rousseau (2016). However, we differentiate from the latter in the following ways: i) we use annual data instead of 5-year intervals. In this way, we take advantage of a higher time dimension in terms of the number of observations that is important for quantile regression to achieve consistent estimates; ii) we enhance the model by including more control variables and iii) we apply quantile regression approaches that account for the unobserved heterogeneity. We consider the following equation under a fixed effect approach:

$$\Delta log(Y_{it}) = \beta_0 + \beta_1 Y_{it-1} + \beta_2 FinDev_{it} + \beta_3 FinRef_{it} + \beta Controls_{it} + \alpha_i + \epsilon_{it} \qquad (1.1)$$

where Y_{it} captures the real GDP per capita and Y_{it-1} is one period lag of the GDP per capita. As far as the financial development ($FinDev$) is concerned, we use the ratio of domestic credit to private sector as a share of GDP, as it captures better the development of private firms, which is a situation more closely related to economic growth. The specific measure for financial development is used extensively in the literature.[9] Unlike existing indices that measure financial reforms based on binary dummy variables, we follow Abiad et al. (2010) who introduce a graded index that measures financial reforms by capturing financial liberalization

[8] The MMQR estimator performs well in the case of an endogenous explanatory variable in a cross-sectional model, as presented in Machado & Silva (2019).

[9] According to Levine (2005), the measures of financial development used in the empirical literature might not fully capture the concepts arising from theoretical models. In our case, the financial development variable captures the financial depth. Other measures of financial development (i.e., credit by banks to private sector and liquid liabilities to GDP) lead to equivalent findings in most cases. The correlation coefficients of different measures of financial development range from 0.601 to 0.823.

policies based on seven components.[10] These components are aggregated into a composite index which is used as a proxy for financial reforms (*FinRef*) in our study. The latter provides higher variation over time than binary reform indices and hence can quantify more efficiently the complex nature of liberalization policies.[11]

Moreover, we account for human capital (measured as average years of schooling, *Schooling*), capital stock (measured as capital formation as a share of GDP, *Capital*), government size (measured as government consumption as a percentage of GDP, *GovSize*), trade openness (measured as the sum of exports and imports as a percentage of GDP, *Openness*), crises in the banking sector (measured by a binary dummy variable that takes the value 1 when a banking crisis is taking place and zero otherwise, *BankCrisis*) and quality of governance (measured by the civil liberties index that ranges from 0 to 7, with higher values corresponding to a higher level of liberties, *Liberty*). In all specifications, we include country-specific and time-specific effects.

The analysis covers the period 1973-2005 and includes annual data for 81 developing and developed countries.[12] From these, 14 countries are in Africa, 19 are in the American continent, 19 are in Asia, 27 are in Europe and 2 are in Oceania. Based on the World Bank Atlas Method, 2005, 37 economies are classified into low and lower-middle income groups (henceforth, low-income) and 44 countries into upper-middle and high-income groups (henceforth, high-income). The choice of variables is driven by data-availability, by following the past literature and by choosing the variables with the lower pairwise correlations to avoid multicollinearity concerns. The corresponding correlation table and the list of countries used

[10] For different measures of financial liberalization, see also Bumann et al. (2013).

[11] As provided by Abiad et al. (2010), the seven aspects of the aggregate index are based on liberalization policies on controlling credit allocation and reserve requirements (Ref_1), interest rates' liberalization (Ref_2), easing banking entry restrictions (Ref_3), supervision of banks (Ref_4), privatization of banks (Ref_5), easing restrictions on flows of capital account (Ref_6) and regulation of securities markets (Ref_7). Higher values of the composite index indicate greater levels of liberalization. A higher value of banking supervision implies a more effective and independent supervision of the banking sector by the authorities, and a higher value of the regulation of securities markets indicates that the authorities promote policies which support the development both for bond and stock markets. For the rest of the reforms indices, higher values imply more liberalization.

[12] We initiate our analysis by compiling an unbalanced panel of 91 countries over the 1973-2005 period as this is the sample for which Abiad et al., (2010) provides data on financial reforms. After compiling our data set and adding all variables needed for the analysis, we result in an unbalanced panel of 81 countries.

in the analysis are reported in the Appendix, Tables A1 and A2, respectively. We present descriptive statistics and the source of the variables of interest in Table 1. In addition, we offer further insights into the distribution of the data across countries in Figures 1-6.

In particular, Figures 1 and 2 summarize the financial development and financial reforms across our sample. The darker the color of the country on the map, the higher the ratio of credit to private sector as a share of GDP or the level of liberalization, respectively.[13] Uganda, Kyrgyz Republic and Albania report the lowest values of financial development, while Japan, Switzerland and United States have the highest ones. Similarly, Latvia, Estonia and Switzerland are the most liberalized countries, while Nepal, China and India are the least liberalized ones.

To shed further insight into the timing of financial reforms, we present Figure 3. The left panel (Figure 3b) plots the aggregate reforms index over time and the right one (Figure 3b) depicts the evolution of the seven reforms components. It appears that most of the reforms have been implemented in the early 1990s. Although the majority of the liberalization policies have been implemented before 2005, and thus their growth effects are potentially captured in our time frame, one could worry that our findings are limited, given that the reform data are available until 2005.[14] For this reason, we have updated our sample using the extended dataset of Denk & Gomes (2017) who extended the dataset of Abiad et al. (2010) to 2015 for 43 OECD and G20 countries. To this end, we merge the initial dataset with the updated one and we replicate the analysis.[15] The findings remain qualitatively the same.[16]

We illustrate the distribution of GDP per capita growth in Figure 4 that depicts a roughly symmetric distribution for both developing and developed countries. Figure 5 demonstrates the average association between the growth rate of GDP per capita and the variables of inter-

[13]The maps were drawn using the SPMAP command in STATA.

[14]We would like to thank one anonymous reviewer and the editor for pointing this out.

[15]We would like to thank Oliver Denk and Gabriel Gomes for sharing the updated reform dataset.

[16]Denk & Gomes (2017) report data for five countries that are not included in the dataset of Abiad et al. (2010). For purposes of comparison, we kept the number of the countries in our sample fixed. That is, the new sample consists of the same 81 countries as before. We present the findings in the Appendix, Tables A3-A6. Based on the updated data, we also provide Figure A1, which shows that, on average, the financial reforms index does not vary considerably after 2005.

est (i.e., financial development and financial reforms). At first glance, low-income countries report lower values of financial development and financial reforms compared to high-income ones. The fitted lines appear to suggest that financial development is positively linked to the growth rate of GDP per capita, whilst financial reforms are negatively associated, in low-income countries. The opposite pattern holds for the high-income ones. To motivate quantile regression further, we present Figure 6. Instead of the linear regression fit, we present the predicted values after applying a simple quantile regression on the 5_{th}, $50th$ and 95_{th} conditional quantile levels between the main variables of interest on the full sample. The relationship between the growth rate of GDP per capita and the two variables of interest, changes across the different quantiles. Given this heterogeneity, quantile regression could show further evidence on the finance-growth nexus as it takes into account low, middle and high quantiles of the conditional growth distribution.

Table 1.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Data Source
GDP_{pc} *Growth*	2,258	0.0206	0.0386	-0.1886	0.1697	World Bank (2020)
FinDev	2,258	3.5176	0.8429	-2.8225	5.3995	World Bank (2019)
FinRef	2,258	0.5172	0.2975	0	1	Abiad et al. (2010)
Capital	2,258	3.1231	0.2903	0.1461	3.9555	World Bank (2020)
Schooling	2,258	6.5441	3.0425	0.4406	13.1261	Barro & Lee (2013)
GovSize	2,258	2.6469	0.3932	1.0737	3.7723	World Bank (2020)
Openness	2,258	3.9909	0.5483	2.1897	6.0413	World Bank (2020)
BankCrisis	2,258	0.0943	0.2924	0	1	World Bank (2019)
Liberty	2,258	3.1156	1.6612	1	7	Freedom House (2019)

Notes: GDP_{pc} *Growth* is measured as the log difference of the real GDP per capita. All other variables are expressed in natural logarithms except for *FinRef*, *Schooling*, *BankCrisis* and *Liberty*. *FinRef* is normalized to take values from 0 to 1. *Schooling* data were transformed from 5-year averages to annual data using interpolation methods. *Schooling* and *Liberty* are drawn from the Quality of Government Dataset (Dahlberg et al., 2020).

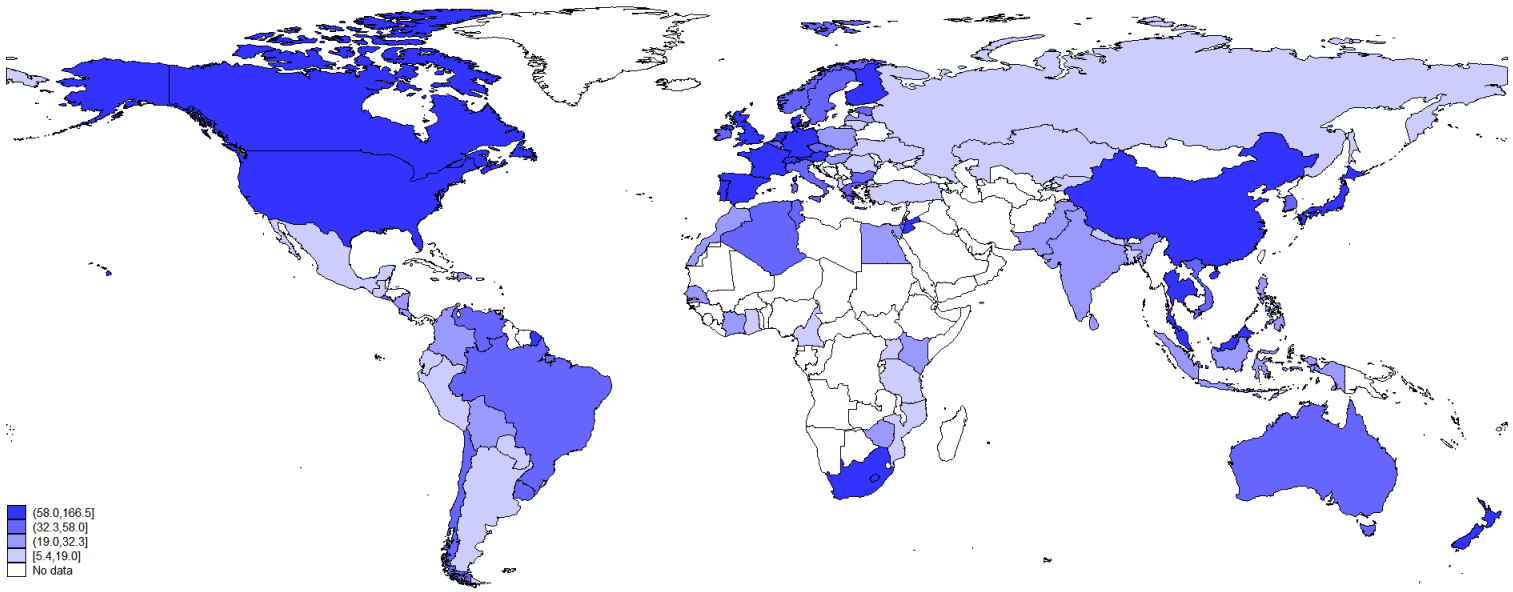


Figure 1.1: Financial Development (mean), 81 countries, 1973-2005

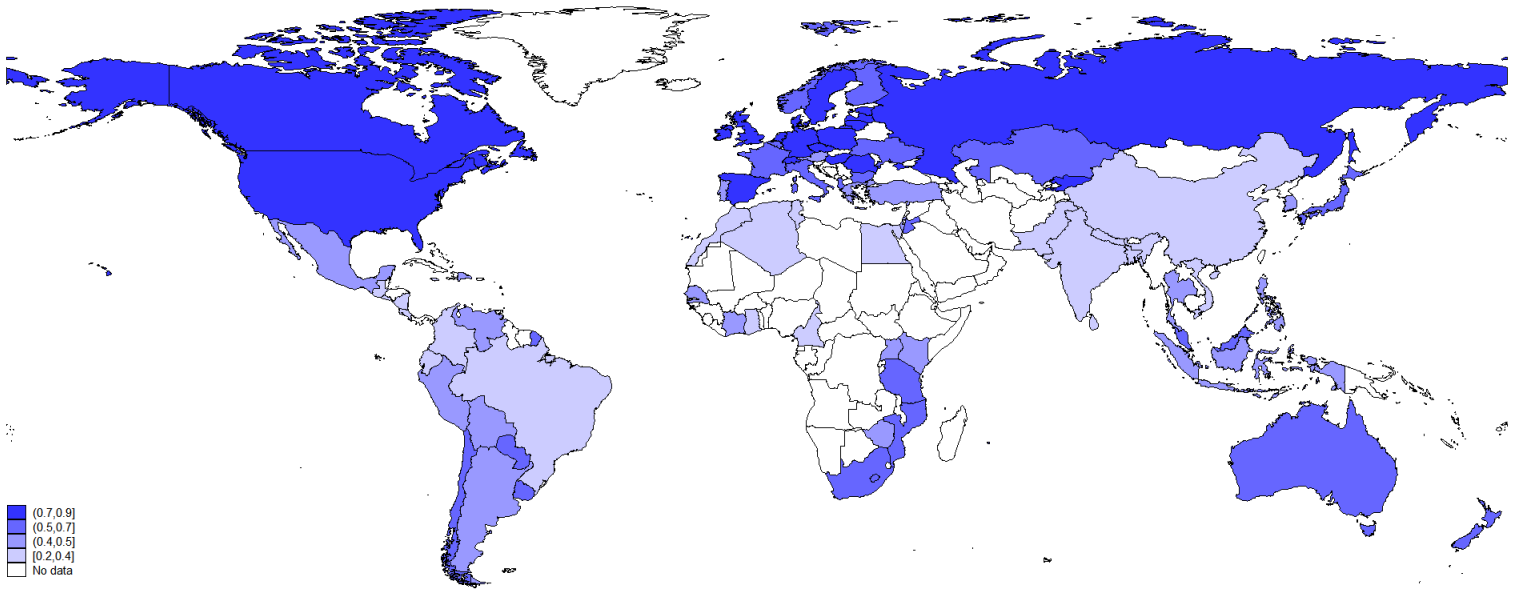
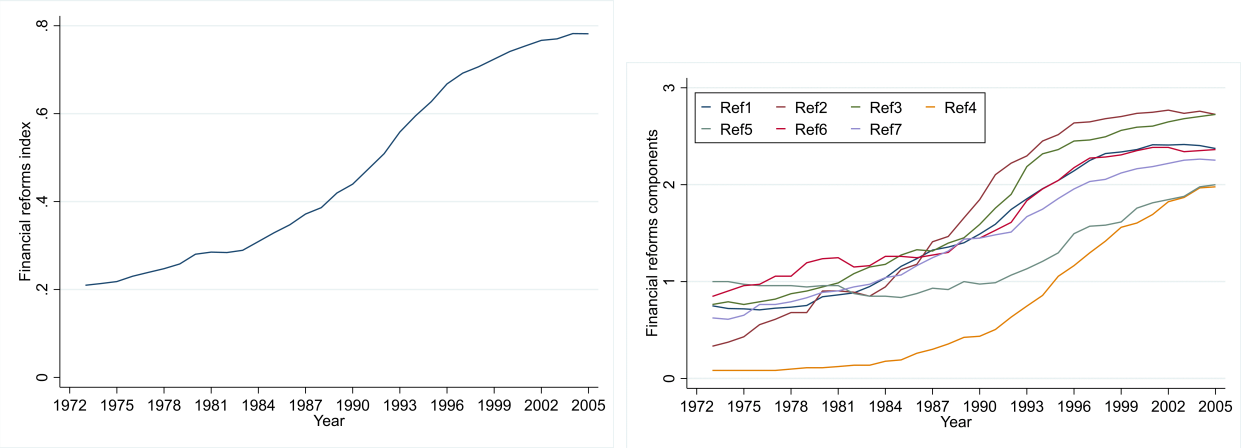


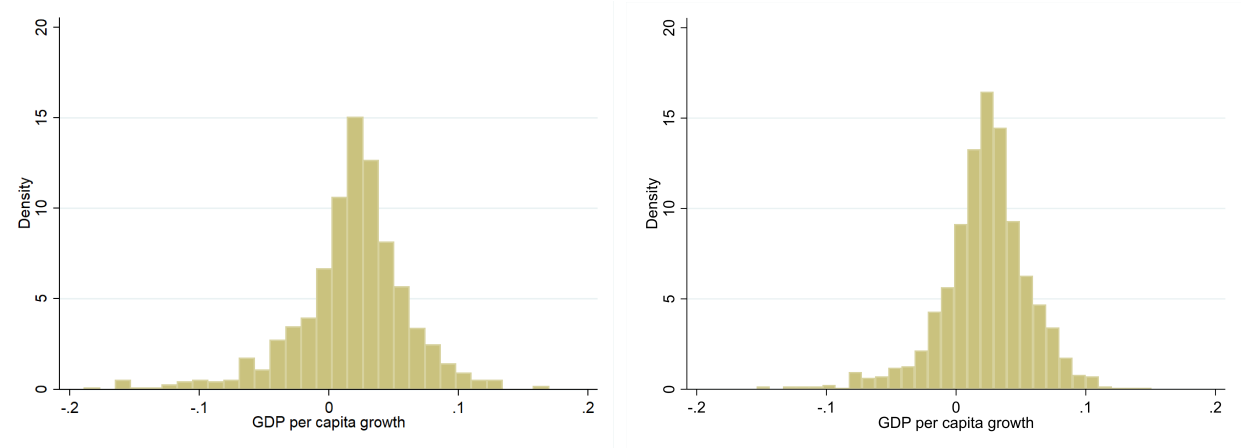
Figure 1.2: Financial Reforms (mean), 81 countries, 1973-2005



(a) Aggregate Financial Reforms index

(b) Financial Reforms components

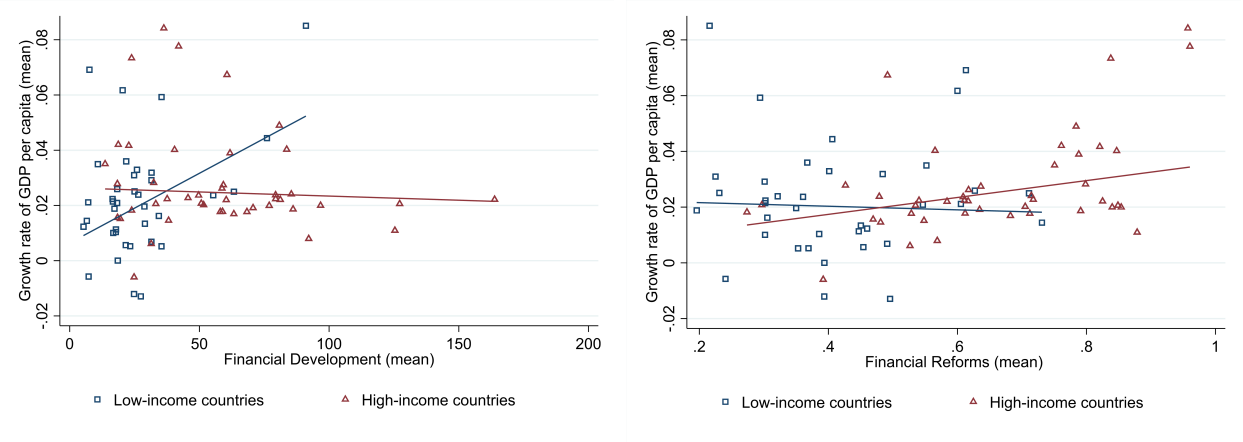
Figure 1.3: The evolution of Financial Reforms



(a) Low-income countries

(b) High-income countries

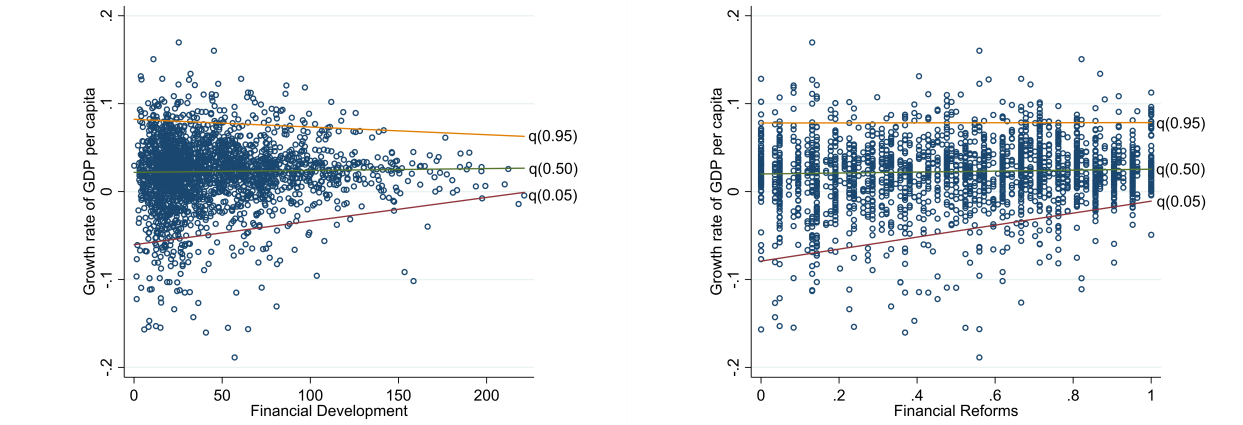
Figure 1.4: Histograms: Growth rate of GDP per capita



(a) Growth rate of GDP per capita and Financial Development

(b) Growth rate of GDP per capita and Financial Reforms

Figure 1.5: Scatter plots with linear regression fitted lines



(a) Growth rate of GDP per capita and Financial Development

(b) Growth rate of GDP per capita and Financial Reforms

Figure 1.6: Scatter plots with quantile regression fitted lines

1.4 Empirical findings

1.4.1 Baseline estimations

We initiate our analysis with the FEQR approach and we report the results in Table 2. For comparison reasons, we also provide estimates based on the conditional mean regression (i.e., fixed effects regression analysis, henceforth FE). Column (1) corresponds to the estimates of FE and columns (2)-(6) report the findings for selected quantiles with respect to the quantile regression approach. Consistent with the endogenous growth literature, the speed of conditional convergence, $lagGDP_{pc}$, is statistically significant and negatively associated with economic growth, both in the FE and FEQR model. Regarding the two variables of interest, *FinDev* and *FinRef*, key findings emerge. First, the FE model fails to support financial development as a determinant of growth. On the contrary, FEQR reveals that financial development matters for growth. More specifically, the lower the conditional growth rate a country experiences, the higher the magnitude of its effect. The effect of *FinDev* on growth disappears at higher levels of the conditional growth distribution.[17] Second, financial reforms are found to have a positive and statistically significant effect on growth that holds in both cases. Remarkably, in terms of magnitude, the effect of financial liberalization on growth at the lower quantiles of the distribution (i.e., q_{05}) is approximately two and three times greater than the effect at the higher ones (i.e., q_{75}, q_{95}).[18] As regards the rest explanatory variables, the results indicate that *Capital*, *GovSize*, *BankCrisis* have the expected signs as literature predicts and are statistically significant in both specifications. More precisely, capital stock is

[17] Andini & Andini (2014) report a positive relationship between financial development and growth, with the corresponding coefficient to increase in some cases, as higher quantiles of the growth distribution are considered. However, the aforementioned result could be attributed to different sample selection, sample size and econometric specification. The authors use the estimator of Koenker & Bassett (1978), which does not take into account the unobserved heterogeneity and the estimator of Canay (2011) for a panel set of 78 countries over the period 1960-1995 using 5-year intervals.

[18] To shed further light on these observations, one could formally test whether the reported coefficients across low and high quantiles are equal for the variables of interest. In most cases, the heterogeneity of coefficients across quantiles is confirmed. In what follows, for the estimates of *FinDev*, we reject the null hypothesis that coefficients between the q_{05} and the q_{50} are equal at the 10% significance level. For the estimates of *FinRef*, we reject equality of the coefficients between the q_{05} and the q_{75} at the 5% significance level. However, the null hypothesis of equality is not rejected when testing the coefficients of *FinRef* between the q_{05} and the q_{75}. The results of the tests are available upon request.

positively associated with economic growth and this holds for the entire growth distribution. Its effect diminishes as we move from lower to higher quantiles. Additionally, we observe a negative effect of the government size on economic growth. One more interesting result is that countries in the lower tail of the conditional growth distribution tend to be more vulnerable to banking crises than countries in the upper one. *Schooling* is positive and statistically significant only at the conditional median. Trade openness contributes to economic growth as the relevant coefficient is positive and statistically significant above the 25_{th} quantile. Finally, *Liberty* appears to have a negative effect at low parts of the conditional growth distribution and it becomes positive above the 50_{th} quantile. However, the positive effect is statistically significant at the upper tail of the distribution.

As described in section 3, to explore the finance-growth linkage further, we also apply the MMQR. Table 3 presents the findings. Column (1) corresponds to the results obtained after performing a two-stage least squares regression analysis (henceforth, 2SLS).[19] Two major implications arise from Table 3. First, although the coefficient of *FinDev* in each quantile follows a similar pattern as in the case of FEQR, it remains statistically insignificant for the entire conditional distribution of growth. Second, *FinRef* is positively associated with economic growth for all quantiles of the conditional distribution and its effect declines in the higher tail of the distribution. The importance of *FinRef* in economic growth is also supported in the 2SLS model, as the relevant coefficient is statistically significant at the 1% level. Apart from the financial development that was found to play no significant role in explaining economic growth, the outcomes provided by applying the MMQR are very much in line with the outcomes of the FEQR. Overall, in comparison with the traditional regression techniques (i.e., FE and 2SLS), quantile regression approaches reveal further evidence for the finance-growth nexus at the lower, middle and upper parts of the conditional distribution of economic growth. A graphical illustration of the coefficients of the variables of interest along the conditional distribution of growth is presented in Figures 7 to 10. The shading area

[19] We instrument the $lagGDP_{pc}$ and *FinDev* with their first and second lags, respectively. The relevant tests perform well in most cases. We have also replicated the analysis by instrumenting the rest regressors and the results remain, in most cases, remarkably similar.

represents the confidence interval at the 90% level. The dashed line depicts the corresponding coefficients at the conditional means of either FE or 2SLS model.

Table 1.2: Results using the FEQR

Dependent variable: GDPpc growth	(1) FE	(2) q_{05}	(3) q_{25}	(4) q_{50}	(5) q_{75}	(6) q_{95}
$lagGDP_{pc}$	-0.0419***	-0.0480***	-0.0422***	-0.0411***	-0.0402***	-0.0406***
	(0.0075)	(0.0037)	(0.0014)	(0.0011)	(0.0015)	(0.0031)
FinDev	0.0016	0.0104**	0.0043**	0.0024**	0.0000	-0.0045
	(0.0034)	(0.0045)	(0.0019)	(0.0012)	(0.0015)	(0.0032)
FinRef	0.0393***	0.0780***	0.0356***	0.0264***	0.0267***	0.0375***
	(0.0094)	(0.0189)	(0.0075)	(0.0047)	(0.0057)	(0.0131)
Capital	0.0425***	0.0541***	0.0449***	0.0411***	0.0370***	0.0232***
	(0.0072)	(0.0094)	(0.0050)	(0.0034)	(0.0035)	(0.0098)
Schooling	0.0002	-0.0013	0.0005	0.0007**	0.0007	0.0005
	(0.0021)	(0.0013)	(0.0005)	(0.0003)	(0.0005)	(0.0012)
GovSize	-0.0250***	-0.0306***	-0.0274***	-0.0244***	-0.0263***	-0.0275***
	(0.0062)	(0.0070)	(0.0030)	(0.0018)	(0.0034)	(0.0068)
Openness	0.0101	0.0018	0.0090***	0.0110***	0.0121***	0.0147***
	(0.0062)	(0.0041)	(0.0018)	(0.0012)	(0.0017)	(0.0036)
BankCrisis	-0.0184***	-0.0490***	-0.0202***	-0.0131***	-0.0122***	-0.0169***
	(0.0033)	(0.0113)	(0.0050)	(0.0026)	(0.0028)	(0.0043)
Liberty	-0.0005	-0.0073***	-0.0019**	0.0003	0.0013	0.0028*
	(0.0013)	(0.0024)	(0.0009)	(0.0008)	(0.0009)	(0.0017)
Observations	2258	2258	2258	2258	2258	2258
Countries	81	81	81	81	81	81
R-squared	0.232					

Notes: Column (1) reports the findings based on the fixed effects model. Robust standard errors clustered at the country level are in parentheses. Columns (2)-(6) report the findings for selected quantiles based on the FEQR model. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

Table 1.3: Results using the MMQR

Dependent variable: GDPpc growth	(1) 2SLS	(2) q_{05}	(3) q_{25}	(4) q_{50}	(5) q_{75}	(6) q_{95}
*lag*GDP$_{pc}$	-0.0474***	-0.0738***	-0.0528***	-0.0405***	-0.0306***	-0.0165
	(0.0089)	(0.0153)	(0.0097)	(0.0079)	(0.0080)	(0.0105)
FinDev	0.0009	0.0043	0.0025	0.0015	0.0007	-0.0004
	(0.0040)	(0.0070)	(0.0045)	(0.0034)	(0.0029)	(0.0032)
FinRef	0.0402***	0.0576***	0.0455***	0.0385***	0.0327***	0.0247**
	(0.0094)	(0.0181)	(0.0114)	(0.0090)	(0.0087)	(0.0109)
Capital	0.0450***	0.0782***	0.0547***	0.0409***	0.0298***	0.0141
	(0.0073)	(0.0106)	(0.0075)	(0.0072)	(0.0079)	(0.0100)
Schooling	0.0012	0.0046	0.0017	0.0000	-0.0013	-0.0032
	(0.0022)	(0.0042)	(0.0024)	(0.0023)	(0.0028)	(0.0041)
GovSize	-0.0257***	-0.0270**	-0.0257***	-0.0249***	-0.0243***	-0.0234***
	(0.0063)	(0.0110)	(0.0075)	(0.0063)	(0.0061)	(0.0070)
Openness	0.0113*	-0.0107	0.0030	0.0110*	0.0175**	0.0266***
	(0.0066)	(0.0124)	(0.0076)	(0.0064)	(0.0069)	(0.0091)
BankCrisis	-0.0181***	-0.0287***	-0.0219***	-0.0180***	-0.0148***	-0.0103***
	(0.0033)	(0.0080)	(0.0046)	(0.0030)	(0.0026)	(0.0037)
Liberty	-0.0005	-0.0036	-0.0016	-0.0004	0.0006	0.0019
	(0.0013)	(0.0029)	(0.0017)	(0.0013)	(0.0014)	(0.0021)
Observations	2208	2258	2258	2258	2258	2258
Countries	81	81	81	81	81	81
R-squared	0.234					

Notes: Column 1 reports the findings based on the 2SLS model. $lagGDP_{pc}$ and *FinDev* are instrumented using both their first and second lags as instruments, respectively. Under-identification test (Kleibergen-Paap) p-val: 0.000, Weak-identification test (Cragg-Donald) p-val: 0.000, Over-identification test (Sargan-Hansen) p-val: 0.8907. Robust standard errors clustered at the country level are in parentheses. Columns 2-6 report the findings for selected quantiles based on the MMQR model. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

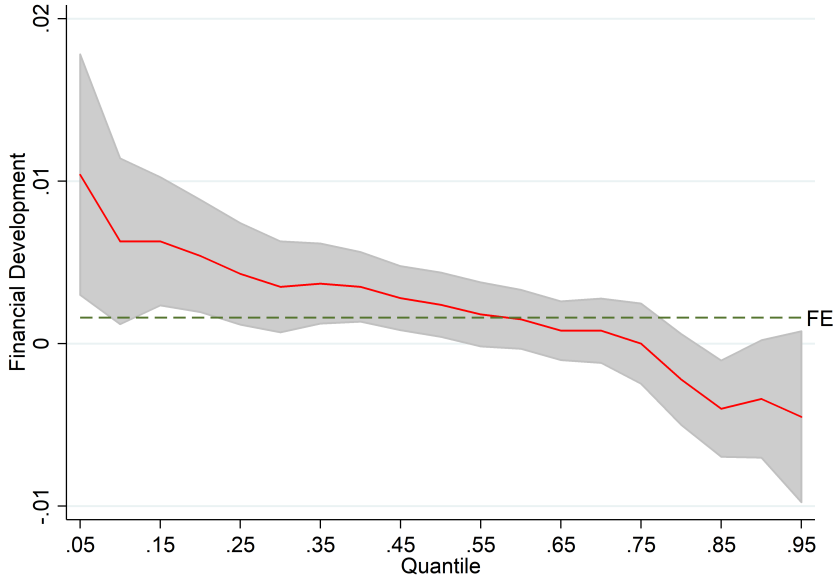


Figure 1.7: Financial Development and Growth: FEQR

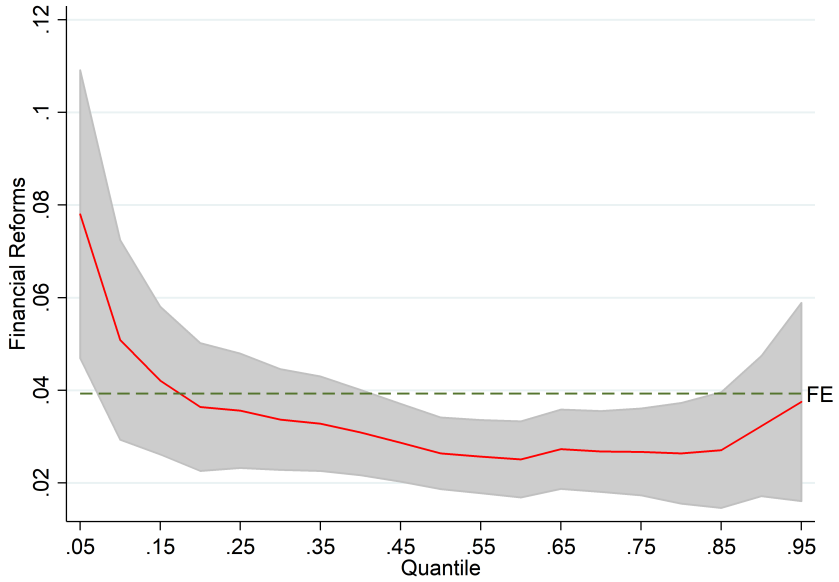


Figure 1.8: Financial Reforms and Growth: FEQR

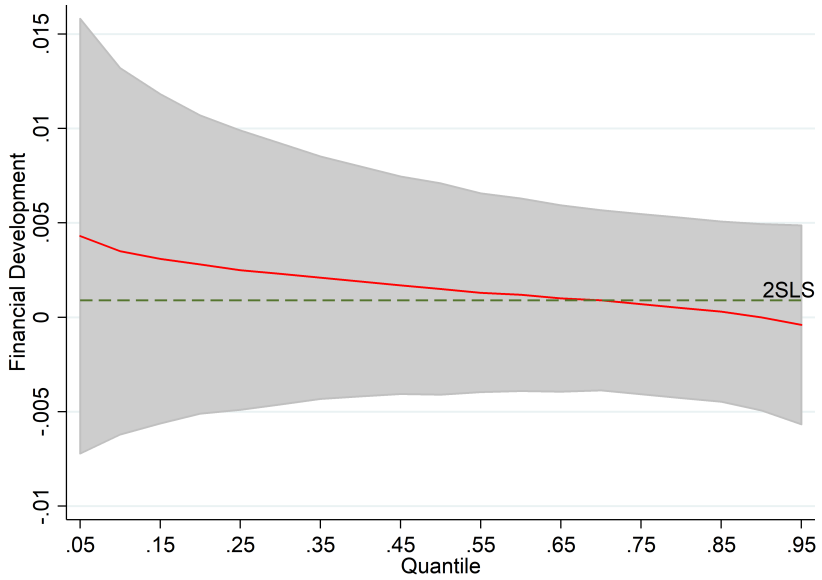


Figure 1.9: Financial Development and Growth: MMQR

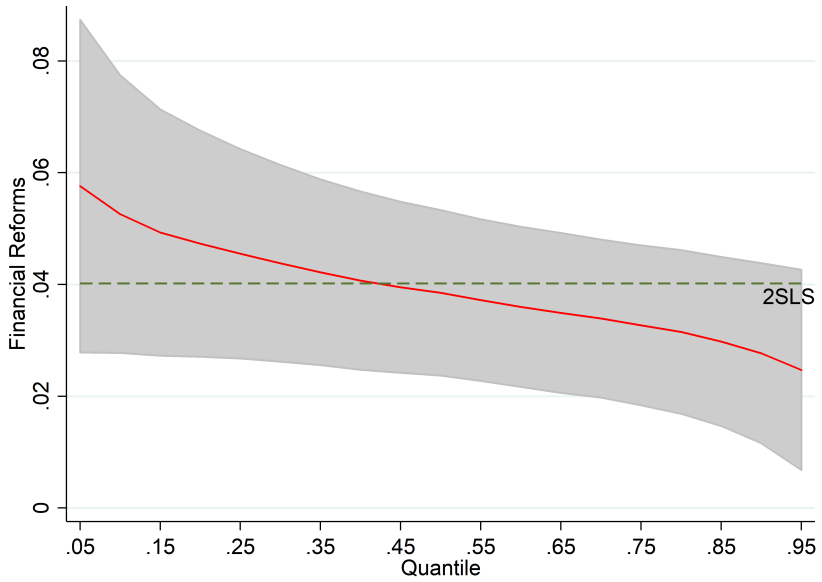


Figure 1.10: Financial Reforms and Growth: MMQR

1.5 Robustness analysis

1.5.1 Decomposition of financial reforms

The first type of robustness analysis is performed by splitting the composite index measuring financial reforms into seven components.[20] This is important mainly because the aggregate index of financial reforms contains a variety of components that may affect differently the financial system and the way that banks operate. Therefore, it would be meaningful for policymakers to know which component of the financial reforms has the most significant impact on economic growth. Moreover, the comparison between financial development and financial liberalization can provide valuable conclusions to the policymakers if we compare each component of financial reforms with the financial development.[21,] In what follows, we replicate the analysis presented in Tables 2 and 3, but we replace *FinRef* with the individual components (i.e., Ref_i, with $i = 1, 2, ..7$) of the composite index.[22] To avoid potential multicollinearity issues between the individual reform sub-indices, we carry out the analysis for each component separately. For brevity, we report only the coefficients of the variables of interest. Table 4 corresponds to the method of FEQR and Table 5 to the method of MMQR. In the last row of each table, we report the relevant estimates of FE and 2SLS, respectively.

Focusing on Table 4, we arrive at the following observations: i) in all cases, financial development is found to be an important determinant of growth in countries in the lower tail of the conditional growth distribution. Moving to higher quantiles of the distribution, its effect shrinks and becomes insignificant; ii) from the seven components of financial reforms, the interest rates' controls (Ref_2) and the removal of banking entry restrictions (Ref_3) do not contribute to economic growth;[23] iii) the rest five components are, in most cases, statistically significant and their effects are heterogeneous across quantiles. Similar to the relevant

[20] The same approach is also followed by Agnello et al. (2012) and Demetriades & Rousseau (2016).

[21] If in the composite index of the financial reform there is a component which has negative or no impact at all, then the aggregate index may underestimate the positive impact of other components of the financial reforms on economic growth.

[22] See also footnote 11.

[23] We find positive and statistically significant evidence only at the q_{05} for Ref_2.

aggregate index, the lower the quantile of the conditional distribution of growth, the higher the relative impact of the reform on economic growth. Among the significant components of financial reforms, banking supervision (Ref_4) and securities markets' regulation (Ref_7) show the highest impact on economic growth in terms of magnitude, especially in the lower tail of the conditional growth distribution. Regarding Table 5, we can note: i) in accordance with the results based on the composite index, financial development plays no role in explaining economic growth when applying the MMQR method; ii) the impact of financial reforms' indices are in most cases consistent with the FEQR results and iii) in terms of magnitude, banking supervision (Ref_4), banking privatization (Ref_5) and securities markets' regulation (Ref_7) have the strongest impact on growth.

Table 1.4: Decomposition of Financial Reforms: the case of FEQR

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Q	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	0.0134***	0.0090***	0.0111**	0.0072**	0.0135***	-0.0002	0.0107**	0.0114***	0.0117***	0.0079***	0.0102**	0.0071**	0.0108**	0.0112***
	(0.0045)	(0.0027)	(0.0048)	(0.0030)	(0.0048)	(0.0029)	(0.0045)	(0.0038)	(0.0045)	(0.0028)	(0.0050)	(0.0032)	(0.0049)	(0.0036)
q_{25}	0.0050***	0.0036***	0.0053***	0.0014	0.0046**	-0.0010	0.0038**	0.0054***	0.0053***	0.0029***	0.0048***	0.0034***	0.0038**	0.0073***
	(0.0019)	(0.0012)	(0.0018)	(0.0013)	(0.0018)	(0.0012)	(0.0018)	(0.0016)	(0.0018)	(0.0009)	(0.0018)	(0.0013)	(0.0019)	(0.0017)
q_{50}	0.0027**	0.0024***	0.0024*	0.0003	0.0024*	-0.0006	0.0023**	0.0043***	0.0027**	0.0025***	0.0029**	0.0025**	0.0024**	0.0061***
	(0.0013)	(0.0009)	(0.0012)	(0.0010)	(0.0012)	(0.0009)	(0.0012)	(0.0013)	(0.0013)	(0.0007)	(0.0012)	(0.0010)	(0.0012)	(0.0013)
q_{75}	0.0004	0.0020**	0.0003	0.0004	0.0004	0.0002	-0.0004	0.0047***	0.0003	0.0024**	0.0004	0.0029***	0.0000	0.0053***
	(0.0015)	(0.0010)	(0.0015)	(0.0010)	(0.0015)	(0.0013)	(0.0014)	(0.0016)	(0.0015)	(0.0010)	(0.0014)	(0.0011)	(0.0015)	(0.0016)
q_{95}	-0.0050	0.0012	-0.0050	0.0009	-0.0037	0.0033	-0.0043	0.0048	-0.0044	0.0032	-0.0043	0.0050**	-0.0036	0.0088***
	(0.0031)	(0.0021)	(0.0032)	(0.0026)	(0.0031)	(0.0026)	(0.0032)	(0.0034)	(0.0036)	(0.0021)	(0.0033)	(0.0020)	(0.0031)	(0.0029)
FE	0.0025	0.0039***	0.0027	0.0014	0.0027	-0.0000	0.0018	0.0072***	0.0023	0.0037**	0.0024	0.0043***	0.0024	0.0076***
	(0.0035)	(0.0015)	(0.0035)	(0.0014)	(0.0035)	(0.0017)	(0.0033)	(0.0023)	(0.0034)	(0.0018)	(0.0035)	(0.0015)	(0.0035)	(0.0021)

Notes: Columns (1)-(7) report the findings for selected quantiles for different components of financial reforms based on the FEQR model (obs=2,258). Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. In the last row of the table, the fixed effects estimates and their corresponding robust standard errors clustered at the country level are reported. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 1.5: Decomposition of Financial Reforms: the case of MMQR

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Quantile	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	0.0061	0.0068***	0.0063	0.0029	0.0065	-0.0008	0.0047	0.0103***	0.0057	0.0082**	0.0055	0.0070**	0.0057	0.0075*
	(0.0071)	(0.0026)	(0.0072)	(0.0026)	(0.0073)	(0.0030)	(0.0066)	(0.0035)	(0.0070)	(0.0032)	(0.0072)	(0.0033)	(0.0072)	(0.0042)
q_{25}	0.0036	0.0048***	0.0039	0.0019	0.0039	-0.0003	0.0028	0.0082***	0.0034	0.0052**	0.0034	0.0052***	0.0035	0.0076***
	(0.0045)	(0.0017)	(0.0045)	(0.0016)	(0.0046)	(0.0021)	(0.0042)	(0.0026)	(0.0044)	(0.0021)	(0.0046)	(0.0020)	(0.0046)	(0.0027)
q_{50}	0.0023	0.0038***	0.0026	0.0013	0.0025	0.0000	0.0017	0.0070***	0.0022	0.0035**	0.0022	0.0042***	0.0022	0.0076***
	(0.0034)	(0.0014)	(0.0034)	(0.0013)	(0.0035)	(0.0018)	(0.0032)	(0.0023)	(0.0034)	(0.0018)	(0.0035)	(0.0015)	(0.0034)	(0.0022)
q_{75}	0.0012	0.0030**	0.0015	0.0008	0.0014	0.0003	0.0008	0.0061**	0.0011	0.0022	0.0013	0.0034***	0.0012	0.0076***
	(0.0029)	(0.0014)	(0.0029)	(0.0014)	(0.0030)	(0.0019)	(0.0028)	(0.0024)	(0.0030)	(0.0018)	(0.0030)	(0.0013)	(0.0029)	(0.0021)
q_{95}	-0.0004	0.0017	-0.0001	0.0001	-0.0003	0.0006	-0.0004	0.0047*	-0.0004	0.0001	-0.0002	0.0021	-0.0004	0.0077***
	(0.0032)	(0.0016)	(0.0033)	(0.0019)	(0.0034)	(0.0024)	(0.0032)	(0.0028)	(0.0034)	(0.0023)	(0.0033)	(0.0017)	(0.0033)	(0.0026)
2SLS	0.0018	0.0039***	0.0021	0.0016	0.0018	0.0004	0.0004	0.0078***	0.0016	0.0029	0.0017	0.0043***	0.0017	0.0083***
	(0.0041)	(0.0014)	(0.0041)	(0.0014)	(0.0041)	(0.0017)	(0.0038)	(0.0025)	(0.0041)	(0.0018)	(0.0041)	(0.0015)	(0.0041)	(0.0022)

Notes: Columns (1)-(7) report the findings for selected quantiles for different components of financial reforms based on the MMQR model (obs=2,258). Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. In the last row of the table, the 2SLS estimates and their corresponding robust standard errors clustered at the country level are reported (obs=2,208). ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

1.5.2 Low- and high-income countries

The second type of robustness analysis is performed by splitting the sample into low- and high-income countries. For each group of countries, we perform the same analysis as presented in Tables 2-5. Although fixed effects in FEQR and MMQR are enough to capture countries' heterogeneity, focusing separately on different country groups could provide further evidence on the finance-growth nexus and, at the same time, it will reveal whether our results are driven by a specific sample group. Tables 6 and 7 report the FEQR findings for the low- and high-income countries, respectively, while Tables 8 and 9 present the corresponding MMQR results. Similarly, Tables 10-13 report the estimation results based on the decomposition of financial reforms.

More precisely, focusing on the variables of interest in Table 6, it becomes apparent that financial development has a negative effect on income growth at the upper quantile of the distribution in low-income countries. The relevant coefficient is statistically significant at the 10% level and is negative. On the contrary, financial reforms are statistically significant and their effect declines when considering higher quantiles of the distribution. The latter is supported in both specifications. When the analysis is restricted to high-income countries (Table 7), we find that financial development positively affects growth in lower quantiles. However, the effect becomes negative at the q_{95}. Financial reforms remain statistically significant (as in the main analysis) and their effect declines as we move to higher quantiles of the conditional income growth distribution. These findings are only supported by the FEQR method. The most surprising result emerging from the FEQR analysis is that the magnitude of the effect of financial reforms in low-income countries is almost two times greater than the corresponding effect in high-income ones. While the MMQR method fails to support the role of financial development on growth in high-income countries, this is not the case for financial reforms which remain statistically significant at higher levels of the conditional growth distribution. Interestingly, the coefficients of *FinDev*, *Openness* and *Liberty* are statistically insignificant in the mean-regression approaches for both income groups. However, this does not apply to the quantile regression approaches, where the aforementioned coefficients are statistically

significant in certain parts of the conditional distribution of growth.

Finally, we analyze the different components of financial reforms and, as in section 4, we present only the coefficients of interest for brevity. As regards our proxy for financial development, the findings in most cases match the results of the composite index (i.e., financial development contributes to economic growth at lower levels of the conditional growth distribution, the effect declines and becomes negative and insignificant as we move to higher quantiles; this effect is driven by high-income countries, while it is only supported by the FEQR model). It is worth noting that in most cases we observe quantile parameter heterogeneity across the variables of interest. While FE and 2SLS fail in some cases to support the role of financial development and financial reforms on economic growth, the quantile regression method reveals considerable insights for various parts of the conditional growth distribution. This analysis has implications for different income-groups. In terms of magnitude, supervision of banks (Ref_4) and liberalization of capital account flows (Ref_6) are the most important determinants of growth in low-income countries. We also find significant evidence supporting the role of reforms on controlling credit allocation and reserve requirements (Ref_1), privatization of banks (Ref_5) and regulation of securities markets (Ref_7) in economic growth. Interest rates' liberalization (Ref_2) and easing banking entry restrictions (Ref_3) play no statistically significant role for growth. The latter holds for both specifications.[24]

When we take into account high-income countries, both specifications support that reforms on banking entry restrictions (Ref_3) have a negative impact on growth. In other words, higher competition in the domestic banking sector and the entrance of new domestic banks could negatively affect economic growth. In addition, the findings imply that interest rates' liberalization (Ref_2), banking supervision (Ref_4) and banking privatization (Ref_5), liberalization of capital account flows (Ref_6) and regulation of securities markets (Ref_7) are positively associated with economic growth.[25]

In what follows, we find heterogeneous effects and patterns between countries with dif-

[24]We find positive and statistically significant evidence at the 10% level only at the q95 for Ref_3 under MMQR.

[25]The coefficients of Ref_4 Ref_6 are statistically significant only under the FEQR approach.

ferent income levels. By splitting the sample into two income groups, we reduce the number of observations. Thus, these findings should be interpreted with caution.[26] When comparing our results in FEQR to those of MMQR, it must be pointed out that we observe differences in the size and significance of the coefficients in some cases. However, the main notion driven by the analysis highlights: (i) the importance of financial development at lower levels of the conditional growth distribution in high-income countries; (ii) the heterogeneous effect of financial reforms' components in different parts of the conditional distribution of economic growth in both income groups and (iii) the negative impact of easing banking entry restrictions on economic growth in high-income countries.

[26] Given the reduction of the sample, to further support the reliance of our results in the MMQR, we have implemented the split-panel jackknife bias correction of Dhaene & Jochmans (2015) as suggested in Machado & Silva (2019).

Table 1.6: Low-income countries' results: the case of FEQR

Dependent variable: GDPpc growth	(1) FE	(2) q_{05}	(3) q_{25}	(4) q_{50}	(5) q_{75}	(6) q_{95}
$lag\text{GDP}_{pc}$	-0.0467***	-0.0509***	-0.0475***	-0.0462***	-0.0461***	-0.0417***
	(0.0120)	(0.0063)	(0.0031)	(0.0022)	(0.0035)	(0.0065)
FinDev	-0.0005	0.0079	0.0023	0.0018	-0.0007	-0.0076*
	(0.0065)	(0.0064)	(0.0031)	(0.0023)	(0.0025)	(0.0046)
FinRef	0.0590***	0.0938***	0.0479***	0.0412***	0.0422***	0.0517***
	(0.0159)	(0.0290)	(0.0125)	(0.0112)	(0.0120)	(0.0193)
Capital	0.0541***	0.0587***	0.0557***	0.0491***	0.0469***	0.0538***
	(0.0073)	(0.0118)	(0.0059)	(0.0053)	(0.0043)	(0.0075)
Schooling	0.0034	0.0017	0.0037***	0.0040***	0.0039***	0.0038**
	(0.0030)	(0.0019)	(0.0011)	(0.0006)	(0.0009)	(0.0019)
GovSize	-0.0178**	-0.0295***	-0.0198***	-0.0162***	-0.0107**	-0.0010
	(0.0084)	(0.0087)	(0.0049)	(0.0032)	(0.0045)	(0.0079)
Openness	0.0084	-0.0006	0.0032	0.0097**	0.0147***	0.0161*
	(0.0093)	(0.0076)	(0.0042)	(0.0040)	(0.0054)	(0.0089)
BankCrisis	-0.0150***	-0.0405***	-0.0178**	-0.0091**	-0.0101***	-0.0163***
	(0.0043)	(0.0152)	(0.0081)	(0.0038)	(0.0036)	(0.0059)
Liberty	0.0022	0.0023	0.0018	0.0021	0.0027*	0.0025
	(0.0019)	(0.0026)	(0.0013)	(0.0014)	(0.0016)	(0.0025)
Observations	1019	1019	1019	1019	1019	1019
Countries	37	37	37	37	37	37
R-squared	0.220					

Notes: Column (1) reports the findings based on the fixed effects model. Robust standard errors clustered at the country level are in parentheses. Columns (2)-(6) report the findings for selected quantiles based on the FEQR model. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

Table 1.7: High-income countries' results: the case of FEQR

Dependent variable: GDPpc growth	(1) FE	(2) q_{05}	(3) q_{25}	(4) q_{50}	(5) q_{75}	(6) q_{95}
*lag*GDP$_{pc}$	-0.0546***	-0.0531***	-0.0527***	-0.0553***	-0.0555***	-0.0537***
	(0.0106)	(0.0070)	(0.0026)	(0.0016)	(0.0019)	(0.0034)
FinDev	0.0016	0.0122**	0.0044**	0.0005	-0.0025	-0.0061*
	(0.0029)	(0.0056)	(0.0020)	(0.0018)	(0.0020)	(0.0032)
FinRef	0.0241*	0.0517***	0.0192**	0.0138*	0.0179***	0.0064
	(0.0132)	(0.0200)	(0.0097)	(0.0077)	(0.0068)	(0.0101)
Capital	0.0392***	0.0625***	0.0525***	0.0363***	0.0358***	0.0073
	(0.0129)	(0.0125)	(0.0066)	(0.0061)	(0.0060)	(0.0105)
Schooling	0.0002	-0.0013	-0.0001	0.0008	0.0009	0.0005
	(0.0021)	(0.0016)	(0.0006)	(0.0006)	(0.0007)	(0.0011)
GovSize	-0.0342***	-0.0057	-0.0291***	-0.0361***	-0.0421***	-0.0599***
	(0.0086)	(0.0097)	(0.0046)	(0.0038)	(0.0041)	(0.0077)
Openness	0.0094	0.0020	0.0101***	0.0097***	0.0094***	0.0119***
	(0.0091)	(0.0053)	(0.0020)	(0.0016)	(0.0019)	(0.0038)
BankCrisis	-0.0203***	-0.0400***	-0.0232***	-0.0177***	-0.0138***	-0.0114***
	(0.0044)	(0.0111)	(0.0054)	(0.0039)	(0.0043)	(0.0041)
Liberty	-0.0023	-0.0099***	-0.0034**	-0.0012	-0.0011	-0.0004
	(0.0014)	(0.0032)	(0.0014)	(0.0011)	(0.0010)	(0.0018)
Observations	1239	1239	1239	1239	1239	1239
Countries	44	44	44	44	44	44
R-squared	0.258					

Notes: Column (1) reports the findings based on the fixed effects model. Robust standard errors clustered at the country level are in parentheses. Columns (2)-(6) report the findings for selected quantiles based on the FEQR model. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

Table 1.8: Low-income countries' results: the case of MMQR

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
GDPpc growth	2SLS	q_{05}	q_{25}	q_{50}	q_{75}	q_{95}
$lag\text{GDP}_{pc}$	-0.0534***	-0.0905***	-0.0592***	-0.0438***	-0.0338***	-0.0150
	(0.0139)	(0.0221)	(0.0154)	(0.0128)	(0.0120)	(0.0139)
FinDev	-0.0002	-0.0075	-0.0025	-0.0001	0.0015	0.0045
	(0.0066)	(0.0120)	(0.0083)	(0.0066)	(0.0058)	(0.0058)
FinRef	0.0646***	0.0762**	0.0639***	0.0579***	0.0539***	0.0465**
	(0.0159)	(0.0359)	(0.0214)	(0.0164)	(0.0165)	(0.0229)
Capital	0.0568***	0.1145***	0.0713***	0.0501***	0.0363***	0.0102
	(0.0077)	(0.0145)	(0.0090)	(0.0076)	(0.0075)	(0.0097)
Schooling	0.0053*	0.0152*	0.0068	0.0026	-0.0001	-0.0051
	(0.0031)	(0.0092)	(0.0049)	(0.0040)	(0.0050)	(0.0078)
GovSize	-0.0191**	-0.0187	-0.0180*	-0.0177**	-0.0175**	-0.0171
	(0.0083)	(0.0160)	(0.0106)	(0.0089)	(0.0088)	(0.0107)
Openness	0.0105	-0.0085	0.0036	0.0095	0.0134	0.0207
	(0.0098)	(0.0190)	(0.0118)	(0.0097)	(0.0101)	(0.0133)
BankCrisis	-0.0136***	-0.0176	-0.0157**	-0.0148***	-0.0142***	-0.0131**
	(0.0045)	(0.0117)	(0.0066)	(0.0042)	(0.0034)	(0.0052)
Liberty	0.0027	0.0047	0.0029	0.0020	0.0014	0.0004
	(0.0018)	(0.0037)	(0.0023)	(0.0018)	(0.0019)	(0.0026)
Observations	993	1019	1019	1019	1019	1019
Countries	37	37	37	37	37	37
R-squared	0.257					

Notes: Column 1 reports the findings based on the 2SLS model. $lagGDP_{pc}$ and *FinDev* are instrumented using both their first and second lags as instruments, respectively. Under-identification test (Kleibergen-Paap) p-val: 0.000, Weak-identification test (Cragg-Donald) p-val: 0.000, Over-identification test (Sargan-Hansen) p-val: 0.6837. Robust standard errors clustered at the country level are in parentheses. Columns 2-6 report the findings for selected quantiles based on the MMQR model. Estimates are corrected using Jackknife bias corrections. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

Table 1.9: High-income countries' results: the case of MMQR

Dependent variable: GDPpc growth	(1) 2SLS	(2) q_{05}	(3) q_{25}	(4) q_{50}	(5) q_{75}	(6) q_{95}
$lag\text{GDP}_{pc}$	-0.0578***	-0.0849***	-0.0636***	-0.0537***	-0.0445***	-0.0317*
	(0.0120)	(0.0217)	(0.0152)	(0.0139)	(0.0150)	(0.0184)
FinDev	-0.0008	0.0072	0.0032	0.0014	-0.0003	-0.0027
	(0.0037)	(0.0074)	(0.0045)	(0.0032)	(0.0026)	(0.0032)
FinRef	0.0202*	0.0245	0.0242	0.0241*	0.0240*	0.0239*
	(0.0117)	(0.0238)	(0.0173)	(0.0142)	(0.0127)	(0.0124)
Capital	0.0415***	0.1065***	0.0592***	0.0372***	0.0168	-0.0117
	(0.0124)	(0.0176)	(0.0137)	(0.0136)	(0.0146)	(0.0170)
Schooling	0.0003	-0.0009	-0.0001	0.0002	0.0005	0.0010
	(0.0023)	(0.0046)	(0.003)	(0.0025)	(0.0025)	(0.0031)
GovSize	-0.0330***	-0.0252	-0.0315**	-0.0344***	-0.0371***	-0.0410***
	(0.0086)	(0.0177)	(0.0122)	(0.0100)	(0.0094)	(0.0104)
Openness	0.0107	-0.0121	0.0031	0.0101	0.0166*	0.0257**
	(0.0098)	(0.0170)	(0.0118)	(0.0100)	(0.0096)	(0.0108)
BankCrisis	-0.0209***	-0.0408***	-0.0264***	-0.0197***	-0.0135***	-0.0048
	(0.0044)	(0.0107)	(0.0065)	(0.0043)	(0.0036)	(0.0047)
Liberty	-0.0023	-0.0087*	-0.0042	-0.0021	-0.0001	0.0026
	(0.0015)	(0.0047)	(0.0026)	(0.0016)	(0.0015)	(0.0024)
Observations	1215	1239	1239	1239	1239	1239
Countries	44	44	44	44	44	44
R-squared	0.284					

Notes: Column 1 reports the findings based on the 2SLS model. $lagGDP_{pc}$ and *FinDev* are instrumented using both their first and second lags as instruments, respectively. Under-identification test (Kleibergen-Paap) p-val: 0.000, Weak-identification test (Cragg-Donald) p-val: 0.000, Over-identification test (Sargan-Hansen) p-val: 0.3683. Robust standard errors clustered at the country level are in parentheses. Columns 2-6 report the findings for selected quantiles based on the MMQR model. Estimates are corrected using Jackknife bias corrections. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

Table 1.10: Low-income countries: Decomposition of Financial Reforms: the case of FEQR

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Q	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	0.0092	0.0059	0.0109	0.0048	0.0081	-0.0001	0.0085	0.0130***	0.0072	0.0070**	0.0108	0.0110**	0.0062	0.0103**
	(0.0070)	(0.0040)	(0.0066)	(0.0045)	(0.0069)	(0.0033)	(0.0062)	(0.0048)	(0.0063)	(0.0033)	(0.0072)	(0.0048)	(0.0072)	(0.0045)
q_{25}	0.0048	0.0059***	0.0051	0.0001	0.0054*	0.0020	0.0044	0.0093***	0.0042	0.0033**	0.0045	0.0029*	0.0048	0.0066**
	(0.0032)	(0.0021)	(0.0032)	(0.0024)	(0.0031)	(0.0015)	(0.0029)	(0.0036)	(0.0031)	(0.0016)	(0.0031)	(0.0016)	(0.0034)	(0.0026)
q_{50}	0.0026	0.0054***	0.0032	-0.0012	0.0024	0.0001	0.0018	0.0095***	0.0027	0.0042***	0.0029	0.0035**	0.0022	0.0074***
	(0.0023)	(0.0021)	(0.0024)	(0.0020)	(0.0023)	(0.0013)	(0.0022)	(0.0036)	(0.0023)	(0.0016)	(0.0025)	(0.0016)	(0.0025)	(0.0025)
q_{75}	0.0005	0.0057***	0.0008	-0.0014	0.0010	0.0015	0.0008	0.0137***	0.0005	0.0043**	0.0012	0.0028	0.0007	0.0059**
	(0.0025)	(0.0022)	(0.0024)	(0.0023)	(0.0024)	(0.0019)	(0.0027)	(0.0039)	(0.0024)	(0.0020)	(0.0025)	(0.0019)	(0.0026)	(0.0030)
q_{95}	-0.0071	0.0070*	-0.0072	-0.0019	-0.0091**	0.0014	-0.0077*	0.0226***	-0.0060	0.0079**	-0.0050	-0.0014	-0.0072	0.0027
	(0.0044)	(0.0042)	(0.0047)	(0.0042)	(0.0045)	(0.0032)	(0.0040)	(0.0055)	(0.0045)	(0.0031)	(0.0046)	(0.0034)	(0.0047)	(0.0051)
FE	0.0010	0.0061**	0.0017	0.0002	0.0015	0.0012	0.0008	0.0130***	0.0007	0.0058**	0.0016	0.0053*	0.0006	0.0079**
	(0.0068)	(0.0029)	(0.0066)	(0.0027)	(0.0066)	(0.0021)	(0.0058)	(0.0047)	(0.0066)	(0.0026)	(0.0067)	(0.0028)	(0.0067)	(0.0038)

Notes: Columns (1)-(7) report the findings for selected quantiles for different components of financial reforms based on the FEQR model for low-income countries (obs=1,019). Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. In the last row of the table, the fixed effects estimates and their corresponding robust standard errors clustered at the country level are reported. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 1.11: High-income countries: Decomposition of Financial Reforms: the case of FEQR

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Q	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	0.0132**	0.0038	0.0127**	0.0070**	0.0085	-0.0084***	0.0069	0.0069**	0.0120**	0.0058*	0.0110**	-0.0003	0.0107*	0.0112***
	(0.0056)	(0.0037)	(0.0059)	(0.0033)	(0.0052)	(0.0032)	(0.0049)	(0.0033)	(0.0059)	(0.0030)	(0.0056)	(0.0037)	(0.0056)	(0.0043)
q_{25}	0.0042**	0.0023	0.0055***	0.0029*	0.0049**	-0.0059***	0.0041**	0.0019	0.0054***	0.0034***	0.0044**	0.0015	0.0036*	0.0069***
	(0.0020)	(0.0017)	(0.0021)	(0.0017)	(0.0020)	(0.0016)	(0.0020)	(0.0015)	(0.0020)	(0.0012)	(0.0020)	(0.0019)	(0.0020)	(0.0024)
q_{50}	0.0007	0.0014	0.0009	0.0028*	0.0022	-0.0049***	0.0012	-0.0007	0.0012	0.0027***	0.0002	0.0021	0.0001	0.0070***
	(0.0020)	(0.0013)	(0.0019)	(0.0015)	(0.0020)	(0.0012)	(0.0018)	(0.0012)	(0.0018)	(0.0008)	(0.0018)	(0.0017)	(0.0016)	(0.0018)
q_{75}	-0.0015	0.0014	-0.0018	0.0039***	-0.0002	-0.0034**	-0.0016	-0.0026	-0.0011	0.0022**	-0.0026	0.0024*	-0.0021	0.0062***
	(0.0019)	(0.0012)	(0.0018)	(0.0011)	(0.0017)	(0.0014)	(0.0018)	(0.0016)	(0.0020)	(0.0011)	(0.0021)	(0.0014)	(0.0018)	(0.0018)
q_{95}	-0.0064*	-0.0016	-0.0043	0.0018	-0.0041	-0.0039	-0.0052	-0.0008	-0.0054*	0.0028*	-0.0062*	0.0023	-0.0050	0.0025
	(0.0034)	(0.0019)	(0.0032)	(0.0020)	(0.0033)	(0.0025)	(0.0036)	(0.0026)	(0.0032)	(0.0017)	(0.0035)	(0.0020)	(0.0032)	(0.0025)
FE	0.0021	0.0024	0.0025	0.0035*	0.0032	-0.0047**	0.0021	0.0003	0.0019	0.0039*	0.0019	0.0021	0.0022	0.0067***
	(0.0028)	(0.0019)	(0.0030)	(0.0019)	(0.0031)	(0.0020)	(0.0029)	(0.0025)	(0.0029)	(0.0023)	(0.0029)	(0.0018)	(0.0029)	(0.0025)

Notes: Columns (1)-(7) report the findings for selected quantiles for different components of financial reforms based on the FEQR model for high-income countries (obs=1,239). Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. In the last row of the table, the fixed effects estimates and their corresponding robust standard errors clustered at the country level are reported. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 1.12: Low-income countries: Decomposition of Financial Reforms: the case of MMQR

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Quantile	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	-0.0041	0.0080*	-0.0040	0.0009	-0.0034	-0.0040	-0.0068	0.0163**	-0.0057	0.0128**	-0.0026	0.0074	-0.0035	0.0001
	(0.0119)	(0.0046)	(0.0119)	(0.0048)	(0.0121)	(0.0044)	(0.0104)	(0.0073)	(0.0116)	(0.0051)	(0.0120)	(0.0061)	(0.0120)	(0.0070)
q_{25}	-0.0005	0.0067**	0.0001	0.0004	0.0002	-0.0002	-0.0014	0.0140***	-0.0011	0.0077**	0.0006	0.0058	-0.0005	0.0058
	(0.0083)	(0.0033)	(0.0082)	(0.0031)	(0.0083)	(0.0028)	(0.0071)	(0.0049)	(0.0081)	(0.0033)	(0.0082)	(0.0037)	(0.0083)	(0.0045)
q_{50}	0.0013	0.0060**	0.0021	0.0002	0.0018	0.0015	0.0012	0.0128***	0.0009	0.0055**	0.0018	0.0052*	0.0009	0.0084**
	(0.0068)	(0.0029)	(0.0067)	(0.0027)	(0.0068)	(0.0023)	(0.0059)	(0.0045)	(0.0066)	(0.0027)	(0.0067)	(0.0027)	(0.0068)	(0.0039)
q_{75}	0.0028	0.0055*	0.0035	0.0000	0.0031	0.0028	0.0031	0.0120**	0.0025	0.0037	0.0029	0.0046*	0.0020	0.0104**
	(0.0060)	(0.0029)	(0.0060)	(0.0029)	(0.0060)	(0.0023)	(0.0055)	(0.0049)	(0.0060)	(0.0029)	(0.0060)	(0.0025)	(0.0060)	(0.0042)
q_{95}	0.0052	0.0046	0.0061	-0.0003	0.0053	0.0051*	0.0068	0.0104*	0.0055	0.0004	0.0047	0.0037	0.0037	0.0136**
	(0.0062)	(0.0035)	(0.0062)	(0.0037)	(0.0064)	(0.0028)	(0.0061)	(0.0062)	(0.0063)	(0.0037)	(0.0062)	(0.0031)	(0.0060)	(0.0056)
2SLS	0.0016	0.0058**	0.0021	0.0015	0.0018	0.0015	0.0006	0.0148***	0.0013	0.0049*	0.0020	0.0055**	0.0011	0.0093**
	(0.0069)	(0.0029)	(0.0066)	(0.0027)	(0.0067)	(0.0022)	(0.0057)	(0.0048)	(0.0068)	(0.0027)	(0.0067)	(0.0028)	(0.0068)	(0.0039)

Notes: Columns (1)-(7) report the findings for selected quantiles for different categories of financial reforms based on the MMQR model (obs=1,019). Estimates are corrected using Jackknife bias corrections. Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. In the last row of the table, the 2SLS estimates and their corresponding robust standard errors clustered at the country level are reported (obs=993). ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 1.13: High-income countries: Decomposition of Financial Reforms: the case of MMQR

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Quantile	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	0.0079	0.0027	0.0082	0.0043	0.0098	-0.0076**	0.0066	0.0040	0.0077	0.0040	0.0077	0.0023	0.0075	0.0091*
	(0.0073)	(0.0034)	(0.0075)	(0.0033)	(0.0072)	(0.0035)	(0.0071)	(0.0048)	(0.0075)	(0.0040)	(0.0070)	(0.0037)	(0.0074)	(0.0052)
q_{25}	0.0039	0.0025	0.0043	0.0037	0.0050	-0.0055**	0.0035	0.0014	0.0037	0.0040	0.0035	0.0022	0.0037	0.0074**
	(0.0045)	(0.0024)	(0.0047)	(0.0023)	(0.0046)	(0.0026)	(0.0044)	(0.0031)	(0.0046)	(0.0029)	(0.0044)	(0.0025)	(0.0045)	(0.0034)
q_{50}	0.0018	0.0024	0.0023	0.0034*	0.0029	-0.0046*	0.0019	0.0001	0.0017	0.0039	0.0016	0.0021	0.0019	0.0066***
	(0.0031)	(0.0020)	(0.0033)	(0.0020)	(0.0034)	(0.0024)	(0.0032)	(0.0026)	(0.0032)	(0.0024)	(0.0032)	(0.0020)	(0.0032)	(0.0025)
q_{75}	0.0002	0.0023	0.0005	0.0032	0.0010	-0.0038	0.0007	-0.0010	-0.0000	0.0039*	0.0000	0.0021	0.0005	0.0060***
	(0.0026)	(0.0019)	(0.0027)	(0.0020)	(0.0029)	(0.0024)	(0.0027)	(0.0027)	(0.0027)	(0.0023)	(0.0027)	(0.0017)	(0.0026)	(0.0021)
q_{95}	-0.0023	0.0021	-0.0019	0.0028	-0.0017	-0.0026	-0.0011	-0.0025	-0.0024	0.0038	-0.0024	0.0020	-0.0016	0.0050**
	(0.0032)	(0.0020)	(0.0031)	(0.0023)	(0.0034)	(0.0028)	(0.0031)	(0.0034)	(0.0033)	(0.0025)	(0.0032)	(0.0017)	(0.0030)	(0.0022)
2SLS	-0.0003	0.0021	0.0003	0.0028	0.0011	-0.0043**	-0.0004	0.0003	-0.0005	0.0032	-0.0006	0.0017	-0.0002	0.0065***
	(0.0038)	(0.0017)	(0.0038)	(0.0017)	(0.0042)	(0.0021)	(0.0040)	(0.0027)	(0.0038)	(0.0022)	(0.0038)	(0.0017)	(0.0038)	(0.0025)

Notes: Columns (1)-(7) report the findings for selected quantiles for different categories of financial reforms based on the MMQR model (obs=1,239). Estimates are corrected using Jackknife bias corrections. Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. In the last row of the table, the 2SLS estimates and their corresponding robust standard errors clustered at the country level are reported (obs=1,215). ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

1.5.3 Endogeneity concerns: further evidence

This section investigates the robustness of the analysis in response to endogeneity concerns. While research of quantile regression estimators that account for fixed effects and at the same time control for endogeneity issues is still in progress, one can handle potential endogenous regressors by introducing lags. For this reason, we substitute the $lag\,GDP_{pc}$ and *FinDev* with their respected two-period lagged values and replicate the main analysis presented in Section 4.[27]

We have also carried out the analysis by taking lags for *FinRef* as well as for all right-hand side variables in our model. Tables 14 and 15 report the findings. For space reasons, we report only the coefficients of the variables of interest. We observe differences both in the magnitude and significance of the corresponding coefficients between the FEQR and MMQR methods when we control for possible endogeneity, nonetheless, the results are in line with the main findings of the study.

[27] A similar approach is followed by Martínez-Zarzoso et al. (2017) where the variable of interest is lagged two periods to handle possible endogeneity in a panel quantile regression framework.

Table 1.14: Lagged regressors: the case of FEQR

Dependent variable:	(1)	(2)	(3)	(4)	(5)
GDPpc growth	q_{05}	q_{25}	q_{50}	q_{75}	q_{95}
$FinDev_{(t-2)}$	0.0078**	0.0034**	0.0011	-0.0009	-0.0029
	(0.0039)	(0.0015)	(0.0010)	(0.0014)	(0.0025)
FinRef	0.0727***	0.0307***	0.0243***	0.0241***	0.0333***
	(0.0163)	(0.0069)	(0.0050)	(0.0054)	(0.0116)
$FinDev_{(t-2)}$	0.0030	0.0018	0.0005	-0.0018	-0.0035
	(0.0042)	(0.0013)	(0.0010)	(0.0014)	(0.0025)
$FinRef_{(t-2)}$	0.0578***	0.0239***	0.0198***	0.0183***	0.0248**
	(0.0141)	(0.0070)	(0.0050)	(0.0049)	(0.0114)
$FinDev_{(t-2)}$	0.0043	0.0027	-0.0004	-0.0025*	-0.0079***
	(0.0047)	(0.0017)	(0.0009)	(0.0013)	(0.0030)
$FinRef_{(t-2)}$	0.0508***	0.0208***	0.0236***	0.0292***	0.0415***
	(0.0170)	(0.0067)	(0.0044)	(0.0055)	(0.0117)

Notes: Columns (1)-(5) report the findings for selected quantiles based on the FEQR model where we introduce two-period lags. We lag $lagGDP_{pc}$ and *FinDev* in rows (1)-(2), $lagGDP_{pc}$, *FinDev* and *FinRef* in rows (3)-(4) and all regressors in rows (5)-(6). Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 1.15: Lagged regressors: the case of MMQR

Dependent variable:	(1)	(2)	(3)	(4)	(5)
GDPpc growth	q_{05}	q_{25}	q_{50}	q_{75}	q_{95}
$FinDev_{(t-2)}$	0.0022	0.0011	0.0005	0.0000	-0.0007
	(0.0048)	(0.0028)	(0.0023)	(0.0024)	(0.0034)
FinRef	0.0541***	0.0425***	0.0360***	0.0308***	0.0233**
	(0.0174)	(0.0104)	(0.0084)	(0.0085)	(0.0115)
$FinDev_{(t-2)}$	0.0006	0.0000	-0.0003	-0.0006	-0.0009
	(0.0049)	(0.0029)	(0.0024)	(0.0026)	(0.0037)
$FinRef_{(t-2)}$	0.0329**	0.0291***	0.0271***	0.0255***	0.0231**
	(0.0154)	(0.0101)	(0.0086)	(0.0088)	(0.0109)
$FinDev_{(t-2)}$	0.0019	0.0002	-0.0008	-0.0015	-0.0025
	(0.0063)	(0.0032)	(0.0022)	(0.0025)	(0.0041)
$FinRef_{(t-2)}$	0.0309*	0.0315***	0.0319***	0.0322***	0.0325***
	(0.0185)	(0.0116)	(0.0095)	(0.0096)	(0.0121)

Notes: Columns (1)-(5) report the findings for selected quantiles based on the MMQR model where we introduce two-period lags. We lag $lagGDP_{pc}$ and *FinDev* in rows (1)-(2), $lagGDP_{pc}$, *FinDev* and *FinRef* in rows (3)-(4) and all regressors in rows (5)-(6). Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

1.6 Concluding Remarks

We investigate the importance of financial development and financial reforms in explaining economic growth under alternative quantile regression approaches. By accounting for unobserved heterogeneity and handling possible endogeneity concerns, we find that financial reforms are important determinants of growth and that their effect is greater at lower quantiles of the conditional distribution of economic growth. Financial development contributes to economic growth, however, the magnitude and significance of the effect are subject to different specifications. We investigate seven different components of financial reforms and we show that each of them responds heterogeneously in the growth process. The aforementioned effects vary across different income groups of countries. Overall, banking supervision and securities markets' regulations are found to be vital components of financial reforms for economic growth. The importance of banking supervision on economic growth is consistent with the results of Demetriades & Rousseau (2016) and Neanidis (2019). The importance of the securities markets, such as stock markets, is well-documented in the literature (e.g., Levine, 1991 and Levine & Zervos, 1998). Our findings are consistent with previous literature supporting the role of liberalization of the financial sector on boosting economic growth (e.g., Bekaert et al., 2005) while at the same time they enhance our understanding of the reforms-growth nexus. As regards the role of financial development on economic growth our findings corroborate previous evidence suggesting that its effect varies across countries (e.g., Rousseau & Wachtel, 2011) and different stages of economic development (e.g., Deidda & Fattouh, 2002 and Sahay et al., 2015). Although the majority of financial reforms' components is found to be positively associated with economic growth, the easing of banking entry restrictions could lead to negative effects (the latter is found statistically significant only in high-income countries). This is in line with a strand of literature suggesting that banking competition is not helpful for economic growth as a more concentrated banking sector can finance firms which are more risky by nature, such as more oriented technological firms (see

Petersen & Rajan, 1995 and Di Patti & Dell'Ariccia, 2004, among others).[28]

Our research suggests some policy implications. First, economic policy for enhancing economic growth through the financial system could be formulated through financial reforms rather than financial development (i.e., financial reforms are found to be more important determinants of growth than financial development). Second, policymakers, before implementing any policy-measure related to the financial system, could take into account the level of economic growth of a country. (i.e., the presence of parameter heterogeneity across different quantiles of the conditional distribution could mean that countries respond differently with respect to their relative growth level). Third, decision-making could be oriented towards specific income-groups of countries (i.e., financial liberalization appeared to contribute more to economic growth in low-income countries for the entire conditional distribution, while financial development found positive for high-income countries at lower quantiles of the distribution). Finally, policymakers should take into account that not all the components of financial reforms can promote economic growth. More precisely, it seems that banking supervision and the promotion of stock-bond markets and of other alternative than the official banking system financial structures could be the most growth promoting factors. In addition, liberalization policies on credit controls and reserve requirements, banking supervision and the easing of restrictions on capital account flows could also be driving factors of economic growth. On the other hand, the elimination of banking entry barriers could negatively affect economic growth. Since our sample is restricted to the period 1973-2005, the aforementioned policy implications should be put into the context of the period analyzed. Nonetheless, in the majority of the countries, financial reforms have been implemented within the period of our analysis. In addition, our findings tend toward the same direction when we consider more recent data. Therefore, our findings could be promising for an effective policy design

[28] We have examined the finance-growth nexus across a number of dimensions (i.e., various econometric contexts, different components of financial reforms, different groups of countries). It is quite common in empirical analyses to split the sample into sub-periods and check whether the results are driven by specific time periods. Given the asymptotic properties of quantile regression estimators, any reduction of the observations of the sample could affect the reliability and the consistency of the findings. To this end, as stated in Section 3, all specifications include specific-time effects that capture all time-variant shocks and effects.

in the future.

The current paper has shown that there is a heterogeneous effect of financial development and financial reforms across different groups of countries which have been categorized according to their degree of development. Therefore, since economic development is determined by the degree of the institutional quality, for future research it would be interesting to analyze the interrelationship that may exist between the institutional quality and the different types of financial reforms and how this relation can determine economic growth.

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Appendix

Table A1: List of countries

Classification	Countries
Low-Income group:	Albania, Algeria, Bangladesh, Bolivia, Cameroon, China, Colombia, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Ghana, Guatemala, India, Indonesia, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Morocco, Mozambique, Nepal, Nicaragua, Pakistan, Paraguay, Peru, Philippines, Senegal, Sri Lanka, Tanzania, Thailand, Tunisia, Uganda, Ukraine, Vietnam, Zimbabwe.
High-Income group:	Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Jamaica, Japan, Korea, Rep., Latvia, Lithuania, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Uruguay, Venezuela, RB.

Notes: Countries are classified into low-income (includes low- and lower-middle income) and high-income (includes upper-middle and high-income) based on the Atlas Method of the World Bank in 2005.

Table A2: Correlation matrix

	$lag\text{GDP}_{pc}$	*FinDev*	*FinRef*	*Capital*	*Schooling*	*GovSize*	*Openness*	*BankCrisis*
FinDev	0.63							
FinRef	0.54	0.41						
Capital	0.23	0.34	0.04					
Schooling	0.74	0.42	0.69	0.12				
GovSize	0.47	0.34	0.29	0.11	0.42			
Openness	0.18	0.18	0.35	0.22	0.23	0.24		
BankCrisis	-0.06	-0.06	-0.04	-0.14	-0.02	-0.01	-0.04	
Liberty	-0.73	-0.39	-0.43	-0.07	-0.65	-0.38	-0.05	0.06

Table A3: Results using the FEQR: updated sample

Dependent variable:	(1)	(2)	(3)	(4)	(5)
GDPpc growth	q_{05}	q_{25}	q_{50}	q_{75}	q_{95}
$lagGDP_{pc}$	-0.0433***	-0.0371***	-0.0360***	-0.0357***	-0.0362***
	(0.0034)	(0.0015)	(0.0012)	(0.0015)	(0.0028)
FinDev	0.0074*	0.0014	-0.0009	-0.0026	-0.0097***
	(0.0043)	(0.0016)	(0.0012)	(0.0017)	(0.0030)
FinRef	0.0766***	0.0264***	0.0199***	0.0189***	0.0331***
	(0.0182)	(0.0071)	(0.0050)	(0.0058)	(0.0125)
Capital	0.0563***	0.0478***	0.0435***	0.0411***	0.0379***
	(0.0086)	(0.0046)	(0.0033)	(0.0034)	(0.0086)
Schooling	-0.0011	0.0006	0.0007**	0.0006	0.0003
	(0.0012)	(0.0004)	(0.0003)	(0.0005)	(0.0012)
GovSize	-0.0304***	-0.0283***	-0.0247***	-0.0262***	-0.0275***
	(0.0064)	(0.0029)	(0.0017)	(0.0031)	(0.0062)
Openness	0.0035	0.0123***	0.0128***	0.0129***	0.0171***
	(0.0036)	(0.0015)	(0.0011)	(0.0017)	(0.0037)
BankCrisis	-0.0438***	-0.0176***	-0.0137***	-0.0134***	-0.0146***
	(0.0107)	(0.0039)	(0.0023)	(0.0024)	(0.0037)
Liberty	-0.0059***	-0.0020**	0.0003	0.0009	0.0018
	(0.0021)	(0.0008)	(0.0008)	(0.0009)	(0.0015)
Observations	2,629	2,629	2,629	2,629	2,629
Countries	81	81	81	81	81

Notes: Columns (1)-(5) report the findings for selected quantiles based on the FEQR model using the updated index data. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

Table A4: Results using the MMQR: updated sample

Dependent variable:	(1)	(2)	(3)	(4)	(5)
GDPpc growth	q_{05}	q_{25}	q_{50}	q_{75}	q_{95}
$lagGDP_{pc}$	-0.0617***	-0.0449***	-0.0360***	-0.0286***	-0.0180**
	(0.0161)	(0.0108)	(0.0084)	(0.0075)	(0.0086)
FinDev	-0.0007	-0.0010	-0.0012	-0.0014	-0.0016
	(0.0066)	(0.0042)	(0.0033)	(0.0029)	(0.0032)
FinRef	0.0536***	0.0391***	0.0314***	0.0251***	0.0159*
	(0.0174)	(0.0108)	(0.0084)	(0.0078)	(0.0097)
Capital	0.0817***	0.0573***	0.0445***	0.0338***	0.0184*
	(0.0102)	(0.0069)	(0.0067)	(0.0074)	(0.0096)
Schooling	0.0025	0.0009	0.0000	-0.0007	-0.0017
	(0.0033)	(0.0019)	(0.0017)	(0.0019)	(0.0028)
GovSize	-0.0240**	-0.0250***	-0.0256***	-0.0260***	-0.0267***
	(0.0109)	(0.0073)	(0.0063)	(0.0063)	(0.0077)
Openness	-0.0053	0.0065	0.0128**	0.0180***	0.0254***
	(0.0108)	(0.0070)	(0.0061)	(0.0064)	(0.0082)
BankCrisis	-0.0268***	-0.0209***	-0.0178***	-0.0152***	-0.0115***
	(0.0069)	(0.0040)	(0.0026)	(0.0023)	(0.0033)
Liberty	-0.0040	-0.0017	-0.0006	0.0004	0.0019
	(0.0029)	(0.0016)	(0.0013)	(0.0013)	(0.0020)
Observations	2,629	2,629	2,629	2,629	2,629
Countries	81	81	81	81	81

Notes: Columns 1-5 report the findings for selected quantiles based on the MMQR model using the updated index data. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

Table A5: Decomposition of Financial Reforms: FEQR, updated sample

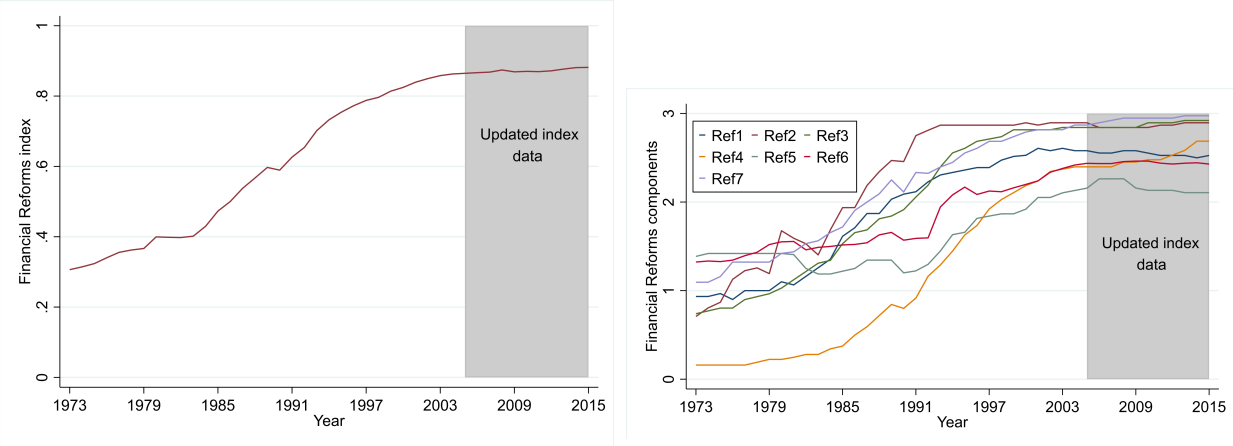
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Q	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	0.0083*	0.0091***	0.0089**	0.0056**	0.0077*	0.0009	0.0049	0.0091**	0.0093**	0.0044*	0.0064	0.0054*	0.0070	0.0105***
	(0.0043)	(0.0023)	(0.0044)	(0.0027)	(0.0044)	(0.0028)	(0.0045)	(0.0036)	(0.0043)	(0.0024)	(0.0046)	(0.0029)	(0.0044)	(0.0035)
q_{25}	0.0021	0.0031***	0.0021	0.0016	0.0017	-0.0004	0.0009	0.0049***	0.0017	0.0013	0.0013	0.0017	0.0015	0.0081***
	(0.0015)	(0.0011)	(0.0015)	(0.0012)	(0.0015)	(0.0012)	(0.0015)	(0.0013)	(0.0015)	(0.0009)	(0.0015)	(0.0012)	(0.0015)	(0.0016)
q_{50}	-0.0006	0.0015	-0.0005	0.0004	-0.0004	0.0001	-0.0010	0.0038***	-0.0004	0.0010	-0.0009	0.0016*	-0.0001	0.0069***
	(0.0012)	(0.0010)	(0.0011)	(0.0010)	(0.0011)	(0.0009)	(0.0011)	(0.0011)	(0.0011)	(0.0008)	(0.0011)	(0.0009)	(0.0012)	(0.0013)
q_{75}	-0.0024	0.0004	-0.0026	0.0009	-0.0028*	0.0004	-0.0031**	0.0045***	-0.0023	0.0005	-0.0025	0.0015	-0.0033**	0.0060***
	(0.0016)	(0.0011)	(0.0016)	(0.0010)	(0.0016)	(0.0014)	(0.0015)	(0.0016)	(0.0017)	(0.0010)	(0.0016)	(0.0010)	(0.0016)	(0.0015)
q_{95}	-0.0078***	-0.0008	-0.0091***	0.0004	-0.0092***	0.0031	-0.0098***	0.0055**	-0.0085***	0.0015	-0.0106***	0.0044**	-0.0083***	0.0092***
	(0.0028)	(0.0020)	(0.0028)	(0.0025)	(0.0028)	(0.0026)	(0.0028)	(0.0027)	(0.0033)	(0.0018)	(0.0028)	(0.0020)	(0.0026)	(0.0028)

Notes: Columns (1)-(7) report the findings for selected quantiles for different components of financial reforms based on the FEQR model for the updated sample (obs=2,629). Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table A6: Decomposition of Financial Reforms: MMQR, updated sample

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Q	*FinDev*	Ref_1	*FinDev*	Ref_2	*FinDev*	Ref_3	*FinDev*	Ref_4	*FinDev*	Ref_5	*FinDev*	Ref_6	*FinDev*	Ref_7
q_{05}	0.0004	0.0057**	0.0008	0.0030	0.0006	0.0010	-0.0004	0.0094***	0.0004	0.0058*	0.0001	0.0051	0.0006	0.0091**
	(0.0067)	(0.0024)	(0.0067)	(0.0026)	(0.0068)	(0.0027)	(0.0064)	(0.0035)	(0.0067)	(0.0031)	(0.0068)	(0.0032)	(0.0067)	(0.0040)
q_{25}	-0.0003	0.0038**	0.0001	0.0019	-0.0001	0.0007	-0.0009	0.0076***	-0.0002	0.0033*	-0.0005	0.0036*	-0.0002	0.0082***
	(0.0043)	(0.0017)	(0.0043)	(0.0015)	(0.0043)	(0.0018)	(0.0041)	(0.0024)	(0.0043)	(0.0019)	(0.0044)	(0.0019)	(0.0043)	(0.0025)
q_{50}	-0.0007	0.0027*	-0.0003	0.0012	-0.0004	0.0005	-0.0011	0.0065***	-0.0006	0.0020	-0.0007	0.0028**	-0.0006	0.0077***
	(0.0033)	(0.0014)	(0.0033)	(0.0013)	(0.0033)	(0.0016)	(0.0031)	(0.0022)	(0.0033)	(0.0016)	(0.0034)	(0.0014)	(0.0033)	(0.0020)
q_{75}	-0.0010	0.0019	-0.0006	0.0007	-0.0007	0.0004	-0.0014	0.0057***	-0.0009	0.0009	-0.0010	0.0022*	-0.0010	0.0073***
	(0.0029)	(0.0013)	(0.0029)	(0.0013)	(0.0029)	(0.0018)	(0.0028)	(0.0022)	(0.0029)	(0.0015)	(0.0029)	(0.0012)	(0.0029)	(0.0020)
q_{95}	-0.0014	0.0006	-0.0011	-0.0001	-0.0012	0.0002	-0.0017	0.0044*	-0.0013	-0.0006	-0.0013	0.0012	-0.0015	0.0067***
	(0.0032)	(0.0015)	(0.0032)	(0.0019)	(0.0033)	(0.0023)	(0.0032)	(0.0026)	(0.0033)	(0.0019)	(0.0032)	(0.0016)	(0.0032)	(0.0025)

Notes: Columns (1)-(7) report the findings for selected quantiles for different components of financial reforms based on the MMQR model for the updated sample (obs=2,629). Estimates are corrected using Jackknife bias corrections. Only the coefficients of financial development and financial reforms are presented. Bootstrapped standard errors clustered at the country level using 999 repetitions are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.



(a) Aggregate Financial Reforms index (mean)

(b) Financial Reforms components (mean)

Figure A1: The evolution of Financial Reforms, 38 countries, updated index

Chapter 2

How Important is Tourism for Growth?

Abstract

We revisit the tourism-led growth hypothesis by utilizing a panel set of 108 countries for more than 20 years. We employ a panel quantile regression approach that can quantify the effects of tourism on the entire conditional distribution of economic growth for both relatively poor and relatively rich countries. We address the unobserved heterogeneity and potential endogeneity concerns. We reveal that the lower the conditional growth rate a country experiences the more important is tourism development for the conditional growth distribution for both developing and developed countries. The size of the effect in developed countries is twice as high as in developing ones. On the other hand, tourism specialization is beneficial only at higher quantiles of the conditional growth distribution and only for the developed countries. On the contrary, it brings about an undesirable effect in developing countries. Finally, we pin down the impact of a reduction in tourism activity on economic growth due to COVID-19. Simulation analysis based on the quantile regression estimates, shows that countries facing relatively low growth rates conditionally to the growth distribution are affected the most, recording a decline of 4.82% decline in their growth rate while the average decline is found to be approximately 1.9%.

Keywords: tourism-led-growth; growth regression; panel quantile regression.

JEL classification codes: L83; C33; O11.

2.1 Introduction

Tourism is important for the economy overall. Its contribution to the economic development and growth is well-established in the literature (Balaguer and Cantavella-Jorda, 2002; Brau et al., 2007; Lee and Chang, 2008; Sequeira and Maçãs Nunes, 2008; Adamou and Clerides, 2010; Antonakakis et al., 2019, among others).

Tourism comprises a vital area of the service sector and the positive effect of the former on economic growth is known as the tourism-led growth hypothesis-TLGH (Balaguer and Cantavella-Jorda, 2002). For several countries, tourism is integral to economic prosperity and the consequences these countries might face if the sector shrinks are significant. The latter is supported by a plethora of arguments through different mechanisms: (i) tourism increases national income, (ii) promotes and stimulates investments, (iii) constitutes a source of employment, (iv) develops positive economies of scale and (v) is intimately linked to other industries (see Andriotis, 2002; Balaguer and Cantavella-Jorda, 2002; Croes, 2006; Seetanah, 2011; Brida et al., 2016, among others). Despite the aforementioned benefits of tourism, the expansion of the sector can lead to: (i) prohibitive costs related to infrastructures' provision and maintenance and to human capital investment (Sinclair, 1998), (ii) negative environmental impacts (Holden, 2000)[1] and (iii) increase of crime in tourism destinations (Biagi and Detotto, 2014). Although there is a general consensus underpinning the significance of tourism on the growth process, some empirical evidence supports that heavy reliance on tourism could lead to moderating effects (Bojanic and Lo, 2016).

From an empirical perspective, the TLGH has mainly been tested via regression models, that in most cases, explore the effect that tourism has on the conditional mean of economic growth. We claim this as one important explanation of the still mixed empirical evidence existing in the literature on TLGH, and, thus, we re-examine the macroeconomic challenges and prospects of TLGH by applying an alternative econometric approach.

For this reason, we take into account the non-linear nature of the tourism-growth nexus

[1]Interestingly, Akadiri et al. (2021) show that tourism, through the channels of globalization and income decrease CO_2 emissions.

and we employ a panel quantile regression approach that, unlike previous literature, accounts for the unobserved heterogeneity, while at the same time we address endogeneity.[2] By doing this, we are able to reveal potential heterogeneous effects of tourism on different quantiles of the conditional distribution of economic growth.

To get a taste of the tourism-growth nexus, we present the following figures. Figure 1 illustrates the average growth rate of GDP per capita across the average tourism receipts as a percentage of GDP for each country in our sample. At first glance, the regression's fitted line reveals a positive correlation between the variables of interest. However, it becomes apparent that given the level of tourism, GDP per capita growth does not lie along the regression line. In Figure 2 we have plotted the corresponding fitted lines after applying simple quantile regressions on the low (5th), middle (50th) and high (95th) conditional quantile levels of growth. The relationship between the variables of interest changes across different quantiles. Hence, given the nature of the data, a quantile regression approach could shed further light on the relationship of interest compared to conventional regression approaches that only focus on mean responses.

This paper aims to further investigate the following research questions. Does indeed tourism affect economic growth? What is the impact of tourism in countries facing relatively low growth rates and countries facing relatively higher ones? How does tourism affect the developed and developing countries? To answer these research questions, we focus on tourism development (tourism receipts per capita) and tourism specialization (tourism receipts as a percentage of GDP). Using annual data for a wide range of countries and for a period that spans from 1996 to 2017, we show that tourism development is beneficial for both developing and developed countries, especially at the lower tail of the conditional growth distribution. Interestingly, we find that the size of the effect in developed countries is twice as high as in developing countries. On the other hand, tourism specialization can lead to negative effects at higher quantiles of the conditional distribution. The latter is also valid for the

[2]There are several studies pointing toward a non-linear relationship between tourism and economic activity (e.g., Adamou and Clerides, 2010)

developing countries. Quantile regression results show further insights and interest patterns across countries compared to traditional econometric approaches. The latter highlights the importance of applying alternative models and specifications to explore the TLGH. This is the contribution this paper intends to give.

Recently, the coronavirus pandemic has triggered a tremendous crisis in the sector, affecting the wider economy and causing a global economic recession (OECD, 2020). As UNCTAD (2021) reports, international tourist arrivals decreased by 74% in 2020 compared with 2019, while the effect was detrimental in many developing countries, where the corresponding decline reached 90% in some cases. While the recovery from the public health crisis is still fragile, the researchers' response has focused on understanding the impact of the crisis and the prospects of the global economic comeback. To this end, we propose a simulation approach that can pin down the impact of a reduction in tourism activity on economic growth. Simulation analysis based on the quantile regression estimates, shows that countries facing relatively low growth rates conditionally to the growth distribution are affected the most, recording a decline of 4.82% decline in their growth rate while the average decline is found to be approximately 1.9%.

The paper is organized as follows. Section 2 reviews the related literature. Section 3 and 4 describe the empirical methodologies applied and the data used. Section 5 presents the empirical findings. Section 6,7 and 8 report further evidence and the robustness analysis. Section 9 provides concluding remarks.

2.2 Related literature

The literature dealing with the role of tourism in economic growth is voluminous. Overall, the empirical studies suggest that international tourism drives economic growth, however, there are exceptions finding no empirical evidence or reporting mixed results.[3] These mixed and inconclusive findings could be attributed to different sample data and time dimension,

[3]For a comprehensive literature review, see Pablo-Romero and Molina, 2013 and Brida et al., 2016.

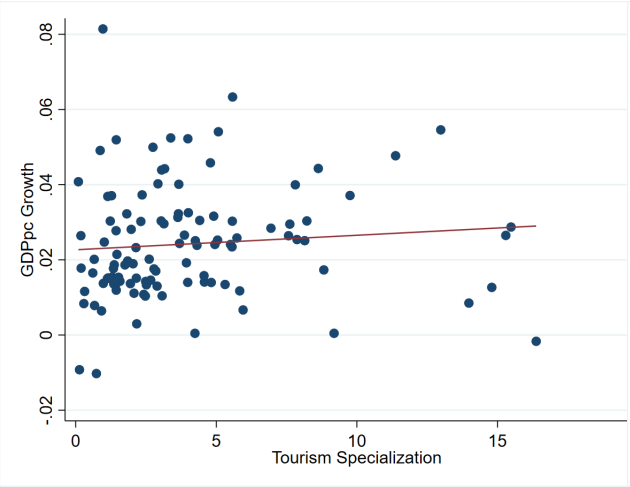


Figure 2.1: Tourism and Growth: OLS

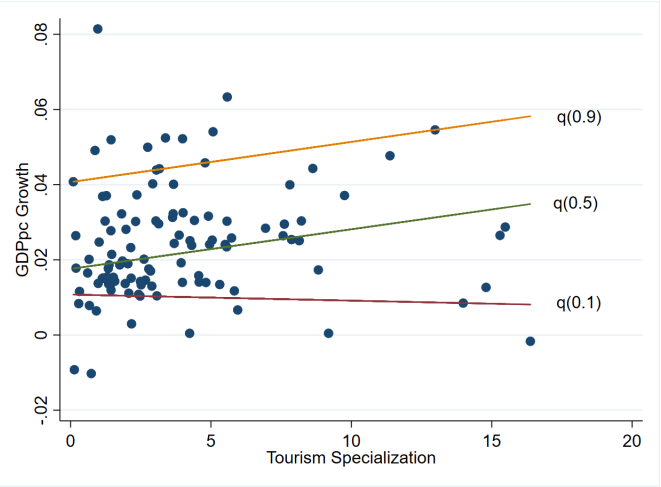


Figure 2.2: Tourism and Growth: QR

but also to different econometric methodologies.

Despite the fact that TLGH is intensively documented in the literature, the empirical studies applying quantile regression approaches are limited. Hence, we quote the following recent contributions. Fayissa et al. (2011) investigate the impact of tourism on the economic growth of 18 Latin American countries over the period 1990-2005, and they find that international tourism receipts have a larger positive impact at the lower quantiles of the income distribution than at the higher quantiles. On the contrary, Du et al. (2016) use cross-sectional data for 109 countries, and by applying standard quantile regression methods, they find no evidence supporting the relationship between tourism and growth. In addition, Bojanic and Lo (2016) use data from 1995 to 2014 for 187 countries, and they find that tourism reliance has a moderating effect on economic development for all countries, but mainly at higher levels of economic development. Next, Shahzad et al. (2017) focus on 10 popular tourist destinations and investigate the TLGH by applying a quantile-on-quantile approach and standard quantile regression techniques. They observed wide differences across countries and across different quantiles, however, according to their results the TLGH is confirmed in most cases. Finally, Sahni et al. (2020) employ a panel quantile regression methodology focusing on African countries over the period 2002-2015 and they find that countries benefit more from tourism at lower levels of economic growth.

In short, some of these recent studies that follow quantile regression approaches find evidence supporting the TLGH, while others find mixed or poor results. However, most of them use standard quantile regression methods (e.g., Koenker and Bassett Jr, 1978) which may be biased as they do not take into account the unobserved heterogeneity (i.e., the unobserved country-specific effect) or they treat fixed effects as a constant term across quantiles (e.g., Koenker, 2004) and they do not consider the potential endogeneity between the variables of interest. We aim at filling this gap in the literature by: first, employing a novel panel quantile regression approach proposed by Machado and Silva (2019); second, using a wide set of both developed and developing countries, and third, handling the potential endogeneity between tourism and economic growth.

2.3 Empirical framework

2.3.1 The model

To examine the relationship between tourism and growth we initiate our analysis by following a Neoclassical growth model. In line with the existing literature, we consider the following regression model:

$$y_{it} = \alpha + \beta_1 Y_{i,t-1} + \beta_2 Tourism_{it} + \beta_3 X_{it} + \eta_i + \delta_t + \epsilon_{it}, \tag{2.1}$$

where y_{it} captures the real growth rate of the outcome variable, $Y_{i,t-1}$ is one period lag of the outcome variable, $Tourism_{it}$ denotes the tourism variable, X_{it} is a set of explanatory variables, and ϵ_{it} is the error term for country $i = 1, 2, ..., N$ and period $t = 1, 2, ..., T$. In all regressions, we account for the unobserved country-specific effect (η_i) and we include year dummies (δ_t) to capture all time-variant effects.

2.3.2 Quantile regression

Quantile regression methods for panel data have received a growing attention over the recent years and they are widely used in empirical research. Quantile regression methods quantify the effect of the independent variable (in our case, *tourism*) on the dependent one (in our case, *economic growth*) by modeling the entire conditional distribution of the latter and shedding light on the behaviour on the tails. On top of this, they allow for a greater flexibility over the "symmetric" assumption that traditional regression methods assume and can be more informative as they focus on lower, middle and upper levels of the conditional distribution of the outcome variable instead of only focusing on mean responses. The aforementioned approaches are robust to outliers, can take into account the unobserved heterogeneity and capture the heterogeneous effects of covariates. This being said, in this study, we adopt the novel "Method of Moments" quantile regression estimator (MMQR) proposed by Machado and Silva (2019).

Given a sample of panel data with $i = 1, 2.., N$ cross-sections and $t = 1, 2.., T$ time periods, we consider the conditional location-scale model that has the following form:

$$y_{it} = \alpha_i + X_{it}^{'}\beta + (\eta_i + H_{it}^{'}\gamma)\epsilon_{it} \tag{2.2}$$

The parameters α_i and η_i capture the individual effects of the ith cross-section. X denotes a k-vector of covariates. H includes the known differentiable transformations of vector X and $Pr\{\eta_i + H_{it}^{'}\gamma\} > 1$. The error term is independent and identically distributed for each i and t, does not statistically depend on X, and satisfies the moment conditions. Then, we consider the conditional quantiles $Q_y(\theta|X)$ of the following model that can be estimated sequentially based on the method of moment regression as defined comprehensively in Machado and Silva (2019).

$$Q_y(\theta|X) = (\alpha_i + \delta_{iq}(\theta)) + X'\beta + H_{it}\gamma q(\theta) \tag{2.3}$$

One of the novelties of the estimator is that the θ^{th} quantile of cross-section i, that is captured

by $\alpha_i + \delta_i q(\theta)$, is allowed to affect the entire distribution of the outcome variable rather than considered constant across quantiles.[4][5]

For comparative purposes, we also implement traditional panel regression methodologies focusing on conditional means. Namely: a) fixed-effect regression and b) two-stage least-squares regression with instrumental variables to handle endogeneity.

2.4 Data

The relationship between tourism and growth is investigated using annual data for an unbalanced panel of 108 countries during the period 1996-2017.[6] The sample size consists of 2,331 observations and the choice was driven by data availability.[7] Based on the World Bank's Atlas classification methodology, our sample combines 56 developing and 52 developed countries: 25 countries are in Africa, 19 are in the Americas, 27 in Asia, 35 are in Europe and 2 are in Oceania. Our sample consists of heterogeneous countries including both islands and non-island countries. One could expect island countries to rely relatively more on tourism than non-island ones, and thus the tourism effect on growth to be driven by the former than the latter ones. However, this is not the case for our analysis, given that individual fixed effects that are included in all specifications can absorb these effects. In the standard literature of economic growth it is quite common for variables to be expressed in 3- or 5-year intervals in order to reduce the effect of measurement errors and business cycles. However, taking into account the unavailability of historical tourism data in conjunction with the advantages of quantile regression techniques over business cycles, we use annual data. In addition, transforming the sample into specific year intervals will decrease the time dimension of the analysis and thus could increase bias in the quantile regression results. To account for economic growth, we consider the growth rate of real GDP per capita. In addition, in

[4]For instance, previous QR estimators, such as the ones proposed by Koenker (2004) and Canay (2011) treat the individual effects as pure "location shifts".
[5]The MMQR estimator also provides reasonably results in situations where one of the explanatory variables is endogenous.
[6]The first observation of GDP_{pc} lagged one period is in 1995.
[7]To provide consistent results, we drop countries reporting less than 15 observations and/or containing gaps.

Section 6.2, we introduce the growth rate of real GDP per capita net of tourism, to avoid the accounting effect on the relation between GDP and tourism and address the potential endogeneity. As far as the tourism variable is concerned, we use separately international tourism receipts per capita to capture tourism development and international tourism receipts as a percentage of GDP to measure tourism specialization.[8] To account for human capital, we use an index based on average schooling years and return-to-education rates.[9] Gross capital formation as a percentage of GDP is used to measure the stock of physical capital, while at the same time, it serves as a proxy for infrastructure (See also Adeola and Evans, 2020) Following the empirical growth literature, we also include the following control variables in our specification. More specifically, we control for trade openness (measured by the sum of international exports and imports as a percentage of GDP), government's size (measured as government expenditure as a percentage of GDP), inflation (measured as the log difference of the consumer price index), population growth, the level of democracy (measured by the political regime index) and the level of corruption (measured by the Bayesian Corruption index). The data were retrieved from the World Development Indicators of the World Bank (2020), except for the human capital index which was obtained from the Penn World Tables 9.0 (Feenstra et al., 2015) and the political regime index and the Bayesian corruption index which were retrieved in the Quality of Government Dataset (Teorell et al., 2020). [10] [11] The list of countries used in the analysis is provided in the Appendix. To get further insight into the nature of the data, we present descriptive statistics in Table 1.

[8] Bojanic and Lo (2016) follow a different specification by integrating both tourism receipts and the product of tourism receipts per capita and tourism receipts as a percentage of GDP in the same regression with GDP per capita as the dependent variable. In our case, we follow the empirical growth literature and we allow for a wide range of growth determinants. Thus, we use tourism development and tourism specialization separately and we consider the growth rate of GDP per capita to be the dependent variable

[9] For more information about the human capital index, visit https://www.rug.nl/ggdc/docs/human_capital_in_pwt_90.pdf.

[10] The political regime index is based on the *Polity*2 index of the Polity IV dataset (see Marshall et al., 2010) and the political rights and civil liberties indices of the House (2019). Higher values correspond to higher levels of democracy. For more details, see Hadenius and Teorell (2005) and Teorell et al. (2020).

[11] The Bayesian corruption index ranges between 0 and 100. The higher the value, the higher the level of corruption. For more details about the construction of the index and its advantages over alternative indicators measuring corruption, see Standaert (2015).

Table 2.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP_{pc} growth	2,331	0.024	0.034	-0.163	0.215
Tourism development	2,331	-4.251	2.015	-11.405	0.033
Tourism specialization	2,331	0.921	1.081	-3.326	3.084
Human capital	2,331	2.556	0.687	1.069	3.974
Capital formation	2,331	3.120	0.292	0.146	4.063
Trade openness	2,331	4.284	0.528	2.750	6.081
Government's size	2,331	2.693	0.376	-0.093	3.418
Population growth	2,331	1.284	1.247	-3.848	8.118
Inflation	2,331	5.503	8.477	-4.581	244.960
Democracy	2,331	7.273	2.771	0	10
Corruption	2,331	3.708	0.507	1.864	4.268

Notes: All variables are expressed in natural logarithms apart from the indices of the human capital, democracy and corruption.

2.5 Empirical findings

2.5.1 Tourism and growth: MMQR

We report the results for the case of tourism development in Table 2 and the findings for the case of tourism specialization in Table 3. In each table, column (1) reports the results of the fixed effects model, column 2 reports the 2SLS estimates and the rest columns present selective quantiles from the quantile regression.

As we observe, in both Table 1 and Table 2, the lagged value of the log of GDP per capita ($lag\text{GDP}_{pc}$), which represents the rate of conditional convergence, is negative and statistically significant in all cases, both in the FE and in the MMQR model as we expect from the growth literature. As far as the coefficient of tourism development is concerned, it is clear that both models (FE and MMQR) positively support tourism receipts as a significant determinant of growth.[12] On top of this, in the MMQR model, there is variation in the coefficients, which range from 0.0128 in the 10^{th} quantile to 0.0048 in the 50^{th} one. That is, a decline of 62.5% in the aforementioned coefficients is noted when we move from low values of the distribution of growth rates to middle ones. In other words, countries which experience low

[12]Under the 2SLS approach, the corresponding coefficient is consistent in terms of sign but is not statistically significant.

growth rates benefit more from tourism revenues than the higher ones, taking into account the conditional growth distribution. On the contrary, tourism specialization (Table 3) is found to have an adverse effect on economic growth. Interestingly, this effect is only statistically significant under the MMQR specification and especially at higher quantiles. The higher the level of economic growth, the more intensive the impact of tourism specialization. As far as the control variables are taken into account, the findings are remarkably consistent with the literature in both Tables. The coefficients have the expected signs and are statistically significant in the majority of cases in both specifications. Figures 3 and 4 illustrate the coefficients of the tourism variables along the distribution of growth rates. The shaded area represents the confidence interval at the 90%. The dashed line depicts the corresponding coefficient of the FE and 2SLS models.

Table 2.2: Tourism Development and Growth: MMQR

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP_{pc}Growth	FE	2SLS	q_{10}	q_{30}	q_{50}	q_{70}	q_{90}
lagGDP$_{pc}$	-0.0441***	-0.0510***	-0.0574***	-0.0485***	-0.0436***	-0.0390***	-0.0327***
	(0.0095)	(0.0098)	(0.0154)	(0.0117)	(0.0101)	(0.0097)	(0.0107)
Tourism Development	0.0050**	0.0024	0.0128***	0.0076**	0.0048*	0.0021	-0.0016
	(0.0025)	(0.0033)	(0.0048)	(0.0034)	(0.0028)	(0.0026)	(0.0030)
Human Capital	0.0080	0.0196*	0.0042	0.0067	0.0082	0.0095	0.0113
	(0.0108)	(0.0108)	(0.0164)	(0.0127)	(0.0117)	(0.0121)	(0.0143)
Physical Capital	0.0338***	0.0449***	0.0551***	0.0409***	0.0331***	0.0257***	0.0156
	(0.0080)	(0.0072)	(0.0083)	(0.0076)	(0.0081)	(0.0092)	(0.0114)
Trade Openness	0.0032	0.0046	0.0009	0.0024	0.0033	0.0040	0.0051
	(0.0062)	(0.0066)	(0.0086)	(0.0069)	(0.0064)	(0.0063)	(0.0069)
Gov. Cons.	-0.0196	-0.0162	-0.0046	-0.0146	-0.0201	-0.0253**	-0.0324***
	(0.0135)	(0.0137)	(0.0166)	(0.0145)	(0.0135)	(0.0128)	(0.0122)
Population	-0.0116***	-0.0122***	-0.0085***	-0.0106***	-0.0117***	-0.0128***	-0.0142***
	(0.0016)	(0.0018)	(0.0024)	(0.0018)	(0.0017)	(0.0020)	(0.0026)
Inflation	-0.0008***	-0.0008***	-0.0009**	-0.0008***	-0.0008***	-0.0007***	-0.0007***
	(0.0002)	(0.0001)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Democracy	0.0020	0.0022	0.0026	0.0022*	0.0020*	0.0018	0.0014
	(0.0012)	(0.0014)	(0.0017)	(0.0013)	(0.0012)	(0.0012)	(0.0013)
Corruption	-0.0052	-0.0088	-0.0018	-0.0041	-0.0053	-0.0065	-0.0082
	(0.0091)	(0.0100)	(0.0154)	(0.0105)	(0.0095)	(0.0106)	(0.0143)
Observations	2,331	2,218	2,331	2,331	2,331	2,331	2,331
Countries	108	108	108	108	108	108	108
R-squared	0.32	0.34					

Notes: Column 1 reports the results of Fixed Effects model. Column 2 reports the results of the 2SLS model where lagGDP$_{pc}$ and tourism variables are instrumented using both the first and second lags as instruments, respectively. Robust standard errors clustered at the country level are in parentheses. Columns 3-7 report the results of MMQR. Jackknife standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 2.3: Tourism Specialization and Growth: MMQR

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP_{pc}Growth	FE	2SLS	q_{10}	q_{30}	q_{50}	q_{70}	q_{90}
lagGDP$_{pc}$	-0.0382***	-0.0485***	-0.0426***	-0.0397***	-0.0380***	-0.0364***	-0.0343***
	(0.0081)	(0.0085)	(0.0135)	(0.0100)	(0.0086)	(0.0083)	(0.0096)
Tourism Specialization	-0.0009	0.0008	0.0048	0.0010	-0.0012	-0.0032	-0.0061**
	(0.0021)	(0.0031)	(0.0047)	(0.0031)	(0.0024)	(0.0022)	(0.0028)
Human Capital	0.0067	0.0196*	0.0039	0.0058	0.0068	0.0078	0.0092
	(0.0104)	(0.0108)	(0.0162)	(0.0122)	(0.0111)	(0.0115)	(0.0139)
Physical Capital	0.0351***	0.0453***	0.0565***	0.0423***	0.0340***	0.0266***	0.0163
	(0.0081)	(0.0073)	(0.0086)	(0.0077)	(0.0082)	(0.0092)	(0.0112)
Trade Openness	0.0070	0.0056	0.0042	0.0061	0.0072	0.0081	0.0095
	(0.0059)	(0.0065)	(0.0084)	(0.0067)	(0.0062)	(0.0061)	(0.0067)
Gov. Cons.	-0.0191	-0.0161	-0.0050	-0.0144	-0.0198	-0.0247*	-0.0316***
	(0.0137)	(0.0138)	(0.0175)	(0.0150)	(0.0136)	(0.0127)	(0.0118)
Population	-0.0118***	-0.0123***	-0.0086***	-0.0107***	-0.0119***	-0.0130***	-0.0145***
	(0.0015)	(0.0018)	(0.0024)	(0.0017)	(0.0017)	(0.0019)	(0.0026)
Inflation	-0.0008***	-0.0008***	-0.0010**	-0.0009***	-0.0008***	-0.0007***	-0.0007***
	(0.0002)	(0.0001)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Democracy	0.0020	0.0023	0.0026	0.0022*	0.0020*	0.0018	0.0015
	(0.0012)	(0.0014)	(0.0018)	(0.0013)	(0.0011)	(0.0011)	(0.0013)
Corruption	-0.0043	-0.0087	-0.0020	-0.0035	-0.0044	-0.0051	-0.0062
	(0.0094)	(0.0101)	(0.0154)	(0.0106)	(0.0096)	(0.0107)	(0.0144)
Observations	2,331	2,218	2,331	2,331	2,331	2,331	2,331
Countries	108	108	108	108	108	108	108
R-squared	0.32	0.34					

Notes: Column 1 reports the results of Fixed Effects model. Column 2 reports the results of the 2SLS model where lagGDP$_{pc}$ and tourism variables are instrumented using both the first and second lags as instruments, respectively. Robust standard errors clustered at the country level are in parentheses. Columns 3-7 report the results of MMQR. Jackknife standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

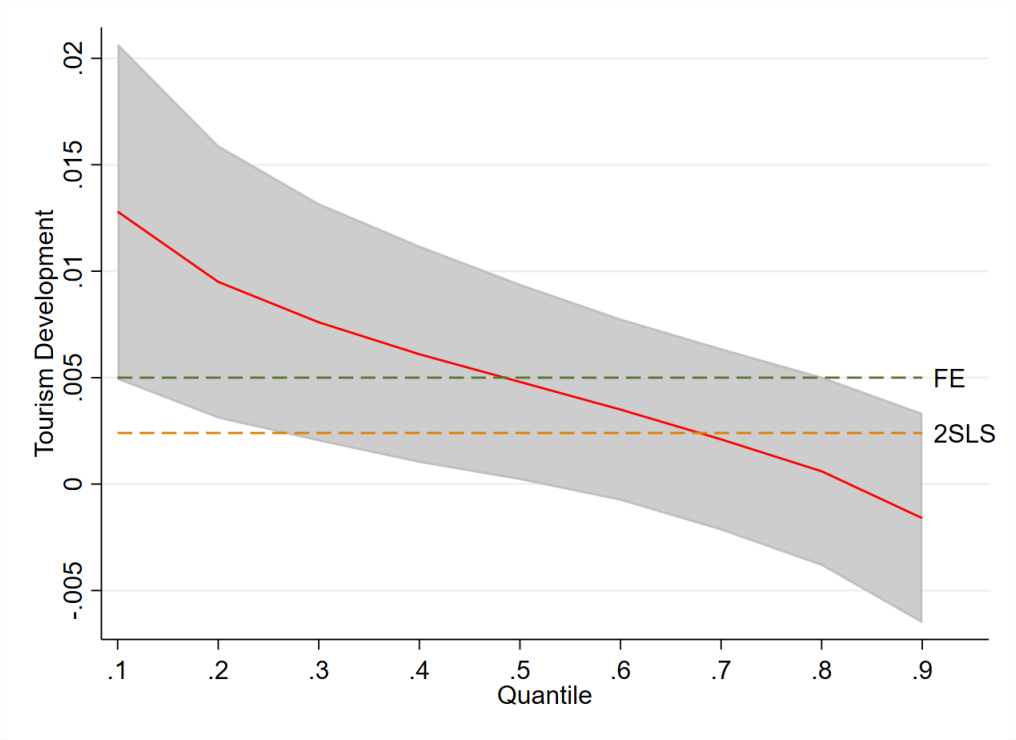


Figure 2.3: Tourism Development and Growth, MMQR

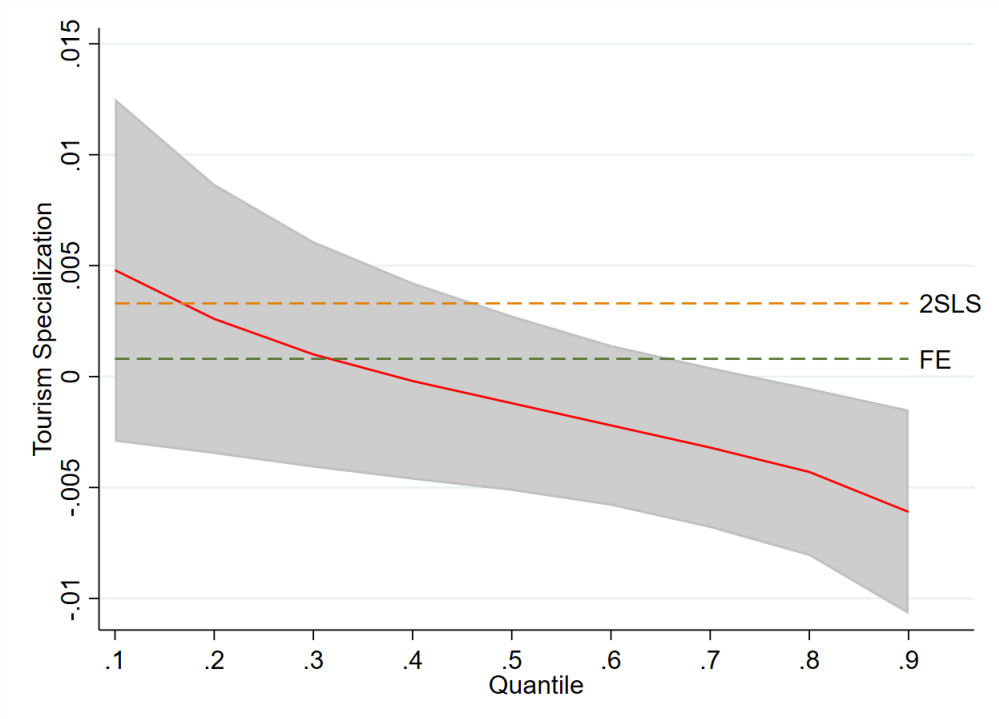


Figure 2.4: Tourism Specialization and Growth, MMQR

2.6 Further evidence

2.6.1 Developing versus developed countries

Overall, tourism revenues are found to be beneficial in the growth process while tourism specialization led to the opposite result at the upper quantiles of the conditional growth distribution. But, how important is tourism specifically for the developing and developed countries? Is tourism specialization linked negatively to economic growth both in relatively poor and relatively rich countries? To address these issues, we split the sample into two groups using the average per capita gross national income based on the World Bank's Atlas method as a threshold variable, over the period of the analysis. We reproduce the analysis using the MMQR methodology and we report only the coefficients of tourism development and tourism specialization for both the developing and developed countries in Table 4.

It becomes apparent that tourism receipts are positively linked to the economic growth for both the developing and developed economies at lower levels of the conditional distribution of economic growth. However, it is noteworthy that the magnitude of the reported coefficient in rich countries is twice as high as in poor ones. Similar to the full-sample approach, the lower the growth rate based on the conditional growth distribution of a country, the more important tourism is for its economy. To continue with, tourism specialization is statistically significant and negatively associated with economic growth in the sample of the developing countries at higher quantiles of the conditional growth distribution. While we report positive coefficients when we focus on the sample of the developed countries, they are not statistically significant under the MMQR approach. However, under the 2SLS approach, where endogeneity is taken into account, the corresponding coefficient becomes significant. For this reason, we address potential endogeneity problems in the following section.

2.6.2 Endogeneity concerns: The case of growth net of tourism

Despite the fact that we found interesting results on the tourism-growth nexus, one may worry that the findings are biased as endogenous variables may be included in the model.

Table 2.4: Tourism and Growth in developing and developed countries: MMQR for selected quantiles

	Developing Countries		Developed Countries	
Quantile	Tourism dev.	Tourism spec.	Tourism dev.	Tourism spec.
q_{10}	0.0095*	0.0037	0.0193***	0.0057
	(0.0052)	(0.0048)	(0.0048)	(0.0091)
q_{30}	0.0047	-0.0001	0.0103***	0.0067
	(0.0037)	(0.0032)	(0.0034)	(0.0070)
q_{50}	0.0022	-0.0020	0.0045	0.0073
	(0.0030)	(0.0026)	(0.0028)	(0.0060)
q_{70}	-0.0006	-0.0043*	-0.0005	0.0078
	(0.0029)	(0.0026)	(0.0026)	(0.0054)
q_{90}	-0.0041	-0.0070**	-0.0075**	0.0083
	(0.0035)	(0.0034)	(0.0030)	(0.0052)
FE	0.0024	-0.0019	0.0179***	0.0072
	(0.0029)	(0.0025)	(0.0055)	(0.0056)
2SLS	-0.0026	-0.0031	0.0178***	0.0139**
	(0.0038)	(0.0037)	(0.0064)	(0.0065)

Notes: Dependent variable: GDP_{pc} *Growth*. Sample size of MMQR: 56 developing countries (1,194 observations) and 52 developed countries (1,137 observations). The findings are obtained after estimating equation (1) for different income groups using the MMQR. Only the coefficients of tourism variables are reported for selected quantiles. Jackknife standard errors clustered at the country level using 500 replications are in parentheses. The last two rows report the results of FE and 2SLS, respectively. In the latter, the $lag\text{GDP}_{pc}$ and tourism variables are instrumented using both the first and second lags as instruments, respectively. Sample size of 2SLS: 56 developing countries (1,082 observations) and 52 developed countries (1,033 observations). For 2SLS, robust standard errors clustered at the country level are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. All regressions include a constant term and time dummies.

The dependent variable used in the model presented in equation (1) consists of the growth rate of the real GDP per capita. Nevertheless, GDP (and consequently GDP growth rate) in its construction includes tourism revenues, and hence it is endogenous to the tourism variable by definition. Although the MMQR estimator can perform well in cases of an endogenous regressor, it is worth verifying our main findings through an additional robustness check. In order to avoid the accounting effect on the relation between tourism and GDP, the variable GDP without tourism is created by subtracting tourism receipts from GDP. In the same way, GDP_{pc}Net of tourism is generated (see also Sharma and Panagiotidis, 2005 and Dreger and Herzer, 2013). Thus, equation (1) takes the following form:

$$ynet_{it} = \alpha + \beta_1 Ynet_{i,t-1} + \beta_2 Tourism_{it} + \beta_3 X_{it} + + \eta_i + \delta_t + \epsilon_{it}, \tag{2.4}$$

where $ynet_{it}$ and $Ynet_{i,t-1}$ are the growth rate of the real GDP per capita and GDP per capita lagged one period, respectively, both without tourism receipts. We replicate the analysis presented in Section 5.2 and we report the coefficients of interest in Table 5. We observe differences in the magnitude of the corresponding coefficients compared to those of the main analysis, nonetheless, the results tie the main findings presented in previous sections in most cases. Thus, for the full sample estimates, we highlight: i) the importance of tourism development in growth, in particular at lower quantiles of the conditional growth distribution; ii) the negative effect of tourism specialization as a determinant of growth especially at the upper tail of the conditional distribution. When we split the sample into rich and poor countries we found heterogeneous effects and patterns between countries with different income levels. Developing countries at higher quantiles of the conditional distribution, could experience a disadvantageous impact on their growth process, if they extensively rely on tourism. This is not happening in the case of developed countries where the effect of tourism specialization is positive and statistically significant especially at higher parts of the growth distribution.

Table 2.5: Tourism and net Growth: MMQR for selected quantiles

Sample	Tourism Variable	(1) q_{10}	(2) q_{30}	(3) q_{50}	(4) q_{70}	(5) q_{90}
Full	Tour. Dev.	0.0152***	0.0090**	0.0058*	0.0028	-0.0012
		(0.0052)	(0.0037)	(0.0031)	(0.0029)	(0.0034)
Full	Tour. Spec.	0.0064	0.0020	-0.0006	-0.0029	-0.0060*
		(0.0051)	(0.0034)	(0.0027)	(0.0025)	(0.0031)
Developing	Tour. Dev.	0.0104*	0.0058	0.0031	0.0000	-0.0035
		(0.0056)	(0.0039)	(0.0031)	(0.0030)	(0.0037)
Developing	Tour. Spec.	0.0043	0.0009	-0.0011	-0.0041	-0.0068*
		(0.0052)	(0.0035)	(0.0028)	(0.0028)	(0.0036)
Developed	Tour. Dev.	0.0236***	0.0125***	0.0053*	-0.0006	-0.0088***
		(0.0094)	(0.0037)	(0.0031)	(0.0029)	(0.0034)
Developed	Tour. Spec.	0.0050	0.0072	0.0085	0.0097*	0.0111**
		(0.0093)	(0.0071)	(0.0061)	(0.0056)	(0.0056)

Notes: The findings are obtained after estimating equation (2) using separately tourism development and tourism receipts and are based on the MMQR method. Only the coefficients of tourism variables are reported for selected quantiles. Jackknife standard errors clustered at the country level using 500 replications are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

2.7 The "two-step" quantile regression estimator

In this section, we aim at further exploring the robustness of our findings. For this reason, we operate within an alternative quantile regression approach. We follow the methodology of Canay (2011) and the well-established in the literature "two-step" estimator (FEQR). Canay (2011) proposed a novel panel quantile regression methodology that accounts for fixed effects (i.e. fixed effects are treated as "location shifters") and at the same time is computational simple. We replicate the main analysis presented in previous sections and we present our findings in the following tables.

It is worth noting that the FEQR model performs consistently better than the MMQR one. The FEQR produced remarkably similar but more strong results in terms of statistical significance compared to the MMQR approach. Tourism development is positively associated with growth and its effect is greater at higher quantiles. Tourism specialization has a negative impact on growth and this is evident at higher parts of the conditional distribution of income growth. In addition, human capital, capital formation and trade openness contribute

positively to economic growth in contrast with governments' size, population growth and inflation have a negative effect on growth as literature suggests. Finally institutions do matter for growth as democratic regimes and lower levels of corruption are beneficial for economic prosperity. However, taking into consideration that the sample size and specifically the time dimension of our analysis is relatively short the results of the FEQR approach should be interpreted with caution. [13][14]

Table 2.6: Tourism Development and Growth: FEQR

Dependent variable:	(1)	(2)	(3)	(4)	(5)
GDP_{pc}Growth	q_{10}	q_{30}	q_{50}	q_{70}	q_{90}
$lag GDP_{pc}$	-0.0414***	-0.0417***	-0.0406***	-0.0402***	-0.0407***
	(0.0019)	(0.0013)	(0.0009)	(0.0012)	(0.0025)
Tourism Development	0.0034***	0.0030***	0.0019***	0.0015**	0.0015
	(0.0011)	(0.0007)	(0.0005)	(0.0007)	(0.0012)
Human Capital	0.0109***	0.0070***	0.0071***	0.0079***	0.0071**
	(0.0035)	(0.0019)	(0.0013)	(0.0018)	(0.0034)
Physical Capital	0.0447***	0.0380***	0.0368***	0.0355***	0.0323***
	(0.0048)	(0.0033)	(0.0027)	(0.0031)	(0.0055)
Trade Openness	0.0003	0.0035***	0.0051***	0.0072***	0.0125***
	(0.0025)	(0.0014)	(0.0012)	(0.0014)	(0.0028)
Gov. Consumption	-0.0238***	-0.0180***	-0.0184***	-0.0188***	-0.0231***
	(0.0056)	(0.0031)	(0.0020)	(0.0021)	(0.0046)
Population	-0.0110***	-0.0129***	-0.0129***	-0.0126***	-0.0124***
	(0.0011)	(0.0008)	(0.0007)	(0.0006)	(0.0013)
Inflation	-0.0019***	-0.0010***	-0.0007***	-0.0004***	-0.0003
	(0.0003)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
Democracy	0.0025***	0.0025***	0.0018***	0.0017***	0.0017***
	(0.0005)	(0.0004)	(0.0002)	(0.0003)	(0.0006)
Corruption	-0.0038	-0.0040***	-0.0027**	-0.0016	-0.0002
	(0.0027)	(0.0015)	(0.0011)	(0.0013)	(0.0030)
Observations	2,331	2,331	2,331	2,331	2,331
Countries	108	108	108	108	108

Notes: Columns 1-5 report the results of FEQR. Standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

[13]The FEQR estimator is consistent when both T and N tend to infinity.

[14]The MMQR estimator is unbiased under smaller samples when jackknife correction is implemented. See (Machado and Silva, 2019).

Table 2.7: Tourism Specialization and Growth: FEQR

Dependent variable:	(1)	(2)	(3)	(4)	(5)
GDP_{pc}Growth	q_{10}	q_{30}	q_{50}	q_{70}	q_{90}
lagGDP$_{pc}$	-0.0377***	-0.0377***	-0.0380***	-0.0382***	-0.0382***
	(0.0017)	(0.0010)	(0.0007)	(0.0010)	(0.0020)
Tourism Specialization	-0.0002	0.0000	-0.0006	-0.0017**	-0.0018
	(0.0012)	(0.0007)	(0.0005)	(0.0007)	(0.0014)
Human Capital	0.0094***	0.0044**	0.0052***	0.0062***	0.0057*
	(0.0036)	(0.0018)	(0.0013)	(0.0017)	(0.0034)
Physical Capital	0.0452***	0.0387***	0.0373***	0.0360***	0.0310***
	(0.0049)	(0.0033)	(0.0026)	(0.0032)	(0.0056)
Trade Openness	0.0017	0.0051***	0.0061***	0.0094***	0.0145***
	(0.0026)	(0.0014)	(0.0012)	(0.0014)	(0.0030)
Gov. Cons.	-0.0224***	-0.0181***	-0.0187***	-0.0178***	-0.0241***
	(0.0058)	(0.0032)	(0.0019)	(0.0021)	(0.0048)
Population	-0.0111***	-0.0131***	-0.0129***	-0.0126***	-0.0126***
	(0.0012)	(0.0008)	(0.0006)	(0.0006)	(0.0013)
Inflation	-0.0019***	-0.0010***	-0.0007***	-0.0005***	-0.0004*
	(0.0003)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
Democracy	0.0028***	0.0025***	0.0019***	0.0017***	0.0016**
	(0.0005)	(0.0004)	(0.0002)	(0.0003)	(0.0006)
Corruption	-0.0049*	-0.0045***	-0.0035***	-0.0023*	-0.0010
	(0.0028)	(0.0015)	(0.0011)	(0.0013)	(0.0030)
Observations	2,331	2,331	2,331	2,331	2,331
Countries	108	108	108	108	108

Notes: Columns 1-5 report the results of FEQR. Standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 2.8: Tourism and Growth in developing and developed countries: FEQR for selected quantiles

	Developing Countries		Developed Countries	
Quantile	Tourism dev.	Tourism spec.	Tourism dev.	Tourism spec.
q_{10}	0.0061***	-0.0006	0.0101***	0.0083***
	(0.0019)	(0.0020)	(0.0020)	(0.0019)
q_{30}	0.0031***	-0.0013	0.0088***	0.0065***
	(0.0009)	(0.0008)	(0.0010)	(0.0010)
q_{50}	0.0029***	-0.0013*	0.0106***	0.0082***
	(0.0008)	(0.0008)	(0.0009)	(0.0010)
q_{70}	0.0021***	-0.0023**	0.0100***	0.0075***
	(0.0008)	(0.0009)	(0.0012)	(0.0012)
q_{90}	0.0003	-0.0046**	0.0096***	0.0062***
	(0.0017)	(0.0020)	(0.0023)	(0.0022)

Notes: Dependent variable: *GDP_{pc} Growth*. Sample size of FEQR: 56 developing countries (1,194 observations) and 52 developed countries (1,137 observations). The findings are obtained after estimating equation (1) for different income groups using the FEQR. Only the coefficients of tourism variables are reported for selected quantiles. Standard errors clustered at the country level using 500 replications are in parentheses.

2.8 Tourism reduction and projections

Recently COVID-19 pandemic severely hit countries worldwide. The tourism sector did not avoid harm. Although our approach is not taking into account the recent pandemic due to data unavailability on key variables, our findings could provide preliminary evidence on the potential impact of a reduction in tourism activity on different quantiles of the distribution of the growth rates. To do so, we make use of the estimated coefficients ($\hat{a}$) of the tourism-growth model presented in Table 2 and we calculate the equation: $Y = \hat{a_0} + \hat{a_1} Tourism + \sum_{i=2} \hat{a_i} X'$, where *Tourism* corresponds to the median value of tourism development and X is a vector of the median values of the corresponding variables used in the analysis. With all other values being constant, we allow tourism to be reduced by 25%, 50% and 75%, respectively. We illustrate the values of Y (i.e., *GDP_{pc} growth rate*) across different rates of reduction of tourism development in Figure 4. The red dot represents the mean effect and the grey dots correspond to the quantile regression approach. Although the figure should be interpreted with caution as it gives a complementary notion by simulating the effect of a reduction in tourism development on growth under a specific framework, it clearly depicts that, on

average, higher reduction rates in tourism receipts lead to lower growth rates (red dots). That is, GDP per capita growth declined by 1.88 percentage points (i.e., from 3.26% under the zero reduction scenario to 1.48% under the 75% reduction scenario). The latter is not far away from reality and recent projections. The estimated averaged losses in GDP due to a reduction in tourism activity are ranging from 1.93% to 2.7% (UNCTAD, 2021).

While there is no significant variation in higher quantiles of the growth rate distribution (lighter dots), this is not the case for the lower ones where the magnitude of the effect is greater (darker dots). More specifically, GDP per capita growth rate drops from 2.24% (no reduction) to -3.88% (75% reduction) at the 10^{th} quantile. This is a decline of 4.82% in income growth. Thus, one could expect that countries facing relatively low growth rates to be affected the most by the reduction in tourism receipts.

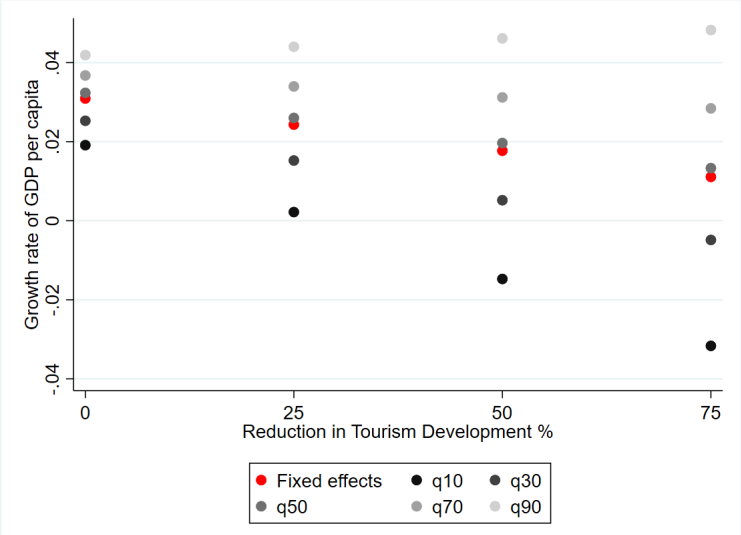


Figure 2.5: Economic growth and the reduction of tourism development: Full Sample

2.9 Concluding remarks

We provide evidence supporting the importance of the tourism sector to the growth process. Unlike previous literature, we model the entire conditional distribution of growth and we investigate the behaviour on the tails (low and high growth rates) by accounting for fixed effects and handling potential endogeneity issues. The results are robust across a number of

dimensions, including alternative econometric settings and tourism definitions. Traditional econometric methods failed to support the TLGH in some cases and quantile regression models shed more light on the research questions. The findings indicate that countries at lower levels of the conditional growth distribution benefit more from tourism development compared to countries at higher ones. While tourism development brings advantages, this is not the case when tourism specialization is taken into account. Heavy dependence on tourism in some cases could have an undesirable negative effect on economic growth. This effect is more intensive in countries at the upper tail of the conditional distribution and, in general, in developing economies. On the contrary, developed countries could benefit from tourism specialization when lower quantiles of the conditional distribution of income growth are taken into account. The results are in line with the majority of the literature which documents the positive impact of tourism on economic growth and at the same time complement the studies who support that heavy dependence on tourism is not always beneficial for the economies (for instance, Bojanic and Lo, 2016).

Tourism could be the road to recovery as long as continued vigilance on measures targeting the bullet-proofing of the economies of the nations is maintained. Given the contribution of the tourism sector in the global economy and welfare, our results are promising for the implementation of more effective policies in the future.

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Appendix

Table B1: List of countries

Classification	Countries
Developed:	Australia, Austria, Bahrain, Belgium, Botswana, Brazil, Canada, Chile, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Rep., Kuwait, Latvia, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Netherlands, New Zealand, Norway, Panama, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Uruguay.
Developing:	Albania, Algeria, Armenia, Bangladesh, Benin, Bolivia, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, China, Colombia, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Eswatini, Ghana, Guatemala, Honduras, India, Indonesia, Iran, Islamic Rep., Jamaica, Jordan, Kenya, Kyrgyz Republic, Lao PDR, Madagascar, Malawi, Mali, Moldova, Mongolia, Morocco, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Paraguay, Peru, Philippines, Rwanda, Senegal, Sri Lanka, Tajikistan, Tanzania, Thailand, Togo, Tunisia, Uganda, Ukraine, Vietnam.

Notes: The data covers the period 1996-2017. The first observation of $lag\text{GDP}_{pc}$ is in 1995. The following countries cover a shorter period: Burkina Faso (2000-2017), Honduras (2000-2017), Lao PDR(2000-2016), Namibia (2003-2017), Nicaragua (2000-2017), Saudi Arabia (2003-2017), Tajikistan (2002-2017), Vietnam (2003-2017).

Chapter 3

Manufacturing or Services Exports?

Abstract

We revisit the export-led growth hypothesis for a panel of 81 countries over the period 1980-2019. Total exports are disaggregated into primary, manufacturing and services exports. We follow a panel quantile regression approach and we pin down the heterogeneous effects of exports on different parts of the entire conditional growth distribution. By taking into account the unobserved heterogeneity and controlling for endogeneity issues, we reveal that the effect of manufacturing and services exports varies along the conditional growth distribution. The findings suggest that manufacturing exports are important determinants of growth for countries facing relatively low growth rates. Services exports matter for growth especially for countries facing relatively higher growth rates. Despite the fact that the export sector overall is an important driver of growth, our findings on exports' components encourage policy formulations.

Keywords: exports-led growth; manufacturing; services; growth regression; panel quantile regression.

JEL classification codes: C31; F13; F43

3.1 Introduction

The export sector is a key component of the growth process and its expansion can function as a vehicle for economic development. This line of reasoning is well established in the literature and, hence, there are many initiatives worldwide that seek to enlarge and expand the export sector. There are several arguments supporting the "so-called" Export-led Growth Hypothesis (henceforth, ELGH). For instance: (i) exports are a component of the aggregate outcome and by definition affect the national income of a country; (ii) exports affect indirectly economic growth through productivity and specialization in the most efficient sectors of the economy where a country has a comparative advantage; (iii) the expansion of exports allows countries to benefit from increasing returns to scale; (iv) export promotion is highly linked with other industries and can be a source of employment; (v) exports create positive externalities to the rest of the economy and to the non-export sector (Tyler, 1981; Feder, 1983; Krugman, 1994; Giles & Williams, 2000 among others)

On top of this, extensive research has focused on whether manufacturing exports can become the new engine of growth, by introducing the "manufacturing-led growth hypothesis" (henceforth, MLGH). Empirical studies, such as Crespo Cuaresma & Wörz (2005), Hausmann et al. (2007), Berg et al. (2012) and Jarreau & Poncet (2012), underscore that manufacturing exports are more important than primary exports in the growth process. The underline concept is that countries can be substantially benefited from technologically-oriented exports through higher knowledge spillovers and economies of scale as well as through enhanced productivity growth given the interactions with the non-manufacturing sectors (Kaldor, 1966; Sheridan, 2014) Some authors confirm the crucial role of manufacturing for growth and catch-up in fast-growing and developing countries (Fagerberg & Verspagen, 1999, Fagerberg & Verspagen, 2002; Haraguchi et al., 2017), while others suggest that the degree of industrialization plays a vital role in growth (Rodrik, 2013) or exports of manufactures is beneficial only when a specific level of education is reached (Sheridan, 2014).

Nonetheless, while there is evidence supporting the MLGH in most cases, the continued importance of the manufacturing sector in the economic process has been challenged. The

shrink of the manufacturing sector in conjunction with the increasing trend of trade in services, highlights the necessity to discover new growth models, for instance, service-led growth models, underlining the consequences of the premature deindustrialization phenomenon (Rodrik, 2016). One important characteristic of growth in several economies outlines the structural change (Diao et al., 2017), highlighting the shift from agriculture to industry (Jorgenson & Timmer, 2011) which is followed by deindustrialization and the rise of services (Olney & Pacitti, 2017).

Can manufacturing exports still be considered the key to success for sustainable economic growth? How important are services for economic growth? And most importantly, is there any specific structure of exports which promotes economic growth or does this structure depend on the level of economic growth itself? While the literature on the exports-growth nexus is voluminous, less is known on how the export sector affects economic growth across different levels of the conditional distribution of growth rates.

In this paper, we revisit the role of exports on economic growth by differentiating from the previous literature in many ways. Instead of focusing on conventional estimation procedures that mainly estimate mean responses, we operate within a panel quantile regression technique that models the entire distribution of economic growth and thus can shed light on the effect of exports on different parts of the conditional distribution of growth rather than focusing only on the conditional mean one. The latter reveals important policy implications. For instance, if parameter heterogeneity across different quantiles of the conditional growth distribution does exist, this could mean that countries' will respond differently with respect to their relative level of growth. The empirical papers applying quantile regression approaches to investigate the ELGH are limited and mainly pay attention to the trade-growth nexus.[1] Surprisingly, to the best of our knowledge, none of them focus extensively on the role of manufacturing or services exports on economic growth. We aim at filling this gap in the literature.

In what follows, we pin down the heterogeneous effect of exports on economic growth.

[1]We discuss the relevant literature in Section 2

Unlike previous attempts, we disaggregate total exports into primary, manufacturing as well as service exports. We take into account the unobserved heterogeneity and potential endogeneity issues. This is the first paper that i) applies panel quantile regression techniques to investigate the role of exports' components on growth; ii) accounts for unobserved heterogeneity and addresses endogeneity concerns; iii) compiles a large panel of 81 heterogeneous countries for 40 years.

We find robust evidence that, overall, exports are important determinants of economic growth and this holds for the entire growth distribution. When we disaggregate exports into categories, interesting patterns are revealed. One significant contributor to growth is the exports of manufactures. The magnitude of the relevant effect is greater at lower parts of the conditional distribution and declines when we consider higher quantiles. Services exports matters for growth, however, their effect on growth is stronger at higher parts of the distribution. Primary exports are positive and statistically significant in most parts of the conditional distribution, however, the magnitude of their effect lags behind manufacturing and services exports.

The remainder of the paper is organized as follows: Section 2 presents the related literature ans Section 3 discusses the quantile regression methodology. Section 4 presents the model and Section 5 analyzes the data. Section 6 includes the empirical findings and Section 6 reports further empirical evidence on the topic. Section 7 concludes.

3.2 Related literature

Since the seminal works of Michaely (1977), Balassa (1978) and Feder (1983) a considerable amount of papers has undertaken extensive research on the importance of export activity on economic growth process. However, far too little attention has been paid to quantile regression approaches as a channel of examining the ELGH.

To start with, Foster (2008) investigates the role of trade liberalisation in enhancing income growth in 75 countries over the period 1960-2003. By implementing simple quantile

regressions techniques, he finds that the effect of trade liberalization is higher at the lower part of the conditional growth distribution and declines when considering higher quantiles. However, the absence of significant growth regressors as well as the use of pooled data could make his analysis wanting.[2] A similar work has also been pursued by Dufrenot et al. (2010) that investigates the impact of trade openness on economic growth for 75 developing countries over the period 1980-2006. By using a Bayesian model averaging approach to identify robust determinants of growth and by operating within a two stage quantile regression approach to address endogeneity, they show that trade openness is an important factor for explaining economic growth and its effect is greater in relatively low quantiles of the conditional growth distribution. [3] More recently, Lee (2011) uses the Balassa's index to capture the degree of exports' specialization. He focuses on a sample of 71 countries over the period 1970-2004 and finds that countries specializing in high-technology goods tend to grow faster than the ones that focus on low-technology goods. By applying simple quantile regressions and in contrast to previous studies, he shows that the effect of trade openness on economic growth is significant only at higher parts of the conditional growth distribution.[4]

Our work is inspired by prior studies on the topic. Hence, in light of new methodologies and data, our paper's goal is to complement the existing literature rather than criticizing the already established one. Our main motivation is to shed light on the importance of exports along the conditional distribution of economic growth. Unlike previous studies, we are interested in isolating not only the effect of exports but also the effect of their components (i.e., primary, manufacturing and services exports) instead of focusing on the trade activity that most of the aforementioned studies do. In addition, we make use of novel panel quantile estimators to provide robust evidence on the topic by taking into account efficiently

[2] Foster (2008) uses pooled data without taking into account country and time fixed effects. Although in some cases he controls for individual time and country individual effects, the inclusion of too many dummies in the model could result into an incidental parameters problem and thus lead to bias estimations.

[3] While Dufrenot et al. (2010) significantly expands prior studies on the trade-growth nexus, their methodology could raise concerns. Not only does the lack of accounting for time fixed effects could be questionable, but also the standard demeaning techniques of quantile regression of Koenker (2004) could lead to infeasible approaches (see also Canay, 2011).

[4] More specifically, it is statistically significant at the 75% quantile.

the unobserved heterogeneity and the endogeneity rather than focusing on simple quantile regressions techniques that the aforementioned studies used that may provide biased results.[5]

3.3 Quantile regression

The quantile regression technique was proposed by Koenker & Bassett Jr (1978) and until today the field abounds with significant advances. The rationale of the methodology is the following. For a country i and time t, the methodology suggests that

$$Y_{it} = \beta_i + X'_{it}\beta_\tau + u_{\tau it} \tag{3.1}$$

where Y is the dependent variable, X is the vector of covariates and u denotes the error term. The τ^{th} quantile of the dependent variable conditional of the vector of the covariates is given by:

$$Q_\tau \left(Y_{it}|X_{it}\right) = X'_{it}\beta_\theta \tag{3.2}$$

By solving the following simple minimization problem using linear programming techniques, we can compute the τ^{th} conditional quantile:

$$\widehat{\beta}(\tau) = \arg\min \sum_{i=1}^{N}\sum_{t=1}^{T} \rho_\tau \left(Y_{it} - X'_{it}\beta\right) \tag{3.3}$$

Although the estimator is well-applied in the research, one major drawback of this approach is that it does not take into account the unobserved time-invariant effects. On top of this, Koenker (2004) and Lamarche (2010) propose a "penalized" quantile estimator that handles longitudinal data with many fixed effects by incorporating a penalization term that shrinks them towards a common value. The approach of Harding & Lamarche (2009) is also worth-mentioned as they extend the work of Koenker (2004) and address endogeneity con-

[5] We follow the methodology of Canay (2011) and as robustness check we also employ the estimator proposed by Machado & Silva (2019). Further details can be found in Sections 3 and 6.

cerns. More recently, Galvao Jr (2011) proposes a quantile regression estimator for dynamic panel data models with fixed effects.[6] There are several noteworthy contributions to the literature regarding the quantile estimators, however, most of them suffer from the incidental parameters problem (Machado & Silva, 2019). Standard demeaning techniques applied by prior studies to account for unobserved heterogeneity assume that expectations are linear operators, that might not hold for conditional quantiles (Canay, 2011).

In this paper, we employ the panel quantile regression approach of Canay (2011) and the well-established in the empirical literature "two-step" estimator (FEQR). Instead of incorporating a penalization parameter, Canay (2011) eliminates fixed effects prior to estimating the quantile regression function by following a simple transformation process. First, the equation of interest is estimated under a fixed effects regression approach.

$$Y_{it} = \beta_0 + \beta X'_{it} + \eta_i + u_{it} \tag{3.4}$$

where Y is the dependent variable and X is a vector of covariates.

Second, the unobserved time-invariant effects are obtained and subtracted from the dependent variable. That is,

$$\hat{\alpha}_i = Y_{it} - \beta_0 - \hat{\beta}_j X'_{it} \tag{3.5}$$

$$\hat{Y_{it}} = Y_{it} - \hat{\alpha}_i \tag{3.6}$$

Allowing the $\hat{\alpha}_i$ to be a "pure location-shifter" (e.g., allowing fixed effects to remain constant across quantiles) the FEQR estimator is obtained after solving equation (3) but with the dependent variable being the $\hat{Y_{it}}$.

$$\frac{1}{NT} \sum_{i=1}^{N} \sum_{t=1}^{T} \rho_\tau \left(\widehat{Y_{it}} - X_{it}\beta \right) \tag{3.7}$$

The estimator is consistent and asymptotically normal when both N (i.e., number of coun-

[6] He also extends the work of Chernozhukov & Hansen (2006) to incorporate instrumental variables in his model.

tries) and T (i.e., the number of time periods) grow. Simulation analyses performed in Canay (2011) shows that our sample size and context of analysis are suitable for providing unbiased estimates.

Quantile regression allows us to model the entire conditional distribution of growth rates and pin down the effect of exports on various quantiles of economic growth. In other words, it provides us with a more comprehensive picture of the relationship of interest as we can observe the relevant effect of exports on growth in different parts (e.g., lower, middle and higher) of the distribution rather than focusing only on the conditional average effect that, for example, the OLS methodology does. This econometric methodology can effectively handle non-normally distributed data and is robust to outliers. While there are several papers supporting the non-linear relationship between exports and growth (see for example Awokuse & Christopoulos, 2009), one could suggest that the traditional regression techniques could lead to inaccurate inferences. On top of this, we operate within a quantile regression methodology that relaxes the "assumption of symmetry" and thus could provide more efficient results. In the analysis that follows, we also implement traditional panel regression methodologies. More specifically, we apply OLS regressions with fixed effects as well as two-stage least-squares regressions with instrumental variables to handle endogeneity.

3.4 The model

We follow the traditional export-growth literature and we estimate a panel growth model by taking into account also the contributions of Solow (1956) and Mankiw et al. (1992). We start with a standard Cobb-Douglas production function of the form:

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} H_{it}^{\gamma} \tag{3.8}$$

where Y denotes the total output, A is the level of technological progress, K is the stock of capital, L is the labor force and H is the human capital for country i and time period t. The parameters α, β and γ denote the output elasticities of capital stock, labor and

human capital, respectively. Following Tyler (1981) and Sheridan (2014), we allow the level of technology to depend on countries' exports. That is, $A_{it} = A_0^{g_{it}}$, where $g_{it} = \delta + \theta E_{it}$. In our specification, we enhance the initial model by controlling for major growth determinants that are commonly used in the relevant literature. Thus, after taking logs in equation (8), we obtain the following equation that consists our baseline model:

$$y_{it} = \delta + \beta_0 Y_{it-1} + \alpha K_{it} + \beta L_{it} + \gamma H_{it} + \theta E_{it} + \zeta X_{it} + \eta_i + \lambda_t + \epsilon_{it} \tag{3.9}$$

where the output variable, y_{it}, is the growth rate of real GDP per capita and Y_{it-1} is one period lag of the real GDP per capita that captures the speed of convergence. We proxy the stock of physical capital by considering the gross capital formation as a share of GDP. Human capital is measured with the Human Capital Index that is based on both average years of schooling and a return rate to education. Labour force consists of population growth. Total exports are expressed as a ratio to GDP and include both exports of goods and services. The vector X includes government size (measured as government final consumption expenditure as a share of GDP) and inflation (measured as the growth rate of the consumer price index). We also take into account country-specific η_i and time-specific effects (λ_t). As it was stated, our main interest is to investigate the effect of exports' components on growth. For this reason, total exports are disaggregated into primary, manufacturing and services exports. All export categories are expressed as a percentage of GDP. Primary exports consist of food and agricultural exports. In another approach, Sheridan (2014) split total exports into primary and manufacturing exports to identify threshold levels of development. In our approach, given the increasing importance of the service sector, we also incorporate services exports in the model. The final equation to be estimated takes the form:

$$y_{it} = \delta + \beta_0 Y_{it-1} + \alpha K_{it} + \beta L_{it} + \gamma H_{it} + \theta E_{it} + \zeta_1 Prim_{it} + \zeta_2 Manuf_{it} + \zeta_3 Serv_{it} + \eta_i + \lambda_t + \epsilon_{it} \tag{3.10}$$

3.5 The data and descriptive analysis

The analysis covers the period 1980-2019 and includes annual data for 81 developing and developed countries. The dataset is unbalanced in some cases, given the non-availability of data in some cases. We report quite similar results when we average the data into 3-year and 5-year intervals as usually the growth literature suggests. Nonetheless, we use annual observations for two reasons. First, the higher the number of observations, the better for the FEQR estimator given that it is consistent when both N and T approach infinity. Second, quantile regressions could perform well with business cycles. The sample consists of heterogeneous countries, of which 30 are in Europe, 22 are in Asia, 17 are in the American Continent, 10 are in Africa, and 2 are in Oceania. The list of countries used in the analysis as well as the corresponding correlation table between the variables of our model are reported in the Appendix, Tables C1 and C2, respectively. Table 1 reports descriptive statistics. In addition, we offer further insights into the nature of the data across countries and time in the following figures. As a starting point, we present the evolution of exports' components over time in Figure 1. While the share of primary exports on GDP remains almost stable over the entire period of the analysis, this is not the case for manufacturing and services exports that reveal a gradual increase over time. The manufacturing exports-to-GDP ratio reached its highest level in 2008, just before the global financial crisis that seems to have affected the sector. Services exports also follow an upward trend and more precisely, a steep increase in the period after 2010.

We continue the descriptive analysis by focusing on the country level. More specifically, for every country in our sample, we plot the primary, manufacturing and services exports averaged over the period of the analysis in three maps, respectively.[7] The darker the colour, the higher the export-GDP ratio in the corresponding country. Countries that appear to have a grey colour have missing data and are not included in our sample. At first glance, the ratio of each export component on GDP varies across countries and regions. In terms of primary

[7]The maps were drawn using the SPMAP command in STATA.

exports, Honduras, Costa Rica, New Zealand and Vietnam report the higher ratios while Brunei Darussalam, Algeria, Japan, Saudi Arabia and Nigeria the lower ones (Figure 2). As regards the manufacturing sector, African countries, such as Nigeria, Algeria and Cameroon, report the lowest export activity in manufacturing. On the contrary, Asian countries, such as China and Singapore as well as European countries, such as the Slovak Republic, the Czech Republic and Belgium, are the leading countries in terms of manufacturing exports in our sample (Figure 3). Last but not least, Nigeria, Brazil, Algeria and Bangladesh do not rely much on services exports in contrast with Luxembourg, Malta, Ireland and Cyprus where services exports contribute more than 50% of their total output (Figure 4).

To shed further light into the relationship between exports and the growth rate of GDP per capita we present Figures 5, 6 and 7. Each country in the dataset is plotted as a point that indicates average values of the variables of interest over the period of the analysis. To motivate quantile regression further, instead of plotting the linear regression fit, we illustrate the predicted values after applying a simple quantile regression on the 10_{th}, $50th$ and 90_{th} conditional quantile levels between the variables of interest on our sample. Interestingly, the relationship between the growth rate of GDP per capita and the components of exports varies across quantiles. The aforementioned heterogeneity along the distribution of income growth could show further evidence on the exports-growth nexus. The fitted lines appear to suggest that exports, in most cases, are positively linked to the growth rate of GDP per capita. The only exception holds in Figure 6, where at higher part of the growth distribution, economic growth tends to decrease as primary exports as a share of GDP increases.

Table 3.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP_{pc} *Growth*	2,749	0.0215	0.0362	-0.2959	0.2151
GDP_{pclag}	2,749	8.9573	1.2746	5.918	11.63
Human Capital	2,749	2.5946	0.6354	1.1697	4.3516
Physical Capital	2,749	3.1555	0.2653	0.1461	4.4929
Total Exports	2,749	3.4973	0.6305	1.6074	5.4337
Primary Exports	2,749	1.1486	1.1103	-5.2359	3.6319
Manufacturing Exports	2,749	2.143	1.3432	-6.0738	4.9678
Services Exports	2,749	1.9682	0.9441	-1.0337	5.1038
Population Growth	2,749	1.2202	1.0897	-3.8477	6.3595
GovSize	2,749	2.6679	0.4148	-0.093	3.5617
Inflation	2,749	0.0907	0.2378	-0.0458	4.7749

Notes: GDP_{pc} *Growth* is measured as the log difference of the real GDP per capita. *Population Growth* is measured as the log difference of the total population. *Inflation* is measured as the log difference of the consumer price index. All other variables are expressed in natural logarithms except for *Human Capital index*.

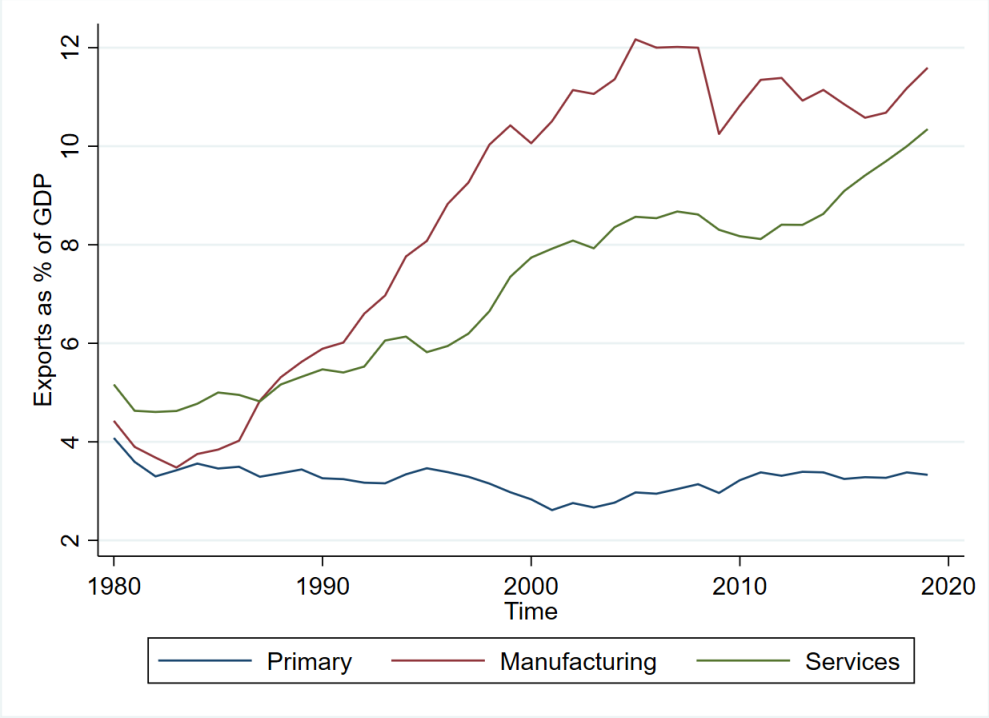

Figure 3.1: Evolution of Exports over time

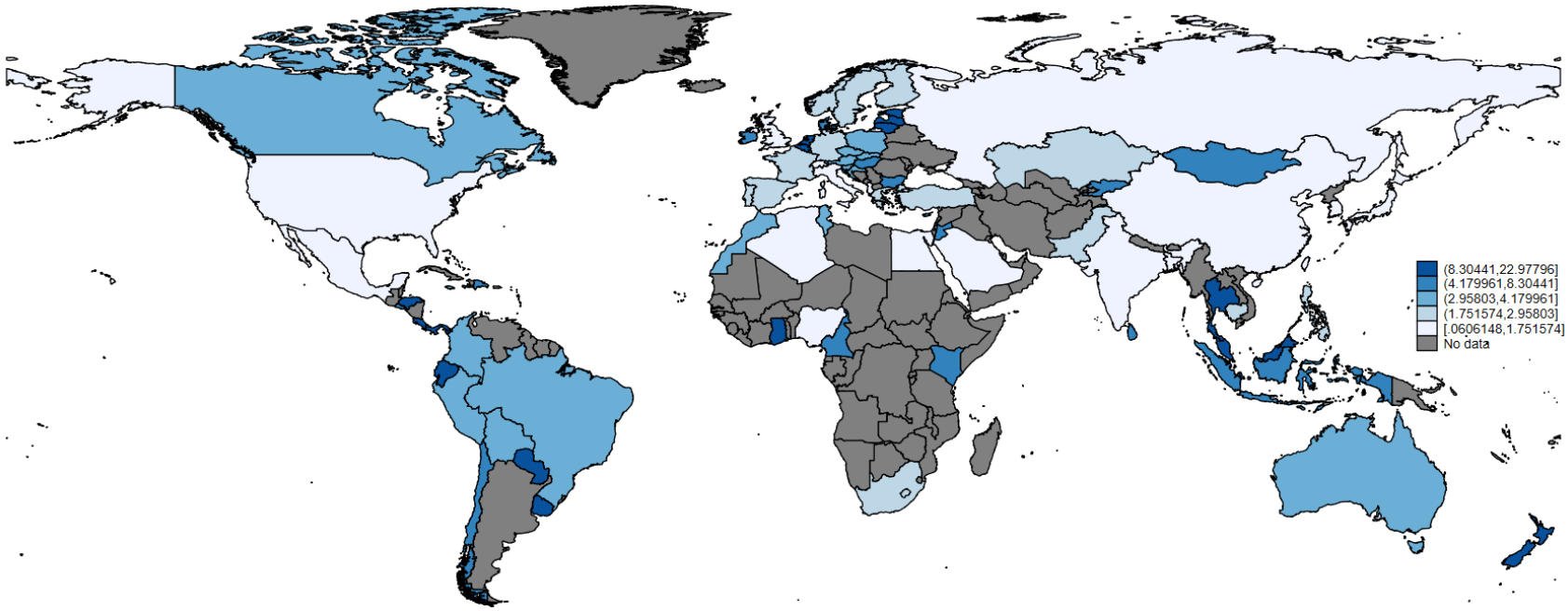

Figure 3.2: Primary Exports as percentage of GDP across countries

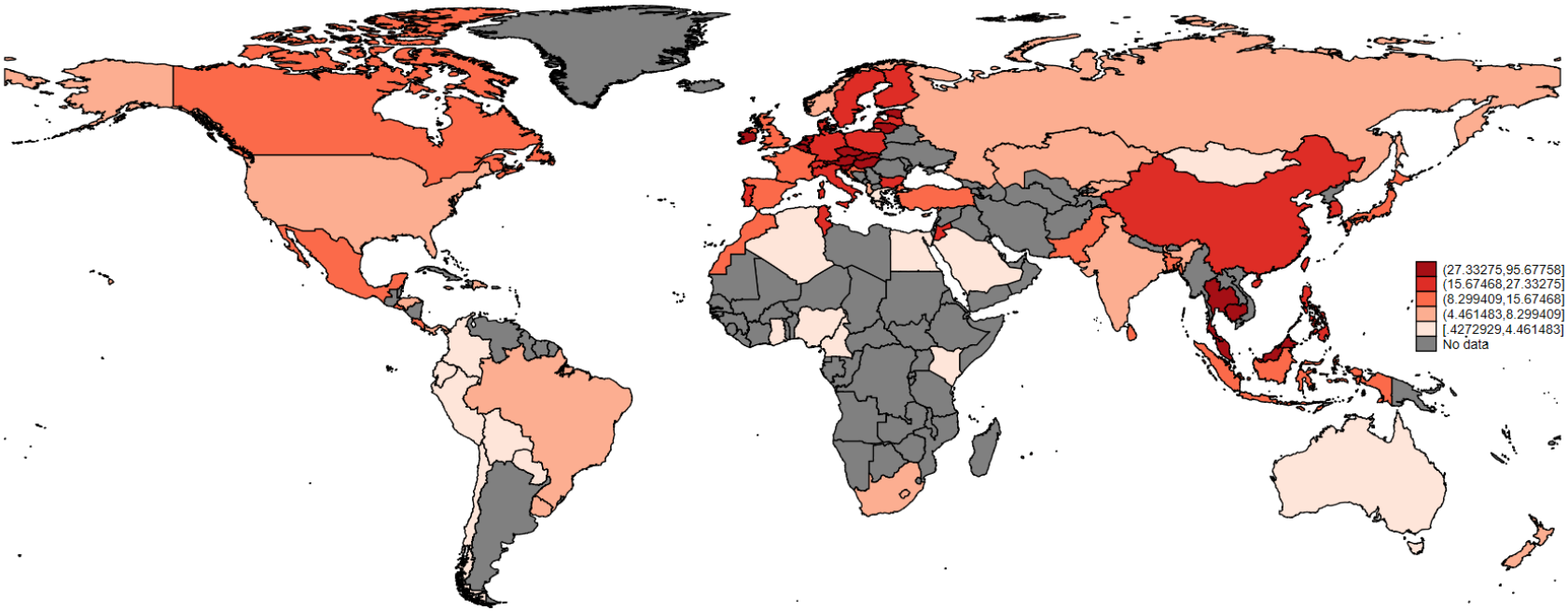

Figure 3.3: Manufacturing Exports as percentage of GDP across countries

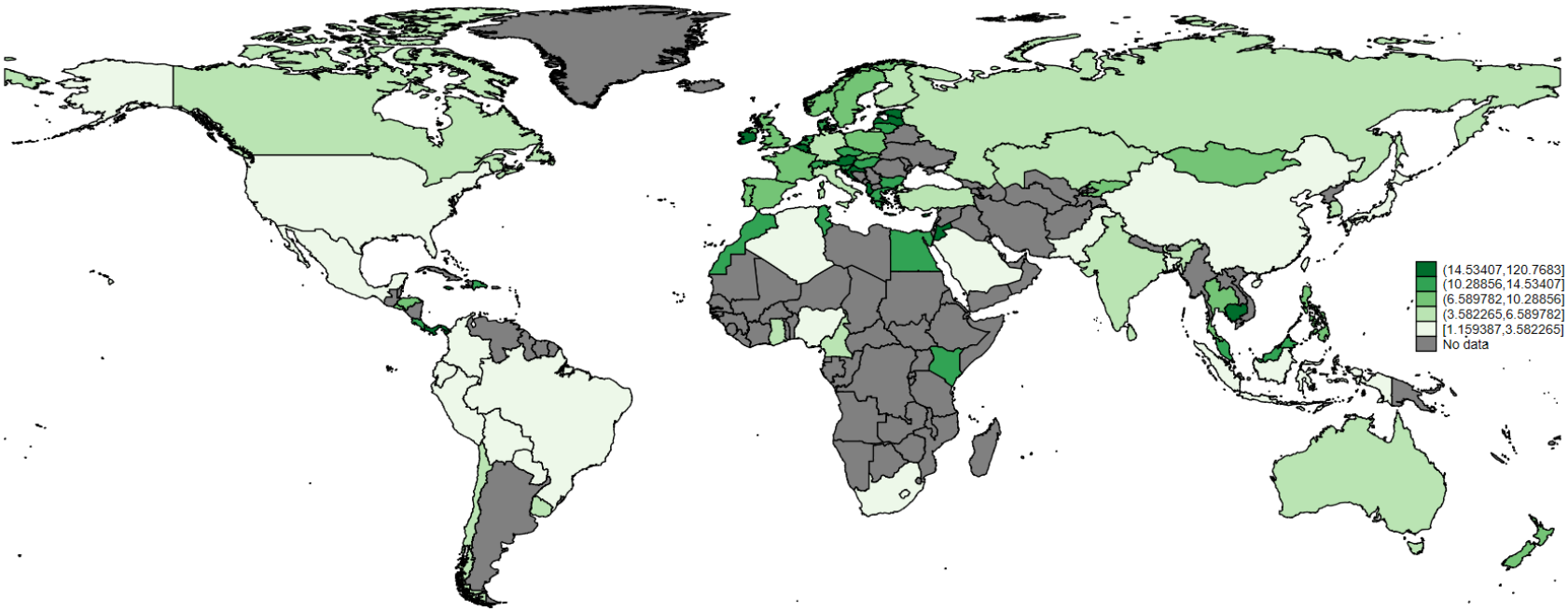

Figure 3.4: Services Exports as percentage of GDP across countries

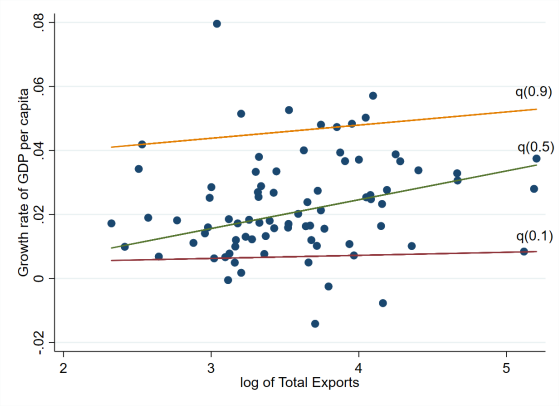

Figure 3.5: Total Exports and Growth

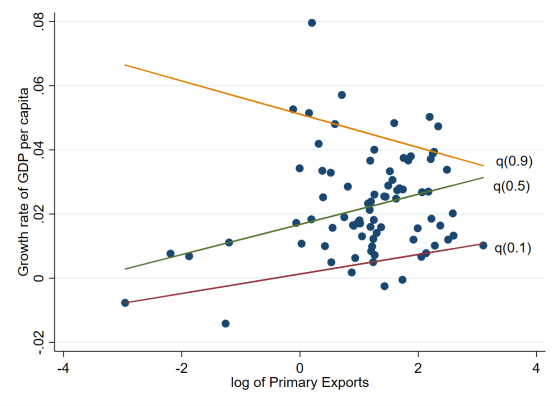

Figure 3.6: Primary Exports and Growth

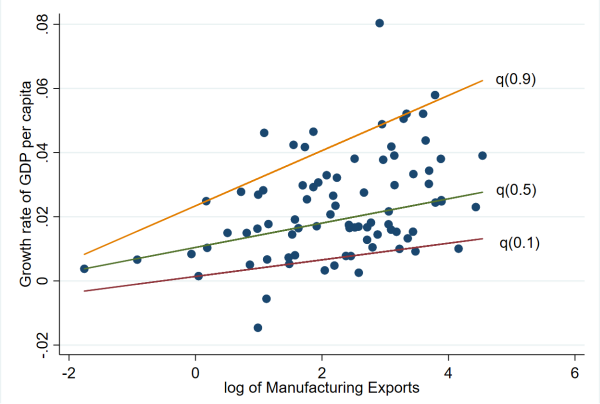

Figure 3.7: Manufacturing Exports and Growth

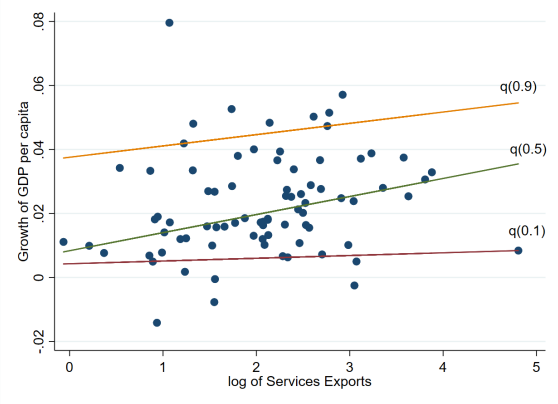

Figure 3.8: Services Exports and Growth

3.6 Empirical findings

We start our analysis with the baseline model and we focus on total exports. We report the results in Table 2. For reasons of comparison, apart from the quantile regression estimates, we also provide the estimated coefficients from a Fixed Effects regression (column 1) and from Two-stage least-squares regression (column 2). The remaining columns, (3)-(11), report the findings of the quantile regression for the following quantiles of the conditional distribution of growth rates: q_{10}, q_{20}, q_{30}, q_{40}, q_{50}, q_{60}, q_{70}, q_{80}, q_{90}).

As the endogenous growth literature suggests, the speed of conditional convergence, that is captured by the $lagGDP_{pc}$, is statistically significant and negatively associated with growth in all specifications. Human capital is an important determinant of growth and appears to have a statistically significant and positive effect that mainly holds for countries in the lower reaches of the conditional growth distribution. Consistent with the majority of the empirical literature, physical capital is positively contributing to economic growth. Of particular interest is the effect of total exports on growth. It becomes apparent that total exports are positively associated with economic growth. The latter is supported both in FE and 2SLS as well as in FEQR. In terms of magnitude, the aforementioned effect is stronger at higher parts of the distribution indicating that focusing on the conditional distribution of growth rates, countries with relatively high growth rates are benefiting more from exports. Figure 9 illustrates the coefficients of *Total Exports* along the distribution of growth rates. The shading area represents the confidence interval at the 90% level. The dashed line corresponds to the estimates of the mean effect from the Fixed Effect regression model. Regarding the rest explanatory variables, the findings indicate that they have the expected signs as literature predicts and are statistically significant in almost all cases and specifications.

We continue our analysis by disaggregating exports into primary, manufacturing and services exports as equation 10 indicated. We report the findings in Table 4. For compatibility purposes, we keep the same structure as in the case of total exports so as to compare the quantile regression coefficients with the effect on the mean of the conditional growth distribution. We focus our attention on the effect of exports' categories on growth and we report the

following key patterns. First, primary exports appear to affect negatively economic growth. The latter holds both in the FE and FEQR specifications. Second, manufacturing exports play an important role in the growth process and their effects are heterogeneous across quantiles. More precisely, the lower the conditional growth rate of a country, the higher the magnitude of their effect. The effect in lower quantiles (e.g., q_{10}) is almost four times greater than the effect in higher ones (e.g., q_{90}). Third, services exports matter for growth, however, unlike manufacturing exports, their effect is greater in higher quantiles. Hence, countries experiencing relatively higher growth rates based on their conditional income growth distribution, could benefit more than countries facing relatively lower ones. Fourth, in accordance with the findings of Table 3 and the case of total exports, the rest variables' coefficients are consistent with the literature. Last but not least, traditional regression specifications fail to support the export-growth nexus in some cases (for instance, in the case of services both specifications provide insignificant results) while at the same time quantile regression estimations reveal interesting and significant patterns along the growth distribution. These heterogeneous effects are graphically illustrated in Figures 10, 11 and 12. Again, the dashed line represents the conditional mean estimate.

Table 3.2: Total Exports and Growth: FEQR

Dep. variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
GDP_{pc}Growth	FE	2SLS	q_{10}	q_{20}	q_{30}	q_{40}	q_{50}	q_{60}	q_{70}	q_{80}	q_{90}
lagGDP_{pc}	-0.0380***	-0.0477***	-0.0390***	-0.0382***	-0.0379***	-0.0365***	-0.0369***	-0.0377***	-0.0379***	-0.0390***	-0.0399***
	(0.0067)	(0.0088)	(0.0020)	(0.0014)	(0.0011)	(0.0008)	(0.0008)	(0.0008)	(0.0010)	(0.0012)	(0.0017)
Human Capital	0.0023	0.0267***	0.0107***	0.0054**	0.0034*	0.0003	-0.0008	-0.0000	-0.0002	0.0004	0.0003
	(0.0076)	(0.0090)	(0.0038)	(0.0026)	(0.0020)	(0.0016)	(0.0017)	(0.0018)	(0.0019)	(0.0022)	(0.0029)
Physical Capital	0.0377***	0.0451***	0.0370***	0.0411***	0.0366***	0.0369***	0.0388***	0.0407***	0.0411***	0.0406***	0.0413***
	(0.0103)	(0.0096)	(0.0081)	(0.0062)	(0.0045)	(0.0039)	(0.0039)	(0.0032)	(0.0031)	(0.0038)	(0.0063)
Total Exports	0.0128**	0.0253***	0.0085***	0.0113***	0.0133***	0.0127***	0.0130***	0.0135***	0.0144***	0.0166***	0.0187***
	(0.0053)	(0.0061)	(0.0019)	(0.0014)	(0.0011)	(0.0009)	(0.0009)	(0.0011)	(0.0013)	(0.0016)	(0.0019)
Pop. Growth	-0.0102***	-0.0117***	-0.0109***	-0.0111***	-0.0113***	-0.0114***	-0.0119***	-0.0118***	-0.0111***	-0.0105***	-0.0102***
	(0.0028)	(0.0030)	(0.0020)	(0.0012)	(0.0009)	(0.0007)	(0.0007)	(0.0007)	(0.0009)	(0.0012)	(0.0015)
Gov. Size	-0.0096	-0.0076	-0.0098	-0.0113***	-0.0117***	-0.0134***	-0.0133***	-0.0136***	-0.0137***	-0.0138***	-0.0148***
	(0.0137)	(0.0143)	(0.0061)	(0.0043)	(0.0036)	(0.0025)	(0.0020)	(0.0021)	(0.0027)	(0.0033)	(0.0050)
Inflation	-0.0248***	-0.0206**	-0.0618***	-0.0576***	-0.0448***	-0.0248*	-0.0221**	-0.0205***	-0.0144**	-0.0138*	-0.0030
	(0.0083)	(0.0082)	(0.0191)	(0.0167)	(0.0151)	(0.0136)	(0.0107)	(0.0074)	(0.0068)	(0.0083)	(0.0091)
Observations	2,749	2,585	2,749	2,749	2,749	2,749	2,749	2,749	2,749	2,749	2,749
Countries	81	81	81	81	81	81	81	81	81	81	81
R-squared	0.28	0.30									

Notes: Column 1 reports the results of Fixed Effects model. Column 2 reports the results of the 2SLS model where $lag GDP_{pc}$ and *Total Exports* are instrumented using both the first and second lags as instruments, respectively. Robust standard errors clustered at the country level are in parentheses. Columns 3-12 report the results of FEQR. Robust standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 3.3: Exports' composition and Growth: FEQR

Dep. variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
GDP_{pc}Growth	FE	2SLS	q_{10}	q_{20}	q_{30}	q_{40}	q_{50}	q_{60}	q_{70}	q_{80}	q_{90}
lagGDP_{pc}	-0.0384***	-0.0439***	-0.0392***	-0.0381***	-0.0376***	-0.0369***	-0.0371***	-0.0378***	-0.0383***	-0.0388***	-0.0402***
	(0.0061)	(0.0084)	(0.0018)	(0.0013)	(0.0010)	(0.0008)	(0.0007)	(0.0008)	(0.0009)	(0.0012)	(0.0017)
Human Capital	0.0009	0.0254***	0.0066*	0.0026	0.0004	-0.0015	-0.0019	-0.0019	-0.0005	-0.0009	0.0013
	(0.0082)	(0.0092)	(0.0035)	(0.0025)	(0.0019)	(0.0015)	(0.0016)	(0.0017)	(0.0019)	(0.0024)	(0.0032)
Psychical Capital	0.0363***	0.0420***	0.0366***	0.0395***	0.0345***	0.0363***	0.0367***	0.0408***	0.0409***	0.0414***	0.0397***
	(0.0100)	(0.0092)	(0.0071)	(0.0061)	(0.0046)	(0.0039)	(0.0038)	(0.0038)	(0.0038)	(0.0045)	(0.0072)
Primary Exports	-0.0044**	-0.0005	-0.0035**	-0.0024**	-0.0031***	-0.0034***	-0.0036***	-0.0038***	-0.0040***	-0.0048***	-0.0055***
	(0.0019)	(0.0032)	(0.0014)	(0.0010)	(0.0008)	(0.0007)	(0.0006)	(0.0006)	(0.0008)	(0.0010)	(0.0014)
Manuf. Exp.	0.0052	0.0069**	0.0080***	0.0066***	0.0059***	0.0055***	0.0051***	0.0044***	0.0038***	0.0034***	0.0021*
	(0.0037)	(0.0034)	(0.0015)	(0.0013)	(0.0009)	(0.0007)	(0.0007)	(0.0008)	(0.0009)	(0.0009)	(0.0011)
Serv. Exp.	0.0025	0.0037	0.0001	0.0003	0.0016	0.0019**	0.0021**	0.0028**	0.0037***	0.0057***	0.0074***
	(0.0030)	(0.0036)	(0.0016)	(0.0014)	(0.0010)	(0.0008)	(0.0009)	(0.0011)	(0.0012)	(0.0012)	(0.0019)
Pop. Growth	-0.0096***	-0.0108***	-0.0108***	-0.0110***	-0.0111***	-0.0111***	-0.0113***	-0.0113***	-0.0112***	-0.0102***	-0.0099***
	(0.0029)	(0.0029)	(0.0019)	(0.0014)	(0.0009)	(0.0007)	(0.0008)	(0.0009)	(0.0010)	(0.0013)	(0.0015)
Gov. Size	-0.0111	-0.0113	-0.0140***	-0.0134***	-0.0136***	-0.0153***	-0.0152***	-0.0135***	-0.0153***	-0.0152***	-0.0148***
	(0.0123)	(0.0123)	(0.0045)	(0.0035)	(0.0030)	(0.0025)	(0.0022)	(0.0022)	(0.0025)	(0.0033)	(0.0048)
Inflation	-0.0253***	-0.0203**	-0.0610***	-0.0531***	-0.0420***	-0.0257*	-0.0234**	-0.0189**	-0.0172**	-0.0141	-0.0038
	(0.0086)	(0.0088)	(0.0199)	(0.0179)	(0.0156)	(0.0141)	(0.0117)	(0.0079)	(0.0073)	(0.0087)	(0.0093)
Observations	2,749	2,585	2,749	2,749	2,749	2,749	2,749	2,749	2,749	2,749	2,749
Countries	81	81	81	81	81	81	81	81	81	81	81
R-squared	0.28	0.30									

Notes: Column 1 reports the results of Fixed Effects model. Column 2 reports the results of the 2SLS model where *lag*GDP_{pc}, *Primary Exports*, *Manufacturing Exports* and *Primary Exports* are instrumented using both the first and second lags as instruments, respectively. Robust standard errors clustered at the country level are in parentheses. Columns 3-12 report the results of FEQR. Robust standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

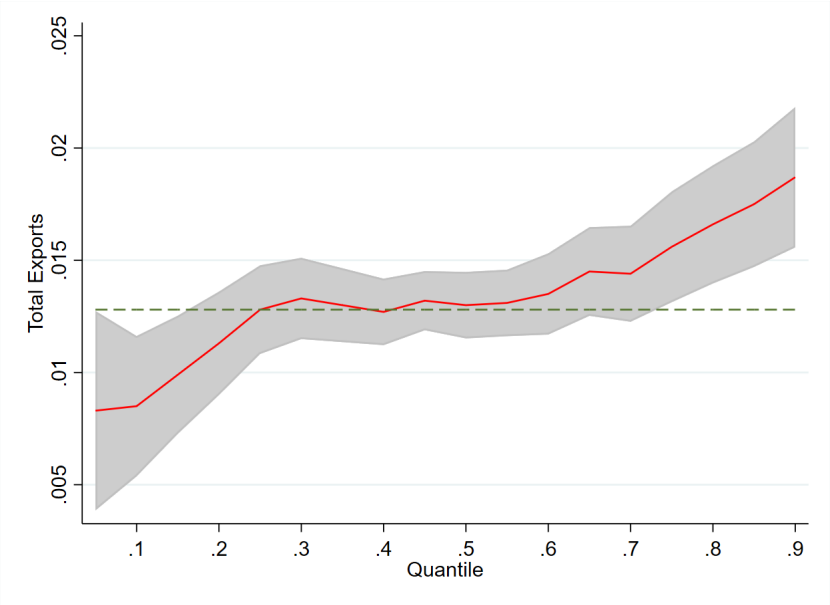

Figure 3.9: The effect of Total Exports on Growth across quantiles

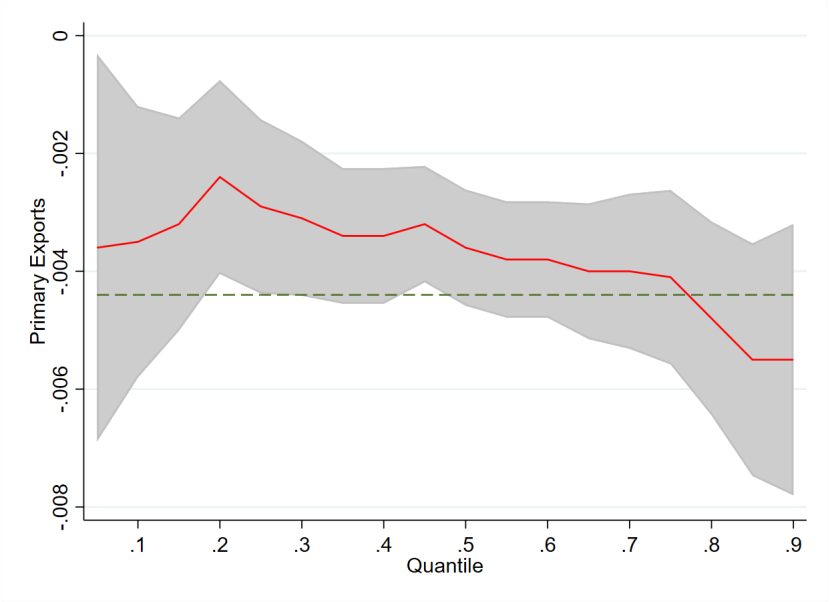

Figure 3.10: The effect of Primary Exports on Growth across quantiles

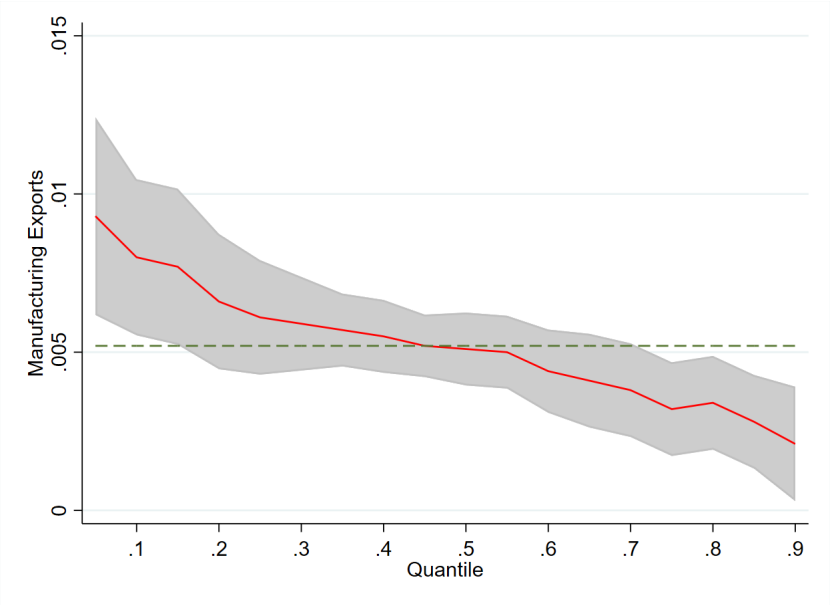

Figure 3.11: The effect of Manufacturing Exports on Growth across quantiles

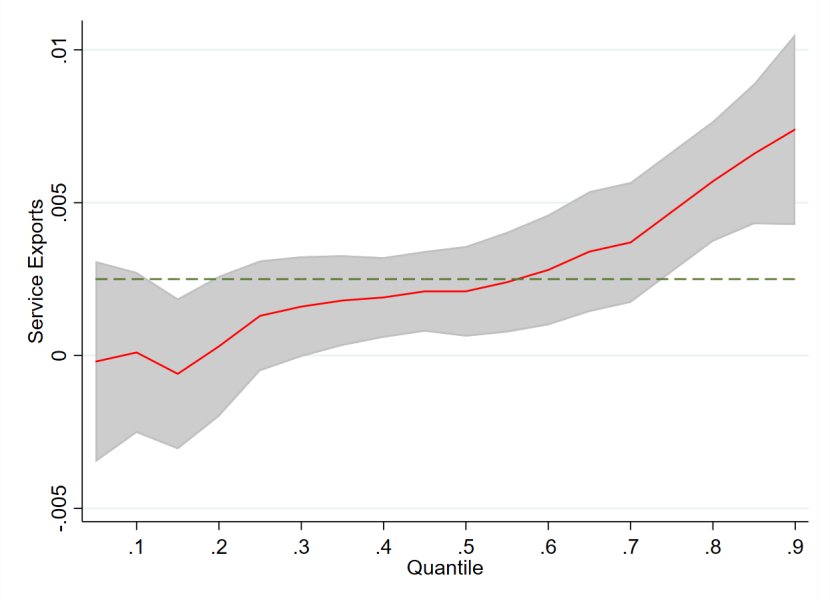

Figure 3.12: The effect of Services Exports on Growth across quantiles

3.7 Further evidence

3.7.1 Endogeneity issues

In this section, we will examine the robustness of the analysis in response to endogeneity issues. While the field of quantile regression estimators that take into account fixed effects has experienced rapid advances, a quantile regression approach that both accounts for fixed effects and at the same will take into account endogeneity has yet to be found. However, it should be pointed out, that there are several attempts in the quantile regression literature toward this direction. For instance, Amemiya (1982) and more recently Chen & Portnoy (1996) propose the "two-stage least square absolute deviations" quantile estimators. Another attempt was made by Abadie et al. (2002) and **?** using instrumental variable approaches and Lee (2007) using a control function approach. In this paper, we will follow Boikos et al. (2022) and Martínez-Zarzoso et al. (2017) and we will introduce lags. In what follows, we substitute *Primary Exports* , *Manufacturing Exports* and *Services Exports* with their respected two-period lagged values and replicate the analysis.[8] Table 4 report the findings. Although we observe differences in the corresponding coefficients when comparing them with Table 3 (i.e. where we do not control for endogeneity) in most cases, the findings are consistent with the empirical findings of Section 6. The main difference is now that the corresponding effect of primary exports on growth is positive and statistically significant, a finding that is consistent with the literature. For this reason, the rest of the analysis, will be carried out by introducing lags in the variables of interest.

[8]We have also carried out the analysis by taking lags for all right-hand side variables in our model and the results remain remarkably similar.

Table 3.4: Exports' composition and Growth: FEQR and endogeneity

Dep. variable: GDP_{pc}Growth	(1) q_{10}	(2) q_{20}	(3) q_{30}	(4) q_{40}	(5) q_{50}	(6) q_{60}	(7) q_{70}	(8) q_{80}	(9) q_{90}
lagGDP_{pc}	-0.0408***	-0.0393***	-0.0392***	-0.0391***	-0.0390***	-0.0393***	-0.0394***	-0.0397***	-0.0413***
	(0.0018)	(0.0014)	(0.0011)	(0.0009)	(0.0008)	(0.0008)	(0.0009)	(0.0011)	(0.0016)
Human Capital	0.0112***	0.0066***	0.0065***	0.0050***	0.0046***	0.0043**	0.0051**	0.0029	0.0054*
	(0.0035)	(0.0024)	(0.0019)	(0.0016)	(0.0017)	(0.0017)	(0.0020)	(0.0022)	(0.0031)
Physical Capital	0.0403***	0.0409***	0.0371***	0.0387***	0.0396***	0.0419***	0.0454***	0.0457***	0.0456***
	(0.0066)	(0.0053)	(0.0043)	(0.0041)	(0.0042)	(0.0039)	(0.0041)	(0.0041)	(0.0058)
Prim. Exp.$_{t-2}$	0.0033**	0.0033***	0.0030***	0.0023***	0.0020***	0.0023***	0.0022**	0.0019*	0.0004
	(0.0014)	(0.0011)	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0009)	(0.0010)	(0.0014)
Manuf. Exp.$_{t-2}$	0.0083***	0.0063***	0.0055***	0.0050***	0.0045***	0.0041***	0.0036***	0.0028***	0.0023**
	(0.0015)	(0.0013)	(0.0008)	(0.0006)	(0.0006)	(0.0007)	(0.0009)	(0.0009)	(0.0011)
Serv. Exp.$_{t-2}$	-0.0006	0.0008	0.0023**	0.0027***	0.0031***	0.0030***	0.0035***	0.0051***	0.0080***
	(0.0016)	(0.0014)	(0.0011)	(0.0009)	(0.0009)	(0.0010)	(0.0011)	(0.0013)	(0.0017)
Pop. Growth	-0.0114***	-0.0119***	-0.0120***	-0.0123***	-0.0125***	-0.0125***	-0.0121***	-0.0119***	-0.0106***
	(0.0018)	(0.0014)	(0.0010)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0012)	(0.0014)
Gov. Size	-0.0120***	-0.0126***	-0.0139***	-0.0144***	-0.0149***	-0.0168***	-0.0172***	-0.0157***	-0.0160***
	(0.0046)	(0.0039)	(0.0034)	(0.0026)	(0.0023)	(0.0022)	(0.0024)	(0.0029)	(0.0045)
Inflation	-0.0598***	-0.0450**	-0.0234*	-0.0232**	-0.0169**	-0.0163***	-0.0131*	-0.0134	-0.0005
	(0.0203)	(0.0185)	(0.0138)	(0.0113)	(0.0086)	(0.0062)	(0.0068)	(0.0082)	(0.0091)
Observations	2,585	2,585	2,585	2,585	2,585	2,585	2,585	2,585	2,585
Countries	81	81	81	81	81	81	81	81	81

Notes: Columns 1-9 report the results of FEQR. Robust standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

3.7.2 Low, middle and high-income countries

While we find robust evidence supporting the heterogeneous effects of exports on the conditional distribution of growth, we now turn our interest to exploring whether this effect is driven by a specific group of countries. For instance, one could expect developed or industrialized countries to rely more on manufacturing than primary exporting and thus to benefit more from them. In addition, this approach could be informative given that the *Total Exports* variable could overshadow the importance of other exports' components on growth. Therefore, this can be used by policymakers to develop targeted interventions and specific export-led growth strategies.

We classify countries into three groups based on their average gross national income over the period of the analysis. Namely, i) low-income, ii) middle-income and iii) high-income countries. We present the findings in Table 5. For brevity, we only present the coefficients of exports variables for selected quantiles. The findings are obtained after estimating equation (10) for different income groups using the FEQR and taking two-period lags in the variables of interest to handle potential endogeneity issues.

Together these results provide important insights that hold for different income groups. The following key findings emerge: First, primary exports influence positively growth only in the middle-income countries. Their effect is greater at higher parts of the growth distribution and diminishes when we consider higher quantiles. On the contrary, they bring an adverse effect on growth that is significant at higher quantiles of the conditional growth distribution in high-income countries. We do not find statistically significant evidence supporting the role of the primary exports in the growth process in low-income countries. Second, manufacturing exports can be considered the engine for growth for all income groups, especially for countries in the lower reaches of the conditional distribution of income growth. When we consider higher parts of the distribution, the effect diminishes or becomes insignificant in some cases. The effect of manufacturing exports in high-income countries is twice as high as in the low- and middle-income countries. Third, services exports drive economic growth in middle- and high income countries. Unlike manufacturing exports, the magnitude of their effect is greater

at the upper end of the conditional growth distribution.

Table 3.5: Exports and Growth in low, middle and high-income countries. FEQR for selected quantiles

	Low-income			Middle-income			High-income		
Q	Prim.	Manuf.	Serv.	Prim.	Manuf.	Serv.	Prim.	Manuf.	Serv.
q_{10}	-0.0030	0.0047**	-0.0015	0.0108***	0.0049*	0.0065*	-0.0005	0.0102***	0.0124***
	(0.0023)	(0.0023)	(0.0033)	(0.0033)	(0.0026)	(0.0038)	(0.0014)	(0.0016)	(0.0021)
q_{30}	-0.0011	0.0013	0.0001	0.0092***	0.0044**	0.0063***	-0.0015	0.0086***	0.0162***
	(0.0012)	(0.0015)	(0.0020)	(0.0022)	(0.0018)	(0.0023)	(0.0010)	(0.0012)	(0.0020)
q_{50}	-0.0012	0.0013	0.0012	0.0066***	0.0046**	0.0081***	-0.0012	0.0070***	0.0173***
	(0.0013)	(0.0013)	(0.0016)	(0.0019)	(0.0019)	(0.0020)	(0.0008)	(0.0012)	(0.0017)
q_{70}	-0.0010	0.0002	0.0014	0.0050**	0.0021	0.0095***	-0.0019*	0.0063***	0.0191***
	(0.0013)	(0.0015)	(0.0022)	(0.0022)	(0.0021)	(0.0022)	(0.0011)	(0.0013)	(0.0019)
q_{90}	-0.0006	-0.0012	0.0028	0.0012	-0.0005	0.0131***	-0.0037**	0.0062***	0.0227***
	(0.0022)	(0.0021)	(0.0042)	(0.0034)	(0.0027)	(0.0035)	(0.0014)	(0.0019)	(0.0023)

Notes: Dependent variable: GDP_{pc} *Growth*. Sample size of FEQR: 26 low-income countries (955 observations), 27 middle-income countries (900 observations) and 28 high-income countries (894 observations). The findings are obtained after estimating equation (10) for different income groups using the FEQR and taking two-period lags for the variables of interest. Only the coefficients of exports variables are reported for selected quantiles. Robust standard errors clustered at the country level using 500 replications are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

3.7.3 Alternative quantile regression estimators

To strengthen our findings further, we also implement the novel "Method of Moments" quantile regression estimator (MMQR) proposed by Machado & Silva (2019). The methodology relies on a conditional location-scale model of the form:

$$y_{it} = \alpha_i + X_{it}^{'}\beta + (\eta_i + H_{it}^{'}\gamma)\epsilon_{it} \tag{3.11}$$

The parameters α_i and η_i capture the individual effects of the ith cross-section. X denotes a k-vector of covariates. H includes the known differentiable transformations of vector X and $Pr\{\eta_i + H_{it}^{'}\gamma\} > 1$. The error term is independent and identically distributed for each i and t, does not statistically depend on X, and satisfies the moment conditions. Then, we consider the conditional quantiles $Q_y(\theta|X)$ of the following model that can be estimated sequentially based on the method of moment regression as defined comprehensively in Machado & Silva (2019).

$$Q_y(\theta|X) = (\alpha_i + \delta_i q(\theta)) + X'\beta + H_{it}(\theta) \tag{3.12}$$

One of the novelties of the estimator is that the θ^{th} quantile of cross-section i, that is captured by $\alpha_i + \delta_i q(\theta)$, is allowed to affect the entire distribution of the outcome variable rather than considered constant across quantiles.[9] Given that our main interest was on the effects of exports' components of growth, we estimate equation (12) and we present the results by implementing the MMQR. At first glance, the quantile regression estimates are very much in line with the FEQR approach in terms of sign, however, there are differences in terms of significance of the coefficients. The findings support the important role of the manufacturing exports sector as a driver of economic growth. Consistent with the previous findings, the results suggest that the effect of manufacturing exports is greater at the lower end of the conditional growth distribution. Nonetheless, although the coefficient of services exports follows similar trends across quantiles, the coefficient is not statistically significant. While this approach is considered more restrictive compared to traditional quantile regression approaches, and hence, we may expect differences compared to Canay's approach, the estimator can shed further light on the research questions by acting as a robustness check.

[9]For instance, previous QR estimators, such as the ones proposed by Koenker (2004) and Canay (2011) treat the individual effects as pure "location shifts".

Table 3.6: Exports' composition and Growth: MMQR

Dep. variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP_{pc}Growth	q_{10}	q_{20}	q_{30}	q_{40}	q_{50}	q_{60}	q_{70}	q_{80}	q_{90}
lagGDP_{pc}	-0.0561***	-0.0499***	-0.0457***	-0.0426***	-0.0393***	-0.0363***	-0.0335***	-0.0304***	-0.0260***
	(0.0163)	(0.0130)	(0.0111)	(0.0095)	(0.0083)	(0.0073)	(0.0066)	(0.0063)	(0.0066)
Human Capital	0.0096	0.0082	0.0072	0.0065	0.0057	0.0051	0.0044	0.0037	0.0027
	(0.0132)	(0.0113)	(0.0103)	(0.0097)	(0.0093)	(0.0092)	(0.0093)	(0.0096)	(0.0105)
Physical Capital	0.0564***	0.0505***	0.0465***	0.0435***	0.0403***	0.0375***	0.0348***	0.0319***	0.0276***
	(0.0127)	(0.0111)	(0.0102)	(0.0095)	(0.0090)	(0.0086)	(0.0083)	(0.0082)	(0.0084)
Primary Exports$_{t-2}$	0.0033	0.0027	0.0023	0.0020	0.0016	0.0013	0.0010	0.0007	0.0003
	(0.0051)	(0.0039)	(0.0032)	(0.0027)	(0.0024)	(0.0022)	(0.0023)	(0.0026)	(0.0033)
Manuf. Exp.$_{t-2}$	0.0070	0.0062*	0.0056*	0.0052*	0.0048*	0.0044*	0.0040*	0.0036*	0.0030
	(0.0045)	(0.0036)	(0.0032)	(0.0028)	(0.0025)	(0.0023)	(0.0021)	(0.0021)	(0.0022)
Serv. Exp.$_{t-2}$	-0.0002	0.0009	0.0016	0.0021	0.0027	0.0032	0.0037	0.0043	0.0051
	(0.0054)	(0.0043)	(0.0037)	(0.0033)	(0.0032)	(0.0032)	(0.0034)	(0.0037)	(0.0044)
Pop. Growth	-0.0145**	-0.0132***	-0.0123***	-0.0116***	-0.0109***	-0.0102***	-0.0096***	-0.0090***	-0.0080***
	(0.0057)	(0.0045)	(0.0037)	(0.0031)	(0.0026)	(0.0023)	(0.0020)	(0.0020)	(0.0023)
Gov. Size	-0.0135	-0.0129	-0.0124	-0.0121	-0.0117	-0.0114	-0.0111	-0.0108	-0.0103
	(0.0174)	(0.0156)	(0.0146)	(0.0138)	(0.0132)	(0.0128)	(0.0125)	(0.0123)	(0.0123)
Inflation	-0.0323*	-0.0281*	-0.0252*	-0.0230*	-0.0207*	-0.0186*	-0.0167	-0.0146	-0.0115
	(0.0183)	(0.0160)	(0.0144)	(0.0132)	(0.0121)	(0.0111)	(0.0103)	(0.0095)	(0.0086)
Observations	2,585	2,585	2,585	2,585	2,585	2,585	2,585	2,585	2,585
Countries	81	81	81	81	81	81	81	81	81

Notes: Columns 1-9 report the results of MMQR. Robust standard errors clustered at the country level using 500 replications are in parentheses. All regressions include time dummies and a constant term. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

3.8 Concluding remarks

Overall, exports matter for economic growth and this is not new in the literature. In this paper, we revisit the exports-led growth hypothesis by applying alternative econometric methodologies including quantile regression techniques. We account for unobserved heterogeneity and we also handle the potential endogeneity. We disaggregate exports into three main components and apart from the conditional mean effect, we focus on the entire conditional distribution of growth rates. We reveal interesting and heterogeneous patterns across countries and quantiles.

First and foremost, the findings tend to show that manufacturing exports is a key driver of economic growth and their effect on growth is significant in all income groups of countries. The latter is in line with studies such as Greenaway et al. (1999), Calderón et al. (2001) and Crespo Cuaresma & Wörz (2005), among others, that support the importance of manufacturing exports in the growth process. In this paper, quantile regression shows further insights into this nexus. That is, their effect is greater at lower parts of the conditional growth distribution and declines as higher parts of the distribution are considered. Second, services exports is a significant contributor to economic growth and this appears to hold for middle- and high-income countries that operate especially in the upper reaches of the conditional growth distribution. While the importance of the service sector can be outlined in the success story of the Indian economy, there are several studies supporting the rise of services, such as Olney & Pacitti (2017). Services exports are found to be insignificant in low-income countries. The latter can be attributed to structural factors. According to Gabriele (2006), the contribution of services exports is weaker in developing countries, as they have "poorly integrated to the rest of the domestic economy". Regarding the effect of exporting primary goods, after controlling for endogeneity, is found to be positive and significant for the whole conditional distribution of growth. The effect is greater in middle-income countries and in the upper tail of the corresponding distribution. Most importantly, the magnitude of their effect lags behind manufacturing and services exports. In addition to the latter, the findings also reveal that relying on primary exporting could have an adverse effect on growth in

high-income countries in some cases.

Given that we find significant parameter heterogeneity across different quantiles of the conditional distribution of the growth rates, this could allow us to assume that countries will respond differently with respect to their relative growth level. Therefore, our results could bear major policy implications. Countries facing relatively low growth rates, could benefit from exports of manufactures while countries facing relatively higher growth rates could adopt services-oriented export activities to enhance economic growth. Finally, decision-making and export-oriented policies should be formulated towards specific income groups of countries.

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Appendix

Table C1: List of countries

Classification	Countries
low-income group:	Algeria, Bangladesh, Bolivia, Cambodia, Cameroon, China, Ecuador, Egypt, El Salvador, Ghana, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Kyrgyz Republic, Mongolia, Morocco, Nigeria, Pakistan, Peru, Philippines, Sri Lanka, Thailand, Tunisia.
Middle-income group:	Albania, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Hungary, Kazakhstan, Latvia, Lithuania, Malaysia, Malta, Mauritius, Mexico, Panama, Paraguay, Poland, Portugal, Portugal, Russian Federation, Saudi Arabia, Slovak Republic, South Africa, Turkey, Uruguay.
High-income group:	Australia, Austria, Belgium, Brunei Darussalam, Canada, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, China, Ireland, Italy, Japan, Korea, Rep., Luxembourg, Netherlands, New Zealand, Norway, Singapore, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States.

Table C2: Correlation matrix

	GDP_{pc} Growth	$lag GDP_{pc}$	*Hum. Capital*	*Ph. Capital*	*Prim. Exports*	*Manuf. Exports*	*Serv. Exports*	*Pop. Growth*	*Gov. Size*	*Inflation*
GDP_{pc} Growth										
$lag GDP_{pc}$	-0.0975									
Hum. Cap.	0.0604	0.7635								
Ph. Capital	0.2660	0.0177	0.0105							
Prim. Exports	0.0807	-0.1296	-0.0087	-0.1489						
Manuf. Exports	0.2114	0.4012	0.4608	0.0676	0.2245					
Serv. Exports	0.1135	0.3247	0.3312	0.0435	0.3533	0.5312				
Total Exports	0.1201	0.3667	0.3683	0.1428	0.2634	0.5403	0.7409			
Pop. Growth	-0.2053	-0.4428	-0.6090	0.0186	-0.0281	-0.4563	-0.2197	-0.1522		
Gov. Size	-0.0956	0.5213	0.4750	-0.1028	0.0414	0.3225	0.2672	0.2008	-0.3425	
Inflation	-0.1718	-0.1707	-0.2277	-0.1049	0.0266	-0.2148	-0.2101	-0.2163	0.1284	-0.1615

Conclusion

The aim of the present thesis is to investigate the macroeconomic determinants of economic growth by focusing on three major topics of finance, tourism and exports, respectively. By utilizing an extensive panel of heterogeneous countries, it provides additional insights into the empirical literature. Thus, the findings of the thesis could be promising for an effective policy design in the future, while at the same time, encourage further investigation by other researchers and policymakers.

In Chapter One, we examine the role of financial development and financial reforms in the growth process. The findings suggest that financial reforms (and especially, banking supervision and securities markets' regulations) are vital drivers of economic growth. Therefore, economic policy could be developed through financial reforms rather than financial development for enhancing economic growth. On the other hand, policymakers should take into account that not all the components of financial reforms can promote economic growth (the elimination of banking entry barriers could negatively affect economic growth). In addition, policymakers, could take into consideration the level of economic growth of a country before implementing any policy-measure related to the financial system. Finally, decision-making could be oriented towards specific income-groups of countries.

In Chapter Two, we enhance our understanding of the tourism-growth nexus. We reveal that countries that experience relatively low growth rates benefit more from tourism. The magnitude of the effect in developed countries is two times greater than in developing ones. On the contrary, tourism specialization is not always beneficial for growth (especially, in developing countries). In addition, we follow a simulation approach and provide evidence on the importance of the tourism sector in global economy and welfare. We estimate the potential impact of a reduction in tourism activity (for instance, due to the Covid-19 pandemic) on economic growth and we find that countries facing relatively low growth rates are affected the most. The latter is quite promising for policy making targeting the bullet-proofing of the

economies.

In Chapter Three, we revisit the exports-led growth hypothesis and we reveal heterogeneous patterns across countries and quantiles of economic growth. We disaggregate exports into primary, manufacturing and services exports. Manufacturing exports are a vital component of economic growth. Our findings could bear important policy implications. Countries experiencing relatively low growth rates could benefit from manufacturing exports, while countries facing relatively higher growth rates could adopt services-oriented export activities to enhance economic growth. Finally, we find that relying on primary exporting could have an adverse effect on economic growth in some cases. Finally, we show that export-oriented policies should be formulated towards specific income groups of countries.