

ON THE GROWTH EFFECTS OF EQUITY MARKET LIBERALIZATION

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While equity market liberalization has been found to be associated with faster economic growth, such a correlation alone cannot identify the direction of causation. Using instrumental variables (IV) methodology, this paper presents empirical evidence of strong growth effects of equity market liberalization. Systematic differences exist in the growth effects across countries at different income levels, and with different size of equity markets. Equity market liberalization benefits high-income and middle-income countries through productivity improvements, while growth instead increases in low-income countries as a result of increased physical capital accumulation. Additional growth effects are found for countries having larger equity markets.

Keywords: Equity Market Liberalization, Growth, Instrumental Variables

JEL classification: F36, F43, G15, G18

1. INTRODUCTION

Equity market liberalization is a policy in which a country's government gives foreign investors the opportunity to purchase shares in that country's equity market and domestic investors the right to transact in foreign shares. Recent decades have witnessed considerable development of equity market liberalization, and the growth effects of such liberalization have been the subject of a large literature. For instance, Bekaert *et al.* (2005) showed that equity market liberalization leads to an increase in a country's annual economic growth. Klein and Olivei (2008) found a significant effect of open capital accounts on financial depth and economic growth, and confirmed that equity market liberalization has an independent effect on economic growth. Henry (2007) provides an informative survey of the research on the macroeconomic impact of capital account liberalization. The evidence of growth effects of liberalizations remains yet

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inconclusive to this date.

Endogeneity often clouds the interpretation of the empirical findings. Countries with particular growth experiences may be more prone to liberalize capital flows, implying the potential for reverse causality. Instrumental variables (IV) methodology is the general tool in dealing with endogeneity. A nation's legal system is widely used in cross-sectional regressions as an instrument for financial variables (Edison *et al.*, 2004). Though it can be a good instrument, time-dimension information is ignored. The general practice in panel data regressions is to use the lagged values of liberalization as the instruments for liberalization, but the lagged values are not necessarily good instruments.

In this paper, we use both the OLS and the IV methods to estimate the growth effects of equity market liberalization. The percentage of a nation's neighboring countries with open equity markets at a given time is used to instrument for equity market liberalization. The instrument can be appropriate because policy contagion is powerful. The demonstration effect and international competition may induce the home country to adopt similar policies as its neighbors. The policies of foreign countries are also unlikely to be correlated with the growth determinants of the home country otherwise.

There are three main findings. First, the point estimates suggest equity market liberalization significantly boosts growth. There is no evidence that the positive relationship between equity market liberalization and economic growth found by OLS is overstated. On the contrary, in every specification, the IV estimates exceed the OLS estimates, often by a considerable margin. Second, both foreign direct investment and portfolio investment increase significantly after equity market liberalization, indicating that the policy has substantial impact on international capital flows. Third, systematic differences exist across countries at different income levels. Equity market liberalization benefits high-income and middle-income countries through productivity improvements, while growth instead increases in low-income countries as a result of increased physical capital accumulation. Stock market capitalization intermediates the growth effects of equity market liberalization. Additional growth effects are found for countries having larger equity markets.

This paper is closely related to the line of research that seeks the causal relationship between equity market development and economic growth. For instance, Caporale *et al.* (2004) found evidence supporting the long-run growth effects of stock market development. It also provided support to theories according to which well-functioning stock markets can promote economic development through faster capital accumulation and better resource allocation. Deb and Mukherjee (2008) examined the causal relationship between stock market development and economic growth, and found a strong causal flow from the former to the latter for the Indian economy. The contribution of our paper to the relevant literature lies in its focus on the causal relation between economic growth and equity market liberalization policy in particular, rather than the overall development of equity markets.

This paper is also related to recent research about the empirical relevance of various

channels through which the growth effects of equity market liberalization operate. There is evidence that equity market liberalization reduces the cost of capital. For instance, at the macro level, Henry (2000a) found that equity price indexes experience abnormal returns in the months preceding equity market liberalization, implying that such liberalization may reduce the liberalizing country's cost of equity capital by allowing for risk sharing. Using micro data, Li (2010) showed that stock market liberalization is associated with a fall in the cost of capital to firms by reducing the wedge between the costs of external and internal capital. There is also evidence that equity market liberalization promotes investment. For instance, Alfaro and Hammel (2007) found that stock market liberalization is associated with a significant increase in the share of imports of machinery and equipment going into domestic equipment investment. Fowowe (2011) found that financial sector reforms had a positive effect on private investment in selected Sub-Saharan African countries. A well designed economic model providing a structural mechanism provides informative insights about the channels through which equity market liberalization boosts growth but it is subject to the endogeneity problem. Our paper seeks making progress on causality to explore the presence of a causal relation between equity market liberalization and the development in real sector.

The rest of the paper is organized as follows. Section 2 sets out the empirical framework. Model specifications, the approach to dating equity market liberalization, the IV method, and the choice of instruments are discussed. Section 3 reports the empirical results, both OLS and IV, of the liberalization's effects on economic performance. Estimation results allowing for parameter heterogeneity across income levels and across countries with different stock market sizes are also presented. Section 4 concludes.

2. ECONOMETRIC MODEL, DATA AND METHODOLOGY

2.1. Econometric Model

The baseline model is as follows:

$$y_{i,t} = \alpha_0 + \gamma * Lib_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t}, \quad (1)$$

where the dependent variable $y_{i,t}$ is one of the following: annual growth rate of real per capita GDP ("Growth"), gross capital formation as a share of GDP ("Investment"), change in real per capita GDP divided by per capita investment ("Productivity"), foreign direct investment as a share of GDP ("FDI"), and portfolio investment as a share of GDP ("Portfolio"). α_0 is the constant intercept. $Lib_{i,t}$ is the equity market liberalization indicator which takes a value of one when liberalized and zero otherwise. η_i and δ_t

are a set of country and time dummies (leaving out one year and one country). $\varepsilon_{i,t}$ is the error term. The subscripts i and t refer to the country and the year of observations. γ is the parameter of interest that measures the changes in dependent variables stemming from equity market liberalization.

Equation (1) is different from conventional growth models. Generally, cross-country data are used to run regressions of growth rates on initial income and a series of variables that are determinants of long-run growth (investment rate, school enrollment, population growth rate, etc.). We use panel data and include country and time dummies as explanatory variables to avoid multicollinearity among economic variables, and to overcome the degree-of-freedom problem by pooling time-series and cross-section information of the data. In addition, country dummies partly solve the problem of endogeneity because they control for the unobserved time-invariant country-specific characteristics that may be correlated with equity market controls. The simultaneity problem will be further dealt with by IV. Considering the risk that the additional information introduced by including time-series may come at the cost of mixing growth effect with business-cycle effects, it is necessary to include time dummies to control for world business cycles. The two fixed effects also account for the convergence phenomenon documented in the growth literature.

2.2. Dating Liberalization

When dating equity market liberalization, researchers typically construct 0/1 liberalization indicators based on the dates of opening equity markets to foreign investors (Bekaert and Harvey, 2000; Bekaert *et al.*, 2003, 2005; Henry, 2000a, 2000b, 2003). There are also efforts in measuring the intensity of equity market liberalization (Edison and Warnock, 2003). We choose to use a dichotomous measure since it is more extensively available.

Official equity market liberalization date is defined as a date of formal regulatory change after which foreign investors officially have the opportunity to invest in domestic equity securities, and domestic investors have the right to transact in foreign equity securities abroad. Data on the official equity market liberalization dates for emerging markets are from Bekaert *et al.* (2003). Data for developed countries are from Bekaert *et al.* (2003) and a NBER working paper by Kaminsky and Schmukler (2003). Data for countries that have never been liberalized are from Bekaert *et al.* (2005).

2.3. IV Method and Instruments

The equity market liberalization indicator is not necessarily exogenous. It is highly possible that a country opens its domestic equity market when it expects future growth opportunities; thus the coefficient γ could be reflecting the reverse causality. Our attempts are based on an IV strategy by using two-stage least squares (2SLS): to find an

instrumental variable which influences equity market liberalization, but is uncorrelated with other plausible (and excluded) determinants of economic growth. The primary variable chosen as instrument for the equity market liberalization indicator is the percentage of neighboring countries with open equity markets at a given time. Global diffusion of values and policies is very likely to influence a nation's international financial policies. Such contagion effect, whereby policy choices in other countries have an impact on those of a given country, may operate through multiple mechanisms: the demonstration effects of the results of other countries' policies; the enhanced difficulties the home country encounters when competing with other countries in attracting foreign capital; the development of profit opportunities for speculators in arbitraging differences in regulatory systems, etc.

To identify neighboring countries, we divide our 95 sample countries into eight geographical regions: East Asia and Pacific, East Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, North America, Western Europe, South Asia, and sub-Saharan Africa. Countries in the same region are called neighbors. The instrument constructed by this definition of neighboring countries is denoted as "Neighbor".

Table 1 lists the sample countries and their equity market liberalization dates by region. There seems to be a pattern of clustering of regional policy changes. For example, Western European countries liberalized earlier. A liberalization wave spread across Asian and Latin American countries around late 1980's and early 1990's. Sub-Saharan African countries liberalized late, and only a few had done so by 2000.

Table 1. Equity Market Liberalization Dates by Region

Region	Country	Liberalization	Region	Country	Liberalization
North America	Canada	1973	Middle East and North Africa	Morocco	1988
	US	1973		Egypt	1992
South Asia	Sri Lanka	1991		Israel	1993
	Pakistan	1991		Tunisia	1995
	Bangladesh	1991		Jordan	1995
	India	1992		Oman	1999
	Nepal	NL		Saudi Arabia	1999
Latin America and Caribbean	Mexico	1989		Algeria	NL
	Argentina	1989		Iran	NL
	Venezuela	1990		Kuwait	NL
	Colombia	1991		Syria	NL
	Brazil	1991	East Asia and Pacific	Australia	1973
	Jamaica	1991		Singapore	1973
				Japan	1983

Chile	1992	New Zealand	1987
Peru	1992	Thailand	1987
Ecuador	1994	Malaysia	1988
Trinidad & Tobago	1997	Indonesia	1989
Barbados	NL	Philippines	1991
Costa Rica	NL	Korea	1992
Dominican Rep.	NL	Fiji	NL
El Salvador	NL	Sub-Saharan Africa	
Guatemala	NL	Botswana	1990
Guyana	NL	Zimbabwe	1993
Haiti	NL	Ghana	1993
Honduras	NL	Mauritius	1994
Nicaragua	NL	Cote d'Ivoire	1995
Paraguay	NL	Kenya	1995
Uruguay	NL	Nigeria	1995
Europe		South Africa	1996
Austria	1973	Benin	NL
Belgium	1973	Burkina Faso	NL
Denmark	1973	Cameroon	NL
Finland	1973	Central African Rep.	NL
France	1973	Chad	NL
Germany	1973	Congo Rep.	NL
Ireland	1973	Gabon	NL
Italy	1973	Gambia	NL
Netherlands	1973	Lesotho	NL
Norway	1973	Madagascar	NL
Sweden	1973	Malawi	NL
Switzerland	1973	Mali	NL
U.K.	1973	Niger	NL
Spain	1985	Rwanda	NL
Portugal	1986	Senegal	NL
Greece	1987	Sierra Leone	NL
Turkey	1989	Swaziland	NL
Iceland	1991	Togo	NL
Malta	1992	Zambia	NL

Notes: Information on regional grouping is from the Global Development Network Growth Database (2002). "NL" refers to not liberalized. The exceptions are Turkey, Portugal, Greece, and Malta. Turkey is considered a country in East Europe and Central Asia. Portugal, Greece and Malta are included in Middle East and North Africa. They are now all included in the group of European countries.

2.4. Relevance of Instruments

Good instrumental variables must satisfy two requirements: they must be correlated with the included endogenous variable and orthogonal to the disturbance. Tests on the correlation between the instruments and the endogenous variables to be instrumented can be processed by an examination on the significance of the excluded instruments in the first stage IV regressions. Table 2 reports the first stage IV estimates for Equation (1) when various instrument sets are used to instrument for the indicator of equity market liberalization. The dependent variable in the second stage in getting these estimates is “Growth”.¹ Table 2 shows that the instruments are in fact relevant in explaining equity market liberalization. All of them are statistically significant. As expected, the impact of neighboring countries’ policies on the home country’s policy decisions is large and overwhelming, regardless of how neighboring countries are defined. This suggests that the influence coming from neighboring countries is a major determinant of the home country’s policy decision.

Table 2. Instrumental Relevance (95 countries, 1975-2000)

	1	2	3	4 ^a	5	6	7	8 ^a
Constant	0.366*** (6.91)	0.426*** (8.15)	0.415*** (7.87)	0.361*** (6.77)	0.365*** (6.94)	0.322*** (6.18)	0.340*** (6.44)	0.315*** (6.02)
Neighbor	0.661*** (15.97)			0.702*** (16.60)	0.648*** (15.71)	0.632*** (15.52)	0.661*** (16.07)	0.653*** (15.77)
N(continental)		0.407*** (16.09)						
N(sea)			0.379*** (15.23)					
Polity				-0.004*** (-2.75)				-0.003* (-1.88)
Left					0.096*** (4.85)			0.089*** (4.50)
Right					0.037* (1.93)			0.032* (1.68)
IT1						0.164*** (9.49)		0.171*** (9.65)
IT2							0.119*** (5.15)	

¹ Since the data are not all available for all the 95 sample countries over the whole sample period, there are differences in the first stage IV estimates when various dependent variables are used. The differences are trivial.

N	2458	2458	2458	2350	2458	2458	2458	2350
Adjusted R^2	0.7461	0.7465	0.7438	0.7465	0.7486	0.7554	0.7488	0.7591
Partial R^2	0.0984	0.0997	0.0902	0.1101	0.1080	0.1319	0.1085	0.1553
F-test				138.11	94.28	177.42	142.18	81.97
				(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes: Reported are the first stage IV estimates for Equation (1) when the dependent variable is annual growth rate of real per capita GDP (“Growth”). The endogenous regressor to be instrumented is the equity market liberalization indicator. The numbers in parentheses in the upper panel are the estimated t-ratios, based on heteroskedasticity-consistent standard errors. The numbers in parentheses in the lower panel are the p-values. Country and time dummies are also included but not reported. The instruments used in various regressions are:

Column 1: “Neighbor” (baseline model),

Column 2: “N(continental)”,

Column 3: “N(sea)”,

Column 4: “Neighbor” + “Polity”,

Column 5: “Neighbor” + “Left” + “Right”,

Column 6: “Neighbor” + “IT1”,

Column 7: “Neighbor” + “IT2”,

Column 8: “Neighbor” + “Polity” + “Left” + “Right” + “IT1”,

Neighbor = % of neighboring countries with open equity markets at a given time, countries in the same geographical region are defined as neighbors,

N(continental) = % of neighboring countries with open equity markets at a given time, neighboring countries are defined as countries sharing continental borders,

N(sea) = % of neighboring countries with open equity markets at a given time, neighboring countries are defined as countries sharing continental borders or separated by small water,

Polity = Composite indicator of democracy and autocracy,

Left = Dummy for left-wing parties,

Right = Dummy for right-wing parties,

IT1 = Dummy for the existence of insider trading laws in stock markets,

IT2 = Dummy for the enforcement of insider trading laws in stock markets.

*** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

^a: Barbados, Cameroon, Malta and Germany are excluded due to missing polity data.

Statistics of the relevance of the instruments are partial R^2 and F statistic. Partial R^2 assesses how high the correlation between the explanatory endogenous variables and the instruments are in the first stage regression by “partialling-out” the included instruments (the exogenous variables common to both two stages). F-statistic from the first stage IV regression captures the joint ability of the instruments in explaining the variation in the endogenous variable. In estimating Equation (1), the marginal contribution of the instruments is about 10%. All F-statistics are significant at the conventional level. The results of Bound *et al.* (1995) imply that these F-statistics are

large enough that the finite-sample bias of IV -which biases the IV estimate in the same direction as the OLS estimate- is unlikely to be a serious problem in these IV regressions. The F-statistics and the relatively high partial R^2 indicate that the instruments are not weak. Thus, a small correlation between the instruments and the error is unlikely to seriously bias the estimates.

3. EMPIRICAL RESULTS

We estimate Equation (1) by two methods: OLS and IV. Table 3 reports the estimation results when the dependent variables, used in turn, are “Growth”, “Investment”, “Productivity”, “FDI” and “Portfolio”. As a convention, the OLS estimation results are reported first, followed by the second stage IV estimates when “Neighbor” is the instrument for the equity market liberalization indicator. We report the coefficients on the constant, the liberalization indicator, and the interactive terms (if any). We do not report the coefficients on country or time dummies. Different numbers of asterisks indicate different levels of significance. In all cases we report heteroskedasticity-consistent standard errors. The last two rows are the number of observations and R^2 (the centered R^2 for IV).

Table 3. Effects of Equity Market Liberalization on Economic Performance
(95 countries, 1975-2000)

Panel A: Liberalization's Effects on Growth Factors						
	1	2	3	4	5	6
	OLS	IV	OLS	IV	OLS	IV
	Growth	Growth	Investment	Investment	Productivity	Productivity
Constant	-0.001 (-0.11)	-0.011 (-0.91)	15.26*** (17.18)	14.12*** (13.63)	-0.024 (-0.35)	-0.065 (-0.84)
Liberalization	0.006* (1.94)	0.025** (2.46)	1.35*** (3.54)	3.49*** (2.98)	0.047** (2.06)	0.125 (1.57)
N	2458	2458	2451	2451	2444	2444
R^2 (centered)	0.1647	0.1565	0.5910	0.5864	0.1192	0.1171
Panel B: Liberalization's Effects on International Capital Flows						
	1	2	3	4		
	OLS	IV	OLS	IV		
	FDI	FDI	Portfolio ^a	Portfolio ^a		
Constant	0.14 (0.25)	-0.26 (-0.41)	-2.22*** (-3.17)	-2.16*** (-3.15)		
Liberalization	0.90*** (5.99)	1.87*** (3.61)	1.36*** (5.36)	1.21* (1.68)		

N	2178	2178	2131	2131
R^2 (centered)	0.3636	0.3535	0.2295	0.2293

Notes: Reported are the OLS and the IV estimates for Equation (1). The dependent variables of Panel A and B are, in turn, annual growth rate of real per capita GDP (“Growth”), gross capital formation as a share of GDP (“Investment”), change in real per capita GDP divided by per capita investment (“Productivity”), foreign direct investment as a share of GDP (“FDI”), and portfolio investment as a share of GDP (“Portfolio”). The numbers in parentheses are the estimated t-ratios, based on heteroskedasticity-consistent standard errors. “Neighbor” is the only instrument for equity market liberalization. Country and time dummies are also included but not reported. ^a: Haiti is excluded due to missing data.

3.1. Growth Effects of Equity Market Liberalization

Columns 1 and 2 of Panel A, Table 3 report the estimation results for Equation (1) when “Growth” is the dependent variable. Both the OLS and the IV estimates show statistically significant relationship between equity market liberalization and economic growth. The growth effect is stronger, both statistically and economically, when IV is used. The OLS coefficient estimate is about 0.006, suggesting that equity market liberalization increases annual growth rate of real per capita GDP by about 0.6%. The fact that the IV estimate is bigger than the OLS estimate suggests that the OLS estimate is unlikely to be overstated. The positive association between equity market liberalization and economic growth is not entirely due to fast growing countries systematically opening their domestic equity markets.

3.2. Channels through which Liberalization Affects Growth

A number of factors have been pointed out as plausible intermediates through which liberalization increases growth, of which investment has received the most attention (Bekaert *et al.*, 2003, 2005; Henry, 2000b, 2003). Liberalizations may also increase growth through increased productivity. For example, Beck *et al.* (2000) showed factor productivity is positively related to the exogenous component of financial development. If equity market liberalization enhances financial development, we may expect it to increase productivity.

In our analysis, investment is measured by the gross capital formation as a share of GDP (“Investment”). Productivity is measured by the change in real per capita GDP divided by per capita investment (“Productivity”). The two measures are obtained from the following approximate decomposition of economic growth (depreciation is ignored):

$$\log \frac{\Delta y}{y} = \log \left(\frac{\Delta K}{Y} * \frac{\Delta y}{\Delta K} \right) = \log \frac{\Delta K}{Y} + \log \frac{\Delta y}{\Delta K},$$

where y is real per capita GDP. Y is real GDP. K is physical capital stock. I is investment. N is population. I/Y is thus the gross capital formation as a share of GDP (“Investment”), and $\frac{\Delta y}{I/N}$ is the change in real per capita GDP divided by per capita investment (“Productivity”).

Columns 3 and 4 of Panel A, Table 3 report the estimation results for Equation (1) when “Investment” is the dependent variable. Both the OLS and the IV estimates are positive and statistically significant. The OLS estimate suggests on average, the rate of physical capital accumulation increases by about 1.35 percentage points after equity market liberalization.

Columns 5 and 6 of Panel A, Table 3 provide the estimation results for Equation (1) when “Productivity” is the dependent variable. Only the OLS estimate is significant. Therefore, it is more likely that the growth effect of equity market liberalization operates through increased physical capital accumulation but not through productivity improvements.

3.3. Effects of Equity Market Liberalization on International Capital Flows

We also examine whether equity market liberalization affects international capital flows. After all, the realization of the potential benefits of equity market liberalization depends on international capital flows. Foreign direct investment as a share of GDP (“FDI”) and portfolio investment as a share of GDP (“Portfolio”) are used as additional dependent variables in the baseline model. We do not consider the debt-creating components of international capital flows such as bank loans and bonds that may be used for purely consumption-smoothing purposes. Episodes like the Asian crisis have shown that direct investment is much less volatile than debt-creating capital flows.

Panel B of Table 3 reports the estimation results. All the coefficient estimates of the liberalization indicator, OLS or IV, enter positively and are statistically significant. Using the OLS point estimates, on average, foreign direct investment as a share of GDP increases by about 0.9 percentage points, and portfolio investment as a share of GDP increases by about 1.36 percentage points after equity market liberalization. Equity market liberalization seems to have done a good job in attracting external infusions of foreign capital in the form of direct investment and portfolio investment.

3.4. Why Are the IV Estimates Bigger Than the OLS Estimates?

A noticeable feature of Table 3 is that the IV estimates of the coefficient on the equity market liberalization indicator are almost always greater than the OLS estimates (except “Portfolio”). This is surprising since we generally suspect OLS is biased upward for various reasons. Countries with fast-growing opportunities may have more incentives to liberalize portfolio flows to attract foreign capital. Opening equity markets may be

correlated with other market-oriented reforms that may increase growth. It is interesting to note that other authors have reported similar findings when both OLS and IV are used to study the effects of certain liberalization policy on economic performance (Edison *et al.*, 2004; Frankel and Romer, 1999; Irwin and Tervio, 2002).

Are the differences between the OLS and the IV estimates systematic, and if so, why? Since there are country dummies in the regressions, the differences are not the results of omitted time-invariant country characteristics. Some plausible explanations are first, the differences result from sample variation - the equity market liberalization indicator happens to be correlated with some time-varying country characteristics; and second, the OLS is biased downward due to measurement error. Leaving out “Growth” for the time being and thinking about other dependent variables, using “Neighbor” to instrument for equity market liberalization raises the estimated positive effects of liberalization on “Investment”, “Productivity” (though insignificant), and “FDI”. Nevertheless, the precision decreases, suggesting the OLS estimates are not biased down, and the differences may be due to sampling errors. That is, although there is no reason to expect that systematic correlation exists between the instrument and the residual, it could be that by chance they are positively correlated.²

Considering “Growth”, however, the coefficient on the liberalization indicator in the IV estimation is four times as large as in the corresponding OLS estimation (0.025 versus 0.006). The IV estimate also increases its precision, suggesting the understatement of the OLS estimate may be systematic. It is likely that the measurement error in the liberalization indicator causes the downward bias in the OLS estimate. Policy changes are complicated. A simple 0/1 dummy variable is prone to errors. Theoretically, measurement error is known to asymptotically bias the OLS estimated coefficient towards zero in a model with a single regressor. Though Equation (1) is a multiple regression model, only the liberalization indicator can be measured with error. The coefficient on the liberalization indicator will still be biased towards zero if it is mismeasured (the other coefficients are biased as well but in unknown directions). The rise in both the point estimate and the precision of the IV estimation suggests that the attenuation bias from measurement error in the liberalization indicator swamps the reverse causality bias that would tend to make the OLS estimate bigger than the IV estimate.

3.5. Estimates of Interactions between Liberalization and Country Characteristics

In Equation (1), the liberalization indicator is constrained to have the same coefficient across countries. This greatly enhances the power of the tests, but it is

² We perform a Durbin-Wu-Hausman test on the hypothesis that the equity market liberalization indicator is uncorrelated with the residual, and thus OLS is not biased. The null hypothesis cannot be rejected at the conventional level in any case.

doubtful that equity market liberalization has the same impact on all countries. There is a long list of factors that may potentially determine the effects of equity market liberalization. We are particularly interested in examining a nation's level of development captured by its income level, and the development of its stock market. The sample countries are grouped by different country characteristics. By allowing heterogeneous parameters for different groups, we explore the possibility of systematic differences in the liberalization effects across countries with different characteristics. The following equations are used to study parameter heterogeneity.

$$y_{i,t} = \alpha_0 + \gamma_1 * Lib_{i,t} * high + \gamma_2 * Lib_{i,t} * middle + \gamma_3 * Lib_{i,t} * low + \eta_i + \delta_t + \varepsilon_{i,t}, \quad (2)$$

$$y_{i,t} = \alpha_0 + \gamma * Lib_{i,t} + \gamma_1 * Lib_{i,t} * Mcap_{i,t} + \eta_i + \delta_t + \varepsilon_{i,t}. \quad (3)$$

In Equations (2) and (3), we introduce interactive terms between the liberalization indicator and dummies for various country characteristics. In Equation (2), “high”, “middle” and “low” are dummy variables for high-income, middle-income and low-income countries, respectively. In Equation (3), “Mcap” is stock market capitalization as a share of GDP. All other variables share the same explanations as in Equation (1).

3.5.1. *Income Level and the Effects of Equity Market Liberalization*

Does equity market liberalization produce the same effects in poor countries as in rich countries? Probably not; there are reasons to think that the effects of equity market liberalization vary with financial and institutional development. Removing portfolio capital controls may stimulate growth only when markets have developed enough to allocate finance efficiently. Although the institutional prerequisites are difficult to measure, there is a presumption that they are more advanced in high-income countries (Klein and Olivei, 2008).

We use Equation (2) to study the impact of a nation's level of development on the effectiveness of equity market liberalization. A nation's income level is used to proxy for its level of development. Countries are divided into three groups: high-income group (both OECD and non-OECD), middle-income group (both upper-middle-income and lower-middle-income) and low-income group, as specified in the Global Development Network Growth Database (2002). Among the 95 sample countries are 26 high-income, 39 middle-income and 30 low-income countries.

The OLS and the IV estimation results of Equation (2) are reported in Panels A and B of Table 4. The dependent variables, used in turn, are “Growth”, “Investment”, “Productivity”, “FDI” and “Portfolio”. The estimates for the constant and the coefficients on the interactive terms are reported. The coefficients on the interactive terms are the coefficients of interest. Table 4 provides evidence of parameter heterogeneity. In the following we only analyze the IV estimates though the OLS

estimates are also presented.

Table 4. Income Level, Stock Market Development, and Equity Market Liberalization

Panel A: Income Level Effect on Growth Factors (95 countries, 1975-2000)						
	1	2	3	4	5	6
	OLS	IV	OLS	IV	OLS	IV
	Growth	Growth	Investment	Investment	Productivity	Productivity
Constant	-0.0007 (-0.06)	-0.012 (-0.94)	14.970*** (16.75)	11.632*** (8.22)	-0.018 (-0.26)	-0.036 (-0.45)
Liberalization*high	0.009** (2.14)	0.030* (1.75)	-0.439 (-0.83)	-2.393 (-1.36)	0.058** (2.30)	0.259** (1.99)
Liberalization*middle	0.006 (1.37)	0.023** (2.01)	1.621*** (3.19)	-0.125 (-0.10)	0.050* (1.91)	0.151* (1.83)
Liberalization*low	0.005 (0.88)	0.027** (2.32)	2.178*** (3.34)	12.096*** (6.79)	0.028 (0.78)	0.023 (0.23)
N	2458	2458	2451	2451	2444	2444
R^2 (centered)	0.1648	0.1565	0.5921	0.5583	0.1192	0.1140
Panel B: Income Level Effect on International Capital Flows (95 countries, 1975-2000)						
	1	2	3	4		
	OLS	IV	OLS	IV		
	FDI	FDI	Portfolio ^a	Portfolio ^a		
Constant	0.160 (0.28)	-0.251 (0.39)	-2.168*** (-3.10)	-2.224*** (-3.12)		
Liberalization*high	0.272 (1.21)	2.566** (2.02)	0.941*** (2.96)	-4.339** (-1.99)		
Liberalization*middle	1.215*** (6.61)	1.883*** (3.81)	1.646*** (5.10)	2.507*** (3.68)		
Liberalization*low	0.582*** (3.12)	1.574*** (3.25)	0.859*** (3.67)	1.623*** (2.77)		
N	2178	2178	2131	2131		
R^2 (centered)	0.3660	0.3475	0.2308	0.1646		
Panel C: Effects of Stock Market Development on Growth Factors (73 countries, 1988-2000)						
	1	2	3	4	5	6
	OLS	IV	OLS	IV	OLS	IV
	Growth	Growth	Investment	Investment	Productivity	Productivity
Constant	-0.009 (-0.56)	-0.016 (-0.93)	16.130*** (15.72)	11.166*** (7.00)	-0.066 (-0.70)	-0.066 (-0.67)
Liberalization	0.014** (2.47)	0.021* (1.75)	0.758 (1.29)	6.496*** (4.61)	0.084*** (2.61)	0.076 (1.28)

Liberalization*Mcap	0.0002*** (6.02)	0.0003*** (6.11)	0.016*** (2.79)	0.029*** (4.02)	0.001*** (4.66)	0.001*** (4.70)
N	816	816	810	810	810	810
R ² (centered)	0.2505	0.2470	0.7168	0.6586	0.1856	0.1852

Panel D: Effects of Stock Market Development on International Capital Flows (73 countries, 1988-2000)

	1	2	3	4
	OLS	IV	OLS	IV
	FDI [#]	FDI ^b	Portfolio ^c	Portfolio ^c
Constant	0.198 (0.37)	0.231 (0.36)	-3.112*** (-3.37)	-2.972*** (-2.98)
Liberalization	1.105*** (3.90)	1.227** (2.02)	2.066*** (4.83)	2.371** (2.05)
Liberalization*Mcap	-0.012** (-2.55)	-0.014** (-2.51)	-0.0001 (-0.02)	-0.007 (-1.33)
N	753	753	767	767
R ² (centered)	0.5225	0.5221	0.3613	0.3591

Notes: Reported in Panel A and B are the OLS and the IV estimates for Equation (2). Reported in Panel C and D are the OLS and the IV estimates for Equation (3). The dependent variables are, in turn, annual growth rate of real per capita GDP (“Growth”), gross capital formation as a share of GDP (“Investment”), change in real per capita GDP divided by per capita investment (“Productivity”), foreign direct investment as a share of GDP (“FDI”), and portfolio investment as a share of GDP (“Portfolio”). The numbers in parentheses are the estimated t-ratios, based on heteroskedasticity-consistent standard errors. The instruments are “Neighbor*High”, “Neighbor*Middle” and “Neighbor*Low” in Panel A and B, and “Neighbor” and “Neighbor*Mcap” in Panel C and D. Country and time dummies are also included but not reported.

a: Haiti is excluded due to missing data, b: 69 countries, 1988-2000, c: 71 countries, 1988-2000.

*** significant at 0.001 level; ** significant at 0.05 level; * significant at 0.10 level.

Columns 1 and 2 of Panel A report the estimation results when “Growth” is the dependent variable. Not much difference is found across income groups. All the IV estimates on the interactive terms are positive and statistically significant, suggesting countries benefit from equity market liberalization in general.

Concerning “Investment”, we no longer find positive effect for either high-income or middle-income groups. Nevertheless, the coefficient estimate of the interactive term between the liberalization indicator and the dummy for low-income group is significantly positive, much bigger than that of the overall sample, implying benefit in investment for low-income countries. As argued by Galor and Moav (2004), physical capital accumulation is the primary source of economic growth in the early stages of development.

It is the opposite case when exploring another channel of growth-productivity. The coefficient estimates for the interactive terms are positive and statistically significant for

high-income and middle-income groups, while the coefficient estimate for the low-income group is no longer significant.

Panel B presents the estimation results when the dependent variable is either “FDI” or “Portfolio”. Column 2 implies countries at all levels of development receive more foreign direct investment after equity market liberalization. However, only countries at lower income levels attract more foreign portfolio investment. The IV estimate for the interactive term for high-income group is indeed negative. One explanation is foreign investors have other channels to exploit investment opportunities in rich countries. Two alternatives are country funds and American Depository Receipts (ADRs). Financial flows are also directed in part by arbitrage opportunities. Compared to middle-income and low-income countries, rich countries generally offer fewer gains from arbitrage because their domestic markets tend to be more correlated with the world market.

To sum several patterns stand out from Panels A and B of Table 4. First, the growth effect of equity market liberalization is strong for countries at all income levels. Second, systematic differences exist regarding the channels through which equity market liberalization spurs growth. In high-income and middle-income countries, liberalization increases growth through enhanced efficiency in capital allocation, while growth in low-income countries is fueled by increased physical capital accumulation. Third, foreign direct investment increases after liberalization in general, but portfolio investment increases only in middle-income and low-income countries.

3.5.2. Stock Market Development and the Effects of Equity Market Liberalization

It is not possible for a country to liberalize its equity market if it does not even have one. The absence of equity market in some sample countries does not bias the estimates in our analysis since the feature has been captured by country fixed effects. The development of a nation’s domestic equity market, nevertheless, may affect how much a country benefits from the liberalization policy. In Equation (3), we add an interactive term between the liberalization indicator and stock market capitalization as a share of GDP (“Mcap”) to the baseline model. Stock market capitalization as a share of GDP is a normal measure of the stock market size. Though it may not adequately reflect the efficiency or the activity of the equity market, it is presumed to be positively associated with the development of the equity market.

“Mcap” data are obtained from the World Bank’s World Development Indicators (WDI, 2001), available for 73 countries, 1988-2000. The results are reported in Panels C and D of Table 4. The growth effect of equity market liberalization remains positive and statistically significant. There is an additional growth effect from having a larger equity market. Interestingly, it seems smaller stock markets do better in attracting foreign capital. Overall, the findings provide evidence that the growth effect of equity market liberalization does go through equity markets.

4. CONCLUSION

This paper investigates the growth effects of equity market liberalization, channels through which growth effects operate, and the potential determinants of the effectiveness of the liberalization policy. Using the percentage of neighboring countries with open equity markets at a given time to instrument for equity market liberalization, this paper presents empirical evidence of strong growth effects of such liberalization in a cross-section time-series regression with data for 95 countries 1975-2000. Concerning the growth channels, evidence from the full sample supports increased physical capital accumulation.

Experiments on the role of country specific characteristics in the effects of equity market liberalization point out: systematic differences exist across countries at different income levels, or with stock markets of different sizes. Physical capital accumulation leads to economic growth in low-income countries, while enhanced efficiency in capital allocation is the momentum of economic growth in high-income and middle-income countries. The development of domestic stock markets matters. The larger the stock market, the more are the growth benefits.

The growth effects of equity market liberalization are stable across a range of econometric specifications. The OLS point estimate is about 0.006, suggesting on average, countries that liberalized their domestic equity markets had experienced an increase in their annual growth rate of real per capita GDP by 0.6%, compared to pre-liberalization times over the sample period of 1975-2000. The IV point estimate is almost always of the order of 0.02. Such growth effects may seem too large to reflect the long-run growth effects of equity market liberalization. Since the estimates come from high frequency data, the results may be dominated by the years just after liberalization. Among the 34 countries out of 95 sample countries that liberalized their equity markets during the sample period, 22 countries did so after 1990. Thus, the coefficient estimates of the liberalization indicator can be interpreted as largely reflecting the growth experience within the 10 years after liberalization. Overall, this paper suggests that at least, part of the positive correlation between equity market liberalization and economic growth is from liberalization to growth, not completely the other way around.

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