

INTERNATIONAL CENTRE FOR ECONOMIC RESEARCH



WORKING PAPER SERIES

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**ENTREPRENEURSHIP, REFORMS, AND DEVELOPMENT:
EMPIRICAL EVIDENCE**

Working Paper No. 38/2007

Entrepreneurship, Reforms, and Development: Empirical Evidence

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Version 1

Abstract

We examine how entrepreneurship and institutional and policy reforms affect development (proxied by the rate of growth in per-capita income). We do so by performing Arellano-Bond GMM estimations on annual data for a large group of developing and developed countries, and covering the period 1990-2002. We focus in particular on the interplay of trade and institutional reforms and entrepreneurship. The empirical results indicate that the interplay of entrepreneurship and institutions, and the interplay of entrepreneurship and policy reforms, influence the growth effects of entrepreneurship. However, the effects are strikingly different. The impact of institutional reform is positive when the level of entrepreneurship is low and negative when it is high. On the other hand, the effect of policy reform is negative when entrepreneurial activity is weak and positive when it is strong. These results are robust to the inclusion of other control variables.

Keywords: development, growth, entrepreneurship, institutions, policy reform

JEL classification: E6, O1, O4

Acknowledgement: The author is grateful to the International Center for Economic Research (ICER), Turin, Italy for research fellowship that supported this work. The usual disclaimer applies.

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1. Introduction

William Baumol has eloquently argued that “[i]f we seek to explain the success of those economies which have managed to grow significantly with those that have remained relatively stagnant, we find it difficult to do so without taking into consideration differences in the availability of entrepreneurial talent and in the motivational mechanism which drives them” (Baumol 1968, p. 66). Indeed, the role of entrepreneurship in less developed economies was considered quite important in the early debates of economic development in the postwar period (Harbison 1956; Papanek 1962; Baumol 1968; Leibenstein 1968). However, it was for the most part ignored in development research and in policy recommendations of the 1980s and 1990s. Yet, it is quite possible that the failure of institutional reform, and other potential determinants of growth, to produce expected economic growth and development could be explained by weak entrepreneurial activity (Iyigun and Owen 1999; Colombatto 2004) or by the interplay of entrepreneurship, and policy and institutional reforms (Iyigun and Rodrik 2004).

Our main goal in this paper is to examine how institutional and policy reforms affect the relationship between entrepreneurship and development (proxied by the rate of growth in per-capita income). We do so by performing Arellano-Bond GMM estimations on annual data from countries at various levels of development and covering the period 1990-2002. We analyze the growth effects of entrepreneurship and reforms and focus, in particular, on the interplay of policy and institutional reforms, and entrepreneurship.

The empirical results indicate that the effects of entrepreneurship—proxied by the ratio of self-employed to total non-agricultural employment—on the growth of income per capita depend on the interactions between the level of entrepreneurship and reforms. Policy reforms—proxied by openness to international trade—have stronger positive effects on growth when the level of entrepreneurship is high, while the impact of institutional reform—proxied by the composite ICRG index—on the growth effects of entrepreneurship is positive (negative) when the level of entrepreneurship is low (high).

The latter result is consistent with the prediction of the Iyigun-Rodrik theoretical model that “institutional reforms work best in settings where entrepreneurial activity is weak (Iyigun and Rodrik 2004).

The remainder of the paper is organized as follows. Section 2 provides a brief overview of the literature on the role of reforms and entrepreneurship in economic development. Section 3 presents the main variables and discusses the estimation results. Section 4 includes concluding remarks.

2. Literature overview

2.1 Policy reform, institutions, and development

In this section, we briefly review recent empirical research on the role of institutional and policy reforms in economic development. We focus on financial markets and trade policy reforms because they have been at the forefront of the policy reform programs implemented by developing and emerging economies. In order to simplify the foregoing discussion we assume that policies that enhance growth and increase per-capita income also promote development.

Financial sector reforms are often implemented with the assumption that such reforms would lead to financial development, which in turn would promote growth. Recent empirical research on financial development and growth includes Demetriades and Hussein (1996), Levine (1997), Beck et al. (2000), Benhabib and Spiegel (2000) Levine et al. (2000), Beck and Levine (2004), and Shan (2005). While many studies have documented that financial development causes growth, some scholars have shown that the evidence is either nonexistent or weak. For example, Thornton (1996) uses data from 22 Asian, Caribbean and Latin American countries and fails to find conclusive evidence that financial development causes growth. Shan (2005) uses vector autoregression (VAR) estimation on data from OECD countries and China and finds only a weak support for the hypothesis that financial development causes growth. The evidence on the direction of

causality between financial development and economic development is mixed. Luintel and Khan (1999) use VAR estimation on data from 10 countries and find bi-directional causality between financial development and economic growth. Similarly, Calderón and Liu (2003) show that there is bi-directional causality between growth and financial development. Demetriades and Hussein (1996) use cointegration and Granger causality on times series data for 16 countries and conclude that there is little empirical evidence that finance causes growth but they find significant evidence of bi-directional causality and show that in some cases there was unidirectional causality from growth to financial development. Finally, Balamoune-Lutz (2003) examines the effects of financial reforms on growth in Morocco and finds that economic growth seems to lead finance.

Trade liberalization reforms and their effects on growth have also been the subject of numerous studies. Recent research includes, among others, Dornbusch (1992), Rodrik (1992), Edwards (1993 and 1998), Sachs et al. (1995), Krueger (1998), Frankel and Romer (1999), Rodriguez and Rodrik (2000), and Rodrik et al. (2004). Some empirical studies on the impact of trade openness have concluded that it has a positive effect on growth (Edwards 1998; Dollar and Kraay 2004) and showed that openness can increase the speed of convergence (Sachs et al. 1995; Sachs and Warner 1997). On the other hand, recent empirical research, including Frankel and Romer (1999), Mukhopadhyay (1999), Rodriguez and Rodrik (2000), Balamoune (2002), and Yanikaya (2003), finds that the growth effects of trade reforms may be insignificant or negative, and often seem to depend on the pre-existing institutional settings (Addison and Balamoune-Lutz 2006; Balamoune-Lutz and Ndikumana 2007). According to Rodrik (2001), “the only systematic relationship is that countries dismantle trade restrictions as they get richer.”

An important body of research has highlighted the role of institutions in development (Scully 1988; North 1990 and 1991; Knack and Keefer 1995; Acemoglu et al. 2002 and 2003; Easterly and Levine 1997 and 2003; Rodrik et al. 2004)¹. For example, Easterly and Levine (2003) show that institutions are the only channel through which tropics, germs, and crops influence development. Moreover, once institutions are controlled for policies

¹ Aron (2000) provides an interesting survey of the evidence on the effects of institutions on growth.

have no effect on development. Similarly, Rodrik et al. (2004) examine the relative contributions of geography, institutions, and trade on income levels and find support for the primacy of institutions over trade and geography. Acemoglu et al. (2004) argue that institutions have a significant effect on economic outcomes and on macroeconomic policies. The authors find a strong link between institutions and macroeconomic volatility and between institutions and growth, and conclude that the evidence suggests that “the major causes of the large cross-country differences in volatility are institutional, and none of the standard macroeconomic variables appear to be the primary mediating channels through which institutional causes lead to economic instability” (Acemoglu et al. 2004, p. 108).

Some studies have shown that institutions can be vital to the success of economic reform, especially in the long run (Dollar and Kraay 2003; Addison and Balamoune-Lutz 2006; Balamoune-Lutz and Ndikumana 2007). For example, Dollar and Kraay (2003) find a significant joint effect of trade and institutions on growth in the long run. Addison and Balamoune-Lutz (2006) find that the quality of institutions has a significant influence on the growth effects of economic reforms in three Maghreb countries (Morocco, Algeria, and Tunisia).

2.2 Entrepreneurship and development

The concept of entrepreneurship has often appeared to be vague and seems to correspond to more than one definition. Leff (1979) remarked that sometimes the term ‘entrepreneur’ has been used to mean ‘firm’ or ‘management’. However, an important segment of the literature on entrepreneurship focuses on ‘Schumpeterian entrepreneurship’ and stresses innovation as the main activity of the entrepreneur. In a 1968 article in the *American Economic Review*, William Baumol pointed out that it is essential to distinguish between entrepreneurial and managerial functions. According to Baumol, the entrepreneur “is the Schumpeterian innovator and some more” (Baumol 1968, p. 65). It is the entrepreneur’s job to find new ideas and put them to use. In the same issue of the journal, Harvey Leibenstein referred to the Schumpeterian type of entrepreneurship as N-entrepreneurship;

where the entrepreneur undertakes “the activities necessary to create or carry on enterprise where not all the markets are well established or clearly defined and/or in which the relevant parts of the production function are not completely known” (Leibenstein 1968, p. 73). Similarly, Leff (1979) argues that “[e]ntrepreneurship clearly refers to the capacity for innovation, investment, and activist expansion in new markets, products, and techniques” (Leff 1979, p. 47). Thus, entrepreneurship affects development through this process of innovation, investment and market expansion.

Baumol (1990) distinguishes between ‘productive’ (for e.g., innovation) and ‘unproductive’ entrepreneurship (such as rent seeking activities or organized crime). He argues that the allocation of entrepreneurial abilities to the former or the latter type of entrepreneurial activity depends on the society’s relative payoffs to these activities. This point has also been stressed by Murphy, Shleifer, and Vishny in their insightful analysis of the allocation of talent and its implications for growth (Murphy et al. 1991). Similarly, Colombatto and Melnik (2005) focus on productive and unproductive entrepreneurship, and examine the mix of entrepreneurial activities in explaining the role and development of venture capitalism in various institutional settings. Banerjee and Newman (1993) examine the role that access to credit and the individual’s financial resources play in the decision to become an entrepreneur and the implications for economic development. In the presence of capital market imperfection, wealthy individuals can become entrepreneurs while poor workers have no choice but to work for a wage. The authors argue that the dynamics of occupational choice can influence the process of development, notably through their effect on the distribution of income and wealth, which in turn would affect growth and development.

2.3 On the interplay of entrepreneurship and reforms

Thus, the decision to allocate talent or entrepreneurial ability to productive rather than to unproductive activities seems to depend on the relative rewards offered by society. Since such rewards are usually governed by pre-existing policies and institutional settings we

would expect a significant interaction between the allocation of entrepreneurship to productive (or unproductive) activities and policy and institutional reforms. An important implication therefore, as pointed out by Baumol (1990), is that “policy can influence the allocation of entrepreneurship more than it can influence its supply”. This also implies that in order to study the growth effects of entrepreneurship we need to take into account the interplay of entrepreneurship and reforms.

Gustav Papanek (1962) studied the development and growth of industrial entrepreneurial activities in Pakistan between the year of its independence (1947) and 1959. He argues that the development of entrepreneurship relied significantly on favorable circumstances that existed in Pakistan. He concludes his thorough analysis with the following.

Conclusions should not be drawn from Pakistan’s experience without an explicit recognition of some favorable noneconomic conditions that existed in Pakistan and that may be necessary to the development of entrepreneurship: (1) a government and civil service able to maintain law and order, to prevent massive capital flight, to enforce import controls, and to provide reasonably adequate overhead facilities; (2) at least a very small proportion of the population accustomed to responding to market incentives; (3) a value system and institutions that were not so hostile to entrepreneurial activity that only a strongly deviant group would be prepared to undertake it; (4) a political system which did not collapse despite high prices to consumers, high profits to industrialists, and the presence of many foreign technicians.

(Papanek 1962, p.56)

Since trade and institutional reforms can have a significant effect on investment decisions we would expect them to have an impact on the level of entrepreneurship. However, such impact may depend on the pre-existing level of entrepreneurship. Iyigun and Rodrik

(2004)² develop a theoretical model where investment decisions and policy outcomes are subject to uncertainty and use the model to examine the growth effects of the interaction between institutional and policy reform and entrepreneurship. The authors show that the impact of institutional reform depends on the level of entrepreneurial activity. Institutional reform produces negative growth effects in settings where entrepreneurial activity is strong and has positive outcome where entrepreneurial activity is weak. Iyigun and Rodrik (2004) distinguish between ‘policy tinkering’ and ‘institutional reform’ and show that the former would work best in settings where the level of entrepreneurship is high, while the latter would have negative effects in such settings and should be more successful where the level of entrepreneurship is low. Iyigun and Rodrik (2004) use cross-sectional data on the ratio of self-employed to total non-agricultural employment and estimate entrepreneurship and growth equations. In the growth equations (two OLS and one instrumental variable (IV) estimation) using actual data (for 53 and 50 countries, respectively), the authors find evidence that the interaction between the proxy for institutional reform and the proxy for entrepreneurship is negative and significant at the 5-percent level (in the IV estimation). The authors interpret this as a validation of the prediction of their model; that institutional reform has disappointing results where the level of entrepreneurship is high.

3 Empirical Analysis

3.1 Variable selection and data description

In the main estimations (reported in Table 3), we define the dependent variable as the rate of growth in per-capita income (in log). To try to explain the effects of the interplay of entrepreneurship and reforms, we use proxies for entrepreneurship (ENT), institutions (ICRG), trade reform (OPEN), and interaction terms involving these variables.

² To the best of our knowledge, the only study that has focused on this interplay is Iyigun and Rodrik (2004). Thus, the authors seem to be pioneers in research on this topic.

Following Iyigun and Rodrik (2004), the proxy for entrepreneurship (the variable ENT), is the ratio of self-employed to total non-agricultural employment (from LABORSTA dataset, *International Labour Organization*). The choice of the countries is dictated by data availability. In the main estimations, we use data for the period 1990-2002 for two reasons. First, this helps to minimize cross-country disparity in the number of observations per country, since many developing countries do not have data on ENT prior to the 1990s. Second, we abstract from the period of pre-transition of Central and Eastern European countries (also included in the sample) to a market economy.

We use openness to international trade—defined as the ratio of the sum of exports and imports to GDP—as a proxy for policy (trade) reform. Iyigun and Rodrik (2004, p.3) argue that “a switch from one trade regime to another is not neutral: it imposes a cost on the incumbents, while new ventures (in export-oriented activities) are unaffected or helped.” The authors view the switch from one trade regime to another as ‘institutional reform’ and use as a proxy for ‘institutional reform’ a dummy variable that takes the value of 1 if the country has undergone a Sachs-Warner-Wacziarg-Welch reform between 1985 and 1994, and the value of zero otherwise. We view an increase in openness as a ‘policy reform’. Since the data are for the period 1990-2002, they reflect varying degrees of openness, as most (if not all) countries were open to a certain degree, rather than a switch from an import-substitution to an export-promotion regime.

The proxy for institutional reform in this paper is the International Country Risk Guide (ICRG) composite index. ICRG ratings are published by the Political Risk Services (PRS) Group and include economic, political, and financial risk. These three categories of risk include scores for 22 risk components. The World Bank publishes a composite index with values ranging from zero (highest risk) to 100 (lowest risk). Many studies have used the ICRG composite index or specific ICRG index components—such as the rule of law, democratic accountability, or the quality of bureaucracy—as proxies for the quality of institutions or institutional reform (Hall and Jones 1997; La Porta et al. 1998; Acemoglu et al. 2001; Brautigam and Knack 2004).

We also use an indicator of financial development, namely domestic credit to private sector (CRDPRIV). Following arguments in the important literature on the role of capital-market constraints in preventing entrepreneurship by low-wealth agents (Evans and Jovanovic 1989; Holtz-Eakin et al. 1994; Blanchflower and Oswald 1998; de Meza and Webb 1999; Hurst and Lusardi 2004), we estimate several other equations (results are not shown but may be obtained from the author) and tested the significance of the interaction between this variable, and ENT and ENT squared but the coefficients were statistically insignificant.

Some estimations include adult literacy as an indicator of human capital. The role of human capital has been emphasized in several influential growth models (Lucas 1988; Romer 1990; Mankiw et al. 1990). However, Benhabib and Spiegel (1994), and Pritchett (2001) did not find significant correlation between human capital and growth. Research on entrepreneurship and growth (or development) has also examined the role of human capital. For example, Schmitz (1989) analyzes the implications of spillovers in knowledge formation. Iyigun and Owen (1999) study how entrepreneurs and professionals accumulate human capital and show that in more developed countries there is a higher accumulation of professional human capital. To take this into account, we also include the interaction between entrepreneurship (ENT) and human capital (LITERACY). Finally, some studies have shown that gender aspects may be important to the growth effects of human capital and to the success or failure of reforms. For example, Baliaoune-Lutz (2007a) presents a thorough discussion of the interplay of gender inequality in education, trade reforms, and growth. The author also examines empirically the effects of growth and increased openness to trade on gender inequality in Africa. Baliaoune-Lutz (2007b) uses Arellano-Bond Generalized Method of Moments (GMM) estimations on data from African and Arab countries and explores the impact on growth of the ratio of girls to boys in primary and secondary enrolment, and the ratio of 15-24 year-old literate females to males. She finds that gender inequalities in literacy have a robust negative effect on growth. Accordingly, we estimate equations where we distinguish between the effect of female literacy and that of male literacy.

The correlation coefficients displayed in Table 1 indicate that the association between most variables and growth is rather weak. The highest association (0.28) that growth has is with the measure of institutional quality (ICRG). On the other hand, per capita income (in log) has high linear correlation with ICRG, fertility, literacy rates, and the indicator of financial development, credit to the private sector. All the correlations that openness has with other variables are below 0.2, while the correlations of ICRG with the other variables, with the exception of growth, are all above 0.5. Interestingly, the association between ICRG and our measure of entrepreneurship (ENT) is negative (-0.69), suggesting a negative interaction. The variable ENT has no significant linear association with growth and has negative correlation with all other variables, except fertility rates. This seems to be consistent with the lower share of self-employed in total non-agricultural employment in developed countries (compared with middle-income countries). Female and male literacy rates both have coefficients of correlation with expected signs but female literacy rates show higher correlation, especially with openness and ENT.

3.2 Estimation results

Following Iyigun and Rodrik (2004), we use the ratio of self-employed individuals to total non-agricultural employment. The data are from ILO and are, as noted by Iyigun and Rodrik, patchy cross sectional data. These are the data the authors use to construct the proxy for entrepreneurial intensity, which they label *ENTRAT*. In this paper, we label this ratio as ENT. It is important to point out that some studies have argued that an increase in self-employment does not necessarily reflect a well-functioning labor market and may indicate an increase in informal activities, often as a result of the inability of less-skilled workers to find jobs in the formal sector (Mazumdar 1983; Gong and Soest 2002). However, this is an issue we take up and examine thoroughly in another study. In the present paper, we use data on self-employment without further analysis of the extent to which it is part of the productive formal sector.

Columns (1)–(3) of Table 2 reproduce the main estimates reported in Table 3 (columns 7–9) of Iyigun and Rodrik (2004). These are the results the authors use to test an important

implication of their theoretical model; that institutional reform should have a positive effect on growth in countries where the levels of entrepreneurship have been too low; i.e. the interaction between entrepreneurship and reforms should be negative. The authors find evidence in support of this relationship in one OLS and one IV estimation (columns 2 and 3 of Table 2 in the present paper).

The results displayed in columns (4)–(8) of Table 2 are from OLS and IV estimations based on decade averages. Similar to the approach in Iyigun and Rodrik (2004), the dependent variable is defined as the difference between average growth rates in the 1990s and 1980s. We use the average growth rates in the 1980s instead of the 1970s, as Iyigun and Rodrik did, mainly due to the small number of observations on ‘self-employed’, which would not allow us to obtain meaningful decade averages. The averages were computed for countries with population of at least one million people and with at least three observations in each decade. This yields a sample of 42 countries.

The results in columns (4) and (5) of Table 2 are compared to those in columns (1) and (2), respectively. South Africa is not included in our sample, since it did not have enough observations on ‘self-employed’ in the 1980s to compute meaningful decade averages. However, the dummy variables for Latin America and Asia are both statistically significant. Similar to the finding in Iyigun and Rodrik (2004), the coefficient on Asia is negative in both equations. The dummy variable for Latin America is also statistically significant and has a positive coefficient, implying that Latin American countries grew faster in the 1990s compared to the 1980s. Similar to the results in column (1) we find a negative but statistically insignificant coefficient on ‘trade reform’—defined, in the cross-section estimations, as the change (difference) in the ratio of the trade volume to GDP. Next, we perform IV estimations and report the results in columns (6)–(8). In equation (8), we add a proxy for human capital (literacy), which is shown to have a positive effect on the change in growth. The results in columns (7) and (8) indicate that the coefficient on the interaction between ENT and REFORM is negative and statistically significant. The coefficient on the variable REFORM (change in openness) is statistically insignificant. This result is not surprising given the growing number of studies that have documented

the weak (or nonexistent) impact of openness to trade on growth, as discussed earlier. Thus, the results relative to the main implication in Iyigun and Rodrik's model are, in general, consistent with their findings. On the other hand, while Iyigun and Rodrik find a negative coefficient on the variable ENT, we find a positive coefficient, suggesting that once we control for the interaction between reforms and pre-existing levels of entrepreneurship we find that countries with higher ENT grew faster, on average.

However, cross-sectional estimations do not allow one to capture the dynamics of the interplay of entrepreneurship and reforms. In order to remedy this weakness we use annual (unbalanced) panel data for 53 countries covering the period 1990-2002, and perform Arellano-bond GMM estimations. In order to minimize the differences in the number of observations among countries, we require that a country have at least six observations to be included in the sample. The estimation results are reported in Table 3. We also show the tests for the validity of instruments (Sargan test) and second-order autocorrelation.

We start with the following model:

$$y_{i,t} = d + ay_{i,t-1} + \mathbf{X}_{i,t}\beta + \eta_i + \xi_t + \varepsilon_{it} \quad (1)$$

where y is income per capita in log form, \mathbf{X} is a row vector of the endogenous and exogenous factors determining income, η_i is the individual (country) fixed effect, and ξ_t is a time-specific effect. Then we apply the Arellano-Bond specification and obtain the following:

$$Dy_{i,t} = aDy_{i,t-1} + D\mathbf{X}_{i,t}\beta + \eta_i + \xi_t + \varepsilon_{it} \quad (2)$$

The left-hand-side variable is the growth rate in per-capita income. We treat the variables (on the right-hand side) INCOME, ENT, ICRG, OPEN, LITERACY and CRDPRIV, as well as their interactions as endogenous.

We perform the Arellano-Bond GMM estimations to try to address three important questions. First, do institutional and policy reforms and entrepreneurship have a positive impact on growth? Second, do interactions between entrepreneurship and institutional and policy reform matter? Third, are the effects linear or are there diminishing returns or threshold effects at work? The estimation results are reported in Table 3.

In the first equation (column (1)) in Table 3 we include, in addition to the proxy for policy reform (*OPEN*), the proxy for institutional reform (*ICRG*), entrepreneurship (*ENT*), income, fertility rates, and an indicator of financial development (domestic credit to private sector as a ratio of GDP, *CRDPRIV*). The variable *CRDPRIV* has a negative coefficient while income and fertility are statistically insignificant. Institutional and policy reforms, and entrepreneurship have positive coefficients and are statistically significant; *ICRG* at the 1-percent, *OPEN* at the 5-percent, and *ENT* at the 10-percent level of significance. Next, we remove fertility (due to its high statistical insignificance) and include the interaction between openness to trade and entrepreneurship, since the results in Iyigun and Rodrik (2004) and the other results we report in Table 2 indicate that this joint effect is significant. The estimates indicate that entrepreneurship, institutions and trade have positive effects (all significant at the 1-percent level). Furthermore, the joint effect of entrepreneurship and openness to trade (*ENT x OPEN*) is negative, as predicted by the Iyigun-Rodrik model. In column (3) we remove income since it was not significant in the first two equations, and include the interaction between *ICRG* and *ENT*. However, it appears to be statistically insignificant, while all other results remain the same in terms of significance and of comparable magnitudes for the coefficients.

In equations (4) and (5) we add the interaction between the square of *ENT*, and openness and *ICRG*. This allows us to test whether the interaction of openness to trade and institutions with entrepreneurship changes depending on the level of entrepreneurship and thus constitutes a further test of the main implication in the Iyigun-Rodrik model. The coefficient on the term '*ENTSQ X OPEN*' changes from negative to positive and has lower statistical significance once we include the interaction between *ENTSQ* and *ICRG* (column (5)). The coefficient on the latter term is negative and significant at the 5-percent

level. In addition, the variables ENT and OPEN are still statistically significant and have positive coefficients, while ICRG is no longer significant.

The results shown in column (6) include the interaction between financial development and income. This is based on the proposition that the effect of financial development on growth may depend on the level of development (Calderón and Liu 2003). Both this interaction term and the indicator of financial development are now statistically insignificant. Given, the mixed findings (mentioned earlier) regarding the effects of financial development and the direction of causality, this result could reflect the fact that in our sample growth in countries with more developed financial markets (primarily OECD countries) has been slower, on average. Also, it is worth noting that some scholars claim that the impact of financial development on growth could be negative as improved resource allocation may lead to lower saving (see for example King and Levine 1993, and Balamoune and Chowdhury 2003).

The last two columns show estimates including the proxy for human capital (adult literacy) and its interaction with the indicator of entrepreneurship (ENT). Both LITERCAY and its interaction with ENT are treated as endogenous. Columns (7) and (8) show the estimates including male and female literacy, respectively. The estimations using female literacy have higher statistical significance; both (female) LITERACY and ‘LITERACY X ENT’ are significant at the 1-percent level (versus 10-percent level for male literacy).³ In general, the results associated with the other variables have maintained the same level of significance as in columns (5) and (6). However, the coefficient on ENT is now negative, but only marginally significant. This is similar to the result in Table 3 of Iyigun and Rodrik (2004).

Thus, the empirical results suggest that the effects of entrepreneurship on growth depend on institutional and policy reforms. As expected, human capital strengthens the growth

³ We also estimate equations including both male and female literacy (in the same equation) but the results (which may be obtained from the author) indicate that only female literacy is significant; the coefficient on the interaction between female literacy and ENT is positive and significant at the 5-percent level.

effects of entrepreneurship. Trade reforms have negative effects in the presence of low levels of entrepreneurship but seem to have a positive effect when entrepreneurial activity is high. On the other hand, improved institutional quality has a positive effect when the level of entrepreneurial activity in the economy is low and a negative impact when entrepreneurship is vibrant.

The answer to the first question posed earlier (do institutional and policy reforms and entrepreneurship have a positive impact on growth?) depends to a large extent on the pre-existing level of entrepreneurship. In the case of policy reform (openness to trade), there is a robust direct positive effect and an additional impact through the joint effect of entrepreneurship and policy reform. In the case of institutional reform, the effect is through the impact institutional reform has on entrepreneurial activity. The effect of entrepreneurship is conditional upon institutional and policy reform and the pre-existing level of entrepreneurship. The answer to the second question (do interactions between entrepreneurship and institutional and policy reform matter?) is a clear 'yes'. Finally, the evidence associated with the third question (are the effects linear or are there diminishing returns or threshold effects at work?) clearly indicates that the effects are non-linear. Both threshold effects and diminishing returns seem to be present in the case of the interplay of entrepreneurship, and institutional and policy reform. In the case of policy reform the evidence suggests the presence of threshold effects associated with the levels of entrepreneurship, while in the case of institutions there seems to be strong diminishing returns associated with the level of entrepreneurship.

4. Conclusion

In this paper, we have examined the impact that institutional and policy reforms have on the growth effects of entrepreneurship. In particular, we have tested an important implication in the Iyigun-Rodrik theoretical model (Iyigun and Rodrik 2004); that institutional reform would have disappointing effects if the pre-existing entrepreneurship activity is vibrant. We did so primarily by using panel data for 53 developing, emerging,

and developed economies, and estimating Arellano-Bond GMM growth equations where we included proxies for entrepreneurship, institutions and policy reforms as well as their interactions, and controlled for the effect of income and human capital. The empirical results indicate that the interplay of entrepreneurship and institutions, and the interplay of entrepreneurship and policy reforms both affect economic growth. However, their effects are strikingly different. The impact of institutional reform (proxied by the ICRG composite index) is positive when the level of entrepreneurship is low and negative when it is high. On the other hand, the effect of policy reform is negative when entrepreneurial activity is weak and positive when it is strong. These results are robust to the inclusion of other control variables, such as human capital, region dummy variables, and the level of per-capita income. Clearly, the results associated with the interplay of institutions and entrepreneurship provide strong support for the prediction of the theoretical model and the arguments in Iyigun and Rodrik (2004).

In the present paper we essentially tried to address three questions: (1) Do institutional and policy reforms and entrepreneurship have a positive impact on growth? (2) Are the interactions between entrepreneurship and institutional and policy reforms statistically significant? (3) Are there diminishing returns or threshold effects at work? The empirical evidence indicates that we cannot answer the first question unambiguously. There is a robust direct positive effect of policy reform on growth and an indirect effect through its interaction with entrepreneurship. Institutional reform has an indirect effect on growth, through its influence on the growth effects of entrepreneurship. On the other hand, the effect of entrepreneurship is conditional on the pre-existing level of entrepreneurial activity, as well as on institutional and policy reforms. The econometric results suggest that the answer to the second question is a clear 'yes'. The results also indicate that the answer to the third question is yes, since we show that the effects are non-linear. In the case of the interplay of entrepreneurship and institutions, there seems to be strong diminishing returns associated with the level of entrepreneurship. Whereas in the case of the interaction between policy reform (trade openness) and entrepreneurship the evidence suggests the presence of threshold effects associated with the levels of entrepreneurship.

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Table 1. Correlation Matrix

| | GROWTH | GDPCAP | OPEN | ICRG | ENT | FERTILITY | LITERACY | MALELIT | FEMALELIT | CREDPRIV |
|-----------|--------|--------|-------|-------|-------|-----------|----------|---------|-----------|----------|
| GROWTH | 1.00 | | | | | | | | | |
| INCOME | .100 | 1.00 | | | | | | | | |
| OPEN | .138 | .097 | 1.00 | | | | | | | |
| ICRG | .280 | .821 | .199 | 1.00 | | | | | | |
| ENT | -.032 | -.806 | -.180 | -.691 | 1.00 | | | | | |
| FERTILITY | -.068 | -.790 | -.096 | -.608 | .665 | 1.00 | | | | |
| LITERACY | .022 | .746 | .109 | .601 | -.630 | -.800 | 1.00 | | | |
| MALELIT | .030 | .717 | .068 | .573 | -.579 | -.797 | .970 | 1.00 | | |
| FEMALELIT | .016 | .737 | .135 | .596 | -.631 | -.771 | .984 | .912 | 1.00 | |
| CRDPRIV | .108 | .621 | .183 | .620 | -.473 | .474 | .378 | .388 | .354 | 1.00 |

See Appendix A for a description of the variables and the source of data.

Table 2. OLS and IV estimations (cross-sectional data)

| Dependent variable: ?GROWTH (change in per-capita income growth) | | | | | | | | |
|--|--------------------|----------------------|---------------------|---|----------------------|---------------------|--|-----------------------|
| Iyigun and Rodrik (eq. 7-9) | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | OLS | OLS | IV | OLS | OLS | IV | IV | IV |
| <i>ln INCOME (GDP PER CAPITA)</i> | -0.112 (.0077) | -0.108 (.0069) | -0.196** (.0086) | .5651 (.4413) | .5623 (.5207) | -.31257 (2.8418) | We dropped ly b/c not sig | |
| <i>ENT</i> | -.0847 (.0579) | -.0143 (.0552) | -.1197** (.064) | .07148** (.0323) | .0709* (.0418) | -.0287 (.3201) | .14942*** (.0468) | .3809** (.1470) |
| <i>LAAM</i> | -.0039 (.0100) | -.0033 (.0093) | -.0019 (.008) | 1.9253** (.7721) | 1.9289** (.8139) | 2.1444** (.9824) | We dropped LAAM since they it was not significant in their model | |
| <i>SOUTHAFRICA</i> | -.0239* (.0133) | -.0646*** (.0122) | -.0566*** (.012) | a we used ssa but was not significant | | | | |
| <i>ASIA</i> | -.0162 (.0105) | -.0165* (.0093) | -.0191*** (.005) | -1.5583** (.6287) | -1.5542** (.7320) | -1.3134 (1.2138) | -2.3191** .9815 | -4.0037** (1.4850) |
| <i>? OPEN (TRADE REFORM)</i> | -.0089 (.009) | .0411*** (.016) | .0351** (.018) | -.0241 (.0241) | -.0246 (.0479) | -.0661 (.1369) | .0327 (.0406) | .0882 (.0636) |
| <i>? OPEN X ENT</i> | | -.2477*** (.0719) | -.1912** (.086) | | .00002 (.0018) | .0018 (.0059) | -.00274* (.0015) | -.0043* (.0022) |
| <i>LITERACY</i> | | | | | | | | .2873** (.1349) |
| Number of obs. | 53 | 53 | 50 | 42 | | 42 | 42 | 42 |
| F-stat | | | | 7.42 | | 4.75 | 5.40 | 2.98 |

OLS regressions with robust standard errors.

* significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent .

Table 3 Arellano-Bond GMM Estimation (Dependent variable: Growth of income per-capita)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) male lit | (8) female |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Growth (lagged) | 0.1441*** (0.038) | 0.1336*** (0.037) | 0.1366*** (0.038) | 0.1365*** (0.037) | 0.1131*** (0.038) | 0.1126*** (0.038) | 0.1633*** (0.041) | 0.1596*** (0.041) |
| Endogenous variables | | | | | | | | |
| INCOME (log) | 1.667 (2.914) | 4.306 (2.857) | | | 2.663 (2.490) | 2.0689 (3.783) | 4.7863* (2.701) | 5.003* (2.687) |
| Fertility | 1.380 (1.423) | | | | | | | |
| CRDPRIV (log) | -1.927*** (.722) | -1.896*** (.695) | -1.996*** (.677) | -1.7581*** (.642) | -2.125*** (.654) | -1.9864 (.654) | -1.5337** (.672) | -1.4346** (.676) |
| ICRG | .2907*** (.037) | .2902*** (.036) | .2027** (.088) | .2454*** (.085) | .2826 (.123) | .0340 (.122) | -.0152 (.125) | .0025 (.125) |
| OPEN (log) | 2.703** (1.240) | 7.685*** (2.565) | 8.229*** (2.591) | 6.333** (2.591) | 8.953*** (3.209) | 8.610*** (3.227) | 7.524** (3.192) | 7.205** (3.209) |
| ENT | .1391* (.081) | 1.0693*** (.356) | .8972** (.401) | 1.0607*** (.391) | .739* (.387) | .7361* (.388) | -.7435* (.837) | -1.3978* (.790) |
| ENT X OPEN | | -.2417*** (.089) | -.2553*** (.091) | -.1471 (.099) | -.4948** (.205) | -.4824** (.208) | -.4529** (.209) | -.4246** (.208) |
| ENT X ICRG | | | .0031 (.003) | .0015 (.003) | .0244** (.010) | .0232** (.011) | .0275** (.011) | .0259** (.011) |
| ENTSQ X OPEN | | | | -.0020** (.001) | .0067* (.00338) | .0063 (.0039) | .0073* (.004) | .0071* (.004) |
| ENTSQ X ICRG | | | | | -.0005** (.0002) | -.0005** (.0002) | -.0005** (.0002) | -.0005** (.0002) |
| INCOME x CRDPRIV | | | | | | -.0776 (.726) | | |
| LITERACY | | | | | | | -.4156* (.235) | -.5704*** (.222) |
| ENT X LITERACY | | | | | | | .0129* (.008) | .0197*** (.007) |
| Exogenous variables | | | | | | | | |
| LAAM | -.3478 (.114) | -.3769*** (.096) | -.3810*** (.099) | -.3448*** (.096) | -.3515*** (.101) | -.3849*** (.105) | -.3814*** (.115) | -.4391*** (.117) |
| ASIA | | | | | -.2877** (.123) | -.2934** (.123) | -.3258** (.137) | -.3152** (.138) |
| obs. (countries) | 510 (53) | 510 (53) | 510 (53) | 510 (53) | 510 (53) | 510 (53) | 468(53) | 468(53) |
| Sargan test ^a , hi2,[pr>chi2] | 485.22 [0.16] | 485.22 [0.16] | 474.01[0.26] | 487.34[0.84] | 530.71 [0.99] | 534.55 [0.99] | 482.79 [0.99] | 475.81 [0.99] |
| M2 ^b , z ; [pr > z] | -0.72 [0.47] | -0.72 [0.47] | -0.72 [0.47] | -0.72 [0.43] | -0.80 [0.42] | -0.81 [0.42] | 0.75 [0.45] | 0.72 [0.47] |

^a Sargan test of over-identifying restrictions (Null: Instruments are valid). ^b Arellano-Bond test that average autocovariance in residuals of order 2 is 0. The equations are estimated with a constant, which we do not show for space reasons.

Appendix A

Note: All variable descriptions are all from the World Development Indicators database, World Bank (2005), except for the variables ICRG and ENT.

GDPCAP: GDP per capita, PPP (constant 1995 international \$). Purchasing-power-parity value of income per capita in 1995 constant international dollars. GDP per capita based on purchasing power parity. PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 1995 international dollars. Source: World Development Indicators database, World Bank (2005).

GROWTH: The rate of annual growth in the log of income per capita. Source: World Development Indicators database, World Bank (2005).

OPEN: Openness to trade. This is the sum of imports and exports as a ratio of GDP. Source: World Development Indicators database, World Bank (2005).

ICRG: International Country Risk Guide rating, published by the Political Risk Services (PRS) Group and includes three subcategories of risk; economic, political, and financial risk. These categories include scores on of 22 risk components. The World Bank publishes composite scores with values ranging from zero (highest risk) to 100 (lowest risk). Source: World Development Indicators database, World Bank (2005).

ENT: Entrepreneurship. The data on ENT are from Table 2.d, LABORSTA dataset produced by *International Labour Organization*. These data are accessible on the Internet.

FERTILITY: Fertility rates. Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with prevailing age-specific fertility rates. Source: World Development Indicators database, World Bank (2005).

LITERACY: Adult total literacy rates (% of people ages 15 and above). Adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life. Source: World Development Indicators database, World Bank (2005).

MALELIT: Adult male literacy rates (% of men, ages 15 and above). Adult male literacy rate is the percentage of men ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life. Source: World Development Indicators database, World Bank (2005).

FEMALELIT: Adult female literacy rates (% of women, ages 15 and above). Adult female literacy rate is the percentage of women ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life. Source: World Development Indicators database, World Bank (2005).

CREDPRIV: Domestic credit to private sector (% of GDP), refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. The data are from the International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates. Source of data used in this paper: World Development Indicators database, World Bank (2005).