Entrepreneurial Capital, the Market for Ideas, and Economic Development

Isaac Ehrlich, Dunli Li

1. Introduction

Motivation

- This preliminary paper is still very much work in progress. But as it evolved, we realized that it links to 2 related themes in Coase's work:
- His recent work with Ning Wang [CW], on "why China became capitalistic". CW hail China's adoption of a market economy as a key to its impressive economic success over the last 3 decades, but point out that it has come mainly from liberalizing the "market for goods" but not so much the "market for ideas", from which innovative and creative ideas spring and assure self-sustaining growth.
- This latter theme traces back to Coase's 1974 paper "The Market for Goods and the Market for Ideas". In it he viewed the economy as consisting of 2 major mkts: for goods and for ideas, and analyzed the roles of distinct institutional factors that affect their performance & the degree to which they ought to be regulated to maximize efficiency.

Motivation- cont'd

- Our paper is a modest attempt to operationalize this Coasian framework in a simple model, which we apply to the process of economic development more generally, not just China's.
- We offer just a prototype model. But, it seems sufficiently general to generate some testable implications about the impact of entrepreneurship on the level and rate of econ. growth & also link it to underlying institutional factors and human capital endowments which empower the markets for both goods and ideas.

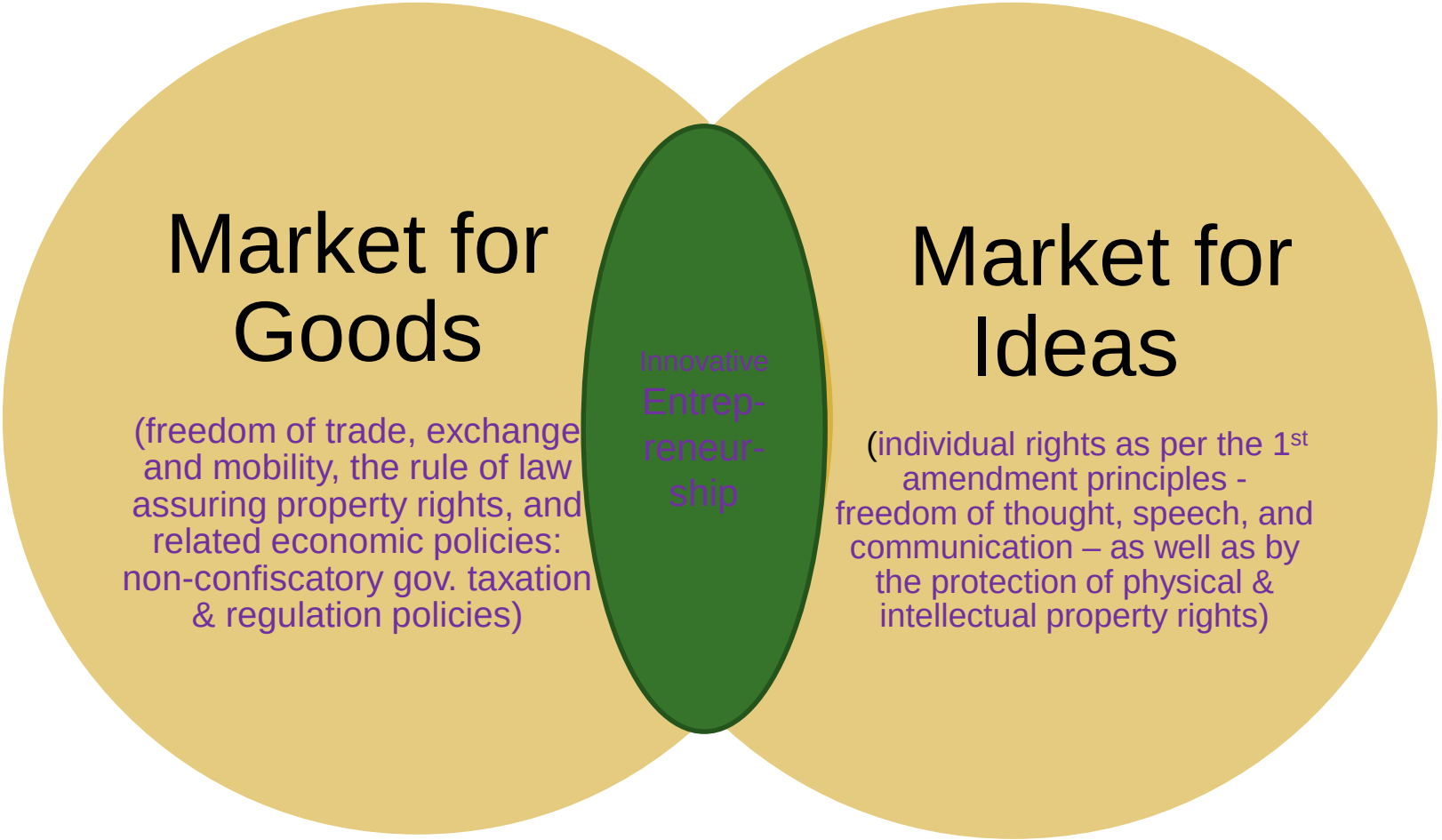
Motivation- cont'd

- We try to address 3 challenges in the endogenous growth literature:
- 1. The lit. points to HC as engine of growth (Lucas 87, BMT 90, EL91, EK 07). But the empirical support for the HC hypothesis has not been strong. (Bils & Klenow 00; Barro 91; Ehrlich 05). We suggest: a more direct engine may be at work: "entrepreneurship".
- 2. There has been an extensive literature on entrepreneurship & growth: both level and rate. But the findings have also been a bit mixed. In these studies entrepreneurship is typically measured as the # of entrepreneurs in the pop, not as HC.
- 3. As IE 05 argues, HC *formation,* of any form, is an endogenous variable which is influenced by underlying institutional factors and a reinforcing economic and legal environment.

Motivation- cont'd

- Our thesis is that entrepreneurship can be thought of as a dynamic store of knowledge : entrepreneurial human capital [EHC], not as the **no.** of entrepreneurs in the pop.
- While EHC shares basic characteristics of general HC, it's a distinct form: *an intermediary betw. the markets for goods & ideas.* Both rely on supporting institutional foundations (Fig.1).
- Treating entrepreneurship as HC or knowledge is the key idea:
  - Makes EHC subject to perpetual accum. via investment at enterprise level.
  - Requires specifying a PF, especially the inputs that lead to knowledge accumulation. We stress 3: past entrepreneurial knowledge (*E*), supporting institutional factors, I, & entrepreneurs' own and "public" HC h: $q=\varphi(\varepsilon,I,h)$ making new knowledge, dE/dt, a direct engine, or enabler, of econ. growth.
- We try to put a simple structure on this thesis & develop its testable propositions. We then test these empirically using a panel of 60 countries over 2001-2008. Our results seem to support to our thesis.

Fig. 1


Market for Goods
(freedom of trade, exchange and mobility, the rule of law assuring property rights, and related economic policies: non-confiscatory gov. taxation & regulation policies)
Innovative Entrep-reneur-ship
Market for Ideas
(individual rights as per the 1st amendment principles - freedom of thought, speech, and communication – as well as by the protection of physical & intellectual property rights)

2. Literature Review

Literature Review

- There is a very extensive literature on the definition, measurement, and testing of the role of entrepreneurship in the economy, which we will outline mainly in terms of its relevance to our work.
- The literature has wrestled with the definition of entrepreneurship based on the employment status of agents it represents -- self-employed, business owners, new startups, small or medium size enterprises -- and its treatment as an occupational choice at the individual level (low risk aversion, wealth, ability, education and work experience and family background). We skip these issues in the prototype model, as our focus is on entrepreneurial human capital as a dynamic asset, and thus on investment in its formation at the enterprise level in our representative agent model.

Literature Review

- Another issue is the role of institutional factors which enhance entrepreneurship: property rights, regulatory burdens, credit constraints, bureaucratic corruption. This is something we do as well. But rather than focus on any one institutional factor separately, we focus on a macro-level index that combines all the institutional factors that can enhance or retard the development of the overlapping markets for goods and ideas, and thus innovative entrepreneurship.

- Finally previous literature also offered theoretical models tracing endogeous growth to technological (process) innovation (Romer 1990), product innovation (quality improvement) (Agion and Howitt, 1992), and investment in formal education, with applications at the micro and macro level. What separates what we do here is emphasis on investment in entrepreneurship as a special kind of human capital by the way entrepreneurs, or enterprises, allocate their own resources between innovative and managerial tasks. In this context we also attempt, however, to explore the interaction between entrepreneurial and general human capital.

3. Model

Model – production of goods

- We adopt an endogenous growth model (EGM) a la Lucas (1988) and basic production relations a la Ehrlich Liu & Lutter [ELL] (1994).
- Economic environment: closed, competitive economy; "Population" (N= proxy for production units) is exogenously given & fully employed. Agents live infinitely and make both productive and consumptive decisions.
- The PF of goods recognizes exhibits CRTS (no need for increasing returns here):

$$(1)\quad Q(t) = \mathrm{A}(\mathrm{H}_0)K(t)^{\beta}\left\{N(t)E(t)[1-\varepsilon(t)]\right\}^{1-\beta}$$

$$(1a)\ Q(t)/N(t) \equiv q(t) = \mathrm{A}(\mathrm{H}_0)k(t)^{\beta}\left\{E(t)[1-\varepsilon(t)]\right\}^{1-\beta}$$

Q(t) = aggregate output (GDP) is a fn. of just 2 major inputs: physical capital *K(t),* & effective labor *N(t)E(t)[1-ε(t)]*, empowered by entrepreneurial human capital, *E(t).*

(1-ε) = share of the enterprise resources allocated by entrepreneur to produce goods.

q(t) ≡ *Q(t)/N(t)* = output per rep. production unit - a fn of *k(t)* ≡ *K(t)/N(t)* and *E(t)*.

H_0 accounts for the HC level of N; taken to be predetermined in our recursive structure, and $A'(H_0) > 0$, by assumption.

Model- PF of entrepreneurial human capital [EHC]

- **The PF** of entrepreneurial human capital is "enterprise specific":

$$(2)\ \mathrm{d}E(t)/\mathrm{dt} \equiv \dot{E}(t) = IhE(t)\varepsilon(t)$$

as in ELL 1994; this avoids issues of rivalry or cooperation across enterprises.

- **Inputs:**
- *I* = institutional index factor promoting econ. freedom in markets for both goods and ideas.
- *h* = endowed HC (education, ability) of innovative entrepreneurs – we use

We treat both I and h as predetermined.

- *E(t)* = accum. past knowledge; critical factor in assuring perpetual growth
- *ε(t)* = share of enterprise (production unit) time & resources devoted by entrepreneur to grow EHC (*E)* = index of investment in EHC. [INV empirically]

- 0≤ *ε*<1. At *ε*=0 (corner solution), the economy is in a stagnant equilibrium of the neo-classical form, i.e., the growth rate of per-capital output, g*=0.

Model – optimization analysis

- Maximization Problem for the representative production unit:
  - The objective function is to maximize the current-value Hamiltonian

$$(3)\quad v(t)=\frac{1}{1-\sigma}\left(c(t)^{1-\sigma}-1\right)+\theta_1\{Ak(t)^{\beta}\{E(t)[1-\varepsilon(t)]\}^{1-\beta}-c(t)\}+\theta_2\rho IhE(t)\varepsilon(t)$$

w.r.t two control variables c, ε and two state variables k and E.

ρ is the discount rate; σ is the coefficient of (relative) risk aversion.

The optimization analysis produces the following equilibrium conditions:

- In a steady state equilibrium position, the rate of growth of per-capita output, physical, and entrepreneurial capital are equalized at the explicit solution:

$$(4)\quad \frac{\dot{q}}{q}=\frac{\dot{k}}{k}=\frac{\dot{E}}{E}=\frac{Ih-\rho}{\sigma}$$ And by using the PF (2), we get :

$$(5)\quad \varepsilon^{*}=\frac{1}{\sigma}(1-\frac{\rho}{Ih})$$

Note that in this explicit solution I , h & σ are treated as given, and innovative investment in entrepreneurial capital, ε^*, is absent from the solution, essentially because it is determined as an endogenous outcome of the underlying institutional and personal parameters, *I h, σ , ρ*.

Propositions and Testable Implications

- **Proposition 1: To assure that the economy can join a regime of persistent growth, the institutional factors supporting open and free markets and the innovators' endowed human capital must exceed individual time preference: *Ih* > *ρ*. It is enhanced by low rel' risk aversion**

  Since, by (5), in equilibrium,

$$\varepsilon^* = \frac{1}{\sigma}\left(1 - \frac{\rho}{Ih}\right)$$

  for ε* to be positive, we need to have ρ/Ih < 1.

  Corollary: a sufficient level of institutional reforms supporting free markets for goods and ideas can trigger a takeoff from stagnant, to persistent, self-sustaining growth.

- **Proposition 2: The institutional index factor & entrepreneurs' own education parameters enhance the steady-state investment in entrepreneurial capital.**

$$(6) \qquad \frac{d\varepsilon^*}{dI} = \frac{\rho}{\sigma h I^2} > 0, \qquad \frac{d\varepsilon^*}{dh} = \frac{\rho}{\sigma I h^2} > 0$$

Propositions & Testable Implications-cont'd

- **Proposition 3: A rise in the equilibrium level of investment in entrepreneurial capital has an ambiguous effect on output level over a transitional period, but an enhancing effect on the equilibrium growth rate of output.**

  - **Level effect:**

The level effect is ambiguous. It may be negative if t is short, but becomes positive over a sufficiently longer time span as the catch-up effect from a higher growth rate kicks in.

$$(7)\ \frac{\partial q(t)}{\partial \varepsilon(t)} = (1-\beta)q(t)[Iht - \frac{1}{1-\varepsilon(t)}]$$

  - **Rate effect is unambiguous:**

$$(8)\ \frac{\partial \hat{q}}{\partial \varepsilon} = \frac{\partial \hat{E}}{\partial \varepsilon} = Ih > 0$$

where $\hat{q} = \frac{\dot{q}}{q}$

The rate effect is independent of the level of ε.

Propositions & Testable Implications-cont'd

- **Proposition 4: A rise in the endowed institutional index factor and innovators' human capital have ambiguous effects on the level of output, but an enhancing effect on the growth rate of output.**
  - **Level effects have ambiguous signs:**

$$(9)\ \frac{\partial q(t)}{\partial I} = \frac{(1-\beta)}{\sigma} q(t)\{ht - \frac{\rho}{[1-\varepsilon(t)]hI^2}\}$$

$$\frac{\partial q(t)}{\partial h} = \frac{(1-\beta)}{\sigma} q(t)\{It - \frac{\rho}{[(1-\varepsilon(t)]Ih^2}\}$$

  - **Rate effects on equilibrium output growth are unambiguous in sign:**

$$(10)\ \frac{d\hat{q}}{dI} = \frac{h}{\sigma} > 0, \qquad \frac{d\hat{q}}{dh} = \frac{I}{\sigma} > 0$$

4. Empirical Analysis

Empirical Implementation

- **Empirical constructs of theoretical variables**
  - **INV** = **IENT / TENT =** proxy for **ε** , the fraction of enterprise resources, or the rate of investment in entrepreneurial capital, *E(t)*. IENT and TENT are the shares of innovative and total entrepreneurs in the LF as determined by entrepreneurs' self-assessment of their engagement in innovative activities. Data are from **Global Entrepreneurship Monitor (GEM) international adult population survey.**
    - **Note that in all steps of the recursive model a higher IENT, given TENT, captures higher rate of investment in E, while a higher TENT, given IENT, lowers it.**
  - I**NS =** proxy for **I,** the market-oriented institutional index factor. INS is a country's overall economic freedom score. It is the simple average of its scores on 10 indiv. Freedoms: Business, Trade, Fiscal, Gov. Spending, Monetary, Investment, Financial, Property rights, Freedom from Corruption, & Labor Freedom. **(Heritage/Wall Street Journal Index of Econ. Freedom)**
  - **GDPn** = proxy for ***Q/N*** measured as real GDP per capita. **(PWT 7.0)***

* PWT = Penn World Table (Summers & Heston)

Empirical Constructs – Cont'd

- **ED-PUB$_0$** used as proxy for ***H$_0$***, the initial public education attainment. ED-PUB$_0$ is the average years of schooling attained by the population over 15 in 2000. **(Barro & Lee , 2010)**
- **ED-IENT** used as a proxy for **h**, the education attainment of *innovative* entrepreneurs. ED-IENT is calculated as the % of *innovative entrepreneurs* who have graduate experience. **(Global Entrepreneurship Monitor)**
- **KI** used as a proxy for ***k***, capital/labor ratio. KI is the investment share of real GDP. **(PWT 7.0)**

Added controls:

- **GOV:** gov. share of GDP **(PWT 7.0)**
- **OPEN:** the trade share of real GDP. **(PWT 7.0)**
- **GDPn$_0$, t*GDPn$_0$** control for stage of dev. & needed for estimation of level effects of ε and I; We use 7 regional dummies – in lieu of "fixed effects" to avoid dummy variables trap when using initial IENT, TENT variables.

Econometric Implementation

- **Implementing propositions 2-4 in the following 3-step recursive system**
  - 1: Determinants of equilibrium investment in EHC capital:

$$IENT=\alpha_0+\alpha_1 INS_0+\alpha_2 TENT+\alpha_3 ED\text{-}IENT+\alpha_4 KI+\alpha_5 GOV+\alpha_6 OPEN+\alpha_7 lnGDPn_0 + \text{regional or country dummies} + \text{year dummies} + \text{error term}$$

  - 2: Level and rate of per-capita GDP, estimated as a function of investment in EHC:

$$lnGDPn=\beta_0+\beta_1 IENT+\beta_2 t*IENT+\beta_3 t+\beta_4 TENT+\beta_5 t*TENT+\beta_6 ED\text{-}PUB_0+\beta_7 KI +\beta_8 GOV+\beta_9 OPEN+\beta_{10} lnGDPn_0+\beta_{11} t*lnGDPn_0+\text{country dummies}+\text{error term}$$

  - 3: Level and rate of equilibrium output estimated as a "reduced-form" function of endowed personal and institutional factors:

$$lnGDPn=\gamma_0+\gamma_1 INS_0+\gamma_2 t*INS_0+\gamma_3 t+\gamma_4 ED\text{-}IENT_0+\gamma_5 t*ED\text{-}IENT_0+\gamma_6 ED\text{-}PUB_0+\gamma_7 KI +\gamma_8 GOV+\gamma_9 OPEN+\gamma_{10} lnGDPn_0+\gamma_{11} t*lnGDPn_0+\text{region dummies}+\text{error term}$$

Econometric Implementation - cont'd

- **Rationale of the recursive set of equations**
  - Step 1 is a linear specification of the equilib. INV in EHC (ε*) in eq. (5). And the testable implications in proposition 2 and eq.(6).
  - Step 2 aims to estimate the level effect, and long-term rate effect of INV on the growth rate of EHC and thus in per-capital GDP in proposition 3 and eqq. (7) and (8).
  - Step 3 aims to verify the equilibrium solutions for the steady-state growth rate in terms of the model's underlying parameters, *I, h, and* H_0, and its testable implications in proposition 4 and equations (9) and (10).
  - In all equation we introduce control variables aimed to capture the country's position on the transition path to the steady-state.
  - The set-up, like the model, considers the pop. edu. attainments and INS as predetermined. The 3-equations are thus estimated as variants of a fixed-effects regression model.

Econometric Implementation - cont'd

- Note that our Edu variables are inherently predetermined at the time of entry to LF (including TENT) , and there is no compelling endogeneity issue about effects of ε(t) on *q(t)* or of TENT(t) on INV(t). But since we do not model TENT and ED-IENT or ED-PUB as choice variables, for robustness they are generally entered in their initial values.

- Final merged dataset: an unbalanced panel covering 60 countries from 2001 to 2008.

- Note on the regression specifications in steps 2 and 3
  - $GDPn_t = (GDPn_0)\ \exp[g(X_t)t]\ \exp(u_t)$, where $g(X_t) = \beta_1 + \beta_2 X_t$. Taking the log transformation, the growth rate equation can then be estimated from:
  - $LGDPn_t = \beta_0 + \beta_1 X_t + \beta_2 * t + \beta_3 * t\ X_t + u_t$, with β_0 representing country dummies allows for estimating both level and rate effects of X_t. The growth rate estimate, g, is the sum of the coefficients of the time trend (t) and its interaction terms (tX). The interaction terms capture both between- and within-country variations in X.

Panel Sample's Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LnGDPn	476	9.638	0.876	6.731	10.941
INS	466	65.997	9.593	43.500	90.000
IENT	256	0.032	0.026	0.002	0.174
TENT	284	0.149	0.087	0.009	0.511
ED-IENT	205	0.299	0.171	0.005	0.727
ED-PUB_0	472	8.898	1.871	4.199	12.706
KI	476	24.190	5.886	10.080	46.840
GOV	476	8.440	2.947	2.580	17.130
OPEN	476	91.248	66.921	22.160	443.080

5. Regression Results

Step1 (dependent variable: IENT)

	(1) IENT	(2) IENT	(3) IENT	(4) IENT
INS_0	0.0028** (2.5334)	0.0029** (2.6109)	0.0005** (2.4432)	0.0005** (2.4744)
ED-IENT	0.0115** (2.0025)	0.0112* (1.9633)	0.0135* (1.7795)	0.0132* (1.7236)
TENT	0.2654*** (12.2404)	0.2613*** (12.0669)	0.2216*** (11.8725)	0.2197*** (11.6226)
KI	0.0002 (0.6786)	0.0003 (1.0599)	0.0006*** (2.6345)	0.0006*** (2.6855)
GOV	-0.0040* (-1.9525)	-0.0047** (-2.2823)	-0.0021*** (-5.4051)	-0.0022*** (-5.4341)
OPEN	-0.0003** (-2.1189)	-0.0003** (-2.0901)	0.0000 (0.6552)	0.0000 (0.5869)
$LnGDPn_0$	0.0157 (1.5579)	0.0102 (0.9761)	-0.0023 (-0.6134)	-0.0047 (-0.8902)
$t*LnGDPn_0$		0.0008* (1.7569)		0.0004 (0.6464)
t		-0.0085* (-1.9530)		-0.0060 (-0.8942)
Country Dummies	yes	yes		
Region Dummies			yes	yes
year dummies	yes	yes	yes	yes
Constant	-0.2683** (-2.5166)	-0.2144* (-1.9514)	-0.0055 (-0.1826)	0.0205 (0.4419)
adj. R-sq	0.921	0.923	0.736	0.735
N	202	202	202	202

Step2 (dependent variable: LnGDPn)

	(1) LnGDPn	(2) LnGDPn	(3) LnGDPn	(4) LnGDPn
IENT	-0.1177	-1.1103**	-0.8497*	-0.8546*
	(-0.2955)	(-2.0672)	(-1.9033)	(-1.8944)
t*IENT	0.1088*	0.2537***	0.1752***	0.1737***
	(1.7249)	(2.8542)	(2.8257)	(2.7584)
t	0.1864***	0.1787***	0.1653***	0.1632***
	(10.5563)	(9.2129)	(12.8763)	(9.9457)
TENT	0.0429			
	(0.3267)			
t*TENT	-0.0095			
	(-0.4554)			
$TENT_0$		0.2195	0.2063	0.2105
		(1.4605)	(1.5664)	(1.5667)
$t*TENT_0$		-0.0014	0.0104	0.0104
		(-0.0537)	(0.6687)	(0.6604)
$ED\text{-}PUB_0$	0.0567***	0.0092***	0.0083	0.0085
	(5.9351)	(2.8599)	(1.5986)	(1.5957)
$ED\text{-}IENT_0$			0.3466***	0.3738**
			(3.1800)	(2.2161)
$t*ED\text{-}IENT_0$				-0.0049
				(-0.2129)
KI	0.0038***	-0.0001	0.0070***	0.0070***
	(4.1072)	(-0.1160)	(5.6834)	(5.6272)
GOV	-0.0603***	-0.0053***	-0.0278***	-0.0277***
	(-9.8197)	(-3.5989)	(-9.2756)	(-9.1905)
OPEN	0.0005*	0.0003***	-0.0004***	-0.0004***
	(1.8417)	(4.5536)	(-4.6007)	(-4.5640)
$LnGDPn_0$	0.9015***	1.0199***	0.4293***	0.4238***
	(37.0870)	(42.8058)	(3.9531)	(3.7652)
$t*LnGDPn_0$	-0.0165***	-0.0159***	-0.0150***	-0.0147***
	(-10.1207)	(-8.6220)	(-12.1103)	(-8.0906)
Country dummies	yes			
region dummies		yes	yes	yes
Constant	0.9505***	-0.2970	4.8747***	4.9194***
	(4.1238)	(-1.4194)	(5.2978)	(5.1675)
adj. R-sq	0.999	0.998	1.000	1.000
N	253	159	70	70

Step3 (dependent variable: LnGDPn)

	(1) LnGDPn	(2) LnGDPn	(3) LnGDPn	(4) LnGDPn
INS_0	-0.0010 (-1.2168)	-0.0010 (-1.0883)	-0.0004 (-0.4407)	-0.0004 (-0.4690)
$t*INS_0$	0.0005*** (3.2709)	0.0005*** (2.9570)	0.0005*** (3.9062)	0.0005*** (3.8908)
t	0.1550*** (11.8925)	0.1522*** (9.5510)	0.1565*** (14.3563)	0.1597*** (11.7534)
$TENT_0$			-0.1723 (-1.3342)	-0.1782 (-1.3642)
$t*TENT_0$			0.0077 (0.6315)	0.0081 (0.6535)
$ED\text{-}PUB_0$	0.0154*** (4.5910)	0.0155*** (4.5785)	-0.0025 (-0.5132)	-0.0027 (-0.5395)
$ED\text{-}IENT_0$	0.4212*** (5.8274)	0.4512*** (3.7125)	0.0830 (0.6940)	0.0448 (0.2924)
$t*ED\text{-}IENT_0$		-0.0065 (-0.3077)		0.0080 (0.4019)
KI	0.0077*** (6.7246)	0.0077*** (6.7017)	0.0093*** (8.1510)	0.0094*** (8.0841)
GOV	-0.0247*** (-6.9591)	-0.0248*** (-6.9333)	-0.0235*** (-7.2041)	-0.0235*** (-7.1625)
OPEN	-0.0004*** (-3.9047)	-0.0004*** (-3.8972)	-0.0005*** (-4.7339)	-0.0005*** (-4.7225)
$LnGDPn_0$	0.4176*** (5.2829)	0.4141*** (5.1629)	0.7049*** (5.8363)	0.7096*** (5.8171)
$t*LnGDPn_0$	-0.0167*** (-9.9414)	-0.0162*** (-7.1530)	-0.0174*** (-11.6531)	-0.0179*** (-9.1675)
region dummies	yes	yes	yes	yes
constant	4.9382*** (7.1261)	4.9633*** (7.0828)	2.5140** (2.3785)	2.4771** (2.3224)
adj. R-sq	0.999	0.999	1.000	1.000
N	120	120	96	96

Summary of Regression Results

- **Step 1: Determinants of INV = ε**
  - Both Institution and entrepreneurs' own education attainment have a significant and positive effect on IENT.
  - Positive TENT sign is largely just a scale effect: if the TENT increases by 1 percentage point, IENT should increase by the average ratio of IENT in TENT in the sample, which is about 0.2%, if INV is unchanged. The estimated coefficient of TENT$\approx$0.22%-0.26% indicates quite a mild effect coming from non-innovating entrepreneurs.
- **Step 2: Dependence of GDPn on IENT (INV)**
  - Controlling for TENT, an increase of IENT, hence investment in E (INV), has a significant positive effect on the *rate* of GDPn growth, but a negative level effect. The results are robust to initial TENT ($TENT_0$) .

Summary of Regression Results-cont'd

- **Step 2: Dependence of GDPn on IENT (INV)(cont'd)**
  - TENT (given IENT) is estimated to have a positive level effect and a negative rate effect (albeit insignificant). Reason: given IENT, higher TENT (1-ε) reduces INV, which should raise output, so by our model it should have a positive level effect & a negative rate effect.
  - ED-$IENT_0$ = Entrep. Initial schooling (h) has an independent effect on the GDPn level, but not the growth rate. The inference may be that its modeled effect on growth (g*) is captured by the rate effect of IENT.
  - ED-PUB_0 = Initial public education attainment (H_0) generally has a positive level effect, consistent with our model specification.
  - In columns 2, 3 and 4, we enter initial $TENT_0$ and t*$TENT_0$ instead of their contemporaneous counterparts as regressors to alleviate possible reverse causality. Note, however, that in these regressions IENT/$TENT_0$ is not an accurate measure of INV.

Summary of Regression Results-cont'd

- **Step 3: Dependence of GDPn on INS**
  - The Institutional index factor has a significant positive effect on the *rate* of GDPn growth, but a negative level effect. The results support our propositions.
  - Similar to step2, Initial public education attainment (H_0) and Entrep. Initial schooling (h) generally have significant positive effects on the GDPn level.
  - We use the initial values of INS - INS_0 and t* INS_0 - instead of their contemporaneous counterparts as regressors to alleviate possible reverse causality.

6. Conclusion

Concluding Remarks

- The markets for goods and ideas can expand on their own, but they are in principle overlapping. Our thesis has been that by serving as intermediary between the 2, entrepreneurship provides a direct link to product and process innovation and thereby to productivity & economic growth.
- We try to frame the idea analytically and test it empirically. We find evidence that investment in EHC, as measured by the proportion of innovative entrepreneurs relative to total may indeed serve as direct engine of growth
- We also find, however, that entrepreneurship, in turn, is strongly influenced by institutional factors that promote freedom in both the markets for goods & ideas. But not only by institutions: the HC of entrepreneurs also enhances the rate of economic growth, and general HC enhanced its level.
- However, the model is limited in that it takes both institutions and endowed human capital as predetermined. A complete model of entrepreneurship and growth will have to relax these assumptions.
- Current study is also limited by the size of int'l sample – length of time period – we could work with. We clearly have more work to do.