Oral Defense of Doctoral Dissertation
School of Public Policy, George Mason University

Insurance Market Development and Entrepreneurship in Latin America and Brazil

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Outline

1. Definitions: Entrepreneurship and Insurance
2. Framework: Insurance in the process of economic growth. The link between Insurance and Entrepreneurship
3. Historical review: Entrepreneurship and Uncertainty
4. Literature review: Entrepreneurship, Risk and Uncertainty
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6. Advanced and Emerging market countries: wealth; institutions; insurance markets
7. USA vs. Brazil
8. Natural and human events and the financial crisis of 2007-8
9. Research Questions
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Research Questions

- What is the relationship between availability of insurance and entrepreneurship?
- What is the direction of causality, e.g., which comes first, insurance or entrepreneurship?
- What is the role of Social Insurance with respect to entrepreneurship?

1. Definitions: Entrepreneurship and Insurance

Entrepreneurship

- There are various definitions of entrepreneur derived from Knight (1921), Schumpeter (1934), and the Austrian School.

- The main difference between Knight and Schumpeter is that the latter holds the view that the entrepreneur does not bear the risk – "*the entrepreneur is never the risk bearer*" (Schumpeter 1934, p.137), which is taken by the capitalist, the banker. Knight believes that the entrepreneur bears the uninsurable business risk, i.e., uncertainty associated with the business venture.

- A definition of entrepreneur for this research is that of someone who has intuition and drive and in a given institutional setting undertakes the uncertainty of the business risk, and uses the insurance market to transfer s specific risks. He creates a new organization to exploit a new technology, or innovative process and generates value and economic growth.

- This definition is closer to the view of Knight in terms of "risk", but recognizing the crucial contribution of Schumpeter to identify the entrepreneur as an engine of growth.

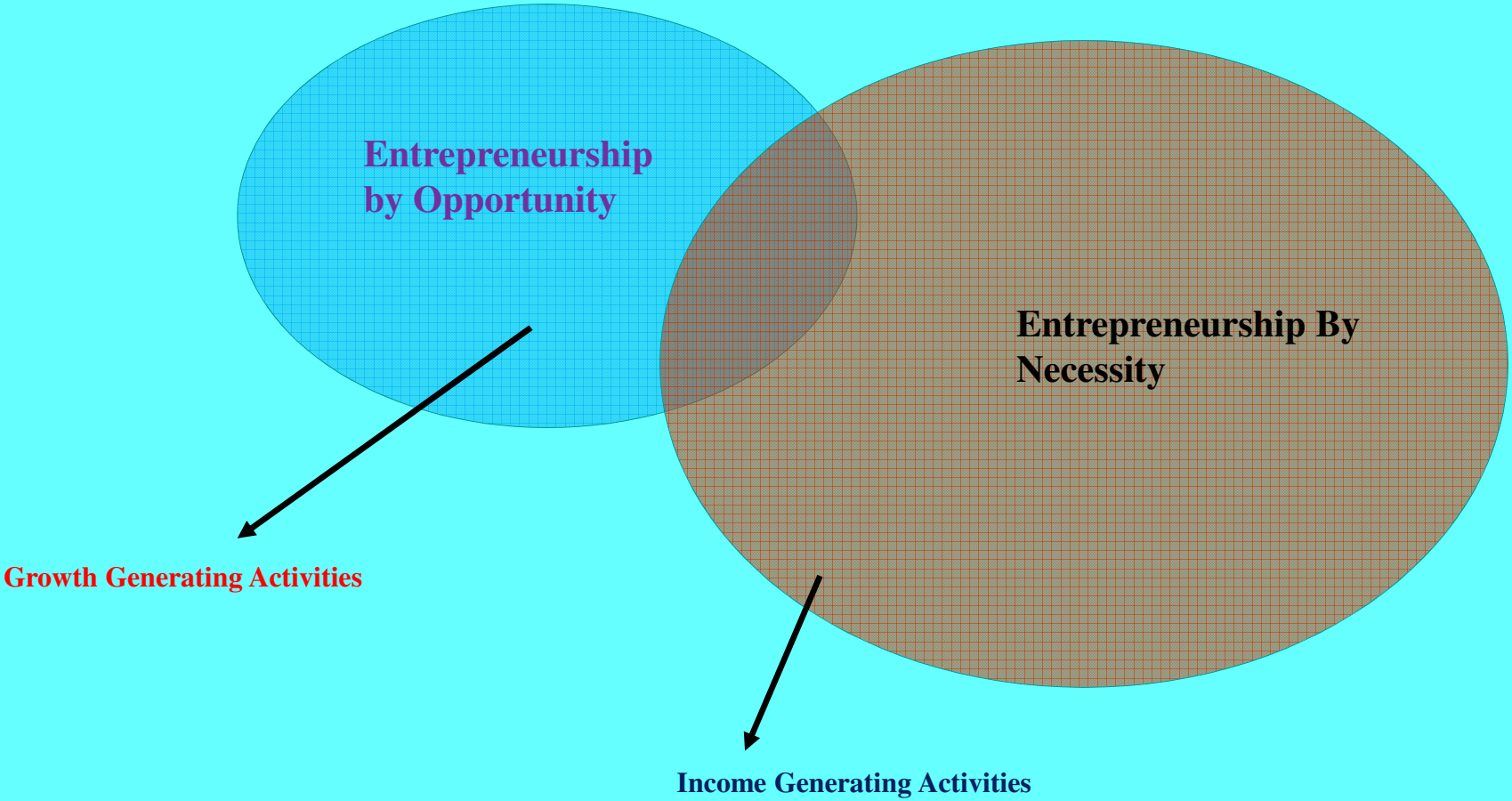
- The definition can be applied to the environment of emerging economies.

Theories, Definitions and Measures

- Theories, definitions and measures of entrepreneurship are strictly connected (i.e., different theories and definitions of entrepreneurship refer to different measures) and entail different implications for public policies (Iversen, Jorgensen, and Malchow-Moller 2007).

- Several researchers (Congregado 2010; Iversen, Jorgensen, and Malchow-Moller 2007) stress that the best measures of entrepreneurship are those of SMEs, **start-ups** and self-employment. In this respect, large firms and low-income people do not measure entrepreneurship, but play a role in the economy.

Types of Entrepreneurship



Definition of Insurance

- Insurance companies bear risk by creating pool risks; assess and cope with non-diversifiable risk; facilitate access to credit.

- Insurance companies are vehicles to mobilize and manage savings investing them in the capital markets, facilitating long-term investments and the growth of debt and equity markets.

- Insurance companies - as institutional investors - can require companies in the stock market to follow standards of corporate governance and transparency. Thus, institutional investors as shareholders play the role of monitoring and disciplining the markets.

- Insurance companies cover risk, but not uncertainty.

- Insurance companies perform a fundamental role for economic growth and must operate efficiently and effectively (e.g., charging fair price and making provisions) and with transparency.

Insurance

Insurance, the main independent variable, is measured using standardized measures.

The first measure that gauges the level of the demand of insurance and effective insurance markets is the penetration ratio defined as the ratio of total premiums (life and non–life) to GDP (i.e., premiums over GDP) for states and for various years.

A second measure is propensity to buy insurance. The propensity to buy insurance can be regarded as risk aversion. Various authors argue that education promotes an understanding of risk and hence an increased demand to buy insurance (Outreville 1990, 2011; Szpiro and Outreville 1988). In other words, the more people are educated, the less risk-averse they become; i.e., better education improves the capability of assessing risk, and increase the demand of insurance and hence the propensity to insurance. In addition, better education facilitates greater risk taking by individuals and less risk aversion and represents a proxy for risk aversion and propensity to buy insurance.

A third measure is density rate. The density rate is defined as the total volume of premiums (life and non–life) per capita (i.e., premiums over population for different states and countries for various years). *Density* is a measure that relates to the knowledge of insurance and influences the availability of insurance. The number of insurance companies (and also the number of brokers) in a given state (or country) could constitute a measure of knowledge of insurance. Olson (Olson 2007, 40) distinguishes between propensity and knowledge of insurance arguing that knowledge facilitates the introduction of rules and institutions that expand insurance products; i.e., cultural values influence the shape and institutions.

2. Insurance in the Process of Economic Development: the Relationship between Insurance and Entrepreneurship

The Process of Development

- According to Schumpeter (1934), the entrepreneur is the innovator who implements change and produces growth by initiating new combinations, which can take several forms:

  (1) the introduction of a new good or quality thereof,
  (2) the introduction of a new method of production,
  (3) the opening of a new market,
  (4) the conquest of a new source of supply of new materials or parts, or
  (5) carrying out the new organization of any industry.

- The basic contention is that small firms, start-ups - home of the independent entrepreneur and the independent inventor- constitute the primary source of the technical ideas and innovations that serve as the foundation for the unprecedented growth performance of the world's industrial economies.

  - Baumol W., The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism, Princeton: Princeton University Press, 2002

The Process of Development

Role of Financial Markets

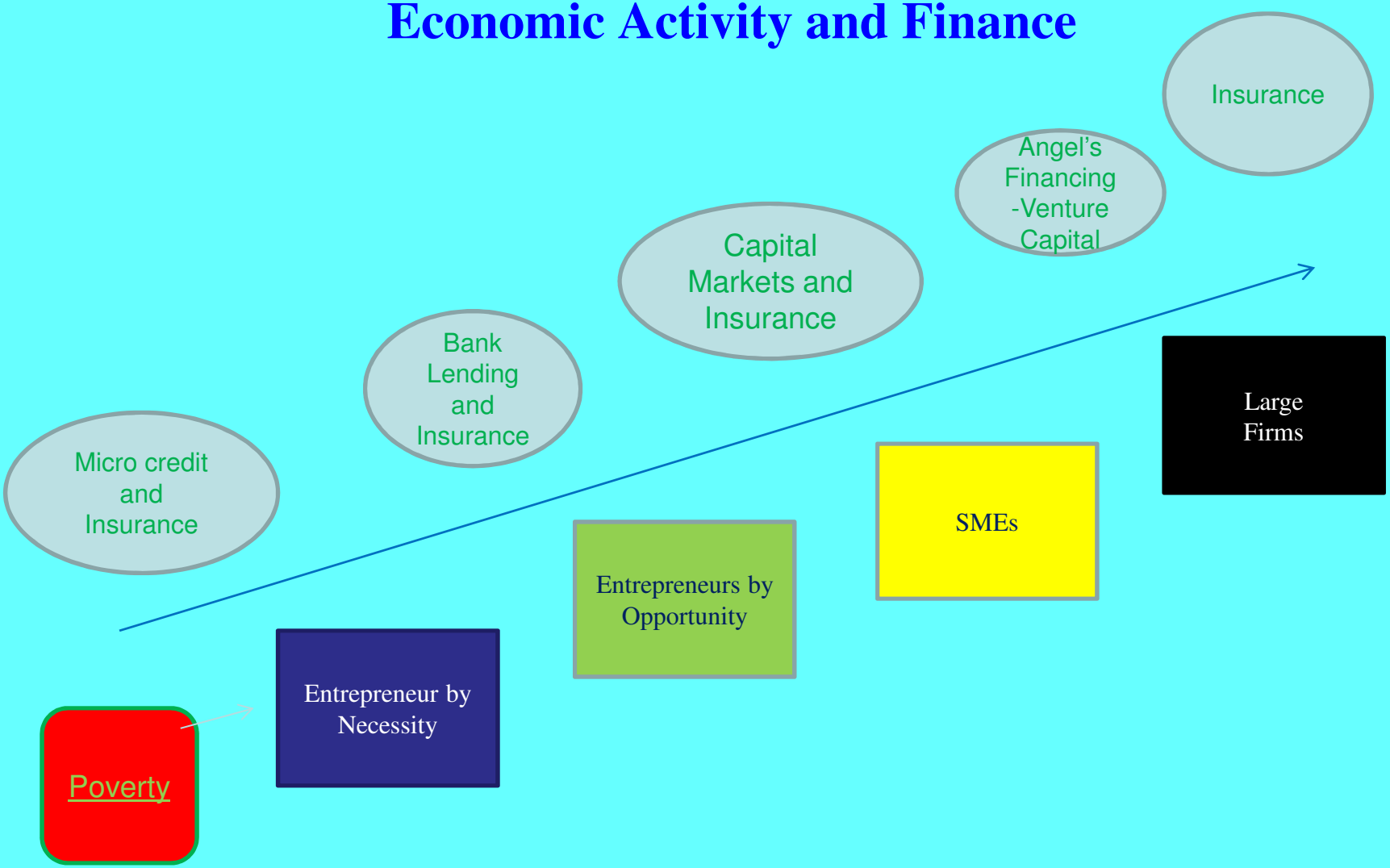
- Allocation of credit according to efficiency criteria, rewarding the "creative destruction" of the Schumpeterian entrepreneur, and therefore facilitating opportunities and economic growth.

Measures of Financial Sector Development

- Domestic Bank Credit/GDP is the indicator of financial sector development
- (2011)

Geographic Area	M_2/GDP(%)	Domestic Bank Credit/GDP (%)
Latin America	0.49	0.67
Middle East	0.72	0.48
OECD Countries	1.32	**2.3**
Egypt	0.79	0.47
Brazil	0.66	**0.97**

Economic Activity and Finance



Availability and Access to Financial Services

A World Bank- Cgap Publication, Access to Finance 2010 has developed a set of financial access indicators for 139 countries across the globe.

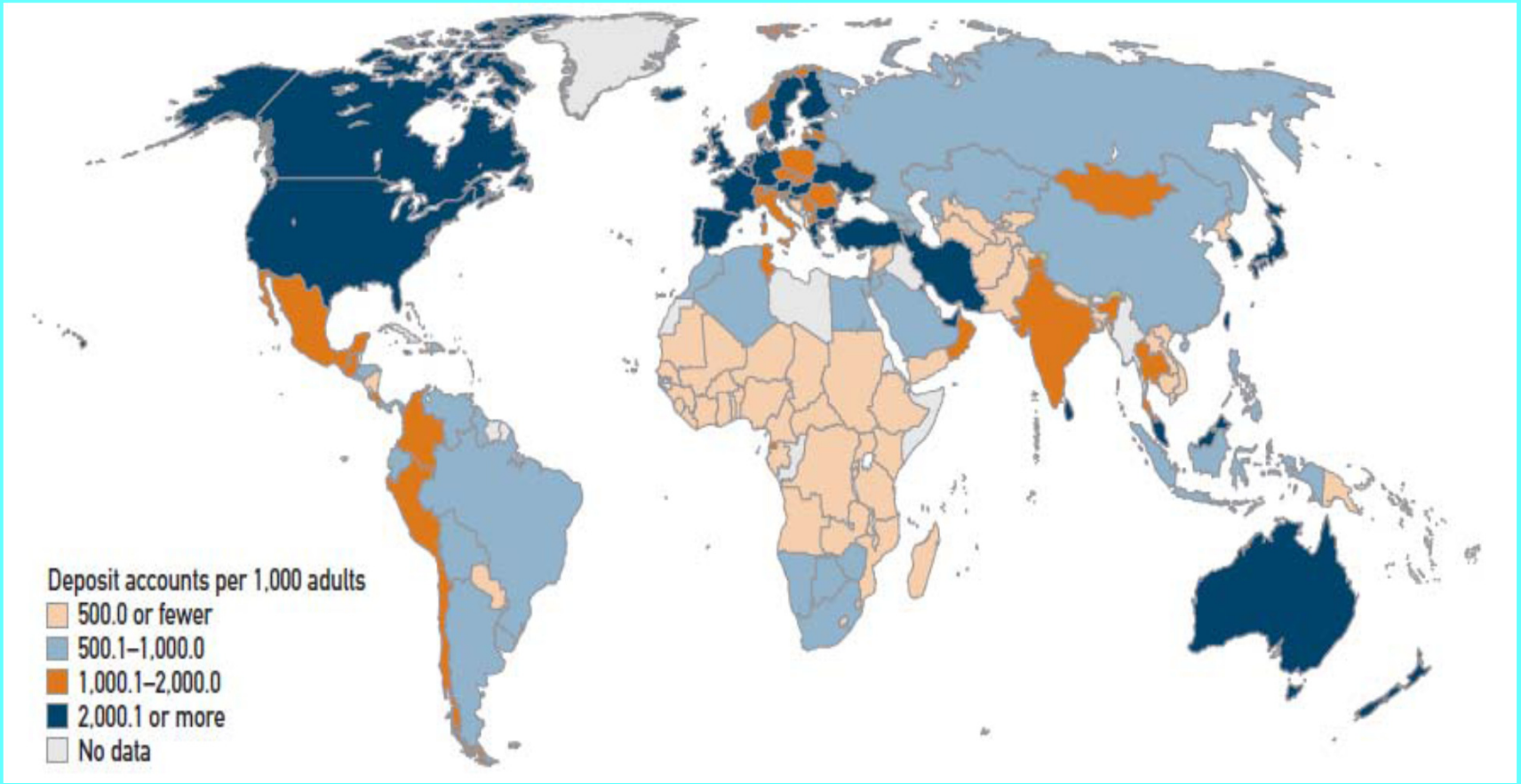
Despite the apparent overabundance of approximately 6.2 billion bank accounts in the world - more than one per adult - a disproportionate amount of the accounts - 3.2 per adult – are located in the developed world economies, while the equivalent figure in the developing world reaches is only approximately 0.9 per adult, inclusive of accounts which are not owned by individuals, such as those owned by government and business entities.

It is estimated that roughly 19% of developed world adults do not have bank accounts (though many may live in households where other members have accounts), **whereas nearer to 72% of adults in the developing world do not have accounts.**

These numbers indicate **a major gap that has not yet even begun to be addressed** by the many policy initiatives currently underway or by the microfinance movement.

Access to Financial Services:
Number of deposit accounts in banks and regulated non-bank financial institutions per thousand adults

World Bank 2011-Measuring Financial Inclusion- The Global Findex Database Asli Demirguc-Kunt Leora Klapper (2012)



Access to and Availability of Financial Services

- For entrepreneurs and businessmen, access to finance and availability of financial services, and particularly insurance, is crucial.

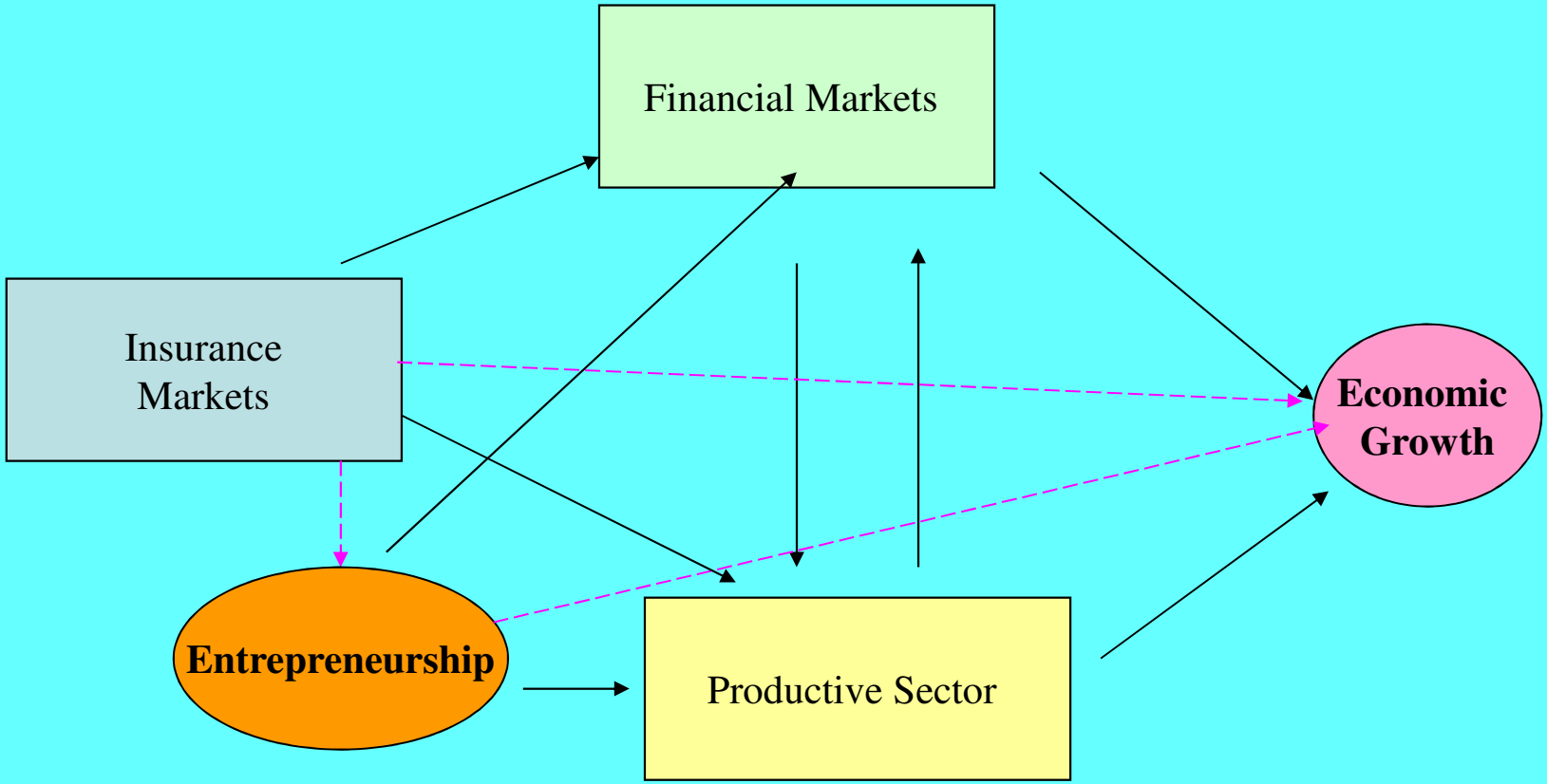
- However, insurance and other financial services have to be available and provide an effective service: the greater the effectiveness, the more uncertainty will be reduced.

- **What is the role of insurance in the development process?**

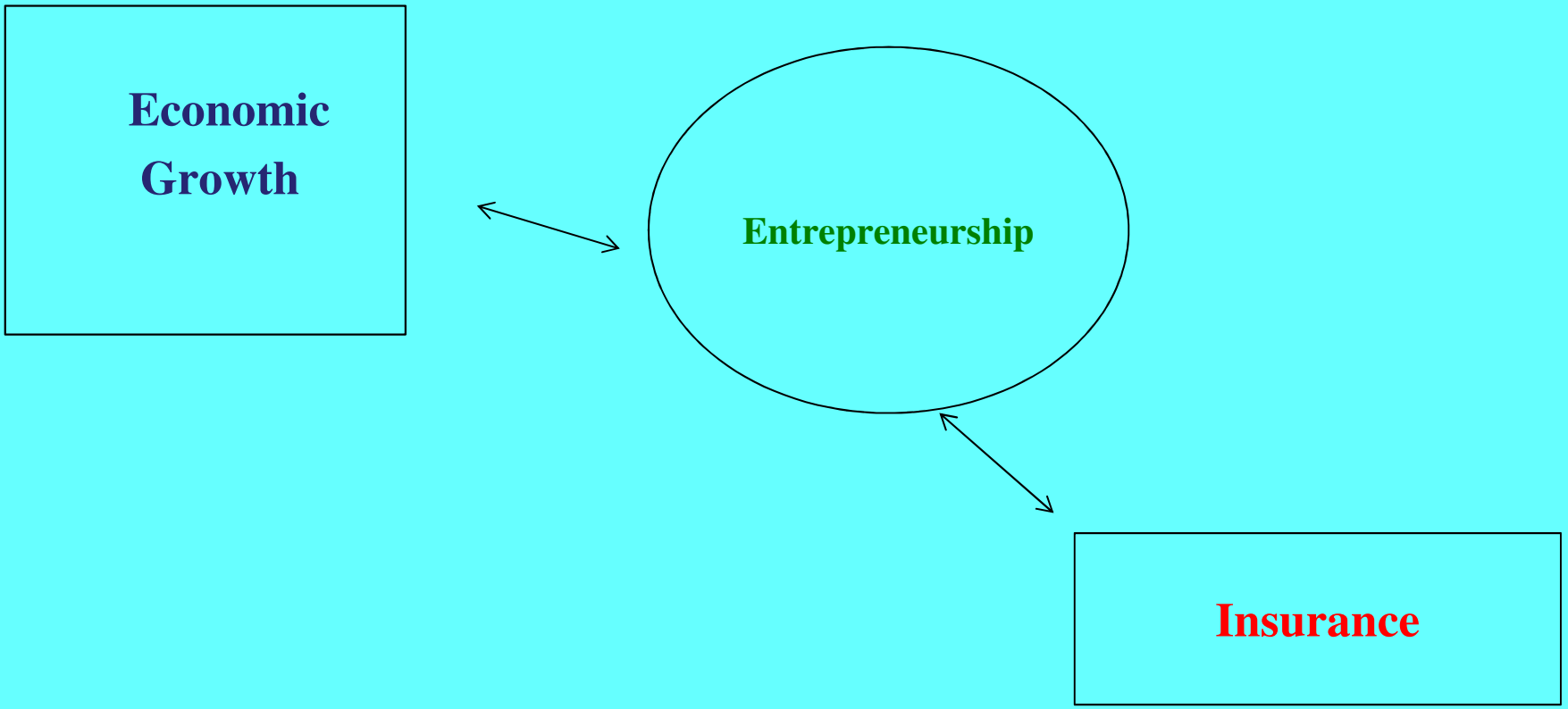
Insurance and Entrepreneurship

Table 1. Availability of Financial Services and Particularly Insurance to Various Forms of Economic Activity in the United States and in Emerging Markets		
Type of Activity	**United States**	**Emerging Markets - Latin America and the Caribbean**
Large Firm	Easily available	Available
Small and Medium-Sized Enterprises	Easily available	Scarcely available
Entrepreneurs	Easily available	Scarcely available
Micro entrepreneurs	Available	Scarcely available
Poor people	Incipient	Rarely available

Framework for Entrepreneurship and Insurance



Insurance Entrepreneurship and Economic Growth



Role of Insurance

To review the role of insurance in the development process and formulate the basis for empirical test:

- Historical review
- Literature review
- Review of the status of developed and emerging as well Latin American countries and Brazil
- Review of recent events

3. Historical Review: Entrepreneurship and Uncertainty

Historical Review

- The historical review of insurance focuses on the evolution of insurance in advanced and emerging markets, with special attention to Latin America and Brazil.

- The historical review is instrumental to investigate whether or not insurance market development and availability of insurance imply a decline of uncertainty; provide support to and favor economic activity and entrepreneurship and ultimately to economic growth.

- The framework of the analysis follows the view that the emergence of market institutions such as insurance derives as an unintended consequence from human activity including entrepreneurship (High 2009a, 5).

- Further, in line with Boettke and Coyne (2003), the proposition to test is whether insurance markets lead to productive entrepreneurship and economic growth.

- A related question has to do with the direction of causality, e.g., which comes first, insurance or entrepreneurship?

Historical Review

The historical review illustrates that

- people motivated by innovation and entrepreneurship have been fighting to overcome uncertainty and in that process rules and institutions for insurance and finance took shape. It is a battle of individuals to control uncertainty;

- research plays a role in the development of insurance even though many insurance activities are undertaken without prior knowledge of probabilities and statistics;

- the development of insurance is connected to that of financial market and linked to entrepreneurship;

- government has intervened at times heavily in the insurance sector often motivated by the need to reduce uncertainty.

4. Literature Review: Entrepreneurship, Risk and Uncertainty

Literature Review

- The analysis starts from the distinction between uncertainty and risk (Knight 2012), with risk including circumstances where an individual who has to take decisions faces unknown outcomes but known ex-ante probability distributions. Instead, uncertainty encompasses situations where the probability distribution of an outcome is unknown.

- Hence, *Knightian uncertainty* cannot be measured or calculated while risk can be. Risk unlike uncertainty can be covered by insurance.

- It also highlights that insurance can take place in formal insurance markets, or using self-insurance and risk avoidance (Mises 2007, 105–18; Rothbard 2011b, 552–57).

- Uncertainty in the sense of business uncertainty is the **source of reward** and profit for the entrepreneur, provided that it is **not excessive**.

Literature Review

There are various factors that shape the risk aversion and the occupational choices of individuals:

- Institutional setting;
- The functioning of insurance markets (e.g., fair actuarial price);
- The level of wealth.

Under the circumstances of emerging market economies these factors are particularly important and make individuals in those countries more risk averse.

Wealth Utility and Risk Aversion

In an emerging economy individuals are more risk averse because:

i) uncertain institutional environment; and

ii) the low level of wealth, i.e., lower part of the utility function.

The uncertainty of the institutional environment and the inefficiencies of the market institutions including insurance **determine the shape of the utility function, i.e., more concavity in emerging economies.** More concave curves of utility imply more risk aversion, i.e., individuals in emerging economies face steeper curves and therefore they resort to be more risk averse.

In addition, emerging market economies are less wealthy, which makes individuals more risk averse. Example: a fire destroys home/business with a loss of almost 100% of capital and wealth. There is no safety net and the individual is reduced to poverty for the remainder of his/her life.

Adverse Events and Insurance in Emerging Markets

Stochastic and black swan adverse events: death of breadwinner/illness/injury/ loss of property/natural disasters like droughts and floods, earthquakes can overwhelm scarce capital.

Lack of regulation and supervision and mispricing lead to mistrust for insurance policies and to under provision of insurance products in the market.

Poor people are subject to many risks, which are much the same as those faced by the non-poor. However, poor people are highly vulnerable and their ability to cope with these risks is lower. Homemade and self-insurance and forms of risk management are common place among micro entrepreneurs, but are insufficient and inefficient, i.e., micro entrepreneurs do not necessarily misunderstand risks, but they utilize inefficient risk mitigation strategies.

The lack of formal insurance and risk management services, of appropriate products and effective distribution channels increases uncertainty and undermines entrepreneurship, economic growth and wealth distribution.

Risk Aversion and Occupational Choices

- In this framework, different situations of uncertainty and risk motivate individuals and their initiatives differently, including with respect to undertaking business initiatives and operating as entrepreneur.

- Kihlstrom and Laffont (1979) state that individuals differ in "risk aversion"; i.e., "more risk-averse individuals become workers while the less risk-averse become entrepreneurs."

- Iyigun and Owen (1998) identify a model of occupational choice with "inherently risky entrepreneurial ventures" and relatively "safe" alternatives, such as professional activities.

- McGrath, MacMillan and Scheinberg (1992) compare attitudes toward risk and failure among entrepreneurs (i.e., founder-managers of businesses at least two years old and with at least one other person) and non-entrepreneurs in eight countries and find that entrepreneurs view a start-up as risk but also excitement, while non-entrepreneurs believe that "failure means losing face and respect."

- Also policies to favor **social insurance** provided by Government will likely have a negative impact on entrepreneurship (Ilmakunnas and Kanniainen 2001).

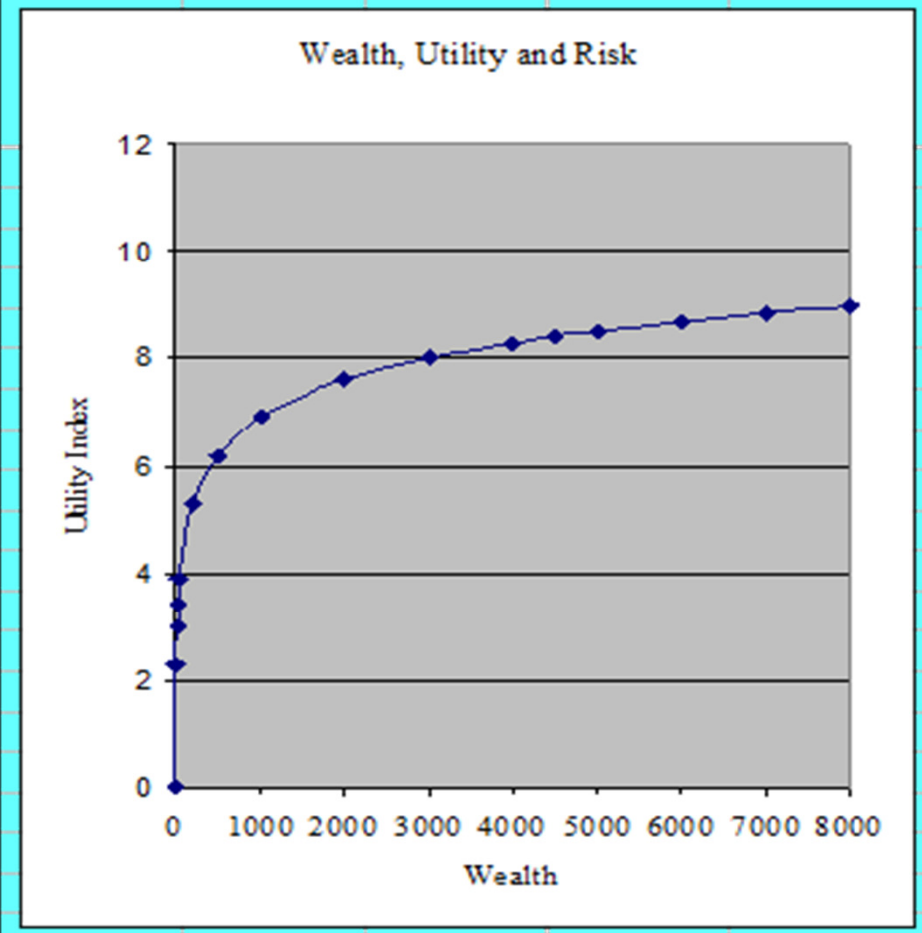
Risk Aversion and Occupational Choices

- Wennekers (2005) introduces a model of choice of occupation to clarify ways in which the avoidance of uncertainty influence the choice of becoming business owner, and the choice between self-employment and wage-employment. Those choices depend on individual's assessment and valuation of the utility of rewards, the alternatives available, taking into account uncertainty (Wennekers et al. 2005, 2007). Wennekers and other authors (2007) also state that due to economic factors and cultural differences, entrepreneurship (measured as the percentage of business owners) differs greatly among countries (Hofstede and Minkov 2010).

- Diversity across individuals in the composition of the portfolio mirror risk preferences in the sense that less risk-averse individuals are more inclined to start uncertain enterprises. Individuals who happen to be more risk-averse will have less fluctuating earnings; however, they would find themselves, on average, poorer than less risk-averse people. Guiso and Paiella (2005) ascertain that "risk preferences have considerable explanatory power for individual decisions (e.g., occupation, job, disposition to risks and to become an entrepreneur)".

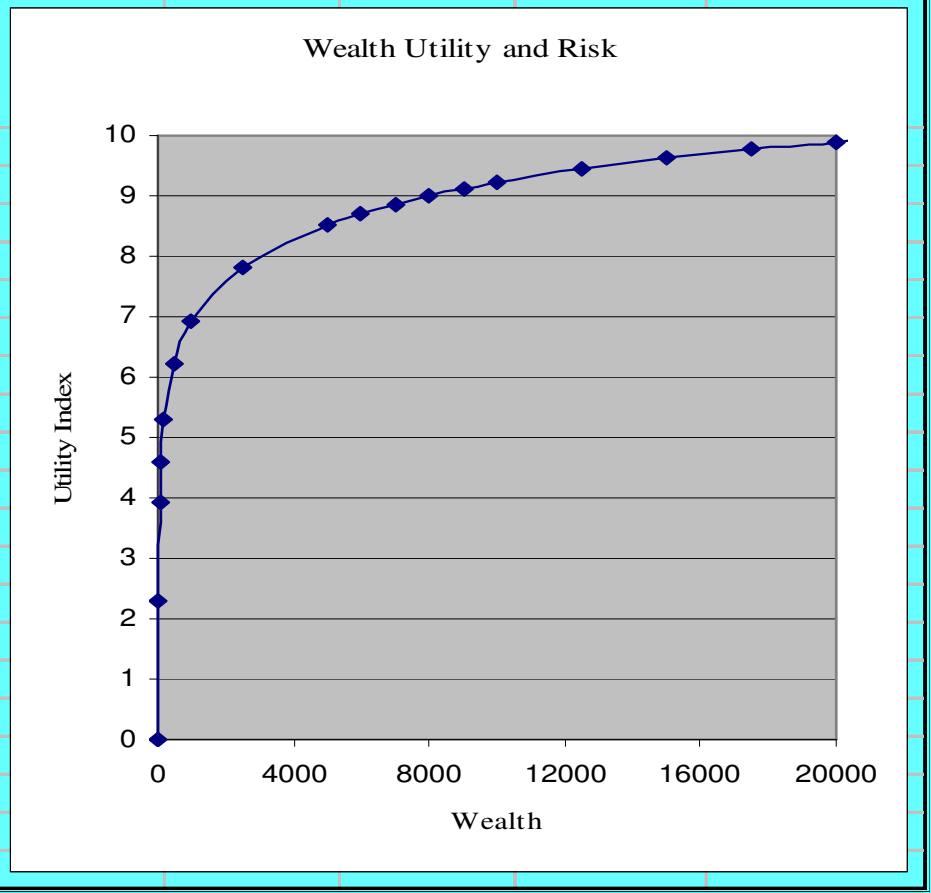
Wealth Utility and Risk Aversion

Steeper Curve	Emerging Country	
Wealth	Utility U(W)=ln(W)	Risk Aversion= (U"(W)/U'(W)
1	0	
10	2.3026	0.1000000
20	2.9957	0.0500000
30	3.4012	0.0333333
50	3.9120	0.0200000
200	5.2983	0.0050000
500	6.2146	0.0020000
1000	6.9078	0.0010000
2000	7.6009	0.0005000
3000	8.0064	0.0003333
4000	8.2940	0.0002500
4500	8.4118	0.0002222
5000	8.5172	0.0002000
6000	8.6995	0.0001667
7000	8.8537	0.0001429
8000	8.9872	0.0001250
8250	9.0180	0.0001212
8500	9.0478	0.0001176
9500	9.1590	0.0001053
10000	9.2103	0.0001000



Wealth Utility and Risk Aversion

Smoother Curve	Developed Country	
Wealth	Utility $U(W)=(W)^{1/2}$	Risk Aversion= (U"(W)/U'(W)
1	1	
10	3.16227766	0.0500
20	4.472135955	0.0250
30	5.477225575	0.0167
50	7.071067812	0.0100
200	14.14213562	0.0025
250	15.8113883	0.0020
300	17.32050808	0.0017
1000	31.6227766	0.0005
5000	70.71067812	0.0001
10000	100	0.0001
20000	141.4213562	0.0000
28900	170	0.0000
29000	170.2938637	0.0000
30000	173.2050808	0.0000
50000	223.6067977	0.0000
66834	258.5227263	0.0000
85000	291.5475947	0.0000
98900	314.4837039	0.0000
100000	316.227766	0.0000



Impact of Events

Normally, if a poor household loses a source of income, or is subject to an adverse event (e.g., fire), the result is devastating, e.g., a child might be withdrawn from school; valuable assets might be sold.

- This makes the household falls deep into poverty.

Protecting against Vulnerabilities

- Financial services like saving, bank deposits, credits and insurance provide sustainable and low cost coping strategies to deal with disruptive events.

- Individuals can re-build their assets or alternate source of income without falling into poverty.

- **Role of Insurance**

5. Insurance as a Market Institution

Insurance as a Market Institution

- The historical and literature reviews shows confirm that insurance markets represent a market institutions (Boettke and Coyne 2003; High 2009a).

- The background within which the research develops is that of institutions that favor the deployment of entrepreneurship; and insurance markets prompt productive actions and economic growth, i.e., "the adoption of certain institutions … channel and encourage entrepreneurial aspect of human activity in a direction that spurs economic growth" (Boettke and Coyne 2003, 3; also see High 2009a, 5).

- Thus, insurance can be seen as a market institution.

6. Advanced and Emerging Countries: Wealth; Institutions; Insurance Markets

Advanced and Emerging Countries: Wealth; Institutions; Insurance Markets

- With a long-term perspective, the IMF (IMF 2011, 2012a, 2012b) argues that emerging market populations are growing and maturing; becoming richer and more financially knowledgeable; banks and insurers are reasonably well-funded, well-capitalized and profitable, with loans, deposits, premiums and assets under management growing at significant rates compared to developed countries where deleveraging is under way, profits are low and growth is sluggish.

- Under these conditions, two key growth drivers for the insurance industry particularly in emerging countries are identified:

  - demographics and financial market development.

- These two factors are expected to facilitate the penetration of financial products including insurance.

The Specificities of Latin American Countries

- The slow economic growth is due to the unsatisfactory development of rules, norms and institutions that allows the so-called extractive political and economic elites to retain power (Acemoglu and Robinson 2012, 400–403). The transition to democracy has taken place in almost all the Latin American countries. However, democratic systems are still young and forms of authoritarian regimes or extreme-left government fueled by inequality can emerge.

- The low level of trust that still exists in Latin American countries prompts insecurity and limited confidence and asymmetrical information; favors the influence of political factors; and makes difficult to build effective institutions. The institutional environment has to consolidate and significant is present. Notable exception is Chile. Brazil is on the road of establishing a reliable and sustainable institutional environment. However, these days a great displeasure of how the system works in Brazil is on display.

- The lack of determination and persistence in the pursuit of changes and innovations. In fact, Latin American countries have layers of bureaucracy that exasperate entrepreneurs.

- "High-impact entrepreneurs" are those who launch and lead companies with an above-average impact in terms of jobs and wealth creation and the development of entrepreneurial role models (Endeavor 2012; Ernst & Young 2011a). These are opportunity entrepreneurs in contrast to the necessity entrepreneurs. Latin American countries have a significant number of necessity entrepreneurs, with a small number of high-impact entrepreneurs who are mainly concentrated in the region's more advanced countries, and also with no great impact and global orientation.

The Specificities of Latin American Countries

- With respect **to insurance**, the dependence of insurance from colonial countries has limited and delayed the emergence and development of local capabilities.

- The intrusive intervention of the government in the business with the argument of reducing foreign influence has hindered the establishment of a competitive system and the development of solid private insurance markets.

- In Latin America's emerging market countries, business insurance is often unavailable and/or mispriced. The insurance industry in Latin America, including Brazil, still has to deal with low efficiency, low penetration, limited competition and measured pace towards deregulation and liberalization.

- While no one single Latin American country can be included in the category of developed economies, prospects of low inflation and high economic growth provide opportunities to the emerging entrepreneurs. At the same time, the insurance industry is more able to respond to a growing and latent demand.

Brazil

- Brazil is a leader in entrepreneurship, with one in eight adults being an "entrepreneur."

- With respect to insurance, the history of insurance in Brazil confirms the relationship between economic activity, economic growth and insurance. Since the success of stabilization in 1994, the country's economy has been growing steadily, and the performance of the Premiums/GDP ratio over time indicates the strong relationship between insurance and economic growth.

- The intervention of the government that limits the role of markets while trying to reduce uncertainty.

- The relationship between insurance and economic activity occurs in the context of a strong and complementary relationship between the insurance market and the financial market and the interconnection between banking and insurance, i.e. , major banks own the main insurers in Brazil.

- The review of the development of insurance in Brazil shows that the improvement of the institutional context, including that for insurance, is crucial in making insurance companies responsive to economic needs. Further institutional improvements would be able to put to work the potential entrepreneurship related to the existence of a large informal sector.

- Reinsurance and micro insurance constitute the favorable factors for insurance development in the coming years. A liberated reinsurance market is growing and establishing itself following decades of state monopoly. Coupled with the stabilization of the economy and a favorable risk climate in Brazil, the reinsurance available improves the prospects of growth for the insurance industry. The expectation is that capacity, competition and sophistication will boost the development of the insurance market in Brazil and prompt economic activity.

7. USA vs. Brazil

USA and Brazil

- The status of insurance and entrepreneurship in advanced countries and particularly the United States represents a benchmark for emerging market economies and especially Brazil.

- Comparing the findings of the Kauffman research on entrepreneurship in the United States with the GEM findings related to Brazil one can see few similarities between the two countries:

  – Construction and services are sectors that worldwide attract new entrepreneurs;

  – Necessity entrepreneurship, particularly in times of crisis, constitutes a feature increasingly important for developed economies like the United States as people who lose a job start some form of business activity as the best alternative. During the recession of 2008–12 many individuals decided to start a business, i.e., individuals have started sole proprietorships and other non-employee firms.

USA and Brazil

- From the institutional point of view the most important difference is that in Brazil the authorization to operate as an insurer is granted at the federal level. Regulation and supervision are performed at the Federal level. In the United States, the State grants the charter for an insurer to operate and regulation and supervision is at the State level. Coordination among states occurs at the national level with NAIC, the National Association of Insurance Commissioners.

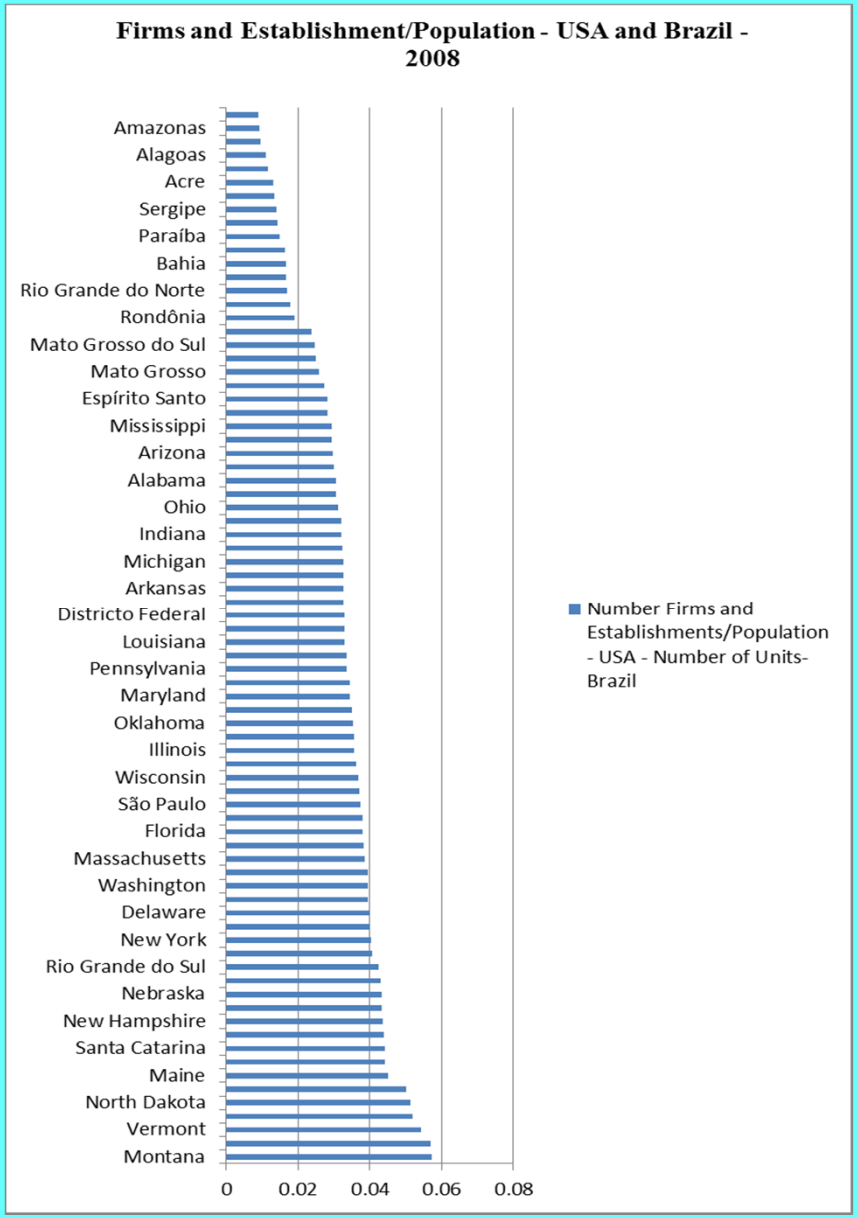
- The share of the insurance industry over GDP is similar between the two countries (in 2011, the share of Insurance industry/GDP is 2.6% in USA and 2.5% in Brazil).

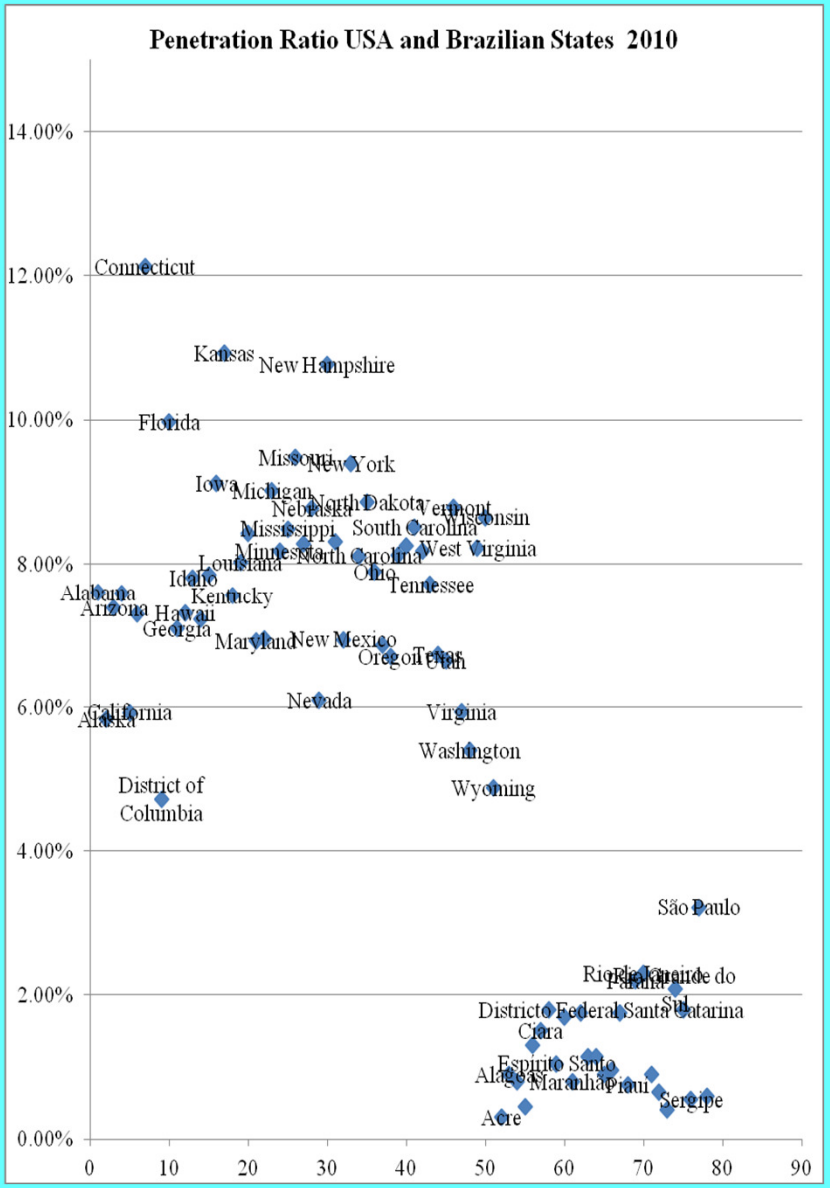
- Both the U.S. and the Brazilian insurance markets are open and competitive with several players. However, in Brazil, insurance companies and banks are very much connected and the largest banks control the main insurance companies. The situation in the U.S. is much different and insurance companies are pretty much independent from banks. The association between banks and insurance companies reduces competition and also threatens the independence of the insurance and the possibility of insurance companies being involved in financial crises.

- The participation of foreign insurance companies in the domestic insurance market is significantly greater in Brazil than in the U.S.

- Penetration ratio in the United States is much greater than that of Brazil, i.e., 12% vs. 3.3% in 2011. This suggests that there is an uneven distribution of insurance products in Brazil, which also implies that an untapped market exists.

USA and Brazil





USA and Brazil

- With respect to entrepreneurship, the Figure on the left shows the percentage of business establishments over the population for the 27 Brazilian states and the 50 States of the United States in 2008. There is some caution to provide a complete interpretation of the data. However, the dynamic Brazilian states of the South of the country have a share of business establishments over the population similar and at times higher than that in many states of the United States. However, the poorest Brazilian states of the North have the lowest percentage of business activity.

- With respect to the insurance markets, Figure on the right compares insurance penetration in the various states of Brazil and of the United States in 2010. The data show how the Brazilian states rank in terms of insurance penetration with respect to the U.S. states. Even the best Brazilian states in terms of penetration ratio, e.g., Saõ Paulo, rank well below the lowest U.S. states, e.g., Wyoming and the District of Columbia. In addition, there are states in Brazil, e.g., Northeastern states and the Amazonia region states, at the bottom, with an extremely low penetration ratio. The figure provides evidence that the insurance industry in Brazil is scarcely developed and presents a significant potential.

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USA and Brazil

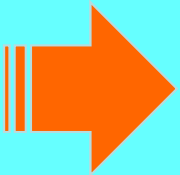
The two figures and particularly the differences in penetration ratio in Brazil allow making some considerations.

- The most important difference between USA and Brazil is less with respect to entrepreneurship than in insurance.
- Brazil is a country with one of the highest levels of inequality and where significant portions of the population still live in poverty. Inequalities are mainly related to states and areas of the county (e.g., North-East) as the right figure shows are reflected in the low insurance penetration.
- Better insurance markets would favor economic activity and entrepreneurship and reinforce the argument that the availability of insurance is a supply problem.
- Public policies should favor open access to financial services particularly for poor people, promote the availability of insurance products directed to the lower segment of the market and provide opportunities for growth.

8. Natural and Human Events and Financial Crisis

Uncontrollable Natural and Human Events and Financial Crisis

- Financial markets are not available during crises
  - Difficult access to financing for Micro and SME Enterprise (MSMEs)
- Sharp decline in capital inflows
- Significant reduction in investment including infrastructure
- Reduction in remittances
- Policy uncertainty
- The category of Unknows unknowns emerge

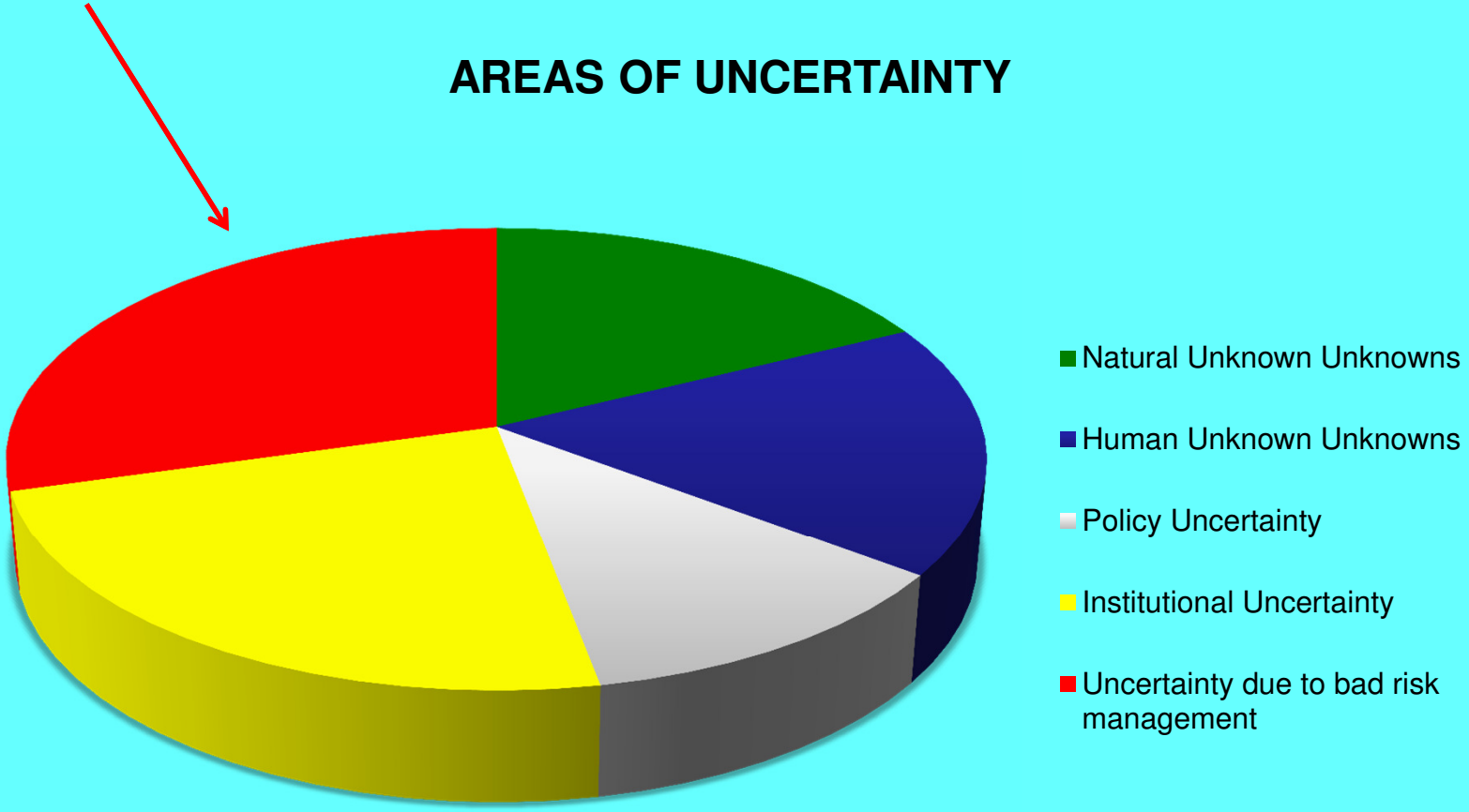


In other words: **Greater Uncertainty**

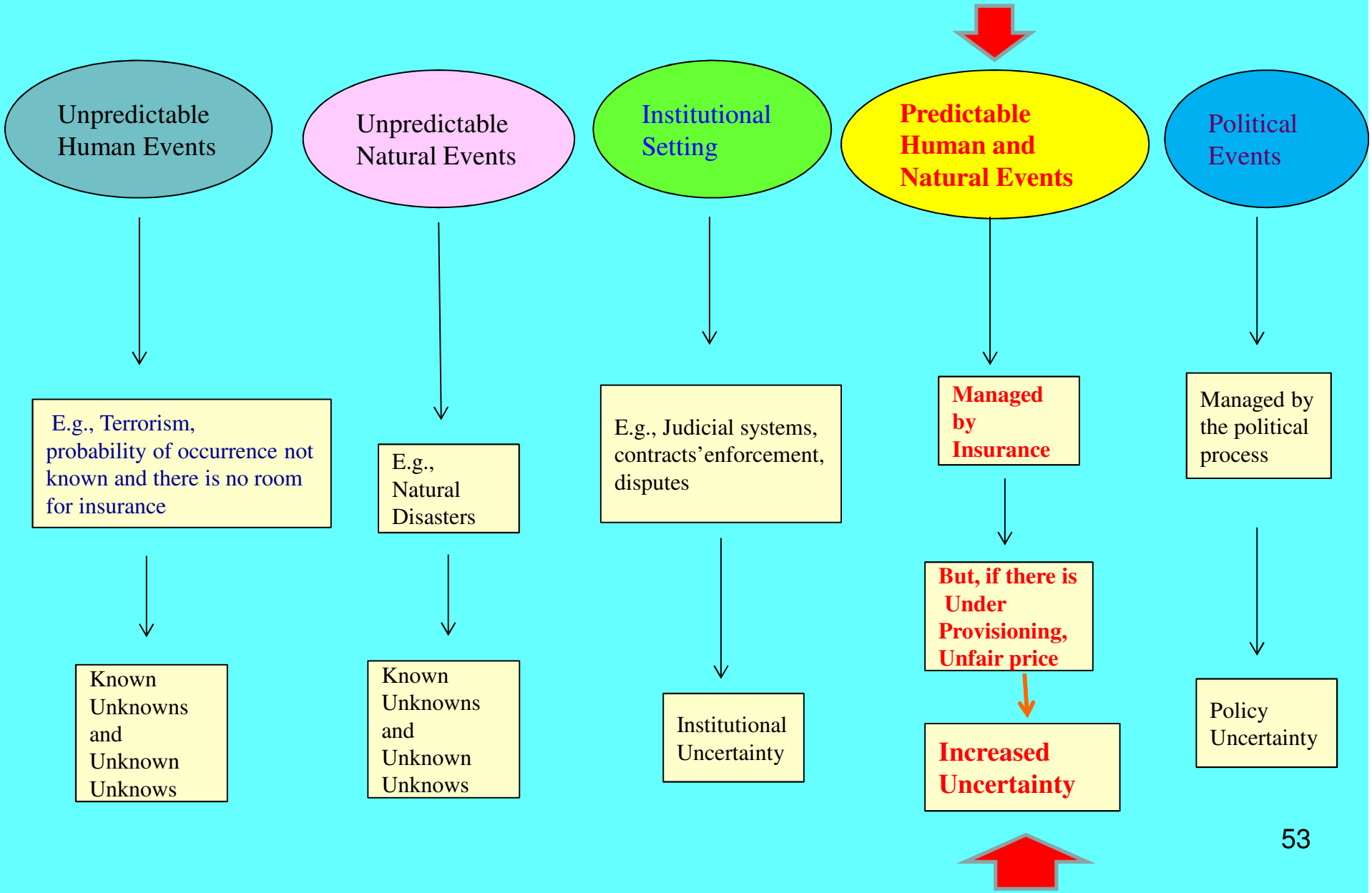
KuU

- The debate between risk and uncertainty can be summarized using the framework of Ralph Gomory (1995). He classifies knowledge into the *K*nown, the *u*nknown and the *U*nknowable, i.e., the *KuU*. The framework includes three categories:
  - (1) known knowns, i.e., things we know that we know;
  - (2) known unknowns, i.e., things that we know we do not know; and
  - (3) unknown unknowns, i.e., things we do not know we do not know.
- In the context of financial risk management, Diebold, Doherty and Herring (2010) also refer to the issue of knowledge as a theory and as a measure. Their framework includes risk, which is measurable; uncertainty, which is not measurable; and unknown unknowns, the unknowable, which we do not even know it exists (Diebold, Doherty and Herring (2010, 2–5).
- This approach constitutes a sophisticated and modern way of expressing the view of Knight about risk and uncertainty adding the dimension of the unknown unknowns, i.e., what we do not even know and we are unable to conceive.

Uncertainty due to bad risk management



Uncertainty, Risk and Entrepreneurship



9. Research Questions

Panel data Brazil and future Global data

Research Question

- The analysis on the role of insurance in economic activity shows that in advanced countries market institutions such as insurance facilitate entrepreneurs. This implies that the level of uncertainty is reduced and transformed into manageable risk. Those entrepreneurs who have access to insurance are more likely to continue in business than those who do not.

- Conversely, in **emerging countries,** the availability of insurance to "entrepreneurs" is limited; uncertainty is greater and individuals are less motivated to undertake initiatives and contribute to economic growth.

- On the basis of the considerations developed above, the research questions to test empirically are:

  - What is the relationship between availability of insurance and entrepreneurship?
  - What is the direction of causality, e.g., which comes first, insurance or entrepreneurship?
  - What is the role of Social Insurance with respect to entrepreneurship?

Hypotheses

The model developed permits to test these hypotheses in Brazil:

- H_1: Does the availability of insurance interact with entrepreneurship under the specification of start-ups?
- H_2: Does a causal relationship between insurance and start-ups exist? And what is the direction of causality?
- H_3: What is the impact of social insurance on start-ups?

10. Analysis:

Fixed and Random Effects

and

Instrumental Variables

The Basic Model for Empirical Test

To test empirically the relationship between insurance and entrepreneurship and the hypotheses, Equation [1] relates entrepreneurship and insurance:

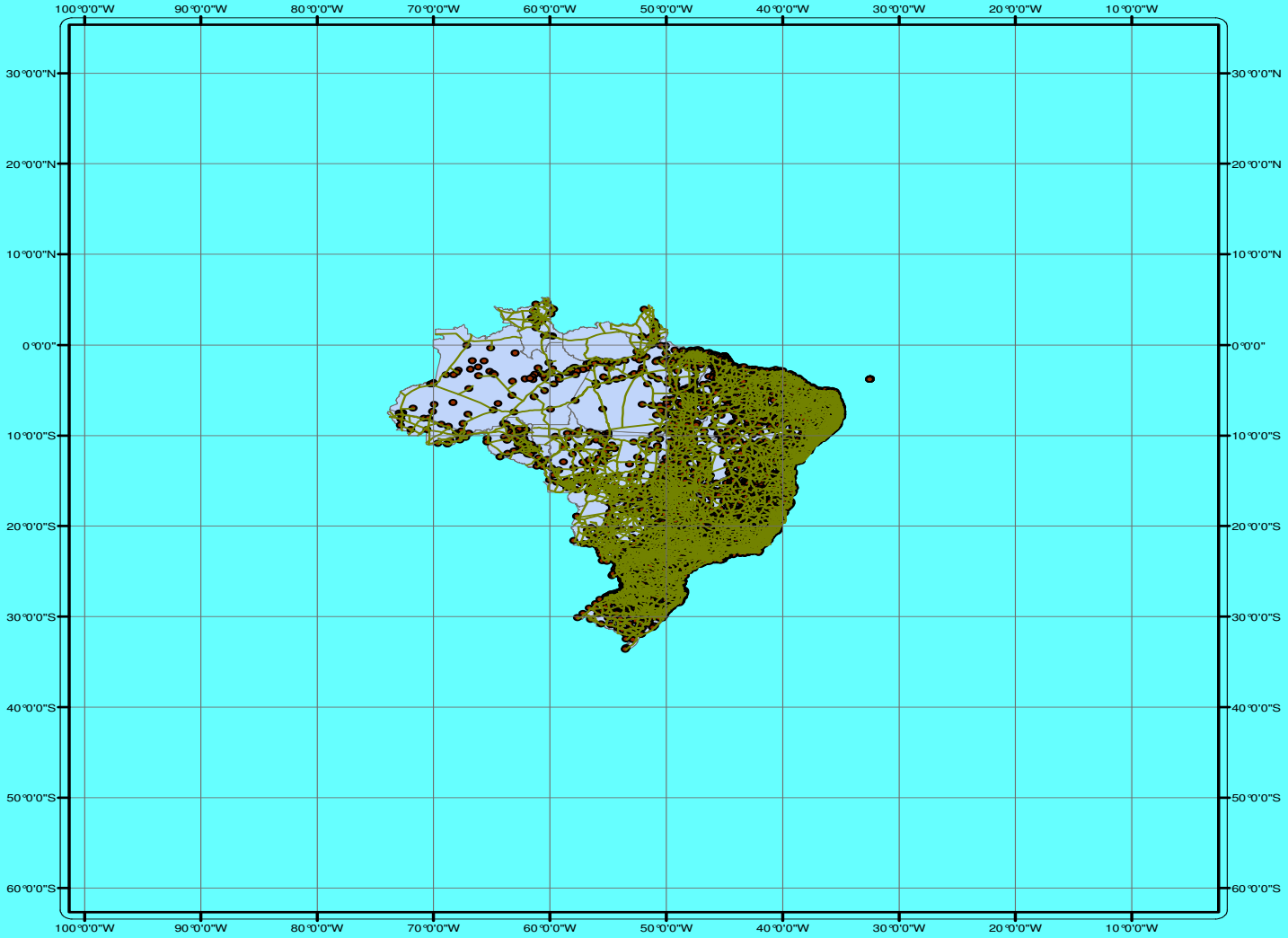
$$Entrepreneurship = a_0 + a_1 Availability\ Insurance + a_2 Social\ Insurance + a_3 Control\ Variables + error \quad [1]$$

The study will also look at the availability of insurance in Equation 1 as part of a dynamic panel, i.e., Simultaneous Equation Model. In this respect, the availability of insurance -in Equation 1 - is dependent on other variables, i.e., Equation 2:

$$Availability\ Insurance = a_0 + a_1 Propensity\ Insurance + a_2 Knowledge\ of\ Insurance + a_3 Institutional\ Setting + a_4 Financial\ Intermediation + a_5 Control\ Variables + error \quad [2]$$

In line with the current literature (Kjosevski 2012; Park and Lemaire 2011), Equation 2 shows the variables that influence the availability of insurance, i.e., the propensity to buy insurance and knowledge of insurance, institutional setting and financial intermediation.

Brazil: A Federal Country



Panel data : 27 States – period 1995-2011
(5906 Cities or Municipalities)

Variables

Variable		Name Variable used in the Brazilian Dataset	Comment
Dependent Variable	Entrepreneurship	Totnumberstartups	Total Number of Startups
Main Independent Variable	Availability Insurance	Penetration2__Insavail2	Penetration Ratio
Dependent Variable	Social Insurance	GastosSaudePercapita	Public Expenditure for Health
		ContrPrevidenzaTrabajo	Contribution of Workers to Social Security
Control Variables	Institutional Setting Variables	Taxamortinfpermil1	Infant Mortality
		Taxtrabinf	Rate of Infantile workers as percentage of population
		MortHomicpermilhab	Coefficient of death by Homicide - Number of dead people dead because homicides by 1000 people.
	Propensity Insurance	PropIns22	Illiteracy for 15 years old or older
		PropenInsurance3	Years of study for 25 years older or more
	Knowledge of Insurance	Density	Premium over Population
	Financial Intermediation	fi	Level of Financial Intermediation
		figdp	Financial Intermediation per capita
Dummies	Dummy 1	Dummy1 (0-1, Centre 0)	Dummy 1 (0=South and Center; 1=North)
	Dummy 2	Dummy2 (0-1-2)	Dummy 2 (0=South; 1=North; 2=Center)
	Dummy 3	Dummy3 (0-1, Center 1)	Dummy 3 (0=South; 1=North, Center)
Interaction	Insurance and Financial Intermediation	Interinsfi	Interaction between Insurance and Financial Intermediation

11. Results

Random Effects

- Following the various steps of the analysis of panel data, the Hausman test indicates that random effects are most appropriate.

- The rationale behind a random-effects model - differently from the fixed-effects model - is that the variation across the Brazilian states is assumed to be random and uncorrelated with the predictors or independent variables (x_{it}) included in the model; i.e., the error term is not correlated with the predictors.

  - "The crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model"(W. H. Greene 2008, 183; Torres-Reyna 2011, 25).

- Thus, with random effects, there are differences across States that influence the dependent variable Start-ups.

Random Effects

Random Effects - Robust						
Number of Obs. =	216					
Group variable =	statebra		Number of groups =		27	
R-sq:	within	=	0.0472	Obs per group	min =	8
	between	=	0.3923		avg =	8
	overall	=	0.3438		max =	8
					Wald Chi2	64.66
	corr(u_i Xb) =	0	Assumed		Prob>F =	0.00
(Std. Err. Adjusted for 27 clusters in statebra)						
logtotnumbrstartupsPCA	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
logPenetration2__Insavail2	0.09201	0.03726	2.47	0.01	0.01897	0.16504
logGastosSaudePercapita	-0.01362	0.02390	-0.57	0.57	-0.06046	0.03321
logTaxtrabinf_2	-0.15682	0.02881	-5.44	0.00	-0.21330	-0.10034
logfigdp	0.11607	0.08942	1.3	0.19	-0.05918	0.29133
loginteractionInsfinFIPremiumGDP	-0.18353	0.08386	-2.19	0.03	-0.34790	-0.01916
_cons	-6.14777	0.23226	-26.47	0.00	-6.60299	-5.69255
sigma_u	|	0.3077455				
sigma_e	|	0.1466769				
rho =	0.81488679	(fraction of variance due to u_i)				

Random Effects

- Given that the $p > 0.05$, small chi2, the Ho is not rejected and based on the results of the Hausman test, the best model - under the specification with the financial intermediation and interaction variables - is the random-effects model (as it is the case for the basic model; see Table).

- Penetration ratio is significant and with the expected sign.
- Institutional setting is significant and with the expected sign.
- Social insurance is negative but highly insignificant.
- Financial intermediation is positive, but not significant.
- Interaction term between insurance and financial intermediation is significant.

- As noted above, in line with what Arena (2006) found in his study on the relationship between insurance and economic growth, the coefficient of the interaction term is negative. Thus as Arena (2006, 12–16) shows in his study, the results suggest that financial intermediation (in the case of Brazil, the variable of financial intermediation does not include the stock market) and insurance measures (life and non–life premiums to GDP) are **substitutes** rather than complements.

Random Effects

- The interpretation of the coefficients of the regressors, in a random-effects model, takes into account effects from both the within-entity and between-entity; i.e., it represents the average effect of *X* (*Penetration*) over *Y (Start-ups)* when *X* (*Penetration*) changes across time and between states by one single unit. The interpretation of the coefficients in this case follows the rules of log-log transformation (Table 27).

- Adding an interaction between penetration and states does not change the model significantly, only pulling up the coefficient of penetration. This implies that there is no apparent pattern of penetration related to the states.

Random Effects

- A model that does not include the variable for financial intermediation was tested.
- In that case financial intermediation can be considered the unobserved effects that are different across entities and have an impact over the variable Start-ups.
- Considering that when the financial intermediation is included in the model, it is not significant, then one could argue that financial intermediation is not the only unobserved effect.
- This circumstance warrants further investigation and also a more precise definition and measures of the existing variables in the model, e.g. institutional setting; social insurance.

Instrumental Variables and Dynamic Panel-Data Models Estimator

- The investigation can advance further introducing instrumental variables (IV) and dynamic panel data with simultaneous equations.

- Instrumental variables are normally used to deal with the issue of endogeneity and causal relationship.

- An instrument is a variable that does not itself belong in the explanatory equation and is correlated with the endogenous explanatory variables, conditional on the other covariates. Instruments are (i) uncorrelated with the error terms and (ii) correlated with the independent variable (University of California 1999).

- Instrumental measures for the study are financial intermediation (measured by *figdp*); interaction term of insurance and financial intermediation (measured by *logintinsurfin, loginteractioninsurancefin loginteractionInsfinFIPremiumGDP*); knowledge of insurance markets (measured by density, i.e., premiums over population); and propensity to buy insurance and risk aversion (measured by *PropIns22* and *PropenInsurance3*) included in Equation 2.

Instrumental Variables and Dynamic Panel-Data Models Estimator

- Based on the results for the section on random effects, the basic model is random effects:
- Start-ups = Penetration + Social Insurance + Institutional Setting.
- This corresponds to:

  logtotnumbrstartupsPCA = logPenetration2__Insavail2 +logGastosSaudePercapita +logTaxtrabinf_2 (or logMortHomicpermilhab)

- The instrument variable and the system of simultaneous equations are instrumental for verifying the endogeneity of the penetration ratio and related it to instruments, i.e., financial intermediation and interaction (*fi* and *logintinsurfin*), propensity (*PropIns22* and *PropenInsurance3*) and availability of insurance (*density*).

- Two static estimators, i.e., *xtivreg* and *xthtaylor*, and a dynamic estimator *xtabond* (or *xtabond2*) are used.

IV Estimators

- Three estimators are used

  - **The *xtivreg* Estimator;**
  - **The *xthtaylor* Estimator; and**
  - **The *xtabond* Estimator**

The *xtivreg* Estimator

- Penetration is endogenous and determined by financial intermediation, risk aversion (or propensity to buy insurance) and knowledge and diffusion of insurance.

- The random-effects model to test is:

xtivreg *logtotnumbrstartupsPCA logGastosSaudePercapita logTaxtrabinf_2*

(logPenetration2__Insavail2 = logfigdp logPropIns22 logDensity), re first vce

In the regression, *logPenetration2__Insavail2* is the instrumented variable and *logfigdp logPropIns22 logDensity* are the instruments.

The *xtivreg* Estimator

First-stage G2SLS Regression						
		Number of obs =	215			
		Wald chi(5) =	1604			
		Prob> chi2 =	0.000			
logPenetration2__Insa~2	**Coeff.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. interval]**	
logGastosSaudePercapita	-0.24611	0.02395	-10.28	0.000	-0.29305	-0.19917
logTaxtrabinf_2	0.04993	0.03262	1.53	0.126	-0.01400	0.11386
logfigdp	0.10439	0.05498	1.90	0.058	-0.00337	0.21214
logPropIns22	0.32234	0.06444	5.00	0.000	0.19604	0.44865
logDensity	0.68337	0.02182	31.32	0.000	0.64060	0.72613
_cons	-6.89147	0.27517	-25.04	0.000	-7.43080	-6.35214
G2SLS random effects regression				Number of obs. =	215	
Group variable :	statebra			Number of groups =	27	
R-sq:	within =	0.0415		Obs per group	min =	7
	between =	0.2915			avg =	8
	overall =	0.2554			max =	8
					Wald Chi2 (3) =	18.16
corr(u_i , X)= 0 (assumed)					Prob> Chi=	0.0004
logtotnumbrstartupsPCA	**Coeff.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. interval]**	
logPenetration2__Insavail2	0.10801	0.04269	2.53	0.011	0.02434	0.19169
logGastosSaudePercapita	-0.02742	0.02734	-1.00	0.316	-0.08101	0.02618
logTaxtrabinf_2	-0.16321	0.04585	-3.56	0.000	-0.25308	-0.07334
_cons	-5.82478	0.28385	-20.52	0.000	-6.38112	-5.26844
sigma_u	0.31274					
sigma_e	0.14674					
rho	0.81957	(fraction of variance due to u_i)				
Instrumented:		logPenetration2__Insavail3				
Instruments:		logGastosSaudePercapita, logTaxtrabinf_2, logfigdp, logPropIns22, logDensity				

The *xtivreg* Estimator

- In the IV estimation, *xtoverid* conducts a test on whether the excluded instruments are valid IVs or not (i.e., whether they are uncorrelated with the error term and correctly excluded from the estimated equation). According to the result, the Ho is not rejected, and therefore the **instruments are valid and uncorrelated with the error** term: Sargan test, *xtoverid* - Test of overidentifying restrictions: 5.161 Chi-sq (2) ***p*-value = 0.0758**

- The Table shows that the significance and sign of the coefficients are those expected. With respect to the second-stage regression (G2SLS random effects regression with start-ups as the dependent variable,
  - **insurance penetration** has a positive impact on start-ups;
  - **social insurance** has a negative impact on start-ups, but it is not significant, even though social insurance is highly significant and with the negative sign with respect to penetration (see the first-stage regression);
  - **institutional setting** has a positive significant effect on start-ups and with the expected sign.
- In the first-stage equation (first-stage G2SLS regression), social insurance is highly significant and its increase leads to a decline of regular insurance measured by penetration; financial intermediation is significant at the 7.5% level; propensity to buy insurance, or risk aversion, is positive (less risk aversion favors start-ups) and significant; and knowledge of insurance (density) is highly significant.

The *xtivreg* Estimator

- If a dummy is included, penetration becomes insignificant, meaning that explanations are at the individual state level.

- Including different variables for the interaction between insurance and financial intermediation, e.g., l*oginteractionInsfinFIPremiumGDP*, and for the propensity to buy insurance and risk aversion, e.g., *logPropenInsurance3*, gives similar results.
- The Hausman test also indicates that the random-effects model is preferred to the fixed-effects model.

- **xtivreg** *logtotnumbrstartupsPCA logGastosSaudePercapita logTaxtrabinf_2 Dummy1 (logPenetration2__Insavail2= logfigdp logPropIns22 logDensity), re first*
  - Test of over-identifying restrictions: Sargan-Hansen statistic 1.933 Chi-sq (2); *p*-value = 0.3804.

- **xtivreg** *logtotnumbrstartupsPCA logTaxtrabinf_2 logGastosSaudePercapita (logPenetration2__Insavail2 = logGastosSaudePercapita logPropenInsurance3 loginteractionInsfinFIPremiumGDP logDensity), re first*
  - Test of over-identifying restrictions: Sargan-Hansen statistic 2.880 Chi-sq (2); *p*-value = 0.2370.

The *xthtaylor* Estimator

- The analysis has shown that the states constitute a very significant factor. When a fixed-effects (FE) model is assumed in panel data, the FE or FD (first difference) methods provide consistent estimates only for time-varying regressors but not for time-invariant regressors; i.e., the time-invariant regressors are automatically deleted and they cannot be estimated by ordinal methods like FE.

- The random-effects models analyzed so far (Tables 15 and 17) have examined the impact of states. However, a dummy for states has not been included in the basic models of Tables 15 and 17. We can use the Hausman-Taylor estimator, *xthtaylor*, a transformed RE model with IVs (Rabe-Hesketh and Skrondal 2012) to distinguish between time-varying and time-invariant regressors.

- The model for the xthtaylor estimator is:

  xthtaylor *logtotnumbrstartupsPCA logPenetration2__Insavail2 logGastosSaudePercapita logintinsurfin logPropenInsurance3 Dummy1, endog (logPenetration2__Insavail2 logintinsurfin logPropenInsurance3)]*

- To estimate l*ogtotnumbrstartupsPCA t*he model uses a number of regressors, where *logGastosSaudePercapita, logTaxtrabinf_2 and logPropenInsurance3* are exogenous time-varying regressors; *logPenetration2__Insavail2 and logintinsurfin* are endogenous time-varying regressors; *Dummy1* is e exogenous time-invariant regressors; and *logPropenInsurance3* can be regarded as an endogenous time-invariant regressor.

The *xthtaylor* Estimator

- Time-invariant variables such as *Dummy1* and *logPropenInsurance3* can be consistently estimated with the *xthtaylor* estimator as well as *logPenetration2__Insavail2 and logintinsurfin*, which are endogenous time-varying regressors. In particular, when determining the impact of *logPropenInsurance3* on *logtotnumbrstartupsPCA*, the Hausman-Taylor method consistently estimates the coefficient of *PropenInsurance3,* the time-invariant endogenous variable.

- This *xthtaylo*r estimator needs a stronger assumption that a specified subset of the regressors (IVs) is uncorrelated with the fixed effect or individual effect terms (a_i), and that all regressors are uncorrelated with the idiosyncratic error terms (e_{it})

- The assumptions can be checked running a correlation among the residuals FE and the variables of interest.

- The assumptions are tested with the *xtoverid*, i.e., to test whether the excluded instruments are valid IVs or not (i.e., whether they are uncorrelated with the error term and correctly excluded from the estimated equation): Sargan-Hansen statistic 2.275 Chi-sq (3); p-value = 0.1314, the Ho is not rejected, and therefore the instruments are valid and uncorrelated with the error term.

The *xthtaylor* Estimator

Hausman-Taylor Estimation				Number of obs. =		228
Group variable :	statebra			Number of groups =		27
				Obs per group	min =	7
					avg =	8.4
					max =	9
Random effects u_i ~ i.i.d.					Wald Chi2 (3) =	51.34
					Prob> Chi=	0.000
logtotnumb~A	**Coeff.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. interval]**	
TVexogenous						
logGastosS~a	-0.03092	0.02847	-1.09	0.278	-0.08672	0.02488
TVendogenous						
logPenetra~2	0.20214	0.09578	2.11	0.035	0.01441	0.38987
logintinsu~n	-0.18496	0.07650	-2.42	0.016	-0.33489	-0.03502
logPropenI~3	0.40358	0.18587	2.17	0.030	0.03928	0.76788
TIexogenous						
Dummy1	-0.63019	0.12053	-5.23	0.000	-0.86643	-0.39394
_cons	-6.78146	0.41092	-16.5	0.000	-7.58684	-5.97608
sigma_u	0.25301					
sigma_e	0.14476					
rho	0.75337	(fraction of variance due to u_i)				
Note:	TV refers to time varying; TI refers to time invariant.					

The *xthtaylor* Estimator

- Penetration is significant and with the expected positive sign, which implies a positive impact on start-ups.
- Interaction between financial intermediation and insurance is significant and with the negative sign, as we found in Arena (2006).
- Social insurance has a negative sign but is not significant.

- The variable for the institutional setting (*logTaxtrabinf_2*) is not included because institutional setting is already part of the model with *logPropenInsurance3* and also with *Dummy1*. In fact, the inclusion of the institutional setting (*logTaxtrabinf_2*) reduces the coefficient of penetration and interaction between financial intermediation and insurance while both remain significant. *Dummy1* variable is significant and with the expected sign, which indicates the role that states play for insurance and entrepreneurship.

- Propensity to buy insurance (*logPropenInsurance3*), measured by the level of education, can be considered as an exogenous variable in the model and still the assumptions are tested (with the *xtoverid*) whether the excluded instruments are valid IVs or not, i.e., whether they are uncorrelated with the error term and correctly excluded from the estimated equation.

- The model is *xthtaylor logtotnumbrstartupsPCA logPenetration2__Insavail2 logGastosSaudePercapita logintinsurfin logTaxtrabinf_2 logPropenInsurance3 Dummy1, endog (logPenetration2__Insavail2 logintinsurfin) where logPropenInsurance3* is considered exogenous. The Sargan-Hansen statistic is 5.964 Chi-sq (3); *p*-value = 0.1134, which means that the Ho is not rejected and the IV are valid and uncorrelated with the error term.

The *xtabond* Estimator

- The *xtabond* is a dynamic estimator as it transforms the model in first differences (Mileva 2007). If a variable *x* is an explanatory variable of the model (whether exogenous or predetermined) - *xtabond* - takes it in first differences of the variables.
- The estimator is also designed for small-*T*, large-*N* panels. In large-*T* panels, a shock to the country's fixed effects, which shows in the error term, will decline with time. The model can be executed with the original syntax *xtabond* or using the *xtabond2* (Roodman 2006).

- The model below examines the impact of insurance on start-ups using the Brazilian data set:

xtabond2 *logtotnumbrstartupsPCA l.logtotnumbrstartupsPCA logPenetration2__Insavail2 logGastosSaudePercapita logintinsurfin logTaxtrabinf_2, gmmstyle (logPenetration2__Insavail2 logintinsurfin logtotnumbrstartupsPCA) iv (logTaxtrabinf_2 logPropIns22 logDensity Year) nolevel twostep robust* **[xta2]**

The *xtabond* Estimator

- The command *xtabond2* is followed by the dependent variable (*totnumbrstartups*) and the list of all right-hand-side variables, which includes the lag of *logTotnumberstartupsPCA*. After the comma, there are two lists of variables: (i) gmm (*Penetration2__Insavail2, figdp, density*) lists the endogenous variables, which are instrumented with GMM-style instruments, i.e., lagged values of the variables. The second list of explanatory variables, iv, lists all exogenous variables (*Taxtrabinf_2 GastosSaudePercapita*) as well as the additional instrumental variables, which are not part of the equation and, therefore, are not listed before the comma in the Stata command; i.e., for the included exogenous variables the option tells Stata to use the variables themselves as their own instruments (Mileva 2007).

- After the comma, two lists of variables are listed: gmm ( ) (or gmmstyle ( ) lists the endogenous variables (*logPenetration2__Insavail2 logintinsurfin logtotnumbrstartupsPCA*), which are instrumented with GMM-style instruments, i.e., lagged values of the variables in levels.

- The second list of explanatory variables, iv (*variables*) (or ivstyle (*variables*)), lists all strictly exogenous variables (*logTaxtrabinf_2 logPropenInsurance3 logDensity Year*) as well as the additional instrumental variables (*logPropenInsurance3 logDensity*), which are not part of equation **[xta2]** and, therefore, are not listed before the comma in the Stata command. This option for the included exogenous variables tells Stata to use the variables themselves as their own instruments.

The *xtabond* Estimator- Dynamic panel-data estimation. Two steps difference GMM

Dynamic panel-data estimation Two steps difference GMM						
Group variable :	statebra			Number of obs. =	187	
Time variable :	Year			Number of groups =	27	
Number of instruments =	182			Obs per group		
Wald Chi2 (3) =	14.93			min =	6	
Prob> Chi =	0.011			avg =	6.93	
				max	7	
logtotnumb~A	**Coeff.**	**Corrected Std. Err.**	**z**	**P>|z|**	**[95% Conf. interval]**	
L1.logtotnumbrstartupsPCA	0.08280	0.14163	0.58	0.559	-0.19479	0.36039
logPenetration2__Insavail2	0.21205	0.09544	2.22	0.026	0.02500	0.39910
logGastosSaudePercapita	-0.00670	0.02554	-0.26	0.793	-0.05677	0.04337
logintinsurfin	-0.13799	0.08798	-1.57	0.117	-0.31042	0.03444
logTaxtrabinf_2	-0.11346	0.03810	-2.98	0.003	-0.18814	-0.03878
Instruments for first difference equation						
Standard						
D.(logTaxtrabinf_2, logPropIns22,logDensity, Year)						
GMM-type (missing=0 separate instrument for each period unless collapsed)						
L(1/16).(logPenetration2__Insavail2, logintinsurfin logtotnumbrstartupsPCA)						
Arellano-Bond test for AR(1) in first difference	z =	-2.15	Pr>z	0.032		
Arellano-Bond test for AR(1) in first difference	z =	0.94	Pr>z	0.347		
Sargan test of overid restrictions (Not robust but not weakened by many instruments):	chi2(177) =	190.36	Prob >chi2 =	0.233		
Hansen test of overid restictions (Not robust but not weakened by many instruments) :	chi2(177) =	25.9	Prob>chi12 =	1.000		
Difference-in-Hansen tests of exogeneity of instruments subsets iv(logTaxtrabinf_2, logPropIns22, logDensity, Year):						
Hansen test excluding group	chi2(173) =	25.96	Prob>chi2 =	1.000		
Difference (null H = exogenous)	chi2(4) =	-0.06	Prob>chi2 =	1.000		

The *xtabond* Estimator- Dynamic panel-data estimation. Two steps difference GMM

- Penetration is significant and with the expected positive sign, which implies that insurance has a positive impact on start-ups.
- Interaction between insurance and financial intermediation has a negative sign implying substitution, but it is not significant.
- Institutional setting is significant and with the expected sign.
- Social insurance is negative, but not significant.

- The Wald test rejects the Ho that all regressors are equal to 0.
- The Sargan test has a null hypothesis of "the instruments as a group are exogenous" (Baum 2006, 201). Therefore, the higher the *p*-value of the Sargan statistic the better it is. This is the case with p= 0.23. In robust estimation, Stata reports the Hansen *J*-statistic instead of the Sargan with the same null hypothesis (Mileva 2007).

- The Arellano-Bond test for autocorrelation has a null hypothesis of no autocorrelation and is applied to the differenced residuals. The test for AR (1) process in first differences usually rejects the null hypothesis, but this is expected since the differences include the errors. In the case of the model, the first order of autocorrelation cannot be rejected (Mileva 2007). The test for AR (2) in first differences is more important because it will detect autocorrelation in levels and the autocorrelation is rejected.
- The serial autocorrelation can be tested with Wooldridge test for autocorrelation in panel data

  H0: no first-order autocorrelation Prob > F = 0.8689, i.e., the Ho of no first-order autocorrelation is not rejected.

Causality

- The Granger causality test on time-series permits to investigate whether lagged values of one variable help in forecasting another variable, i.e., the causal relationship between insurance and start-ups and the direction of causality and/or the bidirectional causality.

- The same concept applies to panel data, but with some limitations. The command in Stata is *gcause2* and works on a single unit of a panel including the "if statement" (e.g., if state = 5). In other words, in a panel context, one variable could Granger -cause another in one panel and not in another.

- The variables of interest are insurance (*Penetration2__Insavail2*) and start-ups (*Totnumberstartups*).

- Before performing the Granger causality test, the two variables need to be checked for unit root (if a series has a unit root means that has more than one trend) against the alternative that the series is stationary.

- The variable *Penetration2__Insavail2* does not contain unit root in any specifications (log, lag, first differences) and the series is stationary. The variable *Totnumberstartups* does not have unit root with the Harris-Tzavalis test and also the first differences of the variable *Totnumberstartups* do not have a unit root and the series are stationary. Table below reports the results of the test.

Granger Causality – Insurance Entrepreneurship

Granger Causality Penetration Ratio and Number of Startups				
#	State	Direction of Causality From Penetration to Number Startups	Level of significance	Region
1	Acre	yes		Norte
2	Alagoas			Nordeste
3	Amapá	yes		Norte
4	Amazonas			Norte
5	Bahia			Nordeste
6	Ceara	yes		Centro-Oeste
7	Districto Federal	yes	10	Nordeste
8	Espírito Santo	yes		Sudeste
9	Goiás			Centro-Oeste
10	Maranhão			Nordeste
11	Mato Grosso			Centro-Oeste
12	Mato Grosso do Sul	yes		Centro-Oeste
13	Minas Gerais	yes	15	Sudeste
14	Pará	yes		Norte
15	Paraíba			Nordeste
16	Paraná			Sul
17	Pernambuco	yes		Nordeste
18	Piauí	yes		Nordeste
19	Rio de Janeiro			Sudeste
20	Rio Grande do Norte	yes	12	Nordeste
21	Rio Grande do Sul			Sul
22	Rondônia			Norte
23	Roraima			Norte
24	Santa Catarina	yes		Sul
25	São Paulo			Sudeste
26	Sergipe	yes		Nordeste
27	Tocantins			Norte

Granger Causality – Insurance Entrepreneurship

- The results show that Insurance (penetration ratio) Granger causes entrepreneurship (total number of start-ups) in 13 states (in one case, the *p*-value is at 15%).

- In all the states, the reverse causality, i.e., start-ups Granger cause insurance is rejected. According to the analysis and the results.

- The causality tests show evidence that in various Brazilian states and particularly those less advanced of North and Northeast, insurance "Granger causes" start-ups. On the other hand, there are no states in which start-ups "Granger cause" insurance. Under these circumstances, there is ground to state that insurance has a substantial casual impact on the willingness of the entrepreneur to start a business.

Gap Analysis

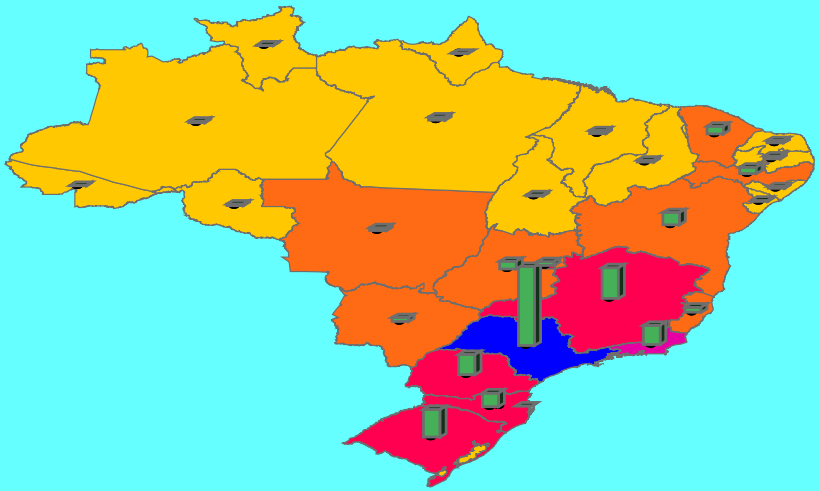
Measure of Insurance over time for Brazilian States - Gap Analysis 2001-2011						
#	State	Region	Penetration Ratio Gap	Density Gap	Entrepreneurship (Start ups) Gap	Entrepreneurship (Start ups) per capita Gap
1	Acre	Norte	0.002524843	42.7524568	553	0.000285872
2	Alagoas	Nordeste	0.002317355	54.11882757	565	-6.5948E-05
3	Amapá	Norte	0.003969028	47.46632697	727	7.76109E-05
4	Amazonas	Norte	0.004882035	97.33121069	1285	-0.00012256
5	Bahia	Nordeste	-0.002527168	75.19120262	7319	0.000244336
6	Ceara	Centro-Oeste	0.008977216	100.8605095	-647	-0.000554136
7	Districto Federal	Nordeste	0.005038904	770.2044568	5114	0.000776301
8	Espírito Santo	Sudeste	0.003626831	175.0058312	2279	8.76768E-05
9	Goiás	Centro-Oeste	-0.01924774	151.5340102	8433	0.000717285
10	Maranhão	Nordeste	0.001573751	41.47642987	-265	-0.000293323
11	Mato Grosso	Centro-Oeste	0.001125761	170.2217395	6215	0.001486206
12	Mato Grosso do Sul	Centro-Oeste	0.009548655	220.7169831	-1260	-0.001311684
13	Minas Gerais	Sudeste	0.005752646	208.905433	-4294	-0.000724342
14	Pará	Norte	0.002676493	58.1528125	4878	0.00428811
15	Paraíba	Nordeste	0.005820973	60.63253126	1484	0.000246536
16	Paraná	Sul	0.006116515	316.0142697	8703	0.000218446
17	Pernambuco	Nordeste	0.001174502	119.1972954	1408	-0.000123642
18	Piauí	Nordeste	0.006816895	45.38398022	1446	0.000331288
19	Rio de Janeiro	Sudeste	-0.006881261	320.2763794	975	-0.000271722
20	Rio Grande do Norte	Nordeste	0.005114865	73.44596816	2076	0.000350388
21	Rio Grande do Sul	Sul	0.005942791	306.5051215	-10939	-0.001677328
22	Rondônia	Norte	0.005145245	89.43460599	100	-0.000440754
23	Roraima	Norte	0.002942883	45.3563709	-256	-0.002072518
24	Santa Catarina	Sul	0.005266279	307.8941307	-998	-0.00125371
25	São Paulo	Sudeste	0.00933039	619.3657218	38054	0.000247678
26	Sergipe	Nordeste	0.002163011	46.45453587	940	0.000190082
27	Tocantins	Norte	0.004846891	61.61009997	506	-0.000170445

Gap Analysis

- The data for the various measures of entrepreneurship and insurance have a spatial dimension and can be mapped representing the measures of penetration and entrepreneurship, at the beginning (1995) and at the end (2011) of the period showing the evolution and the differences over time.

- The gaps for insurance and entrepreneurship show the progress over time of these measures by each state of Brazil.

Insurance premium and number of companies in each state



Results - 1

- The results of the regressions respond to the first part of the research questions in the sense that there is evidence of a strong relationship between availability of insurance and start-ups. Also, insurance favors start-ups according to the dynamic model. There is also evidence that in various Brazilian states insurance Granger causes start-ups, while the reverse direction (from start-ups to insurance) is not supported.

- The study is in line with Cole, Gine', and Vickery (2012) – survey in India- that when people have substantial levels of risk coverage through the provision of insurance, they will adjust their investment decisions toward more profitable and riskier initiatives (i.e., crops).

Results - 2

- Given the transformation of independent and dependent variables, i.e., both logged, looking at the random effects model with the coefficient reported on the Table, the implication of the coefficient 0.09201 for the penetration ratio is that if the penetration ratio increases by 10%, start-ups increase by about 0.87 %; if penetration ratio decline by 10% start-ups decrease by about 0.96%.

- This implies that the development of insurance markets by itself would need a big jump in the supply of insurance policies to generate a substantial increase in start-ups. It confirms that a series of policies in various areas are needed, one of which is developing insurance markets, but insurance alone cannot dix all the problems.

Results - 3

The results about the role of insurance and those related to causality indicate that different conditions in each of the 27 Brazilian states represent a significant explanatory factor.

In other words, the role of insurance over start-ups has a different impact depending on Brazilian state, with the entrepreneurship of less advanced states in the North of the country benefitting more from the availability of insurance.

The between effects better explains the role of Brazilian states over time.

Results - 4

- With respect to the second part of the research questions, there is conflicting evidence about the role of **social insurance** on entrepreneurship in Brazil under the specification of start-ups. In some cases, social insurance (*logGastosSaudePercapita*) appears to have a negative impact on start-ups, i.e., increased social security implies greater start-ups. However, the values are not significant.

- Institutional setting (*logTaxtrabinf_2*) has a positive impact on start-ups.

- With respect to the role of financial intermediation, the results show that the interaction between insurance and financial intermediation (*logintinsurfin*) has normally a significant effect. In line with Arena (2006), insurance and financial intermediation are substitute. Financial intermediation is linked to the insurance and can determine problems of endogeneity. However, the IV models show that financial intermediation can effectively operate as an instrument for insurance.

Results - 5

- The inclusion in the models of the instrumental variables and with the Arellano-Bond dynamic panel data analysis confirm that insurance (penetration ratio) has a significant influence over start-ups.

- The simultaneous equations' model confirms that financial intermediation, propensity to buy insurance and knowledge of insurance are valid instruments.

Results: Technical note on interpretation of log transformation

- Given the transformation of independent and dependent variables, i.e., both logged—and considering for simplicity only the relationship between penetration ratio and number of start-ups—multiplying the original independent variable (i.e., penetration ratio) by the natural number *e*, will multiply the original dependent variable (number of start-ups) by e^b. For the other variables that are also logged, the same type of calculation applies.

- Any proportional change in the independent variable is associated with a proportional change in the dependent variable, and the coefficient *b* represents the elasticity. To get the proportional change in the dependent variable associated with an x% increase in the independent variable, calculate a = log ([100+x]/100) and take e^{ab}. The predicted proportional change can be converted to a predicted percentage change by subtracting 1 and multiplying by 100.

- In practical terms, looking at the fixed effects model with the coefficient reported on Table of the random effects above, the implication of the coefficient 0.09201 for the penetration ratio is that if the penetration ratio increases by 10%, start-ups increase by about 0.87 %; if penetration ratio decline by 10% start-ups decrease by about 0.96% , i.e., start-ups will be multiplied by *e*, roughly 2.71828, to the power of the coefficient 0.09201 multiplied by the log of the increase (or decrease) of the penetration ratio.

12. Conclusions: Policy and Research Implications

Policy Implications

- From the point of view of policy implications, the study stresses the role that insurance plays in supporting start-ups and entrepreneurship in Brazil and possibly in emerging market countries.

- In Brazil- and in Latin America- insurance markets are still underdeveloped, with significant differences among countries and remarkable potential. Demand in the region for insurance is emerging in the private sector, among insurance companies, regulators and supervisors, and in the agriculture sector. Consequently, policymakers should stimulate policies to improve the supply of insurance and its delivery as part of the goal of creating a favorable environment for entrepreneurs and spurring economic growth.

- Given the role that wealth plays to spur entrepreneurship (i.e., wealthier people are more likely to undertake entrepreneurial activities) and insurance (wealthier people are less risk averse and thus more prone to demand insurance), one of the objectives of public policy would be to realize **the enunciation of De Soto (Soto 2003) to recognize the value of property** (and property rights in general) in Latin America that will rise wealth and have positive effects on entrepreneurship and insurance.

Policy Implications

- The significant role that the institutional setting and individual Brazilian states play reinforces the need of policies tailored to specific situations. The findings of the study complement the perspective of Acs and Szerb (2010) among others of differentiated situations, which implies that countries should apply policies to address specific situations.

- Along these lines, the Kauffman Report (Atkinson and Correa 2007) suggests that in advanced economies like the United States, policy should accelerate the transition to an entrepreneurial economy. In emerging market countries, such as Brazil, policies need to focus on enabling the institutional setting - including insurance markets - to function more effectively, i.e., emerging market countries, especially in Latin America, should improve efficiency and effectiveness.

- *Doing Business Publication* of the World Bank starts to give attention to insurance as an important factor for economic actors undertaking and continuing business activities. In that vein, international financial institutions (e.g., the World Bank, Inter-American Development Bank) are implementing programs that will make insurance markets more responsive.

Research Implications - (1)

From a general research point of view, the study prompts a series of theoretical and empirical investigations concerning the role of insurance.

- The study should lead to the expansion of research on the themes of insurance and entrepreneurship and their relationship, which in turn prompts policy implications consistent with the framework of Boettke and Coyne (2003) that insurance market can help promote entrepreneurship and achieve economic growth (High 2009a, 5).

- The study expands knowledge in the field of entrepreneurship as part of the research agenda on entrepreneurship, as spelled out by Shane and Venkataraman (2000), which is related to the conditions under which entrepreneurs operate. In this respect, this study covers the "why, when and how different modes of action are used to exploit entrepreneurial opportunities" (Shane and Venkataraman 2000, 218). Once and opportunity is discovered, the entrepreneur must have the possibility to exploit it. The individual preference, the nature of the opportunity, and the institutional context—including the availability of insurance—all influence the extent to which the opportunities can be pursued.

Research Implications - (2)

More specific research should focus on the following:

- Empirical analysis of the relationship between insurance and entrepreneurship at the global level. This study has given some indication of how to construct an appropriate database taking advantage of the resources (e.g., World Bank, IMF, OECD, ASSAL and Swiss.re).

- The analysis requires some additional work to find an appropriate measure of institutional setting at the state level. In this respect, the two proxies used, *logTaxtrabinf_2* and *logMortHomicpermilhab*, are alternatives for more direct measures of institutional quality.

- The analysis of the relationship between insurance and entrepreneurship could be extended to other countries with high heterogeneity, e.g., the Middle East countries and particular areas, such as rural areas, looking at entrepreneurship, insurance and credit.

- Future researches should look into the relationship between insurance and entrepreneurship at a the level of municipalities, e.g., of Brazil and allow a more meaningful spatial analysis.

- Substitution more than complementarity between insurance and financial sector. It is worth to further explore, for entrepreneurs and micro entrepreneurs, to what extent the only availability of insurance can support businesses independently from financing. This could be the case with entrepreneurs with a certain level of wealth would undertake a business initiative out of self – financing, but still in need of insurance.

Research Implications – (3)

- As the link between insurance and entrepreneurship becomes more evident, new methodologies based on surveys and micro-level data and focusing on attitudes and behavior can be applied, e.g., factor analysis, path analysis and structural equations. This type of analysis relies on latent and not-defined variables, such as regulation and competition, and thus needs measures of the judgment the actors in the market provide rather than hard, macro-level data.

- The analysis should be extended to various specifications of entrepreneurship beyond that of start-ups. In fact, future research at the local level within a country (e.g., Brazil), or at the global level, could test to what extent the availability of insurance affects the various specifications of entrepreneurship and economic activity, e.g., large firms, SMEs, entrepreneurs, micro entrepreneurs, start-ups, limited liability companies (LLCs) as well as on Total Factor Productivity (TFP).

Research Implications – (4)

- Conversely, future research could also look into the various types of insurance policies.

- With respect to the types of insurance policies of interest, life insurance is relevant for the entrepreneur who wants to protect the continuation and continuity of his or her business (e.g., partnership) after his or her death. Life insurance is also relevant for lenders to entrepreneurs. Non–life insurance is critical to protect specific assets or activities. In the non–life categories, business insurance is the first type of insurance policy that an entrepreneur seeks. For example, entrepreneurs are concerned about punitive damages related to product liabilities, and insurance policies are crucial to eliminate the risk that a business could be wiped out because of a liability lawsuit. In this category, one can include casualty insurance to cover the cost of defense and judgment against a company resulting from bodily injuries or property damage that can also be extended to product liability; e.g., automobile insurance. It also includes professional liabilities (e.g., medical), and environmental liability. A relevant form of business insurance for the entrepreneur has to do with fidelity, protection and financial guarantees, such as fidelity bonds to assure against acts of employees. Bonding, for example, protects the company if an employee or subcontractor fails to complete a job within an agreed-on period of time; financial guarantees reduce the liability due to the failure of repayment. Household and property insurance (e.g., fire insurance, robbery and burglar insurance, and business interruption insurance) constitutes a type of protection that is relevant for entrepreneurs. Each of these types of insurance can be measured by the penetration ratio, i.e., the ratio of the volume of the premium for a particular risk covered to GDP; and by the density ratio, i.e., the ratio of the volume of the premium for a particular risk covered to the population.

- The role of social insurance warrants more research. There is conflicting evidence about social insurance: some evidence indicates that social insurance favors entrepreneurship and start-ups; but there is also evidence that social insurance has a negative or no impact on start-ups.

Thank you!

Appendix

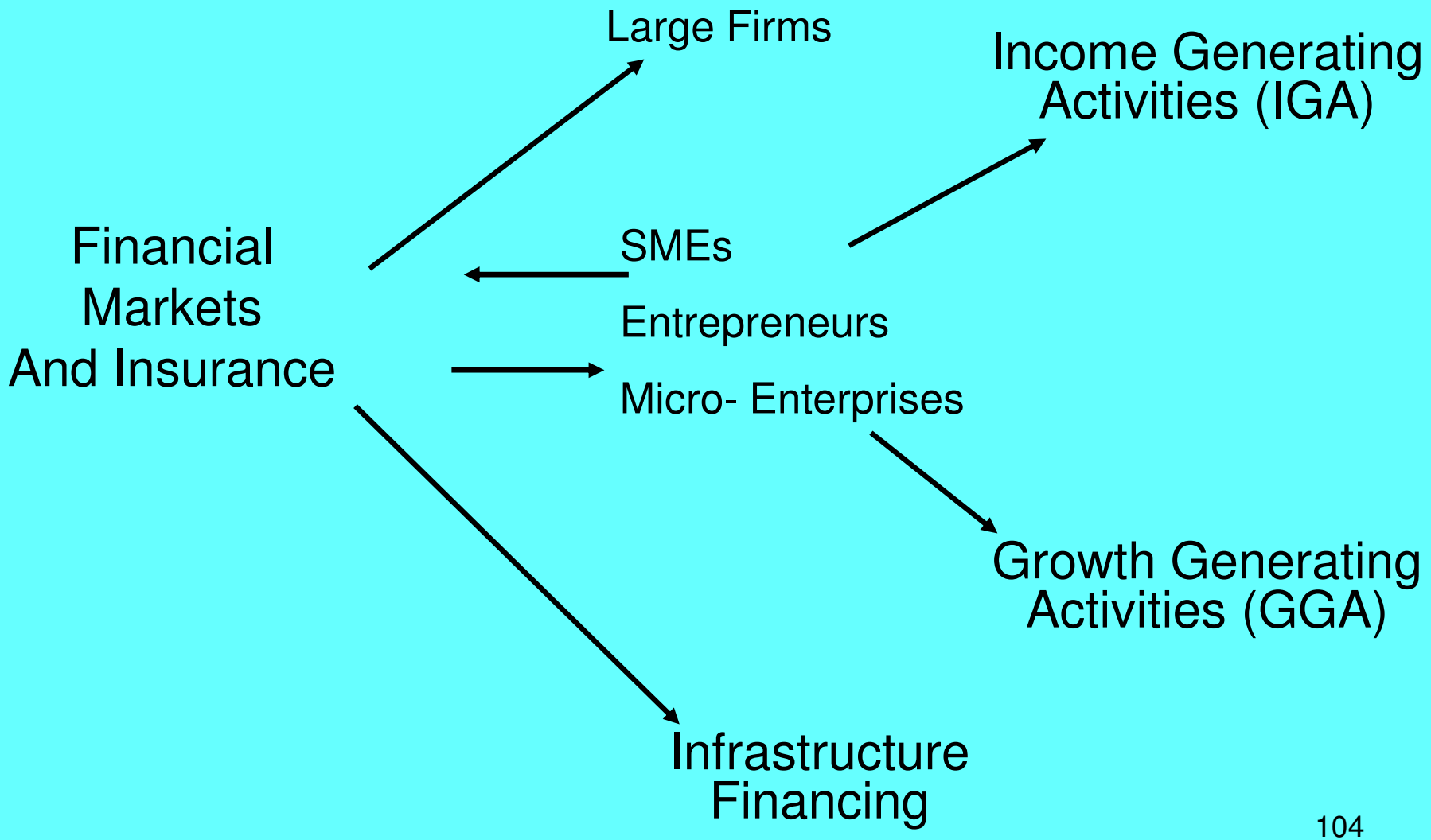
Market Failures

- Financial intermediation is a market function, but does not guarantee financing of MSMEs and Infrastructure and does not allow access to finance

- There is a Market Failure
  - Overcome Uncertainty
  - Limited domestic savings
  - Need of foreign exchange

- Nationalistic attitudes in emerging countries

Activities in Need of Financing



The Challenge of Financial Inclusion

2.7 billion (72% of adults) in developing countries do not use formal financial services

160 million (19% of adults) in developed countries as of 2009 [CGAP, Financial Access, 2009]

The MIX reports 90 millions Microfinance borrowers worldwide as of 2009.

- **Financial Management is a Basic Human Need**

"Money management is, for the poor, a fundamental and well-understood part of everyday life. It is a key factor in determining the level of success that poor households enjoy in improving their own lives" [Collins, Daryl et al., Portfolios of the Poor: How the World's Poor live on $2 a Day]

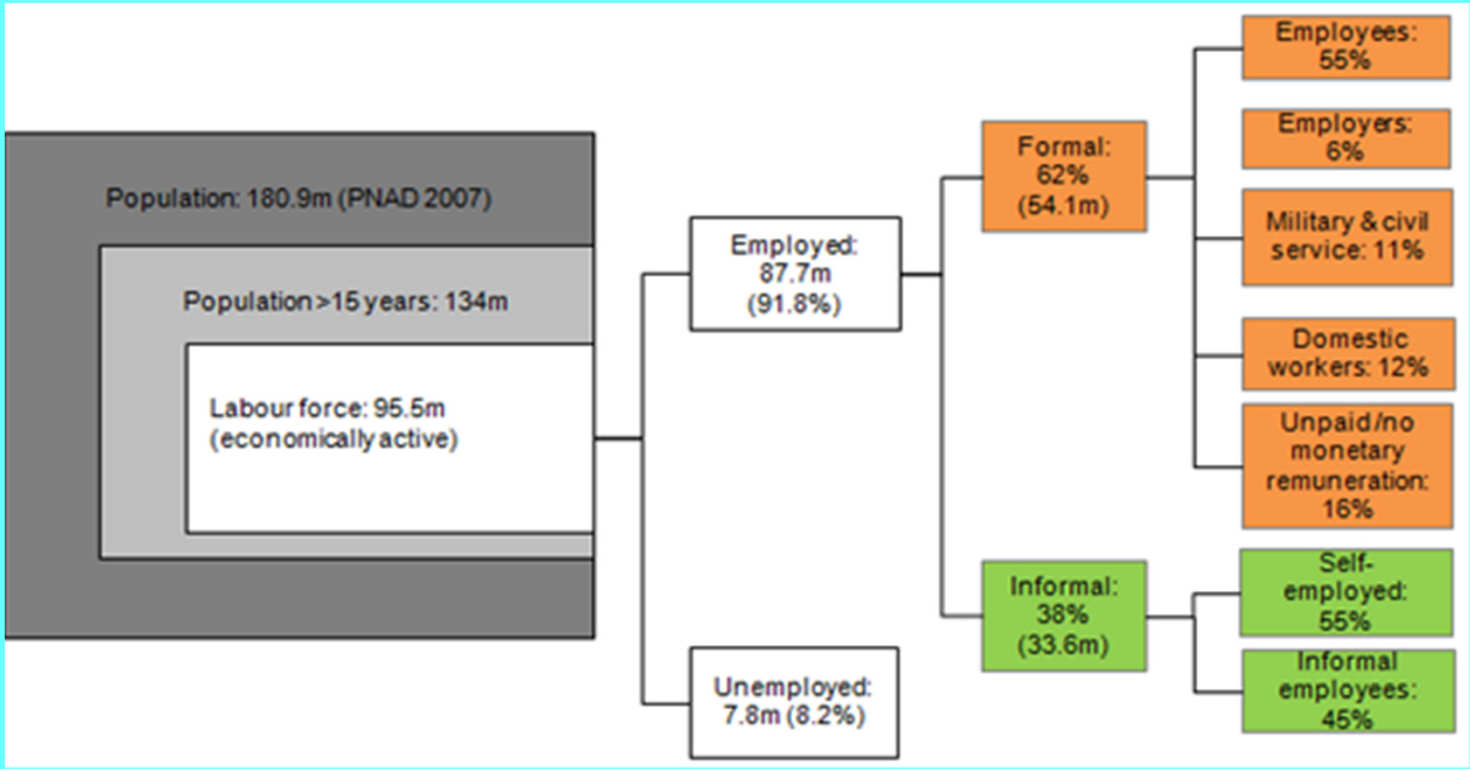
- **Financial Inclusion is widely associated with economic security and development**
  - Income generation (credit)
  - Increases investment capital (savings)
  - Increases economic security (savings, insurance)

- **Financial Inclusion is now an integral part of the regulatory agenda in developed as well as developing countries.**

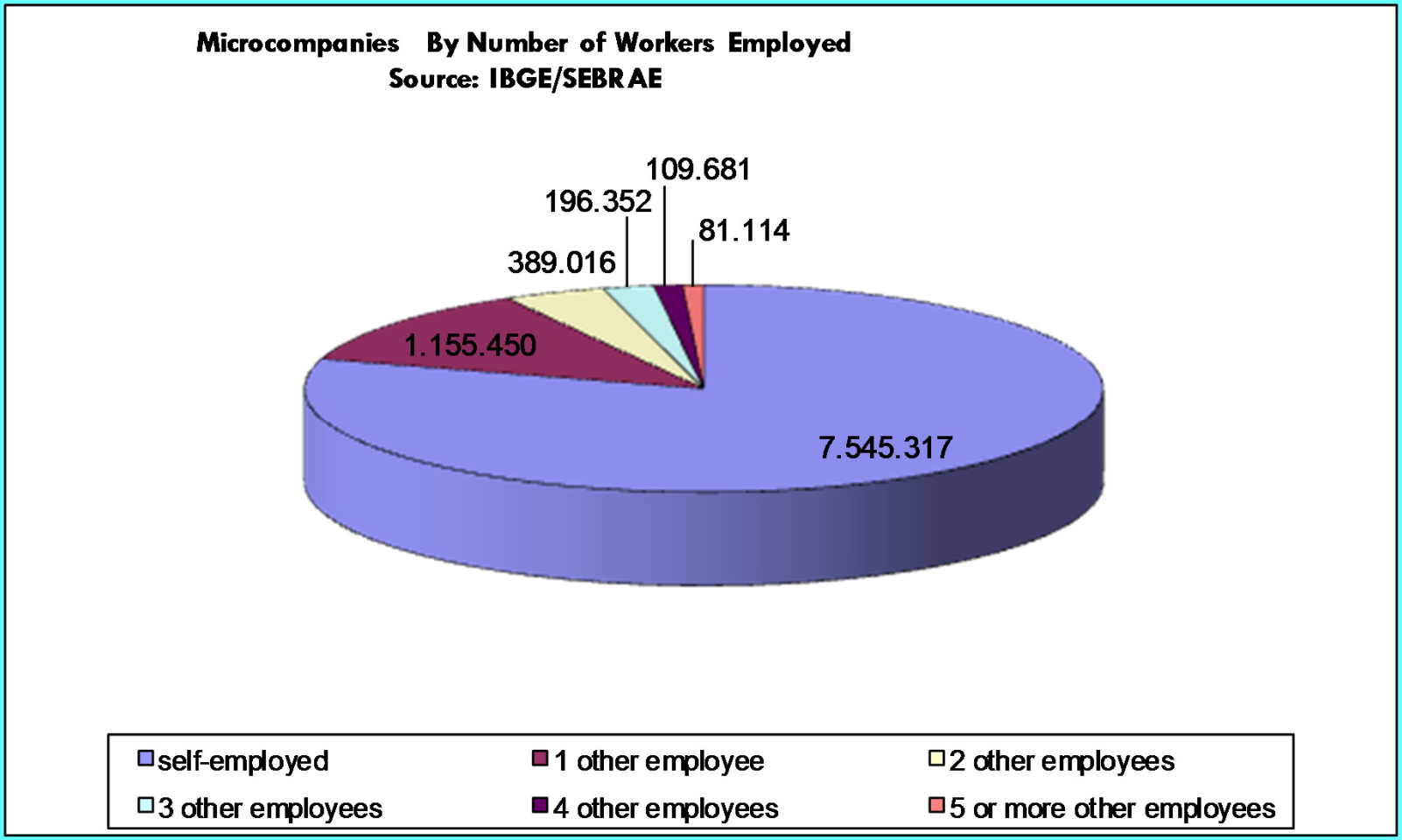
Informal Economy

- The level of informality has important implications for two related aspects.
- First, from the point of view of entrepreneurship, high level of informality is related to entrepreneurship with **lower content of innovation**. At the same time, high level of informality implies greater difficulty in measuring entrepreneurship (see Acs and Virgill 2009).
- Second, from the point of view of insurance, Bebster and others (2010) stress not only that the incomes of those in the informal sector are less certain than of those in the formal sector, but they are also **more difficult to reach, presenting distribution challenges**, e.g., formal sector employees can be reached via their unions and employers, the informal sector is more fragmented.
- **In Brazil,** informality is lower than in similar countries**, but at 38%** it remains substantial (compared to the 27.5% informal employment in Mexico as measured by Cardero and Espinosa, 2009; Argentina, with 20% informal employment; and Chile, where 24.4% of those employed are in the informal sector according to the ILO).
- Though 62% of the labor force is "formally employed", not all of them are in effect formal if considered from **financial services distribution** point of view. In other words, not all of them can be reached via employee groups. If domestic workers and unremunerated employees are taken out of the formal equation, the share of formal employment in the total employed market reduces to just 44%, placing 56% of the population in the informal market that cannot readily be targeted for insurance via their employers.

The Brazilian Economy

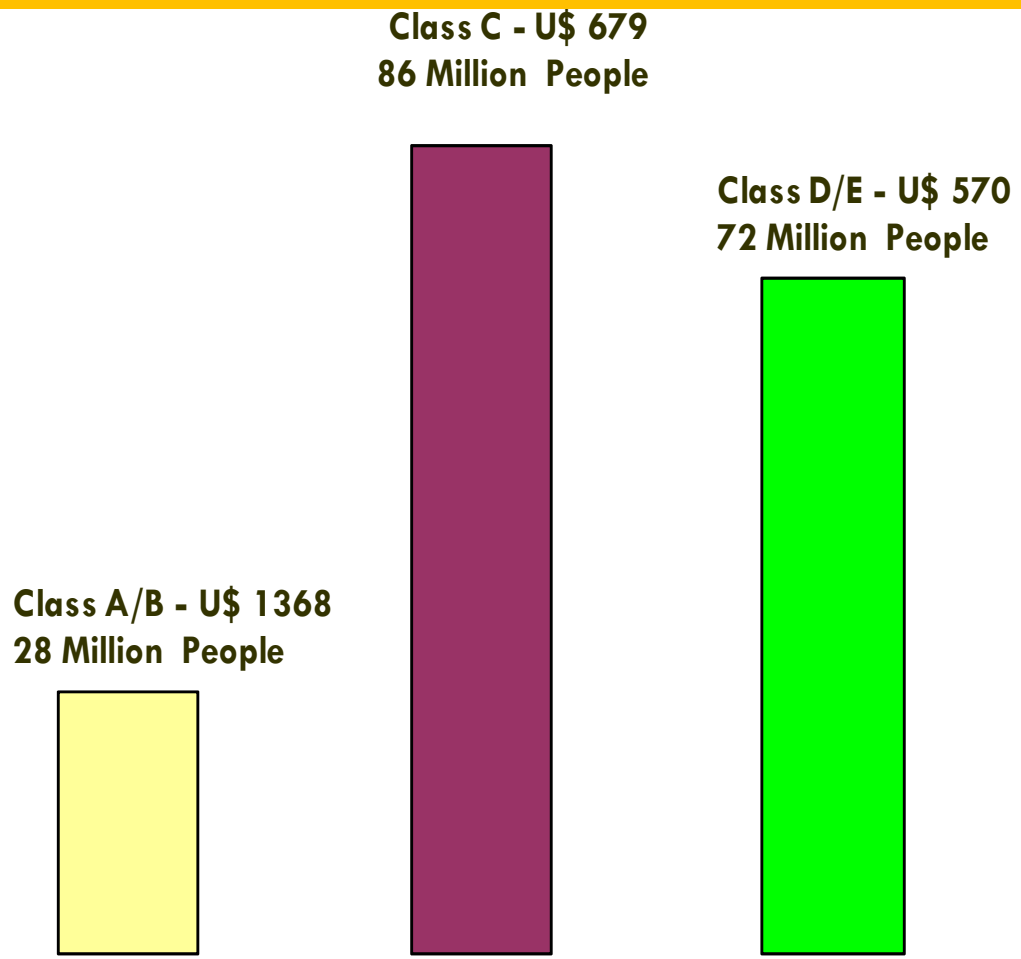


Micro-Entrepreneurs in Brazil



Poverty Overview - Brazil

In the last four years, 35 million people moved from classes D and E, to class C



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Market Overview – Brazil
Disposable Income by Class (US$ Billions)