

*Chapter*

**TWELVE**  
**FUNDAMENTAL CONTEMPORANEOUS**  
**CONTRIBUTIONS**  
**FOR THE ADVANCEMENT OF**  
**ECONOMIC THOUGHT**

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**ABSTRACT**

Research in economics has progressed significantly in the last few decades, with relevant contributions being delivered in the most important areas this science comprehends, e.g., macroeconomic theory, measurement of the economic activity, analysis of individual decision-making, finance, international economics. This chapter provides a discussion on the recent breakthroughs of the economic science, by highlighting twelve outstanding contemporaneous studies in fields that range from business cycles theory, to human capital formation, international trade models, the empirics of economic development or the

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application of statistical techniques to the analysis of economic phenomena. These studies were selected following several criteria: recent publication (in the last half decade) in a top scientific journal and already with a large citation record. Obviously, selecting a few prominent contributions from an extremely wide range of quality studies produced by economists in the last few years ends up by neglecting many other influential works. Nevertheless, we believe that the undertaken choice covers a series of meaningful advancements that are helping in launching the debate in many important topics in the years to come. Each one of the approached articles constitutes a piece of the best the reflection on economic theory and empirical analysis has to offer to the academy, to policy-makers and to all those that somehow rely on the progress of the economic science to optimize the respective decision-making process.

**Keywords:** Economic thought; Economic literature; Research advancements; Business cycles; Finance; Education and skill formation; International trade and development; Econometric analysis.

## 1. INTRODUCTION

The vitality of the economic science is evident on the continuous flow of high quality academic work that is being developed in research centers around the world and published in the most prestigious journals in the field. To evaluate the state of economic research, one may look at some of the most outstanding contributions produced in the last few years. This chapter does precisely this; it selects a series of twelve influential studies that have been published since 2010 in order to critically evaluate the routes that the economic science is taking and how lines of research for the future are being shaped.

The criteria employed for the selection of twelve meaningful contributions from an extremely wide array of important advancements published in the last few years were based on the information in the IDEAS / REPEC database (available at <https://ideas.repec.org/>). It was used the ranking item ‘number of citations by simple impact factor’, and from this item it were chosen the first twelve articles published in 2010 or in a posterior date and that were circulating as working papers in a date not earlier than 2004. This information was collected, from the mentioned database, in December 2014.

The selection process has generated an eclectic choice of papers, approaching themes that are not only varied but also representative of those

that are today the most relevant lines of inquiry pursued by the economic science. The collected papers were grouped in five categories, that correspond to each of the five sections in the main body of the paper.

Section 2 makes a critical assessment of the following two articles:

- Altig, D.; L. Christiano; M. Eichenbaum and J. Linde (2011). “Firm-Specific Capital, Nominal Rigidities and the Business Cycle.” *Review of Economic Dynamics*, vol. 14, pp. 225-247.
- Christiano, L.; M. Eichenbaum and S. Rebelo (2011). “When Is the Government Spending Multiplier Large?” *Journal of Political Economy*, vol. 119, pp. 78-121.

The point in common in these two articles is the concern with how the aggregate economy behaves in the short-run, i.e., how business fluctuations emerge and are perpetuated over time despite the long-term growth potential that the economy exhibits. These two papers, as much of today’s research on macroeconomics and business cycles, introduce nominal rigidities into the well known structure of the dynamic stochastic general equilibrium model. The inclusion of the rigidities, e.g. relating price stickiness, constitutes an attempt of reconciling the scientifically rigorous neoclassical paradigm with some of the behavioral features that constitute the trademark of Keynesian economics.

In section 3, three papers are discussed under the broad theme of international trade, economic growth and development. These are:

- Tabellini, G. (2010). “Culture and Institutions: Economic Development in the Regions of Europe.” *Journal of the European Economic Association*, vol. 8, pp. 677-716.
- Eaton, J.; S. Kortum and F. Kramarz (2011). “An Anatomy of International Trade: Evidence From French Firms.” *Econometrica*, vol. 79, pp. 1453-1498.
- Arkolakis, C.; A. Costinot and A. Rodriguez-Clare (2012). “New Trade Models, Same Old Gains?” *American Economic Review*, vol. 102, pp. 94-130.

The article by Guido Tabellini empirically addresses the role of culture and institutions in historically shaping economic growth and development. This is part of an influential strand of literature that searches for a causality link between how modern economic growth unfolded and the specific

institutional arrangements that have guided it. Under this perspective, economic development is path-dependent. The other two papers are part of a new wave of interest on issues relating international trade. The increase on data availability, namely regarding the productivity of the firms that produce for the external markets, has allowed for a resurgence of the theory of international trade, which now searches for a finer explanation of observable trade patterns.

Section 4 is dedicated to the role of human capital in the generation of wealth, by considering the following two contributions:

- Cunha, F.; J.J. Heckman and S.M. Schennach (2010). "Estimating the Technology of Cognitive and Noncognitive Skill Formation." *Econometrica*, vol. 78(3), pp. 883-931.
- Barro, R.J. and J.-W. Lee (2013). "A New Data Set of Educational Attainment in the World, 1950–2010." *Journal of Development Economics*, vol. 104, pp. 184-198.

The first of the two articles deals with the investment in children's education. An empirical study allows to withdraw meaningful conclusions relating the design of education investment strategies that guarantee the best results in terms of skill acquisition, namely for those with poorer parental and personal birth endowments. In the paper by Robert Barro and Jong-Wha Lee a large set of information on educational attainment is presented and statistically evaluated; as claimed by the authors, their estimations constitute a thorough examination of how education has evolved around the globe and allow for the presentation of proxies for the human capital variable that might be used in a wide range of empirical studies.

The contents of section 5 are associated with financial issues. The selected works are:

- Adrian, T. and H.S. Shin (2010). "Liquidity and Leverage." *Journal of Financial Intermediation*, vol. 19, pp. 418-437.
- Keys, B.J.; T. Mukherjee; A. Seru and V. Vig (2010). "Did Securitization Lead to Lax Screening? Evidence from Subprime Loans." *The Quarterly Journal of Economics*, vol. 125, pp. 307-362.
- Gorton, G. and A. Metrick (2012). "Securitized Banking and the Run on Repo." *Journal of Financial Economics*, vol. 104, pp. 425-451.

A renewed interest on financial issues as emerged in the recent economic literature as a consequence of the subprime crisis of the years 2007 and 2008. These three papers deal with topics concerning the credit market and corporate finance having the crisis as background for the analysis. Specifically, they approach financial leverage, markets liquidity and securitized banking.

Section 6 considers the application of statistical methods in the evaluation of economic phenomena. The two articles that are discussed are:

- Lee, D.S. and T. Lemieux (2010). “Regression Discontinuity Designs in Economics.” *Journal of Economic Literature*, vol. 48, pp. 281-355.
- Cameron, A.C.; J.B. Gelbach and D.L. Miller (2011). “Robust Inference with Multiway Clustering.” *Journal of Business & Economic Statistics*, vol. 29, pp. 238-249.

In the paper by Lee and Lemieux, a specific technique for empirical analysis is described in detail; the technique is called regression discontinuity and it is classified by the authors as a quasi-experimental design. The second article focuses on the analysis of an econometric estimator that enables cluster-robust inference.

In the end of the paper, a final section is included with an assessment of the pathways economic research is likely to follow in the years to come, given the contributions that we discuss along the paper.

## **BUSINESS CYCLES AND SHORT-RUN MACROECONOMICS**

**Altig, D.; L. Christiano; M. Eichenbaum and J. Linde (2011). “Firm-Specific Capital, Nominal Rigidities and the Business Cycle.” *Review of Economic Dynamics*, vol. 14, pp. 225-247.**

Following the tradition in macroeconomic analysis of searching for the causes of cyclical aggregate fluctuations through the construction and analysis of dynamic stochastic general equilibrium (DSGE) models, this article adds a new piece to this literature. The benchmark DSGE model is modified, and this modification allegedly places us closer to a framework capable of describing with rigor how the aggregate economy truly works.

One of the relevant stylized facts about business cycles is the inertia on inflation; basically, this fact is attached to the observation that after a given shock over fundamentals (e.g., an innovation that improves the state of

technology), price-setters react sluggishly, thus implying a non-immediate adjustment towards the economy's new steady-state triggered by the shock. The argument in this paper is that, typically, macro models make an effort to account for this observation but they fail in presenting a plausible assumption capable of conducting to such result. Namely, conventional models of the macro economy incorporate inflation inertia making use of assumptions that are implausible or that are in direct conflict with what micro data shows.

The bulk of the mentioned models considers an extremely high degree of price stickiness. In concrete, for the models to fit the data it is common to assume that firms re-optimize and update prices every two years or even less often. Empirical studies show that such degree of price stickiness is not compatible with the data; available data indicates that, on average, firms change prices much more frequently. To circumvent this counterfactual result, the paper proposes a modification of the standard DSGE model by introducing a plausible new assumption that puts the model closer to what the evidence in most industrialized countries reveals.

The mentioned change on the model's structure is associated with the allocation of the economy's stock of capital. While conventional DSGE models consider that all factors of production, including physical capital, might be reallocated from one firm to another without costs and without delays, this paper argues that the capital stock of the individual firm is pre-determined, i.e., in the short-run transferences of capital across firms do not occur. The introduction of this assumption serves two purposes: it adds an element of credibility to the theoretical framework (capital is, in fact, in many occasions, firm specific) and, by doing that, it allows for a better compatibility with the inflation inertia stylized fact. The authors prove that, under the new assumption, inertia on the evolution of the aggregate price level (i.e., on inflation) exists even if one considers that firms re-optimize and update prices frequently.

The model under the new assumption on firm-specific capital achieves a compatibility between micro-level price flexibility and macro-level inflation inertia. Although this is apparently paradoxical, such result encounters support in the observable evidence about the evolution of prices and it can be supported, according to the view in the paper, by the idea that firms re-optimize prices frequently but they do so through small changes that provoke, on the aggregate, a sluggish evolution of the aggregate price level. The involved mechanism is essentially the following: when a given firm desires to raise the price of the good it delivers to the market, it observes that an increase in the price will lower the demand, implying a contraction on the level of

generated output. Less output signifies lower marginal costs, which in turn lead to a lower equilibrium price. Therefore, two countervailing forces collide: the incentive to raise the prices, on one hand, and the consequent fall in the marginal cost on the other. When evaluating simultaneously these two forces, the change in the price will be lower than one could initially expect. This effect of the marginal cost occurs precisely when capital is firm-specific.

In what concerns the modeling strategy, the article recovers the analytical structure of a previous paper (Christiano et al., 2005), and approaches it under two slightly different versions: (i) the typical homogeneous capital framework and (ii) the new firm-specific capital framework. Although the two versions are not significantly different in their structure, the implications of each version are, as discussed above, divergent in their essence.

The homogeneous capital model considers an economy with the following structure:

- 1) There is a representative firm that produces a final consumption good, resorting to a Dixit-Stiglitz production function where the inputs correspond to a continuum of intermediate goods;
- 2) Intermediate producers are monopolistic competitors who use labor, capital and technology as inputs, and face fixed costs of production. Intermediate good firms set prices infrequently following a price stickiness mechanism *à la* Calvo (1983); under this mechanism, at each date, each intermediate producer faces a constant probability of being one of the firms that goes through a process of re-optimization leading to an eventual price updating;
- 3) In this economy, households are monopolistic suppliers of labor, with wages being set under a same kind of stickiness rule as prices. The preferences of households are taken into account: they maximize consumption utility, with consumption preferences exhibiting habit formation; leisure is also an argument of the utility function. The maximization problem of households is subject to a discrete time dynamic constraint that reflects the accumulation over time of the agents' assets. They can hold, at each period, money and a wide range of other kinds of assets, with different return rates;
- 4) In the model's structure, it is also relevant how the government and the central bank conduct their policies. The monetary authority resorts to a rule that sets the growth rate of money, while the fiscal policy simply consists in an adjustment of lump sum taxes in order to

maintain the equilibrium of the government's intertemporal budget constraint;

- 5) The several components of the model are linked through a couple of market clearing conditions, namely respecting the final goods market and the market for loans.

The firm-specific capital model is different from the previous version in the following point: while in the homogeneous capital case, it were the households who owned the capital and who allocated it in each period in order to optimize the respective employment of resources, in the new setting firms are the owners of the capital they use in production. Thus, firms cannot adjust their capital stock instantly; they can only do so over time, by changing the investment rate. In all the other aspects of the model, there is a perfect coincidence between the two versions.

As mentioned earlier, the new version of the model accomplishes a better fit with the observed data. The estimation of key parameters reveals not only that the updating intervals for prices and wages are closer to what reality shows (the updating frequency of prices and wages is significantly lower in this version of the model than in the original one, what is closer to reality); it also generates estimated responses of the economy to technology shocks and to monetary policy shocks that have a greater compatibility with real-world observed events. An additional advantage of the firm-specific capital version relatively to the first one is that the new model eliminates the counterfactual prediction, present in the original framework, that in the periods after a monetary policy shock a small share of firms will be responsible for the production of a large proportion of the output of the economy.

Overall, the proposed model of business cycles constitutes an important advancement in macroeconomic theory because it continues to account for relevant macro evidence (relating inflation inertia and the response of the economy to a variety of shocks over fundamentals and to a variety of policy shocks), while attaining a better fit with observed micro evidence at the level of the individual firm price setting behavior.

This article is part of a wider research agenda that searches for the determinants of short-run fluctuations in the economy and for the real impact of nominal shocks. Firm-specific capital is certainly, as demonstrated in the article, a relevant source of macro inertia. Nevertheless, there are others that have been thoroughly explored in the literature. Two of the strands of literature that are influential at this level are, as mentioned in the paper under discussion, the rational inattention theory developed by Sims (1998, 2003) and

Mackowiak and Wiederholdt (2008) and the sticky-information framework of Mankiw and Reis (2002, 2006, 2007).

Both rational inattention and information stickiness elect information as the central element in explaining macro inertia. In opposition to orthodox DSGE models where the main source of inertia is price stickiness, the mentioned alternatives point to the sluggishness in the way households and firms collect and process information. This sluggishness is attached, in the sticky-information setting, to the evidence that information diffuses slowly across economic agents, while in the rational inattention setup the argument is of a different nature: agents cannot pay attention to all the available information and, therefore, they have to make a choice; this choice goes on the direction of paying more attention to idiosyncratic conditions, that affect the agent in a more direct way, than to events on the macro economy. The corollary is that firms display a stronger and more prompt reaction to idiosyncratic shocks than to aggregate shocks, and thus aggregate disturbances lead, under this setting, to sluggish effects and inertia.

A common denominator to all this literature is the departure from the frictionless neoclassical model of the macro economy that remains persistently in an equilibrium position. Some type of stickiness, on prices, information or other key element of the economy, is required to trigger the aggregate fluctuations that are observed in the economy as a whole.

**Christiano, L.; M. Eichenbaum and S. Rebelo (2011). "When Is the Government Spending Multiplier Large?" *Journal of Political Economy*, vol. 119, pp. 78-121.**

This article is an outstanding example of how a classical problem in macroeconomics can be successfully approached resorting to the models and techniques of contemporaneous economic analysis. The subject under appreciation relates to the zero bound on nominal interest rates. When the central bank is no longer capable of reducing the interest rate in order to stimulate the demand for money, because such rate cannot fall below zero, then we say that the economy is stuck in a zero bound nominal interest rate position or, similarly, in a state of liquidity trap.

The mentioned scenario is commonly associated with periods of strong recession, where monetary policy is no longer effective to promote output growth and the creation of jobs. In this case, fiscal policy is potentially the most effective tool to encourage economic recovery, because in the zero bound setting the government spending multiplier tends to be larger than in

circumstances in which the output is closer to its potential level; specifically, in such circumstance the multiplier is typically larger than one what implies that government spending may be the solution to boost the economy and to place it in a path of recovery.

The previous reasoning has its origins on the Keynesian analysis of the liquidity trap scenario and it can be addressed resorting to the popular IS-LM graphical apparatus. In a setting of zero bound interest rates, the curve that represents the equilibrium in the money market, the LM curve, is horizontal in the output – interest rate locus at a low interest rate value. Curve IS represents the equilibrium in the goods market and, in the same referential, it is a negatively sloped curve. Fiscal policy, namely an increase in government spending, will shift the IS curve to the right provoking a rise in the level of income, thus triggering a period of economic recovery. Fiscal policy is effective in this case mainly because no crowding-out effect will take place: the government stimulus is not attenuated or eliminated by a fall in private investment, because there will be no (significant) change on the interest rate.

The macroeconomists Christiano, Eichenbaum and Rebelo address the zero bound issue and the effectiveness of fiscal policy in the context of the models that are currently in use to approach the themes of the macro economy, namely the standard new-Keynesian model, without and with capital as a productive input, and the dynamic stochastic general equilibrium model as described in Altig et al. (2011). The analysis is focused on measuring the government spending multiplier when the interest rate is constant and, more specifically, when the zero bound is binding. It is found that in such circumstance the mentioned multiplier is larger than one and, consequently, an expansionist policy should be pursued in order to promote the generation of income.

The attempt to measure the value of the government spending multiplier is not new. As mentioned by the authors, there is a significant empirical literature that has approached this theme, as it is the case of Barro (1981) and Ramey (2011). Results point to a value close to 1, meaning that a 1 unit change on government spending triggers a 1 unit change, in the same direction, in the level of income. Besides pure empirical evaluation, the value of the multiplier has also been assessed in the context of new Keynesian and DSGE business cycles models; again, the multiplier might be lower than 1 or eventually higher but close to 1, depending on how agents' preferences are specified. Therefore, the starting point of the article is the observation that macroeconomics seldom gives a relevant role to government spending in boosting the economy.

The article argues that the mentioned macro models are sufficiently rich to account for the possibility of a large government-spending multiplier. In these models, the multiplier is low under conventional monetary policy, i.e., when the nominal interest rate is determined by a Taylor rule, but it potentially becomes significantly larger than 1 if we consider that the nominal interest rate does not respond to a change in government spending and, specifically, when this non-response is associated with the zero bound scenario. Basically, the authors find that typical models of the macro economy are well equipped to explain the efficacy of fiscal policy in times of recession: these theoretical structures deliver a large government spending multiplier when the zero bound interest rate is binding.

The authors confirm, in this way, the Keynesian view that fiscal stimuli are vital in periods of low growth, periods in which monetary policy can no longer be used to encourage a rise in demand. The increase in government spending will not only have a direct impact on demand and, in equilibrium, also on output, but it will trigger as well a rise in expected inflation that will drive down the real interest rate (for a constant nominal interest rate) and, consequently, it will also promote an increase in private spending.

The theoretical demonstration that fiscal policy is adequate in scenarios where the interest rate is low and approaches or stays in the zero lower bound limit does not necessarily imply that governments should adopt, as an automatic rule, the increase of spending whenever the economy falls into recession and the monetary policy loses its ability to foster economic growth. There are many variables that enter the equation; for instance, at a given time period, a tax cut may be preferable, as an expansionist policy to adopt, than an increase in spending; in other circumstances, the adoption of the public policy may not be at all advisable, namely because of the long time lags that are necessary to implement fiscal policy and the long time lags that such policy takes to have meaningful impact over the economy and over the behavior of agents.

In synthesis, the paper makes a positive claim: fiscal policy has the power to stimulate demand in periods of low growth, when the nominal interest rate is located at its lower bound; but it avoids making a normative assessment: although an increase in government spending is likely to have the desired effects if optimally implemented, there are no guarantees that the specific implementation processes will be successful.

From a technical point of view, the article begins by evaluating a new-Keynesian macro model with labor as the single material input to production. A representative household maximizes intertemporal utility, with private

consumption, leisure and government consumption the arguments of the utility function. The optimization problem is subject to a budget constraint where the sources of the agent's income are wages, profits and the return on the acquisition of government bonds. The structure of production is the trivial one in new-Keynesian macro models: there is a firm that produces a homogeneous final good using as inputs the intermediate goods generated by a continuum of intermediate producers that act monopolistically and that optimize prices infrequently (prices are sticky in the sense that each intermediate producer updates prices at each period with a lower than 1 probability).

In the mentioned setting one also needs to formalize monetary policy. The central bank resorts to a typical Taylor rule in order to fix the nominal interest rate. The Taylor rule describes how the central bank reacts, by changing the nominal interest rate, whenever there are observed or expected changes on the inflation rate or on the output gap. When this rule implies a negative nominal interest rate, the zero lower bound is applied.

Under the described features and resorting to reasonable parameterizations of the model, the authors conclude that outside the zero bound the government-spending multiplier will hardly be larger than 1.2, i.e., the stimulus of government-spending is almost negligible. When the zero bound is binding, the results change radically: while in a baseline parameterization the multiplier was equal to 1.05 outside the zero bound, the same multiplier becomes, with the same parameterization, equal to 3.7 under the zero bound scenario. This demonstrates the relevance that fiscal policy potentially has in a liquidity trap setting.

The analysis in the paper is extended in various directions. Physical capital is included in the new-Keynesian model and in a more complete DSGE model involving investment adjustment costs, habit persistence in consumption, sticky prices and sticky wages. In all the approached cases, the relevance of fiscal policy in the zero bound nominal interest rate case is confirmed.

### **3. INTERNATIONAL TRADE, GROWTH AND DEVELOPMENT**

**Tabellini, G. (2010). "Culture and Institutions: Economic Development in the Regions of Europe." *Journal of the European Economic Association*, vol. 8, pp. 677-716.**

This paper offers important insights on the role of culture in the economic development. The very concrete subject under investigation is an influence of regional culture on regional economy. It is addressed using the data on European regions. The author demonstrates that regional culture has a casual effect on regional economic performance and growth rate while functioning as a time channel allowing for historical influence of previous generations' styles of life on current economic performance of European regions.

To gauge culture, the author uses measures of individual values and beliefs, classifying them into two categories, for describing social interactions and entrepreneurial environment. For social interactions category he quantifies such indicators as trust attitudes, and tolerance and respect towards others, while for entrepreneurial climate category he uses measures of obedience and confidence in self-determination.

This paper goes beyond the state of art in the area that could be resumed as recognition of the importance of informal institution and cultural matters for shaping the economy. The author undertakes a detailed study of how specific cultural features can influence economic performance both directly and indirectly through the better efficiency of institutions.

The main difficulty in estimating a casual effect of culture is that culture is endogenous to progress in economy, i.e., economic performance affects social life and culture. Thus, to assess a causality impact of culture on economic development, the author tries to identify exogenous sources of variation in culture. He isolates the exogenous variation in culture by considering two historical variables employed as instruments: the literacy rate in the late nineteenth century and the regional political institutions, which are observed in Europe since the end of the sixteenth century. The history of Europe represents a great regional variety in these two variables allowing for isolation of the exogenous variation in culture.

The main finding of the paper is that the exogenous history-driven component of culture represents a strong correlation with current regional economic performance, after controlling for national effects, contemporaneous education, and urbanization rates in the middle of the nineteenth century.

The underlying guiding idea of this research is that history shapes institutions, especially the ones protecting property rights. Thus, the development of certain appropriate kind of institutions can affect the current economical situation in a region. Institutions are interpreted in a broad sense, as the designed and implemented constraints that structure political, economic and social interactions. These constrains consist of both informal codes of conduct, such as customs, traditions, and so on, and formal rules like laws,

property rights, etc. But the variable “institution” is difficult to work with, so, that it needs to be transformed into a more dynamic instrument.

Focusing on a regional level within countries (as opposite to the widely used across countries research) this paper isolates the effect of common national institutions, fixes contemporaneous regional education and mid nineteenth century urbanization rate, and obtains cultural indicators depending only on historical variables: regional literacy rate at the end of nineteenth century and indicators of political institutions in the period from 1600 to 1850. The line of research uses within the country variation at regional level to study the link Historical Institutions - Culture - Economic development.

Investigating the different functioning of the same formal institutions across different regions within the same country this paper finds that culture is an important mechanism through which past institutions impact the functioning of current institutions. In particular, this paper points to the importance of understanding the diffusion of specific cultural characteristics.

The data were collected over the 69 regions in eight European countries: France, Germany (excluding East Germany and Berlin), the United Kingdom, Italy, the Netherlands, Spain and Portugal. The regions were defined according to the Eurostat database on regional per capita output. The regional per capita GVA (gross value added) was measured in international prices, adjusted for purchasing power and expressed in percent of the EU15 countries' average. Most of the analyses are confined to the period 1995–2000. Per capita output is highest in the densely inhabited urban areas of Paris, Brussels, northern Germany and northern Italy, while the opposite situations of low per capita output are observed in southern Spain, Portugal, and southern Italy.

Human capital is widely recognized as an important driver of growth and development. Education is also a principal determinant of cultural traits. To avoid using culture as a proxy for human capital in the region, regional differences in the education of adult population are measured by enrollment in primary and secondary schools in percent of the population of the relevant age group. The data refer to 1960s –1970s. Choosing earlier dates reduces the risk of reverse causation and makes regional variations increase.

The identification strategy employed by the author depends on the assumption that the historical variables used as instruments for culture are uncorrelated with unobserved determinants of current economic performance. A working hypothesis is that history would influence current economic performance only through culture rather than through a slow economic growth related process following the law of convergence. But, regional data on per capita have rather limited historical records.

So, as a proxy for regional economic development in previous centuries, the author uses past urbanization rates, as in the seventeenth and eighteenth centuries cities were centers of commerce. An urbanization rate is calculated as the fraction of regional population that lived in cities with more than 30,000 inhabitants around 1850. The threshold of 30,000 is chosen to maximize the correlation between past urbanization and current regional per capita output.

Culture measures refer to two different periods: 1990 – 1991 and 1995 – 1997. These surveys were carried out by the World Value Surveys. There are four cultural traits, which are measurable. Two of them are related to general trust and respect for others that impact welfare enhancing social interactions resulting finally in better institutions. Two other features are related to confidence in virtues of individualism, thus, influencing entrepreneurial environment.

To measure trust, the author analyzes answers to the following question: “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” The level of trust in each region is given by the percentage of respondents who chooses the first option. The main ways in which trust affects the economy are presented by the two following mechanisms. First, more efficient outcomes from interactions lead to the extension of anonymous market exchange. Second, lower cost of transactions outside of local community results in more benefit from trade.

The author discusses general morality associated with trust vs. limited morality, associated with a lack of it. Limited morality is a feature of hierarchical societies where morality is applied in small network. On the contrary, in democratic societies abstract rules of good conduct apply to many social situations.

To measure in a more direct way general vs. limited morality, the author observes the values that parents consider important to teach to their children. He considers the following question: “Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Please choose up to five.” The variable “respect” is defined as the percentage of respondents in each region that has mentioned the quality “tolerance and respect for other people” as being important.

The variable “obedience” is defined as the percentage of respondents that mention “obedience” as an important quality that children should be encouraged to learn. In hierarchical societies individualism is mistrusted, consequently, the good behavior is a result of coercion. Hence, individual initiative and cooperation within a group could be stifled, with bad consequences affecting the economic development of a country.

The variable “control” is derived from the surveys’ question: “Some people feel they have completely free choice and control over their lives, while other people feel that what we do have no real effect on what happens to them. Please use this scale (from 1 to 10) where 1 means ‘none at all’ and 10 means ‘a great deal’ to indicate how much freedom of choice and control in life you have over the way your life turns out.” The variable “control” is defined as the unconditional average response in each region. This variable measures the extent of the conviction that individual effort is likely to pay off for highly motivated people work hard, invest, innovate, undertake new economic initiatives while low motivated people are characterized by passive, resigned, and lazy attitudes.

Thus, the attention is focused on four cultural traits: three of which, trust, respect, and confidence in self-determination are expected to promote economic development, while the restante one, obedience, is expected to hurt it. The estimation strategy approach is based on the assumption that culture is shaped not only by contemporaneous social interactions, but also by the cultural traditions inherited from earlier generations. In its turn, the culture of earlier generations is shaped by past social interactions, and hence by historical features of the political and economic environment.

To estimate the causal effect of culture on output in a linear regression, the author uses the historical counterpart of such current variables, as education and political institutions in the distant past. Past education is measured by the literacy rate around 1880, and early political institutions are measured by constraints on the executives in the years 1600–1850. This isolates the variation in culture that is exogenous.

History shapes culture. Autocratic regimes foster environments of mistrust, helplessness, and resignation. Illiteracy is likely to reinforce these negative attitudes, because it isolates individuals and it reduces their ability to control and understand the external environment. The effect on culture will be opposite in a republican regime where productive entrepreneurs or traders participate openly in the political organization of society, the rule of law is respected, and supreme authority is constrained by formal and informal controls in place. Better political institutions have one or both following features: the holder of executive powers is accountable to bodies of political representatives or to citizens; and/or government authority is constrained by checks and balances and by the rule of law.

Summarizing, all the instrumental variable estimates discussed in the paper present a remarkably consistent and robust picture represented by three main findings. First, past political institutions and low literacy rates left a mark

on regional culture. Second, this cultural legacy of history is an important determinant of current economic performance. And third, the data cannot reject that past political institutions and literacy rates of previous generations influence economic performance only through culture, particularly when culture is measured by broad aggregates.

Additionally, this research uncovers a lot of questions requiring further investigation. Those are questions regarding other ways in which culture could influence economic development. It remains open an issue of what is more important as an influence channeling mechanism: institutions or personal values and beliefs. Additionally, not all ideas of its time might become institutionalized but they sure interact with institutions. So there is a possibility of bias of measuring just observable part of culture. Much more work is needed at microeconomic level to understand which individual beliefs and social norms are economically relevant and how they are formed and transmitted over time.

This is an extraordinary paper. And there is one more especially important aspect why the author's findings raise some doubts on the primacy of formal institutions as determinants of the economic development. This represents an alert to policy makers, as establishing right institutions in a country or a region does not guarantee aspired economic performance. Something else of cultural origin must be thoroughly studied and taken into consideration prior to policy propositions and implementations.

**Eaton, J.; S. Kortum and F. Kramarz (2011). "An Anatomy of International Trade: Evidence From French Firms." *Econometrica*, vol. 79, pp. 1453-1498.**

In the wake of the mainstream analysis related to international trade, this publication adds a new piece to the literature dedicated to assessing the adherence of the detailed data on exports to a vast range of new trade theories. Many of these new generation theories consider technological heterogeneity of exporting enterprises as a main force that directs international trade. Nevertheless, as these researches were focused on aggregated data, the individual heterogeneity across firms remained unaddressed. In particular, in Eaton and Kortum (2002), differences in efficiency across countries in producing different goods were claimed to be a main driver of aggregate bilateral trade flows. The contemporary masterpiece work by Eaton, Kortum, and Kramarz proves that data on individual firms also represent an exceptional opportunity for determining principal drivers of international trade.

The theoretical international trade model developed by the authors is adequately parameterized fitting the historical data and places us closer to a detailed understanding of how international trade impacts individual agents. The preceding basic framework for understanding international trade relationships (see Melitz, 2003) was based on the following core elements: firms' efficiencies follow a Pareto distribution; demand is Dixit-Stiglitz; and markets are separated by non-tariff based barriers, or iceberg trade barriers, and require fixed entry costs.

The authors' new model overcomes major shortcomings of preceding basic models, which became evident while the authors tried to fit with it the empirical set of data. Those theoretical shortcomings are the following: a predefined hierarchy, according to which firms enter markets, not confirmed empirically; huge deviations in the individual sales of exporters already active in the market from theoretically predicted volumes; an inability to explain why exporters present a huge volume of domestic sales; and why in typical big size markets there is a lot of exporting firms selling small to insignificant amounts.

To deal with the first two failures of the preceding basic framework authors introduce market and firm specific heterogeneity in costs and demand. To address the last two shortcomings, Arkolakis' (2010) formulation of market access costs is implemented. Thus, the newly extended model, while remaining very parsimonious and transparent, is one that better adheres to the data.

This article commences by describing a set of relevant empirically observed features related to the sales of roughly 230 thousand French manufacturers in 113 countries, including the domestic sales as one of these destinations. First, the authors analyze how the number of sellers varies with the market size. They conclude that the ratio of the number of French exporters to French market share in the total receiving country market augments systematically with market size. This sounds quite intuitive, but authors go further and evidence that this relationship is very tight and linear in logarithmic scale.

A standard approach commonly used for analysis of firm entry into different sets of markets is based on the assumption that firms obey a certain hierarchy implying that any firm which sells to a chosen less popular market must necessarily sell for the whole range of the more popular destinations. Authors observe that in reality firms are less orderly while choosing their destinations. This quite expectable outcome is supported by empirical evidence that only 27% of exporters obey a hierarchy among the seven most popular destinations.

Second, the article focuses on the entire distribution of sales within individual export destinations. For each of the analyzed 113 destinations authors plot the sales of each exporter in a particular market (relative to the mean sales there) against the fraction of the firms selling in the market who sell at least that much. They find that the basic shape is common for size distributions and somewhat similar to a Pareto one, especially at the higher end.

Third, the paper studies a firm's participation in export markets relative to its sales in France. Authors observe that sales in France monotonically rise with the number of foreign markets served. In addition, average domestic sales by exporters in France are analyzed against the number of exporters selling to the markets ranked by their popularity. The relationship appears to be inverse and linear in logs.

The fourth dimension of the empirical investigation concerns an export intensity of firms involved in international trade. Authors introduce a ratio of what exporters sell abroad and what they sell in France. Then they normalize the numerator by the average sales by French firms in a chosen market and also normalize the denominator by a size of a chosen firm in the French market. Authors find that as a destination becomes more popular, normalized export intensity increases. They also show that even among exporting firms, sales abroad are considerably small, on average about two orders below while compared to sales at home.

At this point, authors engage in the enhancement of the theoretical apparatus. To explain where exporters sell and how much they sell there, they propose a parsimonious model based on the assumption of monopolistic competition, with differentiated goods, each of which corresponding just to a one single firm. Effectuating sales in a market requires a fixed cost, while moving goods from country to country is subject to iceberg costs meaning that exporters need to ship more goods that will be effectively sold in the market. Firms are considered to be heterogeneous in efficiency and in other characteristics. Countries of destinations vary in market size, location, and fixed cost of entry.

The heterogeneity of firms is a very important assumption. If firms were homogeneous, then fixed costs would fully dissipate gross profits. With producer heterogeneity, firms with a unit cost below the entry cutoff in a market retain a net profit there. Authors follow Melitz's (2003) monopolistic competition approach, since it more readily than others delivers the feature that a larger market attracts more firms, as is evidenced in the empirical part of their research. Authors use Arkolakis' (2010) formulation of market access

costs, which is the same across destinations and relates a seller's fixed cost of entering a market to the share of customers it reaches there. The function describing market access costs introduced by Arkolakis (2010) has the desirable properties that the cost of reaching zero buyers in a market is zero and that the total cost increases continuously in the fraction of buyers reached. This formulation can explain why some firms sell a very small amount in a market while others stay out entirely as suggested by the authors' findings in the empirical part of the research.

Fitting the model outcomes to the empirical results regarding normalized export intensity permits to determine the value of the model parameter that translates unobserved heterogeneity in standardized unit costs into observed heterogeneity in sales. The set of five parameters of the model is estimated by the method of simulated moments. Authors simulate firms that make entry into at least one foreign market and into France too. I.e., authors simulate a set of artificial exporters given a particular set of parameter values. Each firm is assigned with three main parameters: a standardized unit cost, a demand shock and an entry shock. The simulated moments from these artificial data are compared to moments from the actual data. The standard normal distribution of these three parameters is employed for simulation procedure.

A special Monte Carlo algorithm is used to simulate the sales of 500,000 hypothetical French exporting firms in 113 markets. From these simulated data authors compute a vector of moments analogous to particular moments in the actual data. Authors use the concept of moments in the sense that moments are the number of firms that fall into sets of exhaustive and mutually exclusive bins, where the number of firms in each bin is counted in the data and is simulated from the model. At each function evaluation involving new values of a set of model parameters, a set of 500,000 hypothetical firms is newly computed and the moments from them are constructed. The simulating algorithm converges in 1 to 3 days on a standard PC.

A basic finding is that the standard errors are small compared to the estimated parameter values. And thus they are good indicators of the ability of the authors' procedure to recover parameters that underlies their model from the empirically observed data.

Then authors use their framework to examine how aggregate shocks in policy affect individual firms. They answer the question how the world will re-equilibrate after such shocks. Authors estimate implications of globalization by considering 10 percent drop in trade barriers. They find that lower trade barriers raise the real wage in every country, typically by less than five percent.

Other findings seem to be more impactful. Total sales by French firms rise by \$16.4 million, the net effect of a \$34.5 million increase in exports and a \$18.1 million decline in domestic sales. Despite this rise in total sales, competition from imports drives almost 27,000 firms out of business, although almost 11,000 firms start exporting. It means that lower trade barriers favor the largest firms at the expense of others. Authors classify this finding as striking. Nonetheless, one could argue that it is not striking at all, as lowering entry barriers makes markets to function in a more competitive manner. Thus, the more efficient firms become in a more advantageous position over less efficient ones they will be. In respect to growth, authors predict that the sales by firms with an initially smaller presence grow substantially more than those at the top.

As a result of their research, authors find that the Melitz (2003) model, with parsimonious modification, succeeds in explaining the basic features of data along a large number of dimensions: entry into markets, sales distributions conditional on entry, and the link between entry and sales in individual foreign destinations and sales at home. Not only does the framework explain the facts, it provides a link between firm-level and aggregate observations that allows for a general-equilibrium examination of the effect of aggregate shocks on individual firms.

The analysis in this paper is a very detailed one. It completely justifies the words “an anatomy of the international trade”. Authors desiccate export activity into very thin layers by mean of the extremely acute scalpel of the fine tuned econometrics. Their framework does not, however, constitute a reductionist explanation of what firms do in different markets around the world. In particular, it leaves the vastly different performance of the same firm in different markets as a residual. Their analysis evidences the necessity of further studies for explaining this variation.

**Arkolakis, C.; A. Costinot and A. Rodriguez-Clare (2012). “New Trade Models, Same Old Gains?” *American Economic Review*, vol. 102, pp. 94-130.**

The theory of international trade is an important topic in the study of economics. Starting with David Ricardo in the beginning of the nineteenth century, the gains from trade have been subject to a rigorous scientific scrutiny. The main idea underlying such body of knowledge is that comparative advantages hold. No matter the levels of absolute productivity in

each sector, there is always a comparative advantage in production given the benefits of specialization when amplified to a supra-national scale.

International trade theory has grown side by side with the developments in commercial relations across countries. A simple theory was initially required to deal with relatively simple trade flows: final goods were exchanged; most of them involving low degrees of technological sophistication, and a straightforward efficient pattern of specialization could be identified looking at the endowments of resources of each economy. Later, on the second half of the twentieth century, the theory of international trade has benefited from the insightful studies by Paul Krugman (1980, 1981), who has brought to the realm of international trade analysis a more realistic market structure, namely monopolistic competition, an environment under which it is possible to offer a credible explanation for intra-industry trade. Countries exchange different varieties of the same type of good, a fact that can be explained under the assumption of market concentration and increasing returns to scale, on one hand, and the consumers' preferences for variety, on the other hand.

In the first years of the new century, a new interpretation of the main trends of international trade has emerged, as a result of the observation that patterns of trade have suffered new and important changes and, more directly, as the result of a new framework of analysis, that was pioneered by Eaton and Kortum (2002) and by Melitz (2003). Today, the conventional trade on final goods is just a small part of international economic relations; many firms are of a large dimension, they are spread across many countries, the share of trade on intermediate goods and productive tasks, rather than final goods, is significant and the outsourcing of activities is a generalized practice. Furthermore, there is now plenty micro evidence on the anatomy of exporting firms. The strongest remark at this level is that exporting firms are not a random sample of the firms in a given industry. On the contrary, empirical evidence shows that only the more productive firms in each industry have the capacity to profitably engage in trade relations with foreign partners.

It is precisely in the context of this third wave of international trade theory that we encounter the article by Costas Arkolakis and his co-authors. They start by highlighting that in the last decade new micro-level data played an important role in allowing trade theorists to address questions as the ones that follow: what share of firms exports? How large are the exporting firms? How many different goods does each firm export? Besides these new concerns, the new trade theory should be capable of answering also the basic questions already addressed in older generations of models, namely a central question

that is pervasive to all the theories in this field: How large are the welfare gains from trade?

The undertaken analysis provides a simple answer to the aforementioned interrogation: the new trade theory does not deliver a substantially different answer from others already given by previous frameworks of analysis. In other words, although the new models emphasize productivity differences and establish a minimum productivity threshold above which firms can engage in international trade, the welfare predictions depend on a few forces that are already identifiable in old trade theories.

The welfare gains from trade are measured through the following entity: the change in real income associated with a foreign shock, a variable that is denoted by  $\widehat{W}$ . In the paper, it is demonstrated that the change in real income is such that

$$\widehat{W} = \hat{\lambda}^{1/\varepsilon}$$

In the above equation,  $\hat{\lambda}$  represents the change in the share of expenditure on domestic goods. The share of domestic goods is equal to 1 minus the imports penetration ratio, i.e., 1 minus the weight of the imports in the expenditure of the country under analysis. The other parameter,  $\varepsilon$ , is the elasticity of the imports with respect to the variable trade costs. Both the change in the share of domestic expenditure and the trade elasticity were already present in old trade theories and, thus, the conclusion is that the new trade theory does not add much at the level of the evaluation of welfare gains.

The strategy employed in the article to arrive to the above conclusion consists in devising a model sufficiently comprehensive to contemplate many features of the old and of the new trade models. The objective is to conclude that despite the different implications at many levels of considering some of such features and not others, the model is robust in terms of welfare implications.

The assumed class of models considers a series of micro-level and macro-level assumptions. In the micro perspective, it is assumed that: preferences are of a Dixit-Stiglitz form, only one factor of production is taken, namely labor, cost functions are linear, and the market environment is one of monopolistic competition. On the macro level, it is assumed that trade is balanced, the ratio between aggregate profits and aggregate revenues is constant, and there is a constant elasticity of substitution for import demand.

Different models, based in some specific combination of the above features, imply different predictions at the micro-level and identify different

sources of gains from trade. The point worth emphasizing is that, no matter the assumptions one relax, the predictions concerning welfare are maintained; the displayed equation is, in any case, a good description of the determinants of the welfare gains from trade. In more concrete terms, the paper confronts the Ricardian model of perfect competition and exogenous technology with the Melitz model of monopolistic competition and firm heterogeneity concerning productivity levels. No significant change in terms of welfare implications is found from one model to the other.

From an intuitive point of view, the substantial argument in the paper is that considerations on different productivities at the micro level are irrelevant for the welfare outcome: gains from trade can be inferred exclusively from trade flows at the aggregate level. This might be viewed as a disappointing result, because it indicates that the new trade theory brings nothing new in terms of welfare analysis; but one can also look at the glass half full: new models in trade theory are capable of addressing many new features at the micro level without damaging the knowledge we already have about the implications of trade over welfare that one can continue to address resorting to a restricted amount of macro data.

#### **4. EDUCATION AND SKILL-FORMATION**

**Cunha, F.; J.J. Heckman and S.M. Schennach (2010). "Estimating the Technology of Cognitive and Noncognitive Skillformation." *Econometrica*, vol. 78(3), pp. 883-931.**

Human capital is a fundamental piece in the process of economic growth. Economies generate income because they accumulate production inputs, and human skills are naturally a central element when assessing the instruments that potentially lead to the creation of increased wealth. For an economy to hold a highly skilled and productive labor force it is necessary to implement an efficient program of investment in human capital that must start in the early stage of the individuals' lives. Vital questions are raised when one puts into perspective how the education of children should be planned in order to promote goals of social and economic development.

This article focuses precisely on the development of children's skills. The main idea is to establish a relation between the investment made by households and the environment they create to foster children's education, and

the respective output in terms of acquired skills. A basic distinction is introduced between cognitive skills, which correspond to standard education results, and non-cognitive or soft skills, which are associated to the development of the personality of the individual and also with social abilities and emotional competences.

The paper is simultaneously theoretical, in the extent in which it presents a modeling framework to deal with skill formation in a multi-skills setting, and empirical, since it resorts to sophisticated econometric techniques in order to estimate the elasticity of substitution between the human capital investments that are undertaken and the resulting stock of skills. The analysis is intertemporal in the sense that the benefits of education investment are assessed in different stages of the formation of the children. The intention is to determine the optimal targeting of education interventions, given that heterogeneity exists: children are different in terms of their parental endowments. The findings are useful in terms of designing and implementing education policies.

The implemented model considers agents who live for multiple periods. The initial periods respect to childhood, a phase in which agents pass through a series of development stages. The second phase, involving also a sequence of time periods is the adulthood phase, in which individuals participate in the economy's labor force. The productivity of the workers when adult depend on the skills, cognitive and non-cognitive, that the individuals have acquired in the early stage of life, i.e., in the childhood. Skills are developed by the children as the result of the investment made by their parents.

In the model, initial conditions play a fundamental role. There is an initial endowment of skills that depends on the conditions of the household and on genetic factors. Skills will evolve according to a series of factors, namely the previous period accumulated stock of skills, the parental skills and the investment in education. Also, there are increasing returns to education: the more skills children possess, the more efficient become their learning abilities and the easier is the acquisition of new competences. Moreover, there is a complementarity between cognitive and non-cognitive skills: holding one type of skills promotes the formation of the other type.

The empirical evaluation of the relation between the investment in education and the creation of competences for work and life in society is a difficult exercise. Typically there are no available exact measures for most of the variables one has been referring to (how do one measure the acquisition of non-cognitive skills?). Proxies have to be found and measurement errors are likely to occur. Endogeneity and correlation problems may exist and, thus, a

careful and rigorous analysis is required. The authors approach these challenges collecting an extensive and comprehensive set of data, that includes test scores, personality evaluation, and a series of variables that account for the investment parents make in the education of their children.

Examples of indicators used in the statistical analysis include:

- For the measurement of the child's cognitive skills: gestation length, weight at birth, motor-social development in the early life stages, memory for locations, picture vocabulary and test scores at the various stages of development;
- For the measurement of the child's non-cognitive skills: friendliness, sociability, anxiety, hyperactive behavior and conflict reactions, at the various stages of development;
- For the measurement of maternal cognitive skills: arithmetic reasoning, literary competences, coding speed;
- For the measurement of maternal non-cognitive skills: self-esteem, locus of control;
- For the measurement of parental investment: number of books, number of toys, how often parents read to the child, how often the child has social contact and goes to cultural events, schooling expenditures.

The authors achieve meaningful conclusions from their empirical analysis and theoretical reflection. These conclusions are essentially the following: as the children become older, they become capable of producing new skills, both cognitive and non-cognitive, from the previously accumulated stock of skills, independently of the parental investment; in the earlier stages of life, the investment in education is essential for both types of skills; most importantly, while the lack of non-cognitive skills at earlier stages might be compensated later with a stronger investment, this is harder with respect to cognitive skills: the authors clearly highlight the difficulty of compensating at later stages for the effects of an initial setting that does not promote the acquisition of cognitive skills.

The capital conclusion is that non-cognitive skills are more malleable than cognitive skills. The analysis shows that initial gaps on cognitive competences are harder to recover than non-cognitive skills. The complementarity between the two types of skills also suggest that non-cognitive skills might develop without a strong effort oriented to this goal; they might emerge as a consequence of the investment in cognitive abilities. Furthermore, if

remediation strategies have to be implemented in advanced childhood stages, these are more effective if directed at non-cognitive skills.

Overall, this paper offers a compelling evaluation of how human capital investment should be approached beginning at the earlier stages of life. By knowing more about the efficiency on the investment in humans, economics can offer solutions that stimulate growth, development and the wellbeing of the society.

**Barro, R.J. and J.-W. Lee (2013). "A New Data Set of Educational Attainment in the World, 1950–2010." *Journal of Development Economics*, vol. 104, pp. 184-198.**

In this paper a large set of new estimates of educational attainment is provided and compared to the authors' previous findings and to available alternative measures. These new estimations constitute a thorough examination of how education has evolved around the globe and present reasonable proxies for the human capital variable that might be used in a wide range of empirical research. It is worth noting that the authors' previous estimates of educational attainment (Barro and Lee, 1993, 1996, and 2001) according to the Web of Science citation database, have been cited in journals over one thousand times, while the total number of citations by all journal articles, books, and working papers amounts to over seven thousand, according to Google Scholar.

Following tradition in development economics of assessing human capital through attained level of education, this article adds a new piece to the literature updating the state of the art in this field. The main contribution of this paper is a new and reliable data set on schooling available for a large group of countries that may prove useful for further research into human capital. In this paper, the authors present new data for years of schooling reducing the measurement error present in currently existing data series and expanding a geographical scope to 146 countries. The time window covered by their work extends from 1950 to 2010.

It has been widely accepted that the share of well-educated people in society goes along with a high level of labor productivity. It also implies larger numbers of more competent workers and greater ability to absorb advanced technology from other countries. The level and distribution of educational attainment also influence social outcomes, such as child mortality, fertility, education of children, and income distribution among many others.

A number of attempts to measure educational attainment across countries have been made in order to quantify the relationship between level of schooling and economic and social outcome variables. But the authors claim that earlier empirical studies, although widely available, do not adequately measure the aggregate stock of human capital available contemporaneously as an input to production. In this paper, they update and expand the data set on educational attainment, with accuracy of estimation improved both, more information and better methodology.

For instance, the accuracy of estimations has benefitted from incorporating recently available census/survey observations, disaggregated by gender and by 5-year age intervals. Following the previously developed approach by Cohen and Soto (2007), the data series in the current research are built by taking into account the age structure of the population. In particular, it is considered that older people, who on average have a lower educational level, have higher mortality rates. Authors present new estimates of mortality rates and completion rates by age and educational level. This allows the authors to make more accurate estimates of the educational level of the labor force for years in which one cannot observe it directly from censuses or surveys.

It is very important that the authors take into consideration mortality heterogeneity among age groups to avoid in this manner the detriment of data quality. Authors avoid the use of sources that employ different classification systems of education in a country over time. Their anchor figures on school attainment come from 621 census/survey observations collected by UNESCO, Eurostat, national statistic agencies, and some other sources. But what is important is that the classification scheme of all these census/ surveys follows UNESCO's "International Standard Classification of Education (ISCED)" and, thereby, facilitates comparisons of education statistics and indicators across countries on the basis of uniform and internationally agreed definitions. This approach leads to a reduction in measurement error of the authors' estimates.

Authors analyze the distribution of educational attainment in the population over age 15 by gender and by 5-year age group in seven categories: no formal education, incomplete primary, complete primary, lower secondary, upper secondary, incomplete tertiary, and complete tertiary education. Nonetheless, the census/survey observations include the countries/territories for which the authors could not construct the complete estimates of educational attainment because of missing information. That is why finally the authors have been able to construct complete estimates only for the 146 countries.

When a census provides only numbers for a combination of several categories, such as no formal education, incomplete primary, and complete primary, the authors use decomposition methods to separate into categories. Most missing observations the authors fill in by forward and backward extrapolation of the census/survey observations on attainment. The estimation procedure extrapolates the census/survey observations on attainment by age group to fill in missing observations with an appropriate time lag. The forward extrapolation method assumes that the distribution of educational attainment of a certain age group at time  $t$  is the same as that of the age group that was five years younger at time  $t-5$ . Similarly, the backward extrapolation method assumes that the distribution of educational attainment of a chosen age group at time  $t$  is the same as that of the age group that was five years younger at time  $t+5$ .

Authors also use the assumption that in the same 5-year age group, the survival rate is the same regardless of a person's educational attainment. It means that person's educational attainment remains unchanged between age 25 and 64. The paper also provides with new estimations of mortality rate per educational attainment level. The estimation results show that the more educated people have lower mortality, i.e., higher survival rates.

An important aspect of this study is evaluation of the accuracy of forward- and backward- extrapolation methods by carrying out ex-post simulations as described in Barro and Lee (1993). Authors find that the method provides reliable estimates for missing observations. An important issue is how to combine forward and backward-flow estimates when both are available for a missing cell. Authors carry out a simulation exercise in which they regress the "observed" actual census values of the various levels of educational attainment on the estimates generated from forward- and backward-flow estimates (based on both five- or ten-year lead and lagged values from actual censuses). They have used the regression results to construct a weighted-average of forward and backward-flow estimates.

It is worth pointing out explicitly some of the important developments that represent the progress of countries in achieving higher educational attainment. For instance, in 2010, the world population aged 15 and above is estimated to have an average of 7.9 years of schooling, increasing steadily from 3.1 years in 1950 and 5.3 years in 1980. The overall population over age 15 in high-income economies is estimated to have 11.3 years of schooling, compared to 7.2 years in developing countries.

While higher secondary and tertiary completion and enrollment ratios account for most of the improvements in years of schooling in advanced

countries, most of the improvements in developing countries are accounted for by higher primary and secondary completion and enrollment ratios.

Developing countries have successfully reduced illiteracy rates, especially among the younger cohorts. Specifically, the proportion of the uneducated in the total population over age 15 in developing countries has declined significantly over the past six decades since 1950, from 61.1% in 1950 to 17.4% in 2010. Among 15–24 year olds, this proportion has declined from 45.2% in 1950 to 5.9% in 2010. Despite these major developments, many challenges in making education more inclusive remain. Notwithstanding significant improvements, the current level and distribution of educational attainment in developing countries is comparable only to that of advanced countries in the late 1960s.

Addressing the gender equality of education related opportunities, the authors evidence, that despite the legendary figure of Latin macho, the most gender–equal education opportunities are found in Latin America and Caribbean countries with gender ratio just of 98.4, closely followed by Europe and Central Asia Countries with gender ratio of 98.3, and followed by advanced economies with gender ratio of 97.8.

As to comparison of the authors' results presented in this paper with the previous ones, on average, recent estimates for average years of schooling for advanced countries are higher than the previous Barro and Lee (2001) estimates. For developing countries, estimates of average years of schooling until 1990 are slightly lower than the previous estimates. The new estimates display a smoother increasing trend in average years of schooling, both for developing and advanced countries, than the previous estimates.

Authors' estimates of educational attainment are thought to provide a reasonable proxy for the stock of schooling capital for a broad group of countries. However, the authors acknowledge that the school attainment does not take into account the skills and experience gained after formal education. The measure does not directly gauge the skills obtained at schools and, specifically, does not take account for differences in the quality of schooling across countries. Educational attainment and human capital quality measures are highly correlated but human capital quality is quite diverse for countries with similar levels of educational attainment.

In conclusion, the authors' estimates of educational attainment seem to provide a reasonable proxy for the stock of human capital for a broad group of countries. The data might be useful for studying the linkages between education and important economic and social variables across vast variety of countries. It is expectable that this new data set will help to improve the

reliability of a wide range of empirical analyses on diverse development economic subjects.

## 5. FINANCE AND BANKING

**Adrian, T. and H.S. Shin (2010). "Liquidity and Leverage." *Journal of Financial Intermediation*, vol. 19, pp. 418-437.**

Analyzing the role of liquidity in asset pricing this paper brings a valuable contribution to the literature on the amplification of financial shocks through balance sheet channels. This is an important step towards improved comprehension of causes of financial crises through the prism of mark-to-market accounting. This research sheds more light on the mechanisms through which marking to market enhances the role of market prices inducing market agents to respond to price changes in a quite predictable way of active balance sheet management.

Adrian and Shin study the reaction of the financial intermediaries to changes in the valuation of their marked-to-market assets, in particular, and investigate the aggregate impact of such reaction on financial markets, in general. Analyzing a sample of five major stand alone Wall Street investment banks, the authors demonstrate that marked-to-market leverage of security broker dealers is strongly pro-cyclical and that the margin of leverage adjustment is being reached through the collateralized borrowing/lending such as repo and reverse repo operations.

This paper presents evidence that expansions and contractions of balance sheets result in asset-pricing consequences originated through shifts in risk appetites. Going further, the authors show that changes in dealer repos possess a predictive power in forecasting changes in financial market risk, which they measure by innovations in the Chicago Board Options Exchange Volatility Index, known as VIX index. Additionally, the definition of financial market liquidity in terms of balance sheets of financial intermediaries is proposed.

In financial systems dominated by deposit-taking banks, money stock tracks aggregate balance sheets. The examples of such systems are the developed countries of nineteenth and early twentieth centuries and developing countries today. But the money stock is a rather poor indicator of aggregate liquidity for the market-oriented financial system. In a financial system where balance sheets are continuously marked to market, changes in asset prices show up immediately on balance sheets, and have an instant impact on the net worth of all constituents of the financial system.

The net worth of financial intermediaries nowadays is especially sensitive to fluctuations in asset prices given the highly leveraged nature of such intermediaries' balance sheets. So there is a need to operate with the right analogies for classical notion of broad money to adequately describe the means of exchange in contemporary financial system. Authors propose repos as the rightful successor of the traditional money stock aggregate.

This paper manifests three main objectives. The first target is to document empirical evidence on the behavior of financial intermediaries, including procyclicality of leverage and its marginal adjustment through repos and reverse repos operations. The second objective is to show that active balance sheet management by individual financial intermediaries that envisages maintenance of constant leverage results in aggregate consequences for risk appetite. Hence balance sheet changes can forecast shifts in risk appetites as described by VIX index. And the third goal of this paper is to shed light on liquidity as change in aggregate balance sheets.

Authors present some very basic arithmetic regarding a relationship between leverage and balance sheet size for four groups of agents differentiating them in according to their passive/active behavior toward asset price changes. They employ the data from Flow of Funds account for the United States within 1963 – 2006 years in order to obtain empirical support for their theoretical propositions.

The first group of agents is composed by households, which are characterized by passive behavior toward asset price changes. Authors empirically evidence negative relationship between leverage and total assets.

The other three types of agents are classified in accordance with their magnitude of active behavior. Beginning from the less active to the most active, they are companies, commercial banks, and security dealers and brokers. Authors show that the relationship between leverage and balance sheet size of companies and commercial banks is considerably less negative than the one of households. For the last group of security dealers and brokers, as it was expected by Authors, this relationship is strongly positive. This result allows the authors to conclude that pro-cyclical reaction to the price behavior of financial intermediaries amplifies the financial cycle.

During the periods when assets price goes up, i.e., when the demand for assets is high, stronger balance sheets allow to augment leverage, making the demand for assets increase even more, which in turn increases asset price and leads to even stronger balance sheet, amplifying the boom. The upturn adjustment circle repeats.

On the other hand, during the periods of assets price decline, when the demand for assets is low, weaker balance sheets cause a decrease of leverage, provoking further decline in demand for assets, which in turn reduces assets price and leads to even more weakened balance sheet, amplifying the downturn. The downturn adjustment circle repeats.

In order to analyze the balance sheets of financial intermediaries, the authors employ the data from regulatory filings with the U.S. Securities and Exchange Commission (SEC) of five investment banks: Bear Stearns, Goldman Sachs, Lehman Brothers, Merrill Lynch, and Morgan Stanley. The sample period is ranged between 10 to 17 years before 2008, the year when investment banks have left the broker dealer sector.

The choice of these five investment banks is twofold. First, the research is primarily focused on the analyses of relationship between balance sheet size and leverage for security broker dealers. So these five above mentioned investment banks, not being part of commercial banking groups, provide a good approximation of the marked to market balance sheet and therefore allow investigating relationship between changes in leverage and changes in size of balance sheets. Second, these “pure play” investment banks represented a significant part of the financial system until the financial crisis of 2008, both in quantities and impact through prices.

For the chosen sample of investment banks, the authors undertake an empirical investigation of changes in their balance sheets and leverage. As the next step, the authors show that changes in aggregate repo positions of the major financial intermediaries can forecast innovations in the volatility risk-premium, where the volatility risk premium is defined as the difference between the VIX index and realized volatility.

In order to address the problem of the relationship between leverage and total assets, the authors perform panel regressions for chosen financial intermediaries separately and on aggregated basis. They make three important findings.

First, in both cases they find that leverage is pro-cyclical, i.e. leverage increases when total assets augment, and on the contrary, a sharp decrease in leverage corresponds to the contractions in balance sheet size. Additionally, the authors highlight an important difference between the distress in 1998 (Q4) associated with the Long-Term Capital Management (LTCM) crisis and the recent financial crisis of 2007/2008, as for the first quarter of 2008 there had not been observed the same type of contraction of balance sheets as was observed in the 1998 crisis.

Second, Adrian and Shin show that the most part of balance sheet fluctuations is originated from the repurchase agreement (repo) operations, when the security seller agrees to buy it back at a pre-agreed price on a pre-defined future date. The original seller is acting as a borrower, using security as collateral for a short-term borrowing. The interest on the loan is the excess of the repurchase price over the sale price. Repo operations are registered on the liability part of balance sheet. For the security buyer such operation is equivalent to give a loan, and is called reverse repo, recorded on the asset side of the balance sheet. The authors evidence a positive relationship between changes in total assets and changes in repos, as well as between changes in repos and reverse repos.

Third, the authors demonstrate that pro-cyclical leverage arises from counter-cyclical nature of value-at-risk (VaR), which could be interpreted as the equity capital that the financial intermediary must hold in order to stay solvent with the some degree of probability.

Having documented the positive relationship between balance sheet size and leverage for security broker dealers, the authors explore the possible consequences of this fact through the forecasting of risk appetite in the financial system. For this reason, they employ weekly data on primary dealers with the Federal Reserve Bank of New York. The primary dealers include the five mentioned above investment banks and commercial and foreign banks that own broker-dealers. In order to forecast financial market conditions in the following week, statistics on repos and reverse repos is used. For the quantification of ongoing financial market conditions the VIX index of implied volatility in S&P500 index options is used.

The forecasting regressions prove that the growth rate of repos and reverse repos on dealers' balance sheets determine future volatility. Additionally Adrian and Shin show that growth rate of repos forecasts S&P500 volatility risk premium. Thus the expansion of the balance sheets through the increased collateralized lending and borrowing leads to increased funding for asset purchases which in their turn results in growth of prices supported by boosted risk appetite.

In conclusion, the authors propose a definition of liquidity as the rate of growth of the aggregate financial sector balance sheet. When asset prices go up, financial intermediaries' balance sheets generally become stronger, and their leverage tends to become lower (without adjusting asset holdings). The financial intermediaries then hold surplus capital, and they seek ways in which they can employ their surplus capital. For such surplus capital to be utilized, the intermediaries must expand their balance sheets. When balance sheets are

expanding fast enough, even borrowers with very low creditworthiness are granted credit. It happens when the urge to employ surplus capital is very strong. The seeds of the subsequent downturn in the credit cycle are thus sown. This statement conceptually reminds of Minsky saying, “stability breeds instability”. So, now we know more precisely how.

**Keys, B.J.; T. Mukherjee; A. Seru and V. Vig (2010). “Did Securitization Lead to Lax Screening? Evidence from Subprime Loans.” *The Quarterly Journal of Economics*, vol. 125, pp. 307-362.**

Addressing issues related to the securitization process of mortgage loans and its links to assets liquidity, this paper brings additional insight on why financial intermediaries might become incentivized to lend money to low quality borrowers. Keys; Mukherjee; Seru and Vig (KMSV) provide comprehensive empirical analyses suggesting that the securitization process appears to be the main cause of lax screening of mortgage borrowers. This study makes a valuable contribution to the growing stream of literature on origins of subprime housing crisis, which later on resulted in the worldwide 2007-2008 financial unrest.

Securitization activities, grown enormously especially in mortgage market since the last decade of the previous century, have transformed the traditional mortgage market, where lending is performed by the bank and loans are maintained on the proper bank balance sheet, to the new financial intermediation system under which credit origination and balance sheet keeping are transferred from the bank to the specialized on these activities institutions, namely Lenders and Special Purpose Vehicles, respectively. This model of securitization process results in a certain distance between the mortgage Lender and the credit default risk taker. By itself, such circumstance might or might not considerably reduce the Lender’s incentives to properly screen and monitor borrowers. But, if screening of customers turns less rigorous, then one could expect loosening lending standards, allowing to argue that lax screening led to higher rates of credit defaults and consecutively to mortgage crisis.

The challenge to empirically confirm such link between securitization and mortgage loans default rates resides in a set of difficulties related to isolating differences in loan outcomes independent of contract and borrower characteristics. KMSV are able to overcome this endogeneity problem by employing a specific rule of thumb that induces exogenous variation in the ease of securitization among loans with apparently similar characteristics. This

rule of thumb is based on the borrower credit quality metric known as the FICO score, acronym for the Fair Isaac Corporation, the creator and provider of the indicator to the US market. The FICO credit score has been enjoying a wide acceptance by lenders, rating agencies, and investors as a *sine qua non* input used to assess creditworthiness of potential borrowers, and its usage has been continuously growing since mid-1990s.

FICO scores provide a ranking of potential borrowers by the probability of having some negative credit event over the next two-year horizon. They range between 400 and 900. A lower score implies a higher probability of a negative event occurrence. The authors focus their analyses on the performance of loans around the 600 and 620 thresholds as a function of amount of information provided to assess the creditworthiness of loan applicant.

Authors compare a set of characteristics of the loan market with FICO scores equal or above the chosen *ad hoc* threshold versus FICO scores below this threshold. KMSV point out that low-documentation loans just above the FICO 620 threshold have a higher unconditional likelihood of being securitized. Their data evidence that a securitization volume roughly doubles while the FICO score climbs over 620. Their analyses show that this augmentation of securitization volume while passing the 620 coincides with 10%-25% increase in default rates. Observing this behavior, KMSV associate a greater likelihood of loan securitization with lax screening of subprime lenders.

The comparative analyses on mortgage loans are performed for the period from 2001 to 2006. The extensive data on more than one million individual loans by “Loan-Performance” (mortgage information and analytics provider) is employed. The data set covers over 90% of the subprime loans that are securitized and represents the only source of detailed information on the non-agency securities market. Authors especially highlight that apart of the FICO score, two other types of information available in the data are of a particular importance.

First, the loans for home purchases are differentiated by the type (fixed rate, adjustable rate, balloon, or hybrid) and by the loan-to-value ratio (the amount of the loan expressed as a percentage of the value of the property).

Second, the documentation with past and current information on income and assets of the borrowers are used to assess the respective creditworthiness. Two categories of borrowers, as a function of the amount of documentation provided, are admitted for the research. “Low-documentation” type of borrowers is a combination of borrowers with no information about their income but some information about their assets and borrowers with no

information at all. “Full-documentation” category includes borrowers who confirm their income and assets. Additionally KMSV distinguish information, used to evaluate applicant’s quality, in respect to the efforts and costs required to its collection. Authors refer to “hard” information as to something that is easy to contract, such as the FICO score. “Soft” information, such as a measure of future income stability of the borrower, entails the costs for lender.

In order to identify whether securitization leads to lax screening, the authors separate the study into two parts. Initially, they investigate the low-documentation segment of loan market employing the FICO threshold of 620, widely accepted by the market for this segment. Additionally, they analyze the full-documentation mortgage market applying the 600 cutoff level, which is also a commonly accepted threshold for such type of mortgages.

As to the use the 620 FICO score level, KMSV further explain this choice in two ways. First, KMSV provide the evidence that lending guidelines, established by the government-sponsored enterprises, Fannie Mae and Freddie Mac, warns on lending to borrowers with FICO scores below 620 considering them as a risky category of borrowers. Rating agencies also used this cutoff to determine default probabilities of loans in order to attribute the rating for mortgage-backed securities with subprime collateral.

Second, KMSV also confirm the validity of the 620 threshold through the comprehensive empirical investigation of origination matrices used by the largest originators in the subprime market, who own the 70% market share.

Additionally, the authors perform a natural experiment that involves the passage and subsequent repeal of anti-predatory lending laws in two states of US (Georgia and New Jersey) as well as several falsification tests employing other levels of FICO scores. These complementary tests also prove the consistency with the rule of thumb that KMSV employ at the FICO score of 620 for low-documentation segment.

KMSV identify a statistical discontinuity in the distribution of default rates of low-documentation loans securitized around the 620 threshold. They associate this disruption in default rates with the discontinuity in increase of the unconditional probability of securitization occurring while moving from the group of loans with FICO scores in the range 615-619 (or 620- loans) to the group of loans with FICO scores in the range 620-624(or 620+ loans.)

Analyzing the performance of low-documentation loans around the 620 threshold, the authors assume that there should not be any noticeable differences in loans default rates if lenders screen similarly for the loans of credit quality 620+ and 620-. They attribute differences in default rates on

either side of the cutoff to the impact that securitization guidelines and practices exercise over lenders' screening standards.

The differences in default rates are estimated using the dollar-weighted fraction of loans defaulted within ten to fifteen months from origination as the dependent variable in the regression discontinuity framework. The loan is considered under default if it satisfies the following conditions: delay on payment for more than 60 (90) days; loan is in foreclosure; or the bank has retaken possession of the home.

Authors perform a comparative analysis on the dynamics of delinquency rates over the age of 620+ and 620- low-documentation loans. The differences begin around four months after the loans have been originated and persist up to two years. There are large differences in default rates: 620- loans are about 20% less likely to default after a year than 620+.

KMSV argue that the results of comparative analyses of low-documentation loans performance described above are conditional on securitization. They confirm this statement by the detailed investigation on how borrowers, investors, and lenders accounts for the differences in the performance of loans around threshold. The similarity of borrowers characteristics is detected around the threshold. Authors also note the difficulty to argue, whether investors purchase more 620- loans as compared to loans of 620+. This is due to the fact that securitized loans are sold to investors in pools consisting by loans with the entire credit score spectrum.

KMSV suggest that the strong incentive to differentially screen loans belongs to independent lenders who do not hold loans portfolio on their balance sheets. For them it is associated with the liquidity features, as it is more difficult to securitize the less scored loans, i.e., those below the threshold. Authors attempt to show that the independent lenders follow the rule of thumb. Additionally, low-documentation loans securitized by them with credit scores of 620- are about 15% less likely to default after a year as compared to low-documentation loans securitized by them with credit scores 620+.

The similar framework to analyze the low-documentation credit is applied for the investigation of the link between screening and the performance of full-documentation loan market. Following the government-sponsored enterprises and academic studies, the credit threshold is assumed to be at the FICO score of 600. KMSV confirm that it is easier to securitize full-documentation loans above the 600 FICO threshold but no differences in default rates around the threshold is detected.

The authors conclude their paper with the discussion section stating that, in the wake of the subprime mortgage crisis, a central question confronting market participants and policy makers is whether securitization had an adverse effect on the *ex ante* screening effort of loan originators. From their empirical analyses they conclude that there is a causal link between ease of securitization and screening. Authors state that the interest rates to borrowers are similar on either side of 620, but no support for this claim is provided. Although this interesting paper is published in *The Quarterly Journal of Economics*, the authors refrain from any welfare claims and economics considerations, focusing merely at historical aspects of financial securitization practices.

It is worth noting that this paper has instigated research and scientific discussions in this area. For instance, performing further investigations into the origin of credit score cutoff rules, Bubb and Kaufman (2011) had come to many findings opposite to those published by KMSV. For example, Bubb and Kaufman (2011) find that the institutional and quantitative evidence strongly rejects KSMV's securitization rule of thumb theory. Contrary to KMSV, they find that lenders change their screening behavior at certain credit score cutoffs for reasons unrelated to changes in the probability of securitization. Bubb and Kaufman (2011) state that the regression discontinuity research design used in KSMV is unable to answer the question of whether securitization led to lax screening, concluding that researchers must continue to search for other sources of evidence that can be brought to bear on this important question. Keys, Seru and Vig (2012), in their turn had continued their research with new findings published in *The Review of Financial Studies*. Nevertheless, Bubb and Kaufman (2014) present analyses indicating that securitization-cause-based beliefs should move away from the conclusion that securitization was an important factor in the decline in underwriting standards in the run-up to the financial crisis.

**Gorton, G. and A. Metrick (2012). "Securitized Banking and the Run on Repo." *Journal of Financial Economics*, vol. 104, pp. 425-451.**

A newly strengthened interest to finance related aspects has been emerging in the contemporary economic literature as a consequence of the recent financial crisis of the years 2007 and 2008. This paper addresses topics concerning the capital markets having the crisis as background for the analysis. Specifically, it approaches so-called "securitized banking", i.e., the business of packaging and reselling loans, with repo agreements as the main source of funds. The term "securitized banking" was coined by the authors to

emphasize the role of the securitization process both as the main intermediation activity and as a crucial source of the collateral used to raise funds in repo transactions.

Making parallels between the traditional banking system and the “securitized banking” this paper provides with important insights on the origins of the 2007-2008 global financial crisis. Authors argue that the recent financial crisis is somehow similar to traditional banking panics of the nineteenth century resulted in run on deposits, but contrary to these panics it had been provoked by a run on the repurchase agreements (repos), which caused a total paralysis of the repo markets.

Traditional banking is the process of financial intermediation between borrowers and depositors in a form of taking deposits and lending the money at a higher rate. Traditional bank run occurs when a large number of depositors simultaneously withdraw their savings and the banking system faces the problem to pay off the demand deposits having lent the money. This situation triggers further withdrawals to the point where banks run out of cash and thus face insolvency due to illiquidity of their assets. Traditional commercial bank runs in United States came to the end due to the implementation of the enhanced discount window lending by the Federal Reserve and due to the establishment of the Federal Deposit Insurance Corporation (FDIC). A proper existence of deposit insurance eliminates any incentive for insured depositors to withdraw their funds.

However, due to the limits on the amount protected by retail deposit insurance, banks are unable to offer insured deposits for large-scale non-retail depositors, such as sovereign wealth funds, mutual funds, and cash-rich nonfinancial companies, among others. The solution to this problem, also related to the liquidity provision and maturity transformation, is the so-called “securitized banking” system. The authors refer securitized banking to the business of packaging and reselling loans running predominantly by investment banks. The main provider of funds for the securitization process is the repo market, which has grown tremendously in the last three decades. Gorton and Metrick argue that the 2007-2008 financial crisis is a system wide bank run occurred in the securitized banking system. Like demand deposits at commercial banks, repo loans are runnable.

The authors propose a theoretical mechanism for bank run on repo, which provide a new perspective on how the problems with subprime housing assets spread to non-subprime assets that have no direct connection to the housing market and have caused a global financial crisis. In order to empirically support proposed theoretical model, defending that repo market, like any

traditional banking market, is inherently susceptible to runs, this paper provides such evidence through the analysis of the data set containing information on 392 securitized bonds and related assets, including many classes of asset-backed securities (ABSs), collateralized debt obligations (CDOs), and credit default swaps (CDSs) and the other repo rates and repo haircuts.

Gorton and Metrick point to the strong contribution of the repo run to the financial crisis by demonstrating that concerns about the liquidity of markets for the bonds used as collateral lead to escalation in repo haircuts, i.e., the amount of collateral required for any given transaction. Repo haircut in securitized banking system is analogue of the reserves in traditional banking with the difference that, in latter case, the counterparties are who imposes the minimum levels of haircuts and there is no borrowing from central bank.

Authors argue that the U.S. banking system had become insolvent in 2007-2008 in the sense that it could not pay off its debt, for the first time since the Great Depression, due to the continuously reinforced cycle of declining asset prices and increasing repo haircuts. This paper empirically tracks such self-reinforcing cycle explaining what had caused and what had happened during the 2007-2008 crisis.

In order to compare traditional banking business with securitized banking, the respective institutional models of financial intermediation of mortgages are developed and analyzed. The first difference between two kinds of intermediation processes is related to the liability side. The government insures deposits in retail bank. It is not so in the case of securitized investment banking, in which the funds are raised through repo agreements from big institutional investors. The investor receives asset as a collateral from the bank, being this procedure comparable to deposit insurance, and the bank agrees to repurchase this asset later paying for this repo rate, which is analogous of the interest rate on a retail deposit.

The second difference between the traditional and the securitized banking dwells on the asset side of financial intermediation in a sense whether a bank holds the originated security on its own balance sheet or not. Commercial banks lend out the raised cash and, as a result, hold the loans on their balance sheets. Differently, investment banks transform loans originated by direct lenders through the securitization process into the securitized bonds and transfer most of these bonds to outside investors.

The securitization process is organized as follows. Investment bank sells the pool of loans to the special purpose vehicle (SPV), which finances their purchase by issuing investment-grade securities (i.e., bonds with ratings in the

categories of between AAA and BBB-) with different seniority, called tranches, to be offered across capital markets. The key feature of the securitization is that the results of this process are used as collateral in raising more funds. Thus the securitized banking could be defined as a cycle that requires all steps to keep running.

The two state variables are proposed to track how deterioration of the subprime market directly impacts banks, which have on their balance sheets securitized assets and pre-securitized mortgages.

The first state variable is the ABX index used as proxy for fundamentals in the subprime mortgage market. The ABX index is a credit derivative that references 20 equally weighted subprime Residential Mortgage-Backed Securities (RMBS) tranches. The second state variable called LIB-OIS spread is the spread difference between the three-month London Interbank Offered Rate (LIBOR) and the three-month Overnight Index Swap (OIS) rate, used as proxy for counterparty risk in the interbank market, i.e., proxy for concerns about bank solvency.

To justify a use of LIB-OIS as such a proxy, Authors divide the LIB-OIS into counterparty and liquidity risk, and find that the counterparty component drives the vast majority of their results, and the liquidity component has no explanatory power. The authors find that changes in the LIB-OIS spread are strongly correlated with changes in credit spreads and repo rates for securitized bonds. These changes imply higher uncertainty about bank solvency and lower values for repo collateral.

Authors, based on the comparative analysis of these two state variables, ABX index and LIB-OIS spread, for 2007 and 2008, show that the 2007-2008 LIB-OIS spikes are not concurrent with the respective continuous ABX spread rising. Additionally they observe, that the ABX's most significant moves begins earlier seeming to lead the LIB-OIS spikes.

Concerns about the liquidity of markets for the bonds used as collateral led to increases in repo haircuts. The repo-haircut averaged across diverse asset classes, i.e., so-called repo-haircut index, rises from zero in early 2007 to nearly 50% at the peak of the crisis in late 2008. During this time period, several classes of assets were stopped entirely from being used as collateral, an unprecedented event that is equivalent to a haircut of 100%.

In parallel, studying changes in repo spreads, the authors show that they are not significantly related to changes in the ABX or volatility or to any of the other control variables. Thus, the state variable for bank-counterparty risk is the only significant correlate with repo spreads.

Authors try to understand how did problems in the subprime mortgages cause a systemic event being the 2007-2008 crisis. Their answer: there was a

run in the repo market. The location and size of subprime risks held by counterparties in the repo market were not known and led to fear that liquidity would dry up for collateral, in particular non-subprime related collateral. Public shocks causing expected future spread volatility led to increases in the repo haircuts, which was tantamount to massive withdrawals from the banking system.

The overall banking system has changed, with securitized banking playing an increasing role alongside traditional banking. One large area of securitized banking, the securitization of subprime home mortgages, began to weaken in early 2007 and continued to decline throughout 2007 and 2008. But, the weakening of subprime per se was not the shock that caused systemic problems. The first systemic event occurs in August 2007, with a shock to the repo market that the authors demonstrate using the LIB-OIS as a proxy. Although the authors state that the reason that this shock occurred in August 2007 is unknowable, many other researchers had come to identifying the cause.

When mortgage defaults rose along with the fall in housing prices, the value of the MBS declined. Investors demanded that the entities put up additional collateral or be forced to pay back the investors immediately, a form of margin call. This resulted in further sales of MBS, which lowered MBS prices further. This dynamics of margin call and price reductions contributed to the first systemic event, collapse of two Bear Stearns hedge funds in July 2007, an event which economist Mark Zandi referred to as "arguably the proximate catalyst" of the crisis in financial markets. On August 9, 2007 French bank BNP Paribas announced that it was halting redemptions on three investment funds due to subprime problems, which was considered as another "beginning point" of the crisis by other researchers.

But finally what is important is that the authors associate the deterioration of the subprime market initiated in the early 2007 with the seeds of the global crisis and confirm their postulate by statistical analyses of the comprehensive data on various categories of asset classes. After August 2007, the securitized-banking model was under pressure, with increasing haircuts on high-grade collateral. The second systemic event and run on repo occurred with the failure of Lehman. In this second event, the authors see parallels to the nineteenthcentury banking crises, with a famine of liquidity leading to

significant premium on even the safest of assets. But this time, it was different; it was securitized banking and the run on repo.

## 6. ECONOMETRIC TECHNIQUES

**Lee, D.S. and T. Lemieux (2010). “Regression Discontinuity Designs in Economics.” *Journal of Economic Literature*, vol. 48, pp. 281-355.**

This article describes, with detail, a specific technique used to evaluate empirical data. The technique is called regression discontinuity design and it studies the causal effect of a given event that is likely to generate a discontinuity in a given sample of data. A thorough discussion of regression discontinuity is undertaken, concerning the explanation of what it effectively is and how it can be applied to data, the scenarios in which it is a valid approach, its most meaningful economic applications and the limitations it is subject to.

The first application of regression discontinuity design to a socio-economic event goes back to Thistlethwaite and Campbell (1960). These authors were concerned with how merit awards impact on the future academic results of students. The setting was as follows: every student in a given universe is subject to a test. All students with a classification larger than a given cutoff value receive the award; all the others receive nothing. There is, in this case, a discontinuity in how the students are treated, with students with close grades being rewarded in a drastically different way. In a setting as this, one should expect the discontinuity in treatment to provoke a discontinuity in the future behavior and achievement of the students. It is precisely this kind of effect that the regression discontinuity design wants to address.

In the referred pioneer work, a simple regression setting was implemented. Variable  $X$  was defined to represent test scores, that could be above or below the cutoff value  $c$ . The dependent variable in this analysis is the future academic achievements, which is denoted by  $Y$ . A dummy variable will represent the difference in rewards,  $D \in \{0,1\}$ , with  $D=0$  if  $X < c$  and  $D=1$  if  $X \geq c$ . One should expect a discontinuous jump in  $Y$  at  $c$ , and it is exactly this impact that one is interested in evaluating. The evaluation may proceed taking the following regression equation,

$$Y = \alpha + \tau D + \beta X + \varepsilon$$

Parameters  $\alpha$ ,  $\tau$  and  $\beta$  are the parameters to estimate and  $\varepsilon$  is a random error term. The relevant result of the estimation procedure is the value of  $\tau$ , it

represents the distance, at point  $c$ , between the regression line for the group of those who have not received the award and the regression line for the other group. This value is, thus, a measure of the causal effect of the award in the population of students. This result must be analyzed carefully, because it is conditional on a series of assumptions, being the most important the one that imposes that all other factors besides the award, namely those that determine  $X$ , are not subject to any discontinuity.

The above example is relatively simple. The relation between the assignment variable ( $X$ ) and the dependent variable ( $Y$ ) is linear, except for the discontinuity at the threshold point, and therefore the relevant parameters can be obtained through the use of a simple Ordinary Least Squares regression over a linear equation. The thorough analysis undertaken by Lee and Lemieux emphatically stresses that there is no peculiar reason why the true model has to be linear. In fact, in most cases, data point to a nonlinear relation between the assignment variable and the outcome variable. One should be careful in specifying the underlying model since misspecification of the functional forms will certainly provoke a bias that will lead to an incorrect estimation of the relevant parameter,  $\tau$ . This is the reason why more sophisticated regression discontinuity analyses choose to estimate nonparametric models, i.e., models for which there is not a pre-determined number of parameters to estimate.

Regression discontinuity is interpreted by the authors of the article as a design and not a method. This essentially means that the assumptions needed to implement regression analysis are few. One does not need to have complete information on what determines the observations of the assignment variable; it is just necessary to know how this variable relates to the observable outcome. In the example of the school grades this signifies that one does not need to know the students' profile or any other element that may exert influence on test scores; the only relevant issue is how the factor that provokes the discontinuity changes the behavior of  $Y$  given the  $X$  observations.

One should be careful when employing regression discontinuity designs. These are not suitable for every scenario in which a discontinuity is observable; there are some caveats that must be carefully weighted. Essentially, regression discontinuity applies to a population where the individuals or agents have no control or a reduced control over the assignment variable; otherwise, the results are biased from the start: individual features

will be the determinant of the threshold, instead of the event that provokes the cutoff. For instance, in the student award example, if a part of the class has

knowledge on the scholarship to be attributed and the other part of the class has not, the experiment is compromised and will generate biased results. This occurs because for some student (the knowledgeable ones) it matters to have one or other grade (when they are extremely close and they matter for the award attribution), while for the other students it is almost indifferent to obtain one grade or the grade immediately above. Therefore, the application of this design should be avoided when individuals near the cutoff value have different information, what may originate a manipulation of the assignment variable because discontinuity rules generate incentives that lead to behavior changes.

Although being an empirical evaluation strategy with more than 50 years, regression discontinuity did not attract much attention from economists until the late 1990s. At that time, a series of applications to economics have emerged and, since then, this design became a relevant tool for the analysis of observable socio-economic phenomena. The article undertakes a thorough review of the empirical literature that employs regression discontinuity. Applications exist in many areas, ranging from studies in the field of education to the analysis of the labor market.

The systematic assessment of the application of regression discontinuity to economic research has allowed the authors of this paper to assert that, despite what some literature claims, the use of this experimental design is not confined to a few specific topics; it is pervasive used in empirical studies concerning economic issues. While a significant part of this literature is focused on test scores and school attendance, given the inspiration of the pioneer contribution that we have characterized above, there are many other phenomena that possess the required features for this type of analysis. It is the case of labor market studies, where the assignment variable can be the age of the worker, the duration of the employment contract, how long is the worker unemployed, and the cutoff might relate getting or not a job or to achieve or not tenure in the work position. Besides these two areas, regression discontinuity also applies to studies about political choices and elections, the contracting of medical insurance, pollution and environmental policy, crime and punishment, and the assignment of subsidies to firms.

All the applications share a common feature: they involve a discontinuity that may exist given the own nature of the phenomena (e.g., geographical discontinuity) or the necessity of establishing a frontier between those who fulfill given criteria relatively to others (as in the case of school grades or in

the case of the established age for countable activities as entering school, learn how to drive or access retirement benefits).

Since its inception, econometrics and the use of statistical tools for the analysis of economic issues as progressed a lot and non-conventional tools are emerging and being recovered for economics at a fast pace. The design characterized in this article is a good example of such tools, which address generic concerns with multiple applications.

**Cameron, A.C.; J.B. Gelbach and D.L. Miller (2011). “Robust Inference with Multiway Clustering.” *Journal of Business & Economic Statistics*, vol. 29, pp. 238-249.**

Clusters are commonly found in economic data. For a given universe or population of agents, similar traits allow to separate individuals into groups that share some common features. These groups are called clusters. Acknowledging the existence of such clusters is essential for any rigorous data analysis one needs to undertake.

This paper is concerned with the accuracy of statistical inference in the presence of clustered data. If clusters exist, the eventuality of intra-group correlation of errors concerning the estimated data is an obstacle that must be accounted for. To circumvent undesirable biases on the estimation results, powerful econometric tools must be developed. The concern of the authors of the article goes in this direction, in the sense they propose a variance estimator for commonly used estimators that is cluster-robust. A cluster-robust variance estimator is supposed to avoid the massive underestimation of standard errors that may be generated, thus minimizing the risk of over-rejection of the assumed hypotheses when resorting to conventional hypothesis tests.

This is not a new problem in econometrics. As emphasized by this article's authors, variance estimators for statistical analyses involving clustered data have been approached before in the literature, e.g., by Liang and Zeger (1986), Arellano (1987) and Hansen (2007). The novelty in this paper relates to the consideration of various levels of non-nested clustering. While the mentioned references dealt essentially with one-way clustering, the paper by Cameron and his co-authors focuses on two-way and multi-way clustering, i.e., it develops sophisticated econometric tools to overcome estimation biases in data sets where one can identify clusters involving more than one dimension, e.g., when observations can be grouped by the location they are in and by some other distinctive feature.

This type of technique implies the construction of a variance estimator over a standard estimation method. In particular, in this article, the emphasis is put on the ordinary least squares (OLS) estimator. This is the simplest estimator on which the analysis can rely and this is the reason why it is used to present the main arguments that culminate on the cluster-robust variance estimator. Nevertheless, to confirm the robustness of the employed method, the analysis is extended to other regression estimators that are typically employed in econometrics, namely the logit, the probit and the generalized method of moments (GMM) estimators.

The authors emphasize that their technique is of great use in many applications in economics and related fields and explore several examples. Examples of multi-way clustering are easy to identify. For instance, a dataset may involve employment data that can be separated by region, by industry or by type of occupation. Another case of multiple clustering that may require the use of the proposed robust inference estimator relates to international trade and to the necessity of grouping countries with respect to their trade flows. Yet another example concerns studies involving labor market matching, i.e., the matching between employers and employees. One more meaningful application is on the field of finance, where one can conceive a double clustering at the level of the firm and at the level of the time interval in which financial transactions typically occur.

Specifically, the article approaches and develops the following applications: (i) cross-section study of wage compensations. In this case, clusters are formed at the industry level and at the occupation level; (ii) the analysis of trade flows between pairs of countries; (iii) the assessment of health insurance, where clustering might take place at the age and household income dimensions.

Basically, this paper can be classified as a relevant effort in contributing to the arsenal of techniques economists need to measure and evaluate empirical data. The reality is complex and, hence, sophisticated tools are required to analyze data and estimate parameters that establish relations among variables. The data is not homogeneous and one needs to account, in many ways, for the observable heterogeneity. This article provides a solid contribution in this context. As the authors emphasize, the urgency of developing a method such as this is strongly based on the evidence that there is a large number of empirical applications where the researcher needs to control for the formation of clusters and, for a same array of data, such clusters may be formed in

multiple dimensions. The large number of citations this paper has received since it was published confirms the prediction the authors leave in the last statement of their conclusion: the offered method should be of considerable use to applied researchers.

## 7. CONCLUSION

Economics is the science that studies human decision-making in multiple contexts and at multiple levels. Households and firms purchase and sell goods and services, undertake financial transactions and optimize their behavior in order to maximize utility and profits, respectively. A sophisticated and complex web of relations emerges from the way agents act and interact, and this network of relations needs to be dissected and understood taking a comprehensive and pervasive view of the reality.

In this chapter, we have highlighted that research in economics is an extremely active field of science, that has produced, in the last years, remarkable contributions for the understanding of decision making at various levels. Although many other issues could have been approached, we have focused in a series of contributions that have accentuated the role of human capital formation, both for individual development and to consolidate the growth potential of economies; the importance of financial decisions, financial transactions and financial intermediation; the gains that emerge from good institutional arrangements and from the stimulus to engage in international trade relations; and the need to have a clear understanding of how the economy as a whole functions in a short-run perspective. Besides the analysis of relevant contents as those mentioned above, the progress of the economic science counts as well with the development of powerful techniques of empirical analysis; two of these techniques were also highlighted.

Most of all, this paper served the purpose of illustrating the richness of economics, in terms of themes of analysis and debate, in terms of subjects that require careful deliberation, in terms of compelling logical arguments it is able to establish, and in terms of the development of substantive tools of analysis. Economics is perhaps the science that has counted with a faster growth in the last decades; the prodigality of subjects to address, the continuously changing economic environment, the increase in the number of economists engaged in research and the improvement in the quality of the formation of economists

around the globe, are all signs that economics will maintain its vitality for many years to come.

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