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CIENCIA Y REALIDADES ECONÓMICAS: RETO DEL MUNDO POST-CRISIS A LA ACTIVIDAD INVESTIGADORA

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Apertura y Presentación

Sesión Académica

APERTURA Y PRESENTACIÓN

JAIME GIL ALUJA
Presidente de la Real Academia de Ciencias Económicas y Financieras

DR. JAIME GIL ALUJA

JAIME GIL ALUJA
Presidente de la Real Academia de Ciencias Económicas y Financieras

CIENCIA Y REALIDADES ECONÓMICAS: RETO DEL MUNDO POST-CRISIS A LA ACTIVIDAD INVESTIGADORA

Presentación

Un año más la Real Academia de Ciencias Económicas y Financieras de España abre sus brazos para recibir a un selecto grupo de científicos procedentes de cuatro continentes para reflexionar, junto con Académicos españoles, sobre uno de los problemas que más preocupan a los responsables de las organizaciones estatales: cómo responder al reto de los sistemas económicos sometidos a los desajustes y tensiones provocadas por los efectos de la reciente crisis económica.

De la propia pregunta planteada se deduce la existencia de dos vertientes distintas, teoría y realidad, tan propias de nuestra Real Corporación que desde hace 75 años las une en las palabras que aparecen en su emblema: "Utraque unum".

Nos mueve el deseo de vislumbrar, de la mejor manera posible, hacia dónde se van a dirigir las actividades económicas futuras y cómo la investigación económica va a encauzar sus esfuerzos para crear los elementos teóricos y técnicos necesarios para su tratamiento. Nuestros

esfuerzos van dirigidos a conseguir una sociedad mejor, en la que el bienestar de los ciudadanos sea percibido y gozado en todos los rincones del planeta.

Es bien cierto que nadie se atreve aún a anunciar cómo calibrará la historia el proceso recesivo y depresivo que ahora parece que empieza a tocar a su fin. En su día, historiadores y economistas no valoraron en su justa dimensión la crisis del 29 y, en cambio, fue necesaria una guerra mundial y varias décadas de discusiones historiográficas para ponerla en su real perspectiva y concederle la justa trascendencia que merecía.

Hoy sabemos con precisión que aquella década ruinosa de los años 30 desembocaría en unos movimientos de masas que acabarían tristemente con la instauración de dictaduras en el sur, el centro y el este de Europa.

Por lo tanto, permítanme a mí, ahora, que demos tiempo al tiempo antes de que juzguemos juntos con garantías cuáles serán las auténticas consecuencias históricas de esta última crisis, la que empezó en el 2007.

Pero mientras damos tiempo a la Historia y va concluyendo la década, tenemos una tarea y, esta sí, urgente. Es la de recordar, analizar y aprender de los errores que la han originado.

Solo tras este aprendizaje podremos mirar adelante, porque el futuro no es un por venir es un por hacer.

Es cierto que en un mundo de incertidumbres no se puede decir que el futuro será una proyección del pasado. Sin embargo, también lo es que al entender el pasado seremos capaces de afinar mejor nuestras herramientas para construir el fututo. Esa es nuestra misión como científicos, como economistas y como ciudadanos.

Esta crisis del 2007 empezó, como tantos errores humanos, con un exceso de confianza. A principios del milenio, el *establishment* financiero, con sus honradas excepciones, y en buena parte también el académico, cayó en el error de sobrevalorar su propia competencia, capacidad y poder para regular el sistema económico y creyó haber domesticado los inevitables ciclos que le dan sentido.

La academia, la banca y el poder político llegaron a confiar en que, con las nuevas tecnologías de la información y la experiencia acumulada en el control de las políticas monetarias, se podrían llegar a anular los ciclos económicos, o, por lo menos, reducir su amplitud y su duración a dimensiones no significativas.

Pero las mismas causas que producían aquel espejismo eufórico explican también los hechos que una década después provocaron el amargo desengaño de la recesión y posterior depresión.

En ese momento comprobamos que, como consecuencia de la interconexión de todos los mercados y actores económicos que en su aspecto positivo nos permitía reaccionar con eficiencia "on line" y modular los suaves altibajos cotidianos del sistema, también en un aspecto negativo nos hacía más vulnerables a lo que en estadística denominamos "eventos de cola": los sucesos menos habituales pero, por eso mismo, potencialmente más desestabilizadores.

El evento de cola que desencadenó el tsunami que colocó a la economía mundial al borde del colapso fueron las "hipotecas subprime". Fue, en realidad, el detonador que puso en evidencia la fragilidad de las estructuras del sistema, como consecuencia de que, al estar todas ellas hiperconectadas en tiempo real, igual que unos acontecimientos lo habían hecho prospero otros lo podían degradar.

El tsunami financiero que se desencadenó como consecuencia de la caída de Lehman Brothers y la primera gran crisis del euro, puso también en evidencia que la "destrucción creativa" Schumpeteriana tenía sus límites. En efecto, este reciente proceso de recesión y depresión ha puesto en evidencia el problema de cómo evitar esa disfunción que pone freno al hecho de que la destrucción sea a la larga creativa. Se trata de un aspecto que todavía no ha sido resuelto.

Por otra parte, había instituciones sobre las que debía haberse aplicado el peso de la ley sin paliativos, por sus actuaciones faltas del necesario rigor económico y financiero. Pero también es cierto, *too big to fall*, que eran demasiado grandes para caer sin poner en más grave riesgo todo el sistema.

Por eso también es urgente ahora elucidar, tras admitir con humildad que no es tan fácil gobernar los ciclos, qué niveles de volatilidad en los mercados deben ser permitidos y cuáles deben ser los aspectos reguladores para evitar que en la próxima recesión la autocomplacencia se transforme otra vez en histeria. Un mercado libre eficiente no es el más desregulado, sino el mejor regulado.

Establecer esta distinción es una tarea tanto más perentoria cuanto quienes han perdido su trabajo y su casa a causa del mal uso de la libertad que nos llevó a la recesión pueden confundir el libre mercado con la absoluta carencia de normas y culpar, así, al capitalismo y a la libre iniciativa de sus desgracias.

Y mucho nos tememos que esa confusión puede llegar a percibirse en las urnas de Europa. ¿O acaso no es esa la causa del auge de los populismos de extrema izquierda y derecha en toda la Unión Europea?

Se percibe el grave peligro de que los ciudadanos acaben creyendo que el libre mercado bien regulado no es un gran creador de riqueza,

sino sólo una excusa para que los poderes políticos y económicos se aprovechen de ellos y los exploten.

Y es fácil que acaben llegando a esa conclusión, cuando hemos visto cómo los planes de rescate empezaban por socorrer a algunas instituciones bancarias que habían sido previamente llevadas a caminos equivocados por unos pocos.

Por eso, nunca insistiremos lo bastante en que de poco sirve proclamar las excelencias del crecimiento macroeconómico si no se distribuye después, con la creación de empleo y buenos salarios, que la convierte en prosperidad para todos.

Todo cuanto ha sido expuesto hasta ahora nos permite pensar en la necesidad de seguir trabajando para construir el futuro. Y este es, en definitiva, el objetivo de la presente Sesión Internacional de la Real Academia de Ciencias Económicas y Financieras de España.

Empezamos a creer, ya con los hechos en la mano, que nos hallamos ante una nueva fase del ciclo económico: la de franca recuperación que debe llevarnos a la deseada prosperidad.

Y, si el marino pesimista se queja del viento, y el optimista cree que va a mejorar, nosotros queremos ser, ahora, los realistas que ajustan las velas.

Ajustar las velas hoy, supone reformar nuestro sistema económico y también nuestro marco institucional hasta lograr que incluya los suficientes incentivos y desincentivos para que la "avaricia" de los mercados se convierta en "sana ambición" generadora de progreso y de algo tan importante como es la innovación tecnológica.

Pero, para que esta reforma tenga lugar no es suficiente con esperar que los agentes económicos de manera milagrosa se autoregulen.

Es necesario utilizar unos elementos teóricos y técnicos aptos para el tratamiento de las nuevas realidades inmersas en un contexto de un cada vez más alto grado de incertidumbre. Para ello se cuenta, ya, con poderosos recursos científicos con base en la teoría de los subconjuntos borrosos.

A partir de ellos debemos aprender a diseñar, con rigor y flexibilidad, unas instituciones capaces de controlarse unas a otras en un "check and balance", como el preconizado por Paterson, para que no sean elementos sometidos al control de las grandes empresas los que controlen a otros elementos sometidos al control de otras.

Con demasiada frecuencia se ha preconizado la existencia positiva del buen control dejado al arbitrio de la mano invisible, pero ésta causa estragos muy visibles a menudo cuando se permite que sea la "avaricia" quien la dirija.

Ante el nuevo horizonte que veladamente se percibe es necesario establecer formalmente aquel nuevo marco institucional que, aún cuando esté falto de precisión sea capaz de albergar en su seno futuras relaciones económicas distintas a las conocidas del pasado.

Empecemos, pues, nuestro trabajo. Escuchemos cuanto en este recinto se defiende, se propone y se sugiere. Hagámoslo con firmeza, pero con la humildad tan propia de la sabiduría. Una vez más nuestra Real Corporación se sitúa a la vanguardia de las instituciones científicas que buscan, a través de sus Académicos, colaborar con todos cuantos quieren un nuevo amanecer para nuestra comunidad internacional.

Queda inaugurada la X Sesión Internacional de la Real Academia de Ciencias Económicas y Financieras de España.

SESIÓN ACADÉMICA

ANDRÉ AZOULAY

Académico Correspondiente para Marruecos
Consejero Económico del Reino de Marruecos

DR. ANDRÉ AZOULAY

ANDRÉ AZOULAY
Académico Correspondiente para Marruecos
Consejero Económico del Reino de Marruecos

AFRIQUE, LA MÉDITERRANÉE ET L´EUROPE, UN NOUVEL ACCORD POUR UNE AUTRE CHANCE À UN MONDE POST-CRISE[1]

Merci Monsieur le Président,
Mesdames et Messieurs,

Cette session sera commencée sur un propos qui n´est pas nécessairement dans l´agenda conventionnelle, dans l´ordre de jours qui vient de présenter le Président.

J´avais, il y a plusieurs mois, pour ce soir, choisi un thème qui est celui dans défi auquel nous allons être confrontés dans les années à venir. Dans cette situation, justement de la pré-crise commencée en 2008, en vous parlant d´un chemin de croix, où de croisade, que beaucoup de mes amis et moi-même avons choisi d´investir depuis quelques années, celui de voire notre région et quand je parle de notre région, je parle de l´Europe, je parle de la Méditerranée, je parle de l´Afrique du Nord et du Moyenne Orient et je parle de l´Afrique.

[1] Transcripción del discurso pronunciado por el Excmo. Sr. Dr. André Azoulay durante el X Acto Internacional de la RACEF.

J´ai choisi de réfléchir avec mes amis sur la possibilité de voir cette région demain prend place dans une communauté des nations et notamment dans la communauté économique internationale avec le même degré de cohérence, d´intégration économique, de logique financière pour devenir dans les atouts de l´économie mondiale demain, un acteur significatif et un acteur qui saura donner à l´Europe, à la Méditerranée, à l´Afrique et au Moyenne Orient, l´espace d´intégration, l´espace de cohérence qui apportera aussi parce que c'est, évidemment, dans l´actualité à laquelle nous sommes confrontés ce jour-ci, qui donnera donc à cette région la possibilité de rebondir en résistant à toutes ces tragédies que nous vivons, en retrouvant le chemin de la paix, en retrouvant le chemin aussi du grand partenariat qui aura su trouver, qui aura su reconquérir un cadre qui soit celui du partage, du respect et de la capacité de créer pour nous, collectivement, les richesses qui sont celles des générations à venir.

Je parle de l´Afrique. L´Afrique aujourd´hui c´est quinze pour cent de la population mondiale, c´est trois pour cent du commerce mondial, c´est quatre pour cent du produit national brut du monde. Quinze pour cent de la population, trois à quatre pour cent de richesse du monde. Ça n´est peut plus rester comme ça allait et au même temps, c´est pour l´Europe une chance exceptionnelle de consolidation de sa croissance, de rebond économique et la possibilité aussi en adoptant cette perspective qui est celle, que moi je qualifie de vertical: l´Europe en O, la Méditerranée, l´Afrique, pour constituer une région qui demain pourra être le partenaire des grandes régions qui tirent l´économie mondiale aujourd´hui: l´Union Européenne, les États-Unis d´Amérique, l´ASEAN en Asie, les pays de la Baltique et les pays de l´Europe de l´Est avec la réussite comme locomotive. À côté de ces régions, nous avons besoin, nous, d´exister aussi avec d´autre air de jeux. Nous avons besoin d´intégrer nos économies, nous avons besoin d´une gouvernance partagée qui nous ramènera à nouveau solidaires et respectueux les uns des autres. Nous avons besoin de créer de la richesse pour que ceux qui aujourd´hui veulent nous installer collectivement dans la régres-

sion, dans l´archaïsme, dans la violence et dans l´exclusion les uns des autres, trouvent d´un espace économique réhabilité, reconstruit qui sera celui aussi qui les rapportera, y compris à ceux qui veulent aujourd´hui se mettre à l´écart du monde civilisé, qui les apportera l´opportunité de s´intégrer et de devenir les acteurs inclusives d´un espace économique, d´un espace politique, d´un espace philosophique et moral qui sera l´espace de résistance qui nous manque aujourd´hui et sur lequel on ne peut plus faire l´impasse.

J´ai dépassé deux minutes Monsieur le Président mais je m´arrête pour respecter vos instructions. Merci beaucoup.

Entrevista

"Ganará el mundo de las libertades[2]

Isabel Ramos Rioja
Barcelona

El consejero económico de Hasan II y ahora de su hijo Mohamed VI, André Azoulay, estuvo en Barcelona poco después de los atentados de París. Azoulay (Esauira, 1941) participó en un foro sobre ciencia y realidades económicas organizado por la Real Academia de Ciencias Económicas y Financieras, que tuvo lugar en el Palau Macaya, de la Obra Social La Caixa.

El Proceso de Barcelona, 20 años después, no ha dado los resultados esperados, sobre todo en la sociedad civil. ¿Por qué?

Estuve esos años muy estrechamente asociado a la construcción de ese gran sueño y creo que hemos hecho muchos progresos. Por primera vez, en el preámbulo se decía que no habría simplemente intercambio de mercancías y servicios sino la oportunidad de construir una sociedad que, manteniendo sus peculiaridades, fuera más equitativa, con un reparto de la riqueza. Pero no hemos afrontado la falta de conocimiento mutuo. En ese plan, y desgraciadamente en este momento estamos viviéndolo, estamos aún en un choque de ignorancias de nuestras identidades respectivas, de nuestros valores, de la coherencia de lo que enseñamos a nuestros hijos. No hemos avanzado lo suficiente para que podamos protegernos de un retroceso tan sangriento como al que nos enfrentamos. En el mundo actual, y hablo de economía y la economía no es ajena, muy al contrario, a lo que ocurre, son los grandes conjuntos –como la UE, China, la ASEAN– los que mandan. Hay asociación euromediterránea –que no está al mismo nivel– con África. Es una nueva región que tiene una lógica vertical: Europa, Mediterráneo,

[2] Reproducción de la entrevista de Isabel Ramos Rioja al Dr. André Azoulay, para el diario *La Vanguardia* del día 11 de diciembre de 2015.

África Occidental pasando por el Norte de África. En los próximos diez años Europa va a desarrollarse a poco más del 1% de media y las previsiones más realistas para África, especialmente Septentrional y Occidental, son del 5%. La riqueza se desplaza y las oportunidades surgirán en esa área.

Por ahora, la presencia europea es básicamente militar.

Más que limitarnos a una estrategia dictada por los avatares del momento debemos ir más allá de la oportunidad económica; hay otra cita a la que no podamos faltar: un mejor reparto de la riqueza y que las decisiones no se tomen sólo en el Norte. Quizá sea ingenuo decirlo hoy porque estamos viviendo un drama, pero creo que vamos a ganar. Es el mundo de todas las libertades el que va a resistir a aquellos que quieren tomarnos como rehenes, privándonos de esos valores que son los mismos en el norte que en el sur: dignidad, libertad, justicia, diversidad. Podemos apoyarnos en una lógica económica ganador-ganador. Actualmente África representa el 15% de la población mundial; el 3% del PIB mundial y el 4% del conjunto del comercio mundial, con un crecimiento previsto del 5%. El desfase es evidente. La mitad del vaso lleno es principalmente económica. Falta el planteamiento alternativo que nos permitirá ganar esta guerra a la que nos enfrentamos. Tiene que ser global, estratégico, incluir seguridad, economía, hombres y mujeres, y no sólo mercancías y servicios.

Ha mencionado China, que tiene una presencia importante en África, donde los occidentales dejaron minas y demás.

China fue la primera en los bancos, las telecomunicaciones. Hicieron mejor el análisis.

Pero dicen que no dejan dinero: compañías chinas, obreros chinos, materiales chinos...

Y están en sus barrios. En Marruecos, hace ya diez años que, por decisión de Su Majestad Mohamed VI, se desarrolló una estrategia a la vez ambiciosa y que tiene mucho éxito en África Occidental. El enfoque no es neocolonial; es global, penetra en las sociedades de esos países. Como ha dicho, hace diez o quince años fue la desbandada; los occidentales vendían, cerraban, se iban.

Durante años actividades en las que debían participar jóvenes del Sur del Mediterráneo han tenido que ser suspendidas porque no les daban el visado.

Hablando de la situación actual, eso parece una provocación. Más que nunca, cuando pase el terror deberemos reflexionar sobre el precio que pagamos ahora porque en un momento en el que podíamos ir más allá no estuvimos a la altura de las circunstancias.

¿Puede ser Marruecos, junto con Argelia por estar ya vacunada, el único país de la región que mantenga la estabilidad?

La estabilidad de Marruecos no es por defecto; es el único país de la región que prohibió el partido único en su constitución de 1962. Fue el único en adoptar la economía de mercado, mientras que a nuestro alrededor todo era economía planificada. Ya empezamos a negociar con el conjunto europeo a mediados de los sesenta. La diversidad no es simplemente una palabra para nosotros. Yo sería un ejemplo: soy árabe, bereber, judío, ciudadano de Marruecos. En el mundo actual siento la responsabilidad de dar testimonio de esta riqueza para decir que es posible.

VALERIU IOAN-FRANC
Miembro de la Academia Rumana

DR. VALERIU IOAN-FRANC

VALERIU IOAN-FRANC
Miembro de la Academia Rumana

LA RECONFIGURATION DE LA VISION STRATEGIQUE DE L'UNION EUROPEENNE DANS LE CONTEXTE MONDIAL ET EUROPEEN

Résumé

*L'ouvrage des chercheurs de l'Institut national de recherches économiques «Costin C. Kiriţescu» de l'Académie roumaine fait partie d'une étude consacrée à la nouvelle image de l'Union européenne, dans le contexte économique actuel, dans la perspective des futurs développements des interférences des pays membres sur la géopolitique européenne. Les auteurs opposent à la reconfiguration actuelle de l'espace europ*éen *des parcours et des programmes de base des engagements communautaires à partir de leurs premières constitutions (1957) jusqu'aujourd'hui (2015).*

MOTS-CLÉS: *géopolitique, modèles économiques, Union européenne, développement économique, relations économiques.*

The paper presented by the researchers of the "Costin C. Kiriţescu" National Institute for Economic Research of the Romanian Academy is part of a more comprehensive study dedicated to the new image of the EU in the present economic context, mainly

with regard to future developments of the inferences of member countries in the geopolitics. The authors oppose to the present resetting of the European economic area basic schedules and programmes of the Community commitments from the early constitution (1957) to the present (2015).

KEYWORDS: *Geopolitics, Economic Models, European Union, Economic Development, Economic Relationships.*

1. Pro memoria: Les traités de l'Union européenne et le projet de l'union de la politique

Un examen des traités qui se sont succédés à partir de la formation des communautés économiques jusqu'à l'institution de l'Union européenne ne nous donne pas l'occasion d'un texte explicite concernant l'union politique comme résultat du fonctionnement de l'UE. Comme nous avons déjà mentionné dans ces études aussi[1], la période de début du processus d›intégration européenne, principalement justifié par la nécessité d'une paix entre les nations belligérantes par le contrôle des facteurs qui pouvaient alimenter le soutien d'une guerre (CECA, Euratom etc.), était extrêmement sensible à l'égard des formulations. La paix se trouvait dans un stade de début afin de pouvoir dire que la nouvelle construction européenne avait en vue une fédéralisation éventuelle, déjà testée par beaucoup d'empires détruits par les conséquences de la Première Guerre Mondiale et trouvés à une petite distance par rapport aux conséquences de la Seconde Guerre Mondiale.

Cependant, seule une lecture superficielle des traités peut justifier l'absence d'une forme sur laquelle nous insistons à nous exprimer positivement, comme une nécessité prévue, quelque soit la formulation.

[1] N. Pop, V. Ioan-Franc, 2010, *Despre criză, fără mânie şi cu discernământ* (À propos de la crise, sans colère et avec discernement), Editions Expert, Bucarest.

En fait, nous trouverons beaucoup d'autres formulations – on dirait subtiles, subliminales – qui ont l'acception cherchée par nous[2]. Nous tenons à cette signification subtile surtout maintenant, sept décennies après les débuts de l'intégration européenne, et ce que la réalité du présent nous permet maintenant est que, ayant en arrière une architecture de l'intégration indéniable, nous avons le droit d'interpréter de manière élargie certaines formulations plus simples ou succinctes des débuts.

La phrase-clé de la première pierre posée à la fondation du processus d'intégration européenne, englobant l'idée de projet politique, est celle qui se réfère au fait que les signataires de 1957 étaient déterminés de mettre les fondements d'une union étroite entre les peuples européens, par l'élimination de toutes barrières qui divisent le continent européen. N'oublions pas que l'Europe était déjà divisée en blocs d'influence, et le concept de nation ayant des intérêts nationaux était remplacé par la notion de peuple, plus près, du point de vue sémantique, de «moteur» des changements attendus avec nécessité.

Les nations ont émergé à la suite de ce que les peuples ont voulu, beaucoup en étant dirigées par des personnalités visionnaires. Pour notre argumentation, il faudrait nous préoccuper laquelle des notions *peuple* et *nation* exprime mieux ce qui est vivant et qui fait histoire. Evidemment, l'Europe appartient aux peuples et l'œuvre européenne, considérée comme contribution à la culture universelle, appartient à ses gens, des individus avec grâce et vocation, respectés par le peuple d'où ils proviennent.

Il n'intéresse plus ce que les autres traités établissent pendant le temps, mais nous allons remarquer qu'il y a des ajouts, dans la même nuance des mots simples ou symboliques, chacun à sa signification d'étape, qui a par derrière la reconnaissance des accumulations du passé, sur lesquelles on peut construire par la suite: l'Europe doit parler

[2] N. Pop, V. Ioan-Franc, *op. cit.*

d'une seule voix; sans frontières intérieures (dans un espace de plusieurs pays); un architecture d'une Europe qui n'est plus divisée; citoyenneté commune (européenne), suite à une union tant soit étroite entre les peuples; cadre institutionnel unique; politiques communes (étrangère, de défense, de sécurité); compétences exclusives de l'union, etc. L'évolution du langage à connotation d'union politique peut être poursuivie par la synthèse des parties pertinentes des traités qui suivent.

Dans le préambule du Traité de Rome (signé le 25 mars 1957, entré en vigueur le 1er juillet 1958), les fondateurs de la Communauté économique européenne se sont déclarés «déterminés de mettre les fondements d'une union de plus en plus étroite entre les peuples européens» *(determined to lay the foundations of an ever-closer union among the peoples of Europe)* et «déterminés d'assurer, par action commune, le progrès économique et social de leurs pays, en éliminant les barrières qui divisent l'Europe» *(resolved to ensure the economic and social progress of their countries by common action to eliminate the barriers which divide Europe***)**.

Dans l'Acte unique européen (signé le 17/18 février 1986, entré en vigueur le 1er juillet 1987) est exprimée la volonté de tous les Etats membres de transformer la totalité des relations d'entre eux pour instituer une Union européenne. Les signataires se sont déclarés «déterminés de mettre en œuvre cette Union européenne, premièrement sur la base des Communautés qui fonctionnent conformément aux propres règles et, deuxièmement, sur la base de la coopération européenne entre les Etats signataires en matière de politique étrangère et, également, d'investir cette Union avec les moyens d'action nécessaires» *(resolved to implement this European Union on the basis, firstly, of the Communities operating in accordance with their own rules and, secondly, of European co-operation among the signatory States in the sphere of foreign policy and to invest this Union with the necessary means of action)*, étant «conscients de la responsabilité qui revient à l'Europe pour

essayer de parler de plus en plus d'une seule voix et d'agir de manière conséquente et solidaire, afin de protéger plus efficacement les intérêts communs et l'indépendance» *(aware of the responsibility incumbent upon Europe to aim at speaking ever increasingly with one voice and to act with consistency and solidarity in order more effectively to protect its common interests and independence)*.

L'article 8A définit le but de l'Acte unique, à savoir «la mise en place progressive du marché intérieur au cours d'une période qui s'achève au 31 décembre 1992» *(progressively establishing the internal market over a period expiring on 31 December 1992)* et définit le marché intérieur comme «l'espace sans frontières intérieures, où la libre circulation des marchandises, des personnes, des services et des capitaux est assurée selon les dispositions du présent traité» *(the internal market shall comprise an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with the provisions of this Treaty)*.

Au 7 février 1992, était signé le Traité sur l'Union européenne, connu comme le Traité de Maastricht (entré en vigueur le 1er novembre 1993), dans le préambule duquel les représentants des Etats membres déclaraient leur «détermination de passer à une nouvelle étape dans le processus d'intégration européenne initié par la création des Communautés européennes» (*resolved to mark a new stage in the process of European integration undertaken with the establishment of the European Communities)*, en rappelant «l'importance historique de la fin de la division du continent européen et la nécessité de fonder des bases solides pour l'architecture de l'Europe future» *(historic importance of the ending of the division of the European continent and the need to create firm bases for the construction of the future Europe),* dans un cadre institutionnel unique *(within a single institutional framework)* et en soulignant la nécessité d'instituer une citoyenneté commune *(establish a citizenship common to nationals of their countries)* dans «le processus

de création d'une union de plus en plus étroite entre les peuples de l'Europe, dans laquelle les décisions soient prises le plus près possible des citoyens, conformément au principe de la subsidiarité» *(process of creating an ever closer union among the peoples of Europe, in which decisions are taken as closely as possible to the citizen in accordance with the principle of subsidiarity).*

Parmi les objectifs du Traité de Maastricht, il y a celui de «favoriser le progrès social et économique équilibré et durable, notamment par la création d'un espace sans frontières intérieures» *(promote economic and social progress which is balanced and sustainable, in particular through the creation of an area without internal frontiers),* ainsi que celui «d'affirmer son identité sur la scène internationale, notamment par la mise en œuvre d'une politique étrangère et de sécurité commune, y compris l'établissement, dans la perspective, d'une politique de défense commune, qui pourrait conduire, au moment opportun, à une défense commune» *(to assert its identity on the international scene, in particular through the implementation of a common foreign and security policy including the eventual framing of a common defence policy, which might in time lead to a common defence).*

En 1997, à Amsterdam, le desiderata de «créer une Union de plus en plus étroite entre les peuples de l'Europe, dans laquelle les décisions soient prises le plus près possible des citoyens» est nuancé et développé en «créer une union de plus en plus profonde entre les peuples de l'Europe, dans laquelle les décisions soient prises en respectant pleinement le principe de la transparence et le plus près possible des citoyens». Dans le Traité signé à Nice (le 26 février 2001, en vigueur à partir du 1er février 2003), on réaffirme l'importance historique de mettre fin à la division du continent européen**.**

Dans le Traité établissant une Constitution pour l'Europe (Rome, le 29 octobre 2004), on réaffirme la croyance d'un destin commun pour

les peuples européens *(convinced that, while remaining proud of their own national identities and history, the peoples of Europe are determined to transcend their former divisions and, united ever more closely, to forge a common destiny)*. Dans l'article I-5, on prévoit le fait que l'Union respecte l'identité nationale de chaque Etat membre, leurs structures fondamentales et la gouvernance locale et régionale *(the Union shall respect the equality of Member States before the constitution as well as their national identities, inherent in their fundamental structures, political and constitutional, inclusive of regional and local self-government. It shall respect their essential State functions, including ensuring the territorial integrity of the State, maintaining law and order and safeguarding national security)*. L'article I-13 met en évidence les domaines de compétence exclusive de l'UE: l'union douanière, l'établissement des règles visant la concurrence nécessaires au bon fonctionnement du marché intérieur, la politique monétaire pour les Etats membres dont la monnaie est l'euro, la conservation des ressources biologiques marines dans le cadre de la politique commune de la pêche, la politique commerciale commune, tandis que, dans l'article I-14, sont désignés les principaux domaines de partage des compétences entre l'UE et les Etats membres, parmi lesquels: le marché intérieur, la politique sociale, la cohésion économique, sociale et territoriale, la protection du consommateur, les transport, les réseaux transeuropéens, l'énergie, la sécurité et la justice.

Dans le Traité de Lisbonne (le 13 décembre 2007, 1 décembre 2009), signé par les représentants d'une Europe élargie (27 Etats membres), on stipule explicitement que «L'Union respecte l'égalité des Etats membres par rapport aux traités, ainsi que leur identité nationale inhérente à leurs structures fondamentales politiques et constitutionnelles, y compris en ce qui concerne l'autonomie locale et régionale», on dirait un pas en arrière par rapport à l›intégration: «notamment, la sécurité nationale reste la responsabilité exclusive de chaque Etat membre»; «la citoyenneté de l'Union s'ajoute à la citoyen-

neté nationale, sans la remplacer (art. 8)»; l'article 49A: «Tout Etat membre peut décider, conformément à ses règles constitutionnelles, de se retirer de l'Union». Toutefois, dans l'article 2B, on stipule les compétences exclusives de l'UE par rapport à l'union douanière, la politique monétaire pour les Etats membres dont la monnaie est l'euro, les règles concernant la concurrence nécessaires au fonctionnement du marché intérieur, la conservation des ressources biologiques de la mer dans le cadre de la politique commune concernant la pêche, la politique commerciale commune. En échange, on maintient le partage des attributions dans de nombreux autres domaines principaux, tels que le marché intérieur, la politique sociale, la cohésion économique et territoriale, les transports, l'énergie, la sécurité et la justice.

Aujourd'hui, les dirigeants européens ont changé, leur volonté a affaibli, mais pas nécessairement à cause de leur envergure beaucoup moindre que celle des dirigeants fondateurs (on reconnait que l'Europe n'a pas le leadership dont elle a besoin pendant ces temps troubles), mais justement comme conséquence – soit pardonnée l'expression – de leur «engorgement» dû à leurs succès de l'intégration, car les fondateurs ont été déterminés et ont réalisé, «*par une action commune, le progrès économique et social de leurs pays*». Le PIB, le niveau de vie des anciens Etats membres le prouvent, mais, malheureusement, ceux-ci sont présentés comme références de la compétition pour les nouveaux Etats membres. Donc, cela est sur le point de détruire la «*voix unique*», en particulier des nouveaux Etats membres, et de souligner des dualités dont le contenu est «enrichi» avec les frustrations historiques dont l'Europe devait se défaire, selon la volonté des pères fondateurs.

Un tel comportement a constitué le déclic pour parler moins, dans les plus hautes structures de l'Union, sur les peuples de l'Europe et plus sur les nations, mais non pas dans le sens de leur convergence vers leur projet politique, mais dans celui de faire respecter les identités nationales jusqu'à la possibilité de quitter l'Union (le Traité de Lisbonne,

2009). Dans ce contexte, à notre avis, le contenu du syntagme «*unité par diversité*» a été détourné et semble être utilisé comme un écran de fumée pour promouvoir des idées, à partir du niveau national et pénétrant jusqu'au niveau du Conseil, qui s'éloignent de la compréhension initiale des parties contractantes (le Traité de Rome).

Bien qu'on ne reconnaît pas de manière ouverte – maintenant, aussi dans la mondialisation de la libre circulation de la main d'œuvre, presque dans l'ensemble de la planète – que l'avance dans l'accentuation des identités nationales défend la fierté nationale de l'Europe d'après-guerre seulement en apparence, il semble que les insistances sur ce sujet ont apporté de graves dommages même à la notion de *droits de l'homme* éga*ux pour tous*. Nous avons déjà des exemples clairs de certaines tendances de discriminations positives et négatives excessives, quelques unes regrettables et inutiles, quand on parle de minorités, et nous insistons sur ce point, parce que les gens de différentes ethnies sont ceux qui «produisent» des actions, et non pas les institutions. N'oublions pas que les gens – les citoyens européens, considérés comme une multitude d'ethnies – sont le sujet du projet politique de l'Union et les architectes de celui-ci.

Peut-être que le paragraphe précédent, exprimant seulement un point de vue[3], est critiquable, mais ceux qui sont tentés par des jugements simplistes doivent faire appel à deux règles obligatoires de l'intégration, auxquelles nous nous sommes soumis du point de vue juridique par la signature des traités: les principes, comme extrait des valeurs de la culture occidentale dominante, et le processus d'harmonisation dans son sens le plus large. En parlant de ces règles et du syntagme «unité par diversité», nous entrons dans un domaine sensible, auquel il faut donner plus d'attention. Ce que suit peut être considéré comme une opinion ouverte au débat.

[3] Voir N. Pop, V. Ioan-Franc, 2015, *Da, există două Europe* (*Oui, il y a deux Europes*), dans *Penser l'Europe*, le séminaire inter-académique de la FNSA, Académie Roumaine, Bucarest, dans *Caiete critice* (*Cahiers critiques*), no. 2, Les Editions Expert, Bucarest.

Les traités d'association signés par les anciens pays socialistes (1992-1993) prennent les principes des traités communautaires existants à ce moment-là, l'article le plus important étant celui qui se réfère au fait que si l'une des parties signataires, soit les Communautés, soit l'Etat signataire, ne respecte pas les principes de la démocratie, les droits de l'homme et des citoyens appartenant aux minorités, les principes de l'économie de marché fondée sur la libre initiative et la compétition, les traités conclus entre les parties n'existent pas. Ces principes fondamentaux nous amènent à la règle de l›harmonisation législative, par laquelle des lois et des institutions appartenant aux nouveaux Etats signataires doivent garantir ces principes.

Fondamentalement, l'harmonisation législative dans ses détails, dans le processus d'intégration européenne tel qu'il a été conçu, a pour objet des CHOSES: marchandises de toutes sortes, y compris des flux d'argent, et institutions comme structures disposant de compétences spécifiques, qui forment l'architecture de l'Etat de droit. L'harmonisation législative crée, dans le sens le plus large, l'habitude pour des standards, respectivement, n'importe où vous allez dans l'espace communautaire, vous trouvez ou vous êtes traités selon les mêmes standards.

Il faut retenir que la règle de l'harmonisation a précédé l'émergence du concept d'unité par diversité, son apparition remontant à deux décennies au plus, lorsque la mondialisation a été perçue comme suffisamment étendue, donc comme phénomène irréversible. Il est certain que la mondialisation a inspiré la nécessité du concept d'unité par diversité[4], comme un nouveau et utile instrument d'une intégration européenne, avec les quatre libertés en expansion continentale, l'Europe elle-même devenant un acteur de la mondialisation.

[4] Th. de Montbrial, 2003, *Acţiunea şi sistemul lumii (L'action et le système du monde)*, Les Editions Expert, Bucarest.

La règle des principes et de l'harmonisation appliquée, de la même manière dans le nouveau contexte, n'a pas réussi cependant l'intégration fonctionnelle neutre du nouveau concept, à notre avis, il étant créé comme un antidote à la «*basse entropie*», où la dynamique de la mondialisation pourrait mettre son empreinte sur le processus d'intégration. N'oublions pas que toute une série de philosophes contemporains (Kaplan, Mackinder) donnent l'impression que la mondialisation (qui comprend aussi le phénomène d'intégration) nous conduit vers «*une terre (une planète) plat*», une métaphore aussi réussie qu'inquiétante pour la vie mondaine, surtout du point de vue de ceux qui parlent de la fin de l'histoire (Fukuyama).

Nous croyons cependant que les réalités récentes de l'intérieur de l'UE reflètent un éloignement de la bonne intention de l'unité par diversité, étant absent le processus, peut-être le plus important, d'harmonisation du comportement de l'HOMME – quelles que soient son ethnie et sa tradition – à un niveau minimum obligatoire des standards de droits et de libertés de l'HOMME, par lesquels on évite la manifestation des excès, de la radicalisation. Le fait que ces excès se manifestent comme tels et qu'ils ont passé à la phase du terrorisme issu peut-être de plus en plus dans l'intérieur de l'espace de l'Union doit soulever une question concernant le sens institutionnel, avec la participation de l'HOMME, à l'implémentation de l'unité de l'Union par diversité. Rien n'est plus instable lorsque la paix sociale est irritée, et l'histoire nous démontre que la dimension de l'étincelle ne compte pas pour la vitesse probable de certains changements-surprise.

Nous sommes témoins d'une façon particulière, outre les règles de l'harmonisation, à l'expansion de la manifestation de certaines traditions de race et religion au-delà de «l'espace humain» légal, réservé pour eux, ce qui signifie pour les gens ayant d'autres traditions une ingérence agressive, même sous la forme du terrorisme dans leur propre «espace humain» aussi légalement défini. Cette tendance, manifeste

déjà dans l'intérieur de l'Union, par l'application même des principes nobles de l'égalité et de la liberté, est de nature à détourner le projet de l'Union politique.

Le processus de l'unité par diversité est-il accompagné par une cohésion humaine – pas institutionnelle – plus forte dans l'Union d'aujourd'hui ou il est érodé par la fausse liberté pour sa protection? Voici une question soulevée par un thème épineux, tout simplement parce qu'on ne détecte aucun message à l'intérieur de l'UE par lequel soit entendu qu'une union politique conforme à l'espace des valeurs occidentales partagées en commun appartient tout d'abord à l'HOMME, à tous les citoyens européens.

Les excès des traditions, en sens large, comme expression de la diversité, en cultivant la haine et en incitant à celle-ci au lieu de la solidarité, éloignent le contenu de la diversité de son objectif-même déclaré au niveau politique le plus élevé de l'Union. La richesse culturelle européenne est la source de la multiplication des biens et du bonheur commun pour les citoyens européens, un facteur qui devrait unir et stimuler les citoyens respectifs dans leur démarche authentique pour le projet politique. Il faut toujours répéter que la définition de l'union politique, pas le concept lui-même, est *l'union de plus en plus étroite entre les peuples européens*, donc des hommes, et non pas l'une impériale personnelle, appartenant aux temps passés, ni même l'une institutionnelle, de l'ordre du monde d'aujourd'hui.

Quant à la sensibilité du sujet avec lequel nous concluons cette intervention, nous croyons qu'un texte d'actualité du point de vue du moment de son écriture et du contenu digne de réflexion académique, nous offre Robert D. Kaplan (2014)[5]: «*...L'Europe, justement* à cause *du fait qu'elle cherche une unité de plus en plus vaste et profonde, va*

[5] R.D. Kaplan, 2014, *Răzbunarea geografiei. Ce ne spune harta despre conflictele viitoare* şi *lupta* împotriva *destinului* (*La revanche de la géographie. Ce que la carte nous dit à propos de futurs conflits et la lutte contre le destin*), Editions Litera, Bucarest.

continuer d'être tracassée par ses propres divisions internes, qui, malgré la forme économique sous laquelle se manifeste aujourd'hui à la surface *de cette fissure – par exemple, la colère de l'Allemagne face à la crise des dettes de la Grèce – sont en fait des manières atemporelles d'exprimer la géographie... La complexité mirifique de la géographie européenne... a soutenu la formation de certains groupes et Etats-nations séparés du point de vue linguistique et va continuer à contribuer, pendant les périodes suivantes, au manque d'unité politique et économique, malgré toutes les institutions paneuropéennes*». C'est un point de vue d'un analyste politique d'envergure par ses fonctions occupées (professeur de sécurité nationale à l'Académie navale des Etats Unis, conseiller du secrétaire de la défense, chercheur principal au Center for a New American Security, Washington, DC, Stratfor's Chief Geo-political Analyst), qui concentre encore son argumentation concernant le manque d'unité en Europe (avec extension dans l'espace de l'UE – n.n.) sur les divisions internes historiques et géographiques, tandis que nous attirons l'attention sur les nouvelles divisions internes causées par race et religion, comme effet de l'évolution de l'intégration européenne.

2. L'interprétation de la reconfiguration de la vision à travers les facteurs extérieurs de l'UE

La question d'une nouvelle vision ou d'une vision différente de celle initiale concernant la stratégie de l'achèvement du projet politique européen devient une nécessité urgente. Nous avons en vue, premièrement, le retardement historique du projet par rapport à un calendrier considéré optimal (70 ans sont pourtant passés!), et les motivations qui justifieraient ce retard, à une analyse plus approfondie, semblent être utilisées non pas pour expliquer le retard, mais pour le produire. Comme la monnaie démontre historiquement ce que lie une nation en termes de son unité politique, la gouvernance de l'euro démontre une autre direction, notamment un succès financier de celle-ci (sa transformation en monnaie de réserve, recommandée pourtant

du point de vue administratif pour les Etats membres de l'Union européenne, en monnaie de transactions dans le commerce international, ayant déjà un poids qui dépasse 15%, en offres de ressource financière sur le marché de capital libellé en euro, etc.), pour ne pas parler du fait que la célébration des 10 ans de fonctionnement de l'euro ne fait aucune mention d'un rôle tant soit petit de l'euro dans la réalisation de la future union politique.

Deuxièmement, dans le domaine de la recherche académique, une question d'un grand intérêt est l'identification d'une connexion possible entre l'éventuelle inversion du cours historique de l'introduction de l'euro, dans le sens d'une «monnaie nationale» – communautaire, dans notre cas – et la réalisation d'une union politique, si celle-ci reste encore un projet d'intérêt majeur pour les Etats membres de l'UE. Pour l'instant, l'intérêt pour le projet politique européen reste circonscrit seulement à l'idée de sa complexité, le premier obstacle à résoudre étant l'union fiscale. Dans ce contexte, on prédit pourtant, depuis des années déjà, la disparition du dollar comme monnaie de réserve, la baisse de son rôle dans la cotation des matières premières, la perte de la confiance internationale dans une économie qui ne peut plus démontrer sa qualité de moteur mondial. Ceux qui tentent de construire de tels scénarios, même dans la situation de l'appréciation de la monnaie des Etats-Unis du mois de février 2015 et de la cotation sous-unitaire de l'euro par rapport au dollar, auxquelles s'ajoute aussi la situation exceptionnelle de l'économie américaine (redevenue à nouveau le leader mondial), semblent ne pas remarquer ce qui se passe avec la relance difficile de l'économie de beaucoup d'Etats membres ayant un poids significatif dans l'UE.

Les analystes financiers avertissent que la situation de faiblesse économique de l'UE en ensemble est maintenue aussi par les hésitations et par le retardement de la décision de mettre en pratique, par la BCE, la formule de relaxation quantitative (QE), appliquée avec succès par le

FED dans les Etats-Unis, tandis que la perception de l'euro se détériore en général, et en particulier à cause des âpres négociations concernant la dette de la Grèce. John Plender – d'où nous avons pris l'idée connue que l'intention de l'UE de créer une union monétaire sans une union politique a été un geste forcé de peu[6] – nous dit que les sceptiques des marchés osent déjà une métaphore, malheureusement concernant un vérité pas trop lointain dans l'histoire européenne: «*As the euro takes a continued battering, market sceptics argue that the European Central Bank could go the way of the Austro-Hungarian Bank after the disintegration of the Habsburg Empire*» (Comme l'euro supporte un choc continu, les sceptiques du marché argumentent que la Banque centrale européenne pourrait suivre la voie de la Banque austro-hongrois après la désintégration de l'Empire des Habsbourg, n.t.)

En revenant aux perceptions qui justifient la nécessité d'une nouvelle vision stratégique de l'UE, la seconde concerne les peu nombreuses et pauvres interventions en langage déclaratif, des plus hauts niveaux de compétence, concernant l'union politique. Nous ne pouvons pas signaler des messages directs pour l'encourager, pour la faire pénétrer du point de vue conceptuel dans la conscience des citoyens européens, pour être comprise comme une nécessité pour le développement futur lui-même de l'Union. Mais, nous voyons de telles formulations de nature à induire terreur si on passe à cet objectif d'une manière pragmatique, comme étapes et mode d'action, disons même selon l'exemple de l'UEM.

Il semble que le présent apporte des arguments sérieux au détriment de la réalisation de l'objectif politique de l'intégration, le discours optant pour la complexité de sa mise en œuvre dans les conditions actuelles et, par conséquent, pour l'ajourner jusqu'à ce que des conditions

[6] «*The question is whether the European Union attempt to run a monetary union without political union was a case of policy overstretch*» (La question concerne si la tentative de l'Union Européenne de créer une union monétaire sans une union politique a été ou non un cas d'exagération politique, n.t.), dans: John Plender, *Euro is at wrong end of a historic long-term shift*, dans *The Financial Times*, 29.06.2010.

plus favorables soient accomplies, sans que celles-ci soient explicitement identifiées.

Sans doute, il y a un contexte européen et mondial qui impose une reconfiguration de la vision stratégique de l'UE, mais ce qui reste inconnu, tant que ce processus est laissé seulement dans les mains des pays de l'avant-garde de l'intégration européenne, est la direction qui sera choisie pour cette reconfiguration. N'oublions pas que, dans le milieu de la crise financière de l'Europe et, en particulier, des mesures de relance économique, le sujet de l'hégémonie d'un Etat membre sur les autres a été relancé, en ce qui concerne le danger qu'une telle approche représente pour la cohésion de l'Union européenne. Le pays le plus visé a été l›Allemagne, non pas par des considérations d'une histoire pas trop lointaine, mais pour des motifs de dureté et de manque de flexibilité dans les moments les plus critiques de l'Union au cours des dernières années.

Les réactions aux mesures de sortir de l'excès du déficit budgétaire appliquées même à certains anciens Etats membres ont sauté hors des négociations fluides, ayant pour effet soit le changent de certains gouvernements (Italie, Espagne, etc.), soit l'extension de la tension sociale à des phases radicales encore non-explosives, avec l'acceptation de la réduction significative des revenus de la population. Les programmes durs d'austérité appliqués n'ont pas conduit à la consolidation fiscale attendue pour beaucoup d'Etats membres ayant des dettes publiques élevées, les déficits budgétaires et le sous-financement des taux des dettes par des ressources propres se prolongeant à la longue.

Face à ces attitudes perçues comme hégémoniques, mais moins critiquées à Bruxelles – certaines recevant les réactions publiques méritées –, les gouvernements opposants ont profité du discours national, afin de démontrer aux ceux gouvernés qu'ils les défendent en fait, de telle manière que la manipulation de la naïveté a constitué un autre facteur d'affaiblissant de la solidarité et de la cohésion, principes fondamen-

taux de la convergence dont l'avenir de l'Union européenne a besoin, au niveau du citoyen. Par conséquent, le pas vers l'euroscepticisme et un nouveau nationalisme économique est très petit et facile à nourrir, étant donné que les enquêtes (le baromètre européen) font référence à des opinions des sujets, citoyens européens, et non pas aux actions institutionnelles.

Les programmes d'austérité, soi-disant imposés par la Commission européenne, ont révélé la dualité du traitement pratiqué entre les «pays du nord» de l›UE et les «pays du sud» de l'UE, la Roumanie étant aussi une «victime» de certaines décisions trop sévères en ce qui concerne les indicateurs consacrés aux évaluations en cause. La Roumanie a réussi, pratiquement pendant une année, de résoudre le problème du déficit excessif, en dépit des ressources précaires causées par la fuite des capitaux étrangers, tandis que la France a bénéficié de délais pour atteindre à nouveau les standards du Pacte de croissance et de stabilité.

Il est de plus en plus évident le fait que les politiques de l'Union européenne, considérées comme solutions pour l'ensemble de la communauté, ont plusieurs effets de divergence. L'opinion presque généralisée des analystes qui nous dit que la récente crise financière a arrêté le processus de convergence au sein de l'Union est vérifiée, y compris par la décision d'arrêter le processus d'expansion géographique de celle-ci, au moins pour les cinq années prochaines. Par l'identification de certains phénomènes extérieurs à l'Union, mais ayant un impact sur celle-ci (pratiquement, le contenu de ce chapitre), il y a le danger d'apprécier leur pertinence pour la reconfiguration de la vision stratégique de l'UE justement en *sens opposé* par rapport à l'achèvement du projet politique, respectivement de conclure que le contexte actuel ne lui est pas favorable, de sorte qu'il peut être retardé.

Notre plaidoirie, ce que nous voulons soutenir dans cette étude, est de sortir de la simple contemplation qui donnent lieu à des énoncés sur

le blocage du projet politique en raison de l'incapacité de gestion des problèmes internes d'un pays par des reformes structurelles à cause du simple désir des certaines force de rester au pouvoir.

Ce qu'il faut soutenir – en observant que l'UE est encore attendue à la table du G-20 comme une entité prête et forte – est l'implication de la Roumanie dans la transformation de la phénoménologie extérieure à l'UE, mais nuisible à son projet politique, dans des opportunités qui ne freinent pas le projet, mais le rendent possible dans un laps de temps optimal. Il faut de nouveau **c**hoisir entre une finalité-but et un véhicule vers un but, et par le fait que tous les Etats membres de l'UE sont juridiquement tenus de répondre à un but final par les traités, ils ont le besoin, mais aussi la puissance et l'obligation de chercher un véhicule. Celui-ci ne peut être que la reconfiguration de la vision concernant l'accomplissement du but en prenant en compte le fait que même la phénoménologie extérieure à l'Union, hostile au but, doit être influencée et transformée dans le véhicule cherché.

Tout phénomène extérieur à l'Union, apparemment pas facile à gérer par les Etats membres, a un siège institutionnel multinational et un ensemble d'actions multilatérales prédéterminées (l'ONU, l'OMC, le FMI, la Banque mondiale, l'OCDE, le G-7, le G-8, le G-20, etc.) où les Etats membres de l'UE sont présents et sont appelés dans d'autres hypostases. Il est facile à comprendre que justement la mondialisation peut être un véhicule vers le but de l'Union, non pas considéré comme un point final, mais comme une ouverture d'une nouvelle étape de l'intégration européenne, dans l'esprit de la dignité et du respect pour nos semblables. Nous insistons sur la dimension apparemment idéaliste de l'union politique – dignité et respect pour les citoyens européens, parmi lesquels nous nous comptons nous aussi, les Roumains – dans un contexte extrêmement dramatique de la situation de la zone de l'euro, respectivement le problème de la Grèce.

Nous croyons qu'il n'est pas tout à fait par hasard que, dans le contexte d'une telle appréciation, 300 économistes, experts universitaires et académiciens représentant des écoles prestigieuses du domaine des sciences économiques et sociales (parmi lesquels il y a Tony Lawson de l'Université de Cambridge, Stephany Griffith-Jones de l'Université de Columbia, Clair Brown de l'Université de Californie, Alfonso Palacio de l'Université Complutense et Jacques Sapir de l'Ecole française de hautes études en sciences sociales) ont signé récemment un document de solidarité. Il s'agit de négociations pour stimuler l'économie au niveau européen, de manière uniforme, sans privilège, les délimitations survenant comme suite aux effets de l'application en pratique, dans les espaces nationaux, des politiques économiques neutres et à leur impact sur la compétitivité internationale.

Ce qu'on observe aujourd'hui est un glissement égoïste de la coordination des politiques au niveau communautaire, pour des raisons de «protection» des propres citoyens. Donc, des stimulations par des politiques particulaires dans des pays individuels, dont la relance fragile et sélective n'a pas un effet positif simultanément sur tous les pays membres. Une telle approche a aussi un effet négatif sur la migration excessive de certaines politiques soit à gauche, soit à droite, et les extrêmes s'unissent, habituellement, sur le terrain commun du radicalisme, comme un autre facteur d'instabilité politique. Les manuels classiques «d'économics» nous incitent à trouver un moyen de stimuler les économies par des mesures fiscales et monétaires, mais dans le cadre de certains «*programmes de réformes structurelles claires, vérifiables et mises en œuvre*» par chacun des Etats membres de l'UE.

Moyen réel pour faire bouger les choses dans la bonne direction, les négociations doivent être paneuropéennes et doivent apporter aux Etats membres le confort des bénéfices au niveau européen si nous voulons parvenir à «*une troisième voie*», celle de la conformation de tous les Etats à un accord paneuropéen sur les réformes structurelles. Les

éventuelles tolérances doivent être permises seulement pour provoquer des changements à long terme dans la compétitivité internationale des économies, ce qui aurait l'effet nécessaire à la gestion des déséquilibres internes avec moins de douleurs sociales. L'Europe n'a pas besoin (comme disait récemment Tony Blair dans ce contexte) en même temps d'austérité et de réformes structurelles – une combinaison déjà prouvée non-fonctionnelle – mais d'une croissance économique accompagnée par des réformes structurelles qui consomment des ressources de la croissance économique, et non pas de l'augmentation des dettes publiques. Cette voie est susceptible de démanteler les programmes des partis anti-réforme de gauche et de droite, qui n'offrent que de la colère au public et aucune solution concrète, ce qui empêche l'issue-même du blocage existant. En échange, dans ce blocage, les partis respectifs peuvent pédaler facilement sur des sujets tels que les immigrants, le faux mythe que les problèmes complexes peuvent être résolus par des coûts très réduits, la croyance que les réformes structurelles réclament une type d'autoritarisme masqué.

La réalité européenne, en ce qui concerne le nouveau nationalisme économique, l'introversion des Etats, les tendances vers des formes déguisées de protectionnisme, etc. nous montre que, si le pouvoir central ne dirige pas vraiment, alors les gens vont facilement suivre ceux qui prêchent des politiques extrêmes, qui mettent en péril même le projet politique de l'intégration européenne.

Si nous prenons conscience de la pertinence de certains phénomènes extérieurs à l'Union européenne pour la reconfiguration de sa vision stratégique, le «bénéfice» de ceux-ci dans l'idée d'être pris comme opportunités exige un «remodelage» de la situation interne de l'UE, respectivement la réalisation d'une croissance économique durable dans l'ensemble, créatrice d'emplois, ainsi que des réformes structurelles, toujours retardées et oubliées notamment pendant les périodes d'essor des cycles économiques, lorsqu'il fallait amasser les réserves de ressources pour de telles réformes.

KORKMAZ IMANOV
Académico Correspondiente para Azerbaiyán
Director Institute of Cybernetics of the National Academy of Sciences of Azerbaijan

DR. KORKMAZ IMANOV

KORKMAZ IMANOV
Académico Correspondiente para Azerbaiyán
Director Institute of Cybernetics of the National Academy of Sciences
of Azerbaijan

OIL PRICES AND ECONOMIC DIVERSIFICATION PROBLEM OF AZERBAIJAN

1. Introduction

The period of 2005 – 2015 years was flourishing for oil and gas industry of Azerbaijan. Reduced prices on the world oil market strongly influence the development of the national economy of oil and gas extracting countries, including Azerbaijan. During this period share of this sector in the structure of country's GDP was 0.42-0.54, in the volume of investments - 0.25-0.65, in export – 0.77-0.95 and structure budget revenue was about 0.25-0.34. The average export price of Azerbaijan oil in the first half of 2015 year was 50 USD, against 104 USD for the average annual export price in 2014.

Today, not only the decrease in oil prices on world markets, but also the decline in oil production due to the reduction of reserves greatly affects the process of a normal functioning of Azerbaijan's economy. So, if the volume of oil extraction in 2008 was 50.8 million tons, this indicator amounted to 45.6 in 2011, and 43.84 million tons in 2014 respectively, and forecast for 2016 is 40.62 million tons. In these conditions the diversification of economic structure of Azerbaijan is part of

the strategic development of the country. Liquidity reserves allow Azerbaijan to fulfill the diversification of the national economy structure, as this indicator was 50 billion USD at the beginning of 2015.

In this paper we analyze the structure of the current economic diversification during 2005-2015 and recommend appropriate direction of diversification. In order to do this fuzzy sets theory and fuzzy logic instruments are applied. Application of fuzzy sets and fuzzy logic is based on the problems of uncertainty in oil prices on the world market and the volume of resources in the country.

2. Analysis of economic diversification level

Diversification of the economic structure is the main state in achieving sustainable development. Normally diversified economy provides optimal growth and relation among industries of national economy. There are various methods for determining the level of economic diversification in literature, among which I would like to highlight Ogive Index[1], Entropy Index[2], and Herfindahl-Hirschman Index[3]. Simultaneously, the level of diversification is determined by means of W.Leontiev input-output model [4], [5], [6].

In this work, to estimate of diversification level fuzzy entropy composite index and fuzzy version of input-output model is proposed. The carried out calculation is based on the data of Azerbaijan Republic [http\\stat.gov.az].

3. Fuzzy entropy composite index

In order to calculate fuzzy entropy composite index of diversification level of Azerbaijan economy we used structural indicators of GDP for

2013. Using the formula of equiproportional distribution (1 / N = 1/13 = 0.077, where N is a number of sectors), intervals and corresponding terms are determined:

Lowest norm (VLN)	**(0.010, 0.030, 0.050)**
Below the norm (LON)	**(0.040, 0.053, 0.065)**
Norm(NOR)	**(0.060, 0.080, 0.100)**
Above the norm (HAN)	**(0.090, 0.295, 0.500)**

Further, membership degree of structural parameters to corresponding terms $\mu_A(x)$ is defined. Based on this information and fuzzy entropy of economic sectors- $E_i(A_i)$ parameters of the model are computed.

The obtained results of parameters calculation are shown in Table 1.

Table 1. Parameters of the entropy model 1

Economic sectors	2013		Terms	
Agriculture	0.057	0.667	**LON**	**0.7395**
Mining industry	0.420	0.39	**HAN**	**0.4535**
Manufacturing	0.045	0.25	**VLN**	**0.2698**
Construction	0.124	0.166	**HAN**	**0.1756**
Trade	0.076	0.8	**NOR**	**0.8627**
Transport and communication	0.066	0.3	**NOR**	**0.3208**
Tourism	0.020	0.5	**VLN**	**0.5833**
Real estate	0.022	0.6	**VLN**	**0.6964**
State governance and social insurance	0.027	0.85	**VLN**	**0.8779**
Education	0.050	0.769	**LON**	**0.8188**
Health care	0.019	0.45	**VLN**	**0.5094**
Finance, insurance	0.062	0.25	**LON**	**0.2679**
Other services	0.012	0.1	**VLN**	**0.0995**

On the basis of the following formula Fuzzy Entropy Composite Index of diversification- $E(A)$ is defined:

$$E(A) = \sum_{i=1}^{n} E_i(A_i)_i = \sum_{i=1}^{n} \frac{|A_i \cap A_i^C|}{|A_i \cup A_i^C|} = \frac{1.9+4.226+5.1+2.988}{19.1+15.774+15.9+17.012} = 0.209689, i = 1, \dots, 13.$$

Obtained results of calculations of Fuzzy Entropy Composite Index demonstrate a low level of diversification of Azerbaijani economy in 2013.

Investigations [5], [6] of economic diversification level by using the methods of equiproportional distribution do not provide a complete assessment of economic diversification. In order to get a full assessment the use of input-output balance model is recomended.

4. Input-output model analysis of economic diversification

P.B. Siegel [7], J.E. Wagner and S.C.Deller [5] suggest the analysis of regional economic diversification based on V. Leontiev's input-output model. Following the idea, we suppose fuzzy approach to analyze input-output balance. With this purpose, input-output balance of 2006 year of Azerbaijan is fuzzificated in the following manner. The minimum and maximum values for the coefficients are identified in direct relation matrix. The interval of minimum and maximum values is divided into appropriate linguistic terms, demonstrated below:

Table 2. Direct relation matrix of input

Code		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Agriculture	0.204269	0.003035	0.000001	0.084648	0.000001	0.002291	0.000763	0.000506	0.000003	0.000000	0.000246	0.001681	0.000000	0.000357	0.000764
2	Fishing	0.000000	0.189500	0.000000	0.000054	0.000000	0.000000	0.000000	0.000786	0.000000	0.000000	0.000000	0.000000	0.000000	0.000008	0.000000
3	Mining industry	0.001415	0.004435	0.014485	0.221853	0.526327	0.060578	0.000215	0.000067	0.002764	0.000000	0.001746	0.000095	0.000024	0.000026	0.001358
4	Manufacturing	0.038532	0.058219	0.032094	0.291153	0.099320	0.134819	0.169255	0.040592	0.088213	0.049674	0.070987	0.095654	0.256503	0.064769	0.129991
5	Electricity, gas and water	0.018128	0.057058	0.005949	0.030128	0.090972	0.004440	0.004781	0.012823	0.007426	0.002043	0.017129	0.012629	0.014314	0.017298	0.007215
6	Construction	0.019910	0.000000	0.009124	0.026276	0.037204	0.303251	0.063960	0.077207	0.015718	0.002830	0.067204	0.038156	0.014581	0.224881	0.088182
7	Trade	0.072712	0.000103	0.007313	0.033896	0.016781	0.000193	0.042780	0.002240	0.004837	0.015993	0.008761	0.000678	0.003900	0.002501	0.000892
8	Tourism	0.000301	0.001419	0.000279	0.000522	0.000558	0.002499	0.009662	0.141207	0.002847	0.002758	0.007699	0.004848	0.000506	0.006517	0.007620
9	Transport, storage and communication	0.018382	0.053113	0.018334	0.026855	0.015597	0.028151	0.021167	0.035524	0.263558	0.055142	0.083494	0.015965	0.014565	0.029849	0.033603
10	Finance, insurance	0.000550	0.001830	0.000258	0.003223	0.001666	0.001988	0.001692	0.003063	0.006351	0.043175	0.002439	0.002679	0.000847	0.006385	0.003528
11	Real estate	0.001841	0.000582	0.005590	0.016417	0.002520	0.027050	0.017117	0.014041	0.029639	0.105612	0.152905	0.008587	0.005131	0.018405	0.009638
12	Education services	0.000000	0.000000	0.000006	0.000301	0.000027	0.000690	0.000046	0.000000	0.000573	0.000935	0.001445	0.019255	0.000000	0.000662	0.000031
13	Health care and social services	0.000027	0.001364	0.000073	0.000358	0.000072	0.000081	0.000004	0.000106	0.000097	0.000003	0.000332	0.008220	0.001914	0.000657	0.000255
14	Public administration and social insurance	0.000000	0.000000	0.001883	0.000086	0.001571	0.018739	0.026356	0.004295	0.022167	0.001177	0.018313	0.001859	0.000487	0.017934	0.000185
15	Public utilities	0.000418	0.000261	0.000567	0.004718	0.000778	0.002041	0.001347	0.004169	0.004531	0.001701	0.002610	0.012704	0.004135	0.005157	0.103799

Table 3. Interval terms

Term Code	Terms	A	C	B
R1	Very Weak	0	0.01	0.02
R2	Weak	0.015	0.03	0.045
R3	Average	0.04	0.055	0.07
R4	Below average	0.065	0.1075	0.15
R5	Strong	0.1	0.25	0.4
R6	Very strong	0.35	0.5	0.65

Linguistic matrix formulated on the basis of linguistic terms has been described in Table 4.

Table 4.Linguistic matrix of intersectoral relations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	R5	R1	R1	R4	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1
2	R1	R5	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1
3	R1	R1	R1	R5	R6	R3	R1	R1	R1	R1	R1	R1	R1	R1	R1
4	R2	R3	R2	R5	R4	R4	R5	R2	R4	R3	R4	R4	R5	R3	R4
5	R1	R3	R1	R2	R4	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1
6	R1	R1	R1	R2	R2	R5	R3	R4	R1	R1	R3	R2	R1	R5	R4
7	R4	R1	R1	R2	R1	R1	R2	R1	R1	R1	R1	R1	R1	R1	R1
8	R1	R1	R1	R1	R1	R1	R1	R4	R1	R1	R1	R1	R1	R1	R1
9	R1	R3	R1	R2	R1	R2	R2	R2	R5	R3	R4	R1	R1	R2	R2
10	R1	R1	R1	R1	R1	R1	R1	R1	R1	R2	R1	R1	R1	R1	R1
11	R1	R1	R1	R1	R1	R2	R1	R1	R2	R4	R5	R1	R1	R1	R1
12	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1
13	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1
14	R1	R1	R1	R1	R1	R1	R2	R1	R2	R1	R1	R1	R1	R1	R1
15	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1	R4

As it is seen from Table 3, the number of all intersectoral relations is 225, of which 170 (75.5%) - are very weak, 20 (9%) - weak, 9 (4%)

- average, 15 (6.7%) - below average, 10 (4.4%) - strong and 1 (0.4%) - very strong.

In order to analyze intersectoral relations and identify the leading industries affecting the overall development of the economy, we use fuzzy DEMATEL method proposed by C.L. Lin and W.W. Wu[8].

For this purpose we constructed a matrix of fuzzy triangular numbers (Table 5.), corresponding to a linguistic matrix (Table 4).

Then, fuzzy number S is calculated on the basis of elements demonstrated in the table 5 and the following formula:

$$S = \frac{1}{\max 1 \le i \le n \sum_{j=1}^{n} (l_{ij}, m_{ij}, u_{ij})} = \frac{1}{(0.76, 1.40, 2.04)} = (0.49, 0.71, 1.32) \quad (1)$$

Here l_{ij}, m_{ij}, u_{ij} are respectively the left, middle and right elements of a triangular fuzzy number. Further, normalized matrix T (Table 6) is determined on the basis of the following formula:

$$T=S*A \quad (2)$$

As the next stage in calculations, the total intersectoral relations matrix F (Table 7) is defined by means of the following formula:

$$F = T\,(I - T)^{-1}, \text{ where I- is the identity matrix} \quad (3)$$

Table 5.Fuzzy numbers matrix of intersectoral relations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	(0.1,0.25,0.4)	(0,0.01,0.02)	(0,0.01,0.02)	(0.065,0.108,0.15)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
2	(0,0.01,0.02)	(0.1,0.25,0.4)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
3	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0.1,0.25,0.4)	(0.35,0.5,0.65)	(0.04,0.055,0.07)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
4	(0.015,0.03,0.045)	(0.04,0.055,0.07)	(0.015,0.03,0.045)	(0.1,0.25,0.4)	(0.065,0.108,0.15)	(0.065,0.108,0.15)	(0.1,0.25,0.4)	(0.015,0.03,0.045)	(0.065,0.108,0.15)	(0.04,0.055,0.07)	(0.065,0.108,0.15)	(0.065,0.108,0.15)	(0.1,0.25,0.4)	(0.04,0.055,0.07)	(0.065,0.108,0.15)
5	(0,0.01,0.02)	(0.04,0.055,0.07)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0.065,0.108,0.15)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
6	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0.015,0.03,0.045)	(0.1,0.25,0.4)	(0.04,0.055,0.07)	(0.065,0.108,0.15)	(0,0.01,0.02)	(0,0.01,0.02)	(0.04,0.055,0.07)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0.1,0.25,0.4)	(0.065,0.108,0.15)
7	(0.065,0.108,0.15)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
8	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0.065,0.108,0.15)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
9	(0,0.01,0.02)	(0.04,0.055,0.07)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0.015,0.03,0.045)	(0.015,0.03,0.045)	(0.1,0.25,0.4)	(0.04,0.055,0.07)	(0.065,0.108,0.15)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0.015,0.03,0.045)
10	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
11	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0.065,0.108,0.15)	(0.1,0.25,0.4)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
12	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
13	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
14	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0.015,0.03,0.045)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)
15	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0,0.01,0.02)	(0.065,0.108,0.15)

Table 6. The normalized matrix of the intersectoral relations – T

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.07,0.11,0.15	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
2	0.00,0.01,0.02	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
3	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00	0.10,0.25,0.40	0.35,0.50,0.65	0.04,0.06,0.07	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
4	0.01,0.03,0.04	0.04,0.06,0.07	0.01,0.03,0.04	0.00,0.00,0.00	0.07,0.11,0.15	0.07,0.11,0.15	0.10,0.25,0.40	0.01,0.03,0.04	0.07,0.11,0.15	0.04,0.06,0.07	0.07,0.11,0.15	0.07,0.11,0.15	0.10,0.25,0.40	0.04,0.06,0.07	0.07,0.11,0.15
5	0.00,0.01,0.02	0.04,0.06,0.07	0.00,0.01,0.02	0.01,0.03,0.04	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
6	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.01,0.03,0.04	0.01,0.03,0.04	0.00,0.00,0.00	0.04,0.06,0.07	0.07,0.11,0.15	0.00,0.01,0.02	0.00,0.01,0.02	0.04,0.06,0.07	0.01,0.03,0.04	0.00,0.01,0.02	0.10,0.25,0.40	0.07,0.11,0.15
7	0.07,0.11,0.15	0.00,0.01,0.02	0.00,0.01,0.02	0.01,0.03,0.04	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
8	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
9	0.00,0.01,0.02	0.04,0.06,0.07	0.00,0.01,0.02	0.01,0.03,0.04	0.00,0.01,0.02	0.01,0.03,0.04	0.01,0.03,0.04	0.01,0.03,0.04	0.00,0.00,0.00	0.04,0.06,0.07	0.07,0.11,0.15	0.00,0.01,0.02	0.00,0.01,0.02	0.01,0.03,0.04	0.01,0.03,0.04
10	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
11	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.01,0.03,0.04	0.00,0.01,0.02	0.00,0.01,0.02	0.01,0.03,0.04	0.07,0.11,0.15	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
12	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02
13	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00	0.00,0.01,0.02	0.00,0.01,0.02
14	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.01,0.03,0.04	0.00,0.01,0.02	0.01,0.03,0.04	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00	0.00,0.01,0.02
15	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.01,0.02	0.00,0.00,0.00

Table 7. Total intersectoral relations matrix – F

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.00,0.00,0.01	0.00,0.00,0.03	0.00,0.00,0.02	0.02,0.04,0.11	0.00,0.01,0.04	0.00,0.01,0.03	0.00,0.01,0.05	0.00,0.00,0.02	0.00,0.01,0.03	0.00,0.00,0.03	0.00,0.01,0.03	0.00,0.01,0.03	0.00,0.01,0.05	0.00,0.00,0.03	0.00,0.01,0.03
2	0.00,0.00,0.02	0.00,0.00,0.01	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02
3	0.00,0.01,0.05	0.00,0.01,0.06	0.00,0.00,0.03	0.02,0.09,0.30	0.08,0.18,0.47	0.01,0.02,0.09	0.00,0.01,0.11	0.00,0.01,0.05	0.00,0.01,0.06	0.00,0.01,0.05	0.00,0.01,0.07	0.00,0.01,0.06	0.00,0.01,0.11	0.00,0.01,0.07	0.00,0.01,0.07
4	0.00,0.02,0.08	0.01,0.02,0.08	0.00,0.01,0.05	0.00,0.00,0.06	0.02,0.04,0.15	0.02,0.04,0.13	0.02,0.09,0.30	0.00,0.01,0.07	0.02,0.04,0.13	0.01,0.02,0.09	0.02,0.04,0.14	0.02,0.04,0.13	0.02,0.09,0.29	0.01,0.02,0.11	0.02,0.04,0.14
5	0.00,0.00,0.02	0.01,0.02,0.05	0.00,0.00,0.02	0.00,0.01,0.04	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02
6	0.00,0.01,0.03	0.00,0.00,0.03	0.00,0.00,0.03	0.00,0.01,0.05	0.00,0.01,0.06	0.00,0.00,0.02	0.01,0.02,0.08	0.02,0.04,0.11	0.00,0.01,0.04	0.00,0.01,0.03	0.01,0.02,0.07	0.00,0.01,0.05	0.00,0.01,0.04	0.02,0.09,0.28	0.02,0.04,0.12
7	0.02,0.04,0.10	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.01,0.05	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.03	0.00,0.00,0.03
8	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.01	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02
9	0.00,0.00,0.03	0.01,0.02,0.06	0.00,0.00,0.02	0.00,0.01,0.05	0.00,0.01,0.03	0.00,0.01,0.04	0.00,0.01,0.05	0.00,0.01,0.04	0.00,0.00,0.02	0.01,0.02,0.06	0.02,0.04,0.11	0.00,0.00,0.03	0.00,0.01,0.03	0.00,0.01,0.05	0.00,0.01,0.05
10	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.01	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02
11	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.03	0.00,0.01,0.04	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.01,0.04	0.02,0.04,0.10	0.00,0.00,0.01	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.03	0.00,0.00,0.02
12	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.01	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02
13	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.01	0.00,0.00,0.02	0.00,0.00,0.02
14	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.01,0.04	0.00,0.00,0.02	0.00,0.01,0.04	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.01	0.00,0.00,0.02
15	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.03	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.02	0.00,0.00,0.01

In the last stage, the sum of elements rows and columns shown in the table 8 is determined by using the following formulas:

$$R_i=\sum_{j=1}^{n}(l_{ij},m_{ij},u_{ij}),\ (i=1,2,..,n) \quad (4)$$

$$D_j=\sum_{j=1}^{n}(l_{ij},m_{ij},u_{ij}),\ (j=1,2,..,n) \quad (5)$$

Table 8. The results of solution I-O matrix in 2006

Number of Economic sectors	Dl	Dm	Du	Rl	Rm	Ru	Dl+Rl	Dm+Rm	Du+Ru	Dl-Rl	Dm-Rm	Du-Ru
1	0.019	0.108	0.541	0.020	0.105	0.480	0.039	0.213	1.021	-0.461	0.003	0.521
2	0.000	0.056	0.297	0.031	0.113	0.469	0.031	0.169	0.766	-0.469	-0.057	0.266
3	0.124	0.388	1.633	0.004	0.065	0.327	0.128	0.453	1.960	-0.203	0.323	1.629
4	0.185	0.539	1.941	0.055	0.215	0.852	0.240	0.754	2.793	-0.667	0.324	1.886
5	0.014	0.083	0.386	0.105	0.286	1.010	0.119	0.369	1.396	-0.996	-0.203	0.281
6	0.087	0.277	1.023	0.034	0.130	0.543	0.121	0.407	1.566	-0.456	0.147	0.989
7	0.020	0.104	0.472	0.043	0.191	0.848	0.063	0.295	1.320	-0.828	-0.087	0.429
8	0.000	0.056	0.297	0.024	0.111	0.479	0.024	0.167	0.776	-0.479	-0.055	0.273
9	0.058	0.176	0.667	0.024	0.113	0.505	0.082	0.289	1.172	-0.447	0.063	0.643
10	0.000	0.056	0.297	0.036	0.131	0.539	0.036	0.187	0.836	-0.539	-0.075	0.261
11	0.023	0.109	0.464	0.042	0.153	0.625	0.065	0.262	1.089	-0.602	-0.044	0.422
12	0.000	0.056	0.297	0.020	0.105	0.476	0.020	0.161	0.773	-0.476	-0.049	0.277
13	0.000	0.056	0.297	0.025	0.157	0.747	0.025	0.213	1.044	-0.747	-0.101	0.272
14	0.007	0.072	0.347	0.039	0.177	0.755	0.046	0.249	1.102	-0.748	-0.105	0.308
15	0.000	0.056	0.297	0.036	0.143	0.603	0.036	0.199	0.900	-0.603	-0.087	0.261

Fig.1 Diagram results of solution I-O matrix 2006

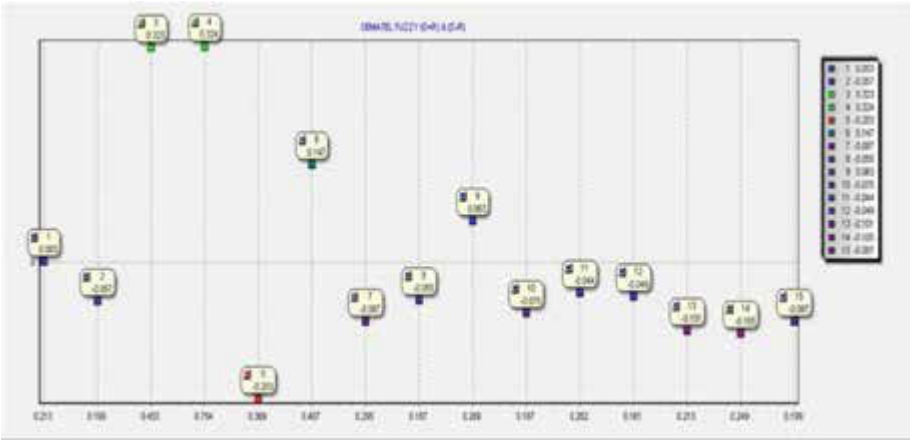
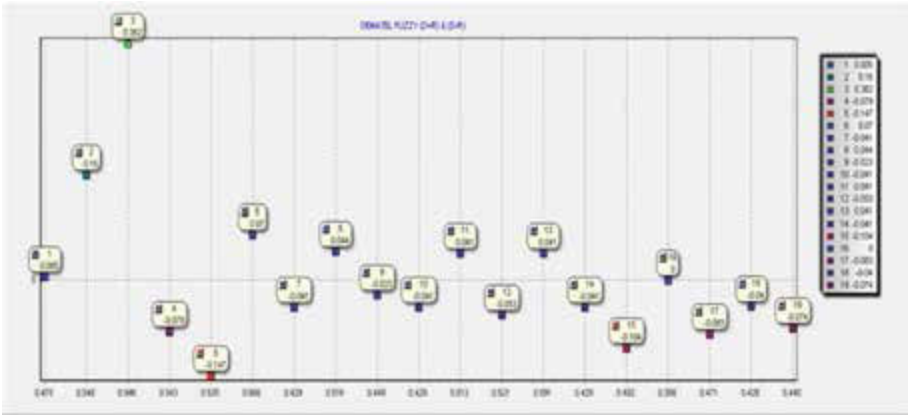


Fig.2 Diagram results of solution I-O matrix 2011



The results of calculation with I-O matrix 2006 given in the fig.1 shows mining industry [3], manufacturing [4], construction [6], transportation - [9], agriculture [1] as the leading sectors of Azerbaijan economy. The other sectors of national economy are underdeveloped.

Based on the input-output balance of Azerbaijan in 2011, covering 19 industries, using fuzzy method DEMATEL, also major industry sectors affecting the growth of the economy are found. The results of solving the problem are given in the Table. 8 and Fig. 3.

As seen from the Fig.2, which shows the results of calculation for I-O matrix 2011 with 19 sectors of economy, leading branches are manufacturing ③, mining ②, construction ⑥, transportation- ⑧, finance and insurance ⑪, agriculture ①.

Table 9.The results of solution I-O matrix in 2011

Code	Economic sectors	Dl	Dm	Du	Rl	Rm	Ru	Dl+Rl	Dm+Rm	Du+Ru	Dl-Rl	Dm-Rm	Du-Ru
1	Agriculture	0.027	0.24	1.117	0.024	0.235	1.096	0.051	0.475	2.213	-1.069	0.005	1.093
2	Mining industry	0.093	0.354	1.432	0	0.194	0.989	0.093	0.548	2.421	-0.896	0.16	1.432
3	Manufacturing industry	0.278	0.654	2.187	0.059	0.292	1.24	0.337	0.946	3.427	-0.962	0.362	2.128
4	Energy	0.023	0.232	1.087	0.071	0.311	1.289	0.094	0.543	2.376	-1.266	-0.079	1.016
5	Water supply	0	0.194	0.989	0.087	0.341	1.38	0.087	0.535	2.369	-1.38	-0.147	0.902
6	Construction	0.106	0.368	1.434	0.062	0.298	1.264	0.168	0.666	2.698	-1.158	0.07	1.372
7	Trade	0	0.194	0.989	0.025	0.235	1.099	0.025	0.429	2.088	-1.099	-0.041	0.964
8	Transport	0.051	0.28	1.223	0.025	0.236	1.1	0.076	0.516	2.323	-1.049	0.044	1.198
9	Tourism	0.012	0.213	1.038	0.025	0.236	1.1	0.037	0.449	2.138	-1.088	-0.023	1.013
10	Information technology	0	0.194	0.989	0.025	0.235	1.098	0.025	0.429	2.087	-1.098	-0.041	0.964
11	Finance and insurance	0.05	0.277	1.209	0.025	0.236	1.099	0.075	0.513	2.308	-1.049	0.041	1.184
12	Real estate	0.024	0.234	1.093	0.062	0.287	1.211	0.086	0.521	2.304	-1.187	-0.053	1.031
13	Professional activities	0.073	0.316	1.308	0.049	0.275	1.2	0.122	0.591	2.508	-1.127	0.041	1.259
14	Administration	0	0.194	0.989	0.025	0.235	1.099	0.025	0.429	2.088	-1.099	-0.041	0.964
15	Public administration and social security	0	0.194	0.989	0.062	0.298	1.264	0.062	0.492	2.253	-1.264	-0.104	0.927
16	Education	0	0.194	0.989	0	0.194	0.989	0	0.388	1.978	-0.989	0	0.989
17	Health care	0	0.194	0.989	0.05	0.277	1.211	0.05	0.471	2.2	-1.211	-0.083	0.939
18	Recreation	0	0.194	0.989	0.024	0.234	1.093	0.024	0.428	2.082	-1.093	-0.04	0.965
19	Other services	0	0.183	0.937	0.037	0.257	1.156	0.037	0.44	2.093	-1.156	-0.074	0.9
		0.737	4.903	21.977	0.737	4.906	21.977	1.474	9.809	43.954	-21.24	-0.003	21.24

The results of researches on the analysis of development of the Azerbaijan economy carried out by the International Economic Organizations such as UNDP [9], The World Bank in 2005 [10], and Chemonics International in 2009 [11] show a high potential for the development of agriculture, agro-industry and service sectors.

5. Conclusion

The results of investigation show that diversification of Azerbaijan economy does not pretend to be fully covered. For a complete investigation of this problem there is a need to study other subsystems of the economy, such as employment, investment, exports and imports. The results should be integrated to one indicator of diversification level of national economy. The process of diversification of national economy should be done regularly.

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JANUSZ KACPRZYK

Académico Correspondiente para Polonia

Miembro de la Academia de Ciencias de Polonia

DR. JANUSZ KACPRZYK

JANUSZ KACPRZYK
Académico Correspondiente para Polonia
Miembro de la Academia de Ciencias de Polonia

HIGHER EDUCATION SYSTEM IN EUROPE: SHOULD WE GO BACK TO BASICS?

Abstract

We first analyze issues related to the essence of innovativeness and competitiveness of national economies, in various countries which differ in many respects. We concentrate on the role of a proper education system, notably at a middle level (high school or pre-university), and show that it is crucial. We analyze solutions in this respect in many countries, at various development levels, from Germany and some Western European countries, to some Eastern European countries, and discuss their advantages and deficiencies. We emphasize the role of effective and efficient mid-level vocational systems which may yield well trained young people with specific skills that are badly needed by companies and institutions. We advocate a need for more profound and formal economic analyses of these issues of an extremely high social importance because if not solved properly, they can lead to unemployment, lack of qualified labor force, and hence difficulties to compete with economies of other countries.

The very purpose of this short note is to present some reflections and the author's opinions on one of the crucial issues that the world faces in the present time, that is, education, to be more specific, the higher education. This is an issue that has many dimensions, both with respect to many fields of science within which it should be dealt with, spatio-temporal, in the sense that it concerns a particular geographic region or country at a particular time moment and span over which it should be analyzed, social, as it concerns human individuals, groups and even the whole society, economic, as it involves large investments and expenditure, both public and individual, just to name a few. It is therefore no surprise that issues related to the broadly perceived higher education have been both studied by researchers and scholars all over the world, and have been a subject of deep concern of governments and international agencies.

By necessity, we will not be in a position to take into account all those important aspects related to the higher education, and will assume that – from the point of view of the scope interest and mission of the Real Academia de Ciencias Económicas y Financieras (RACEF), as well as from the point of view of the X Solemn Session "Science and the economic realities: the challenge to investigation in the post-crisis world" held on November 18, 2015 in Barcelona, Spain – we will concentrate on just some aspects of the problem, to be more specific on economic and social aspects, all that related to the focal point, that is, consequences and implication of the fact that the economic crisis of the late 2000s – early 2010s seems to be easing, though maybe it would be too optimistic to say that it is totally over. Moreover, we will concentrate on Europe, notably the so called old and new countries of the European Union, but bearing in mind that our opinions can well be valid for other countries, notably at least some Mediterranean countries the education system of which is strongly influenced, both historically and in the present time, not only by the ``old good'' European system, notably the French one, and also on newer, not always

better, tendencies which occur in the European countries and often beyond Europe.

Our discussion should be started with some more general remarks. First, the role of education – let it be meant for now in a more general sense, not what we presently mean by "higher education", that is, at a post-secondary school level – has been appreciated since the very beginning of the mankind, first – even in primitive societies – by a simple instruction of skills that has been conveyed to young people by experienced and older members of their groups, then by a more sophisticated education – mostly by some specialized teachers at home – which was accessible for more privileged members of societies, and then, finally, by the introduction of a universal system of schooling, starting of the grammar or primary schools, then step by step extended to secondary schools, both general and vocations, that had been made available to all young people. For sure that continuous growth of the level of education of societies has been a very important factor in the development of countries and has significantly contributed to their competitive edge, both from the sense of military dominance and technological superiority as for both the availability of skilled, literate, intellectually more flexible, etc. soldiers and workers has been a crucial factor, for instance making it possible to change the war strategy or technologies.

From the point of view of our note the so called higher education, that is, at a post-secondary school level is important. This type of education has gone through different phases. The first one, that has been started with the establishment of the first universities, that is – if we limit our attention to Europe – that dates back to the early 11th century, and one can mention here, just to give a few examples,: the University of Bologna (1088), the University of Paris (ca. 1150), the University of Oxford (1167), the University of Modena (1175), the University of Vicenza (1204), the University of Palencia (1208, later disappeared and reemerged as the University of Valladolid), the University of Cambridge

(1209), the University of Salamanca (1218), the University of Montpellier (1220), the University of Padua (1222), the University of Naples Federico II (1224), the University of Toulouse (1229), the University of Siena (1240), the University of Valladolid (1241), the University of Northampton (1261), the University of Murcia (1272), the University of Macerata (1290), the University of Coimbra (1290), and then – in the Central and Eastern Europe – Charles University of Prague (1348), Jagiellonian University in Cracow (1364), the University of Vienna (1365), the University of Pécs (1367), the University of Heidelberg (1386), the University of Leipzig (1409), the University of Rostock (1419), Uppsala University (1477), the University of Copenhagen (1479), etc. As to the American universities that dominate now the "university market", one can mention here: Harvard University (1636), Yale University (1701), Princeton University (1746), Columbia University (1754), the University of Pennsylvania (1740), to list just a few.

All those universities have been key centers of intellectual activities and progress again, in the first period, for the chosen few, those (with a few exceptions) who, or whose parents, have been in a position to afford an extremely high cost of higher education. One can give here numerous examples of famous people from the past who had changed the way the world or universe had been perceived, like Nicolaus Copernicus, who were in a position to study at great universities of their times thanks to the support of the Church, as they were either priests or monks, even if their families were considered rich. These examples of grand European universities have all been perfect examples of what the famous theorist of education, Charles Trow (cf. Trow, 2005) calls the elite education. This clearly exists even in the present time, for instance as the so called American "Ivy League universities", that is Brown University, Columbia University, Cornell University, Dartmouth College, Harvard University, the University of Pennsylvania, Princeton University, and Yale University, and also some prestigious universities in virtually all other countries.

However, the situation has changed since more or less the post World War II period. The old concept of an (elite) university, that is an institution of higher education that has been meant to provide more gifted (not necessarily richer or more privileged) young population with a possibility to learn some non-vocational, more sophisticated and intellectually challenging skills, granting at the end of their education some diploma or a degree of proficiency just confirming the acquisition of some knowledge and (rarely vocational, mostly more mental or intellectual) skills, and their related "intellectual flexibility" has proved to be not enough, both in the sense of quantity and quality.

First, a rapid development of all kinds of technologies that has clearly been fueled by many high tech developments has been a result of a huge military efforts aimed at the winning of the War, called for a larger number of young people who would be better prepared than just having basic technical skills. To be more specific, the new situation, which has also been amplified by the Cold War – with its associated huge emphasis on new technologies that could bring a technological and military edge over the adversary – that have quickly followed the euphoria after the end of the War, have called for a rapid development of the higher education systems in virtually all countries. First of all, the number of graduates who have been demanded by the rapidly developing economies has gone up. This has obviously implied a huge change of how the role of a higher education institution (university) should be perceived, that is, as an establishment at which the young people can not only acquire high level intellectual skills, usually very sophisticated but often of a limited practical importance both for the individual, in terms of an availability of adequate jobs, and the society and national economy, in terms of being able to fulfill the real needs in the conditions of a necessary development of manufacturing and advanced services to face fierce competition from other nations. This has clearly led to what Trow (2005) calls a mass education system which is predominant nowadays.

All over the world education has become an important sector of the national economy, and in most countries, notably those belonging to the European Union, public expenditures on education are a considerable part of the state budget. A good source of data may here be the reports by the World Bank (cf. http://data.worldbank.org/topic/education). Basically, they consider mostly the total expenditures on educational institutions, public and non-public, educational administration, and some subsidies as the percentage of the total government expenditures. Quite obviously, this has triggered much interest in various issues related to education, also higher education which is our point of interest, which has implied some desirable and undesirable consequences that have resulted in some economic and social problems over the years, notably during the recent economic crisis and after it, which is our concern in this note.

To start any analysis of education, be it higher or not, one should bear in mind that this cannot be done solely in terms of economic aspects but social aspects should also be taken into account. First of all, let us start with some more general remarks. For a long time it has been acknowledged that the availability of a well-educated and trained work force is a pre-condition for any attempt to develop economy beyond a simple level of basic production and manufacturing. Examples are here abundant, and one can cite here many countries exemplified not only by the USA, UK, Germany, Switzerland or other European countries, but also Japan, South Korea, Singapore, Brazil, and – maybe above all China – in which a transition to high technology industries has occurred.

Quite naturally, some deep analyses has been attempted to aim at developing some sort of a theory of what is a key determinant why the above mentioned availability of educated people, and – in general – why education (also higher education as in our case) is so important for the prosperity of both the society and individual. We will not attempt to present all those views, perspectives and theories, because of lack of space, and will concentrate on some more relevant ones from our point of view.

Maybe the main concept that has been proposed as an underlying foundation of those theories of education is that of the so-called human capital. Though this concept has been already mentioned and discussed for many decades, even centuries, in various contexts and wordings, it is usually assumed that deeper studies in this area have been initiated by the works of Schultz (1961), Becker (1964), Mincer (1974), to just name a few.

Basically, human capital is meant as a collection of resources, including knowledge, abilities, talents, skills, experience, intelligence, judgmental abilities, etc. which is possessed by an individual, a human group or even a society. It is obvious that these capacities of the humans are very relevant, maybe most relevant, for the functioning and well-being of both the individuals and the society. Therefore, it has been obvious that these facts have triggered research and scholarly efforts to develop a comprehensive theory to analyze and understand the very essence of human capital, its growth, evolution in time, etc. Moreover, which is the most important from our point of view, virtually all of them have emphasized the importance of education in the development of human capital, and then the role of human capital for economic development, productivity growth, and innovation of the economy. This reasoning, the truth of which cannot be in general argued, has clearly provided a justification for the development of education and its availability to a larger and larger part of the society. This has in particular concerned the higher education which has enjoyed more and more governmental financial support and more and more young people have been entering colleges and universities.

Of course, the concept and theory of human capital, as powerful as it is, has not been accepted by all economists and social scientists as the best explanation of what is the driving force for the functioning and development of the society, but we will not deal with this important issue in this note. We will only mention that, just an example, the concept of social capital has been proposed, as a somewhat more general

and comprehensive idea (cf. Bourdieu, 1986; Coleman, 1988; Putnam, 1993). Basically, the concept of social capital emphasizes the role of mutual trust (with respect to other members of the society), following social norms, cohesion of social groups, propensity to think and act for the well-being of the groups, etc. This is clearly extremely important for the functioning and well-being of the nation. What is important for our purposes is that here, again, it has been found by many empirical studies that education is an important factor in the growth of social capital.

Therefore, the above mentioned two important theories on what is relevant for the well-being of the society, as well as for the maintaining the nation's competitiveness, have clearly indicated a crucial role of education, needless to say – higher education. This has been clearly important to some extent for virtually all governments around the world for the allocation of more funds to the development of their national higher education systems. This has implied a tremendous increase of the number of universities, both old and newly founded, around the globe, and its related huge increase of the number of students in virtually all countries. One can therefore view that initial period as a real success.

On a personal level, with respect to the "basic actors", that is, students, the success has been initially similarly high. Various studies around the world have clearly indicated that a broadly perceived success of the college/university graduates has been higher than of non-graduates, both with respect to higher salaries and a lower jobless rate, as well as with respect to some less tangible aspects like personal satisfaction, and even better health, longer life, etc.

An important aspect in this respect that should be emphasized is that the new mass higher education system has secured in that early period the two main conditions which are considered to be a prerequisite for a good and fair education system. First, by providing a high, and

growing, number of highly educated people who could enter the labor market, it has proved to be effective. Second, since the productivity and innovation capabilities of those graduates have been attained, the system could have been also considered to be efficient (of course, in most cases). On the other hand, due to the acceptance of modern standards, and in fact the very idea of mass education, the system has been in most cases equitable in the sense that young people have been provided more or less equal opportunities with respect to equal access to education, and leaving to individual willingness, abilities, hard work, etc. the resulting success of a particular individual. The jobless rate, carrier opportunities, etc. for those graduates could have been assured for granted in that first period.

That huge development of the "basic" higher education systems in virtually all countries, notably those belonging to the European Union which are of interest to us, has been followed by some next steps which have played an important role, unfortunately both with positive but also negative consequences. On the one hand, in many countries the governments have faced a big problem of a huge increase of public spending on higher education due to, practically in all European countries, a free of charge (or with non-essential tuition fees) education system. This all, in the presence of an increasing number of students has had to imply financial difficulties in particular since these expenditures have been to some extent related to an increase of broadly perceived social expenditures, for instance for social security and retirees, which – in view of many unfavorable social factors, mainly the ageing of the society – have implied more and more serious difficulties. Needless to say, the quality of the higher education system could have been compromised in such conditions.

Second, it seems that in most countries an extremely important education planning system, in the sense of an early recognition and reaction to needs of new technologies and services, has not been working well.

In general, the structures of the colleges/universities has not adequately responded to some obvious changes as, for instance, a rapidly growing job market demand for college/university graduates in modern and developing areas exemplified by information and communication technology, biotechnology, material sciences, medicine, elderly care, etc. The university system has continued to "produce" graduates in more traditional areas like humanities, social sciences, political sciences, etc. with cannot guarantee ample work opportunities, for obvious reasons. However, the costs of providing education in these areas are lower since no high tech labs, expensive equipment, etc. are needed. However, the later costs can well surpass the initial lower costs due to an unused human capital, possible jobless payments, etc.

The above aspect is closely related to another problem faced by many countries. Namely, due to a growing scarcity of public funds for higher education, and yet a "political willingness" to increase the number of higher education students and graduates, in many countries new private colleges and universities have been founded where the legal system has allowed that. This large scale phenomenon, at least in many countries, has had many effects. On the one hand, it has made it possible for many young people to get a higher education, not always at the highest level, but maybe adequate. On the other hand, unfortunately, those higher education institutions have rarely responded to the real needs of the modern economy and have followed a much cheaper path of providing instruction in areas, notably in humanities or social sciences, with limited work opportunities for the graduates. However, to be just, some of them have offered degrees in the new high tech areas, and a high level education too.

Third, the introduction of the so-called three step education system in which – roughly speaking – the education at the level of a Master of Science or Arts (or equivalent) has been extended by an immediate, for those who are capable of and willing to start PhD studies, has also implied many positive but also extremely negative. On the one hand, it

has made it possible to use a natural enthusiasm and abilities of some talented young people to quickly get a PhD degree, without an unnecessary delay so that they have an opportunity to speed up their academic career. On the other hand, unfortunately, the system has not been followed by an adequate system of creating positions for those people at universities or research institutes so that an overwhelming majority of those graduates cannot pursue, as planned by the system developers in good faith, their academic careers. They can either emigrate to countries, which are less and less numerous, in which there are better opportunities for an academic carrier or to enter the job market in their countries. Unfortunately, except for just a few countries, exemplified by Germany or Austria, in which it is normal that the PhDs work in banks, public administration, NGOs, industry, etc., in most countries this is unusual, and those people have real difficulties to find an adequate job to use their potentials, that is, their human capital, as otherwise there will be an obvious loss to the society.

We have therefore in recent years a strange and potentially dangerous situation, from a social and economic point of view, that in most European Union countries the higher education systems are predominantly high level, their output (in terms of graduates) is unprecedented as it can be even at the level of almost a half of young people who, after the secondary school, enter a college/university, and yet – in spite of the economic crisis being presumably over – so many young people with various university degrees cannot find proper jobs, are frustrated, emigrate even to non- European Union countries, etc.

A natural question is: what is wrong with our European Higher education system? Or, since the higher education system is just a final level of the education systems as a whole, what is wrong with our education system? Of course, there may be – like in the case of all such complicated matters – many views and opinions, and that is why in this note we will only present a personal opinion that can be shared or not by other people.

We start by asking a fundamental question that can provide an answer to the above posed question. Namely: in which European countries the unemployment among young people, in particular young graduates, is low, or the lowest? There are many statistics and a couple of countries can be cited but we will concentrate just on two: Germany and Switzerland.

The second, natural question is: why is this so? Of course, there may be different views and opinions again but, from our point of view the answer may be as follows. First, to discuss the case of the higher education one has to start from the lower levels of educations. If we look at many European countries, one can clearly see that the problem may be in the way of thinking, which has been proper in first years when the technological and social progress has started. Namely, the essence of that way of thinking has been to some extent implied by the ideas related to the broadly perceived human capital or social capital, maybe even knowledge based society, and can be summarized as follows. The modern times need the workforce that should be flexible and open minded to be able to adapt to technological changes, and not trained in special skills social capital. This has been for a long time maybe true and justified but, on the wave of that enthusiasm, many countries have practically dissolved the vocational education and training at the pre-college/university level, leaving just general secondary schools that have been meant to prepare student for a college/university education, and completely forgetting a possibility those young people who would not, for one reason or another, drop after the secondary school, and would be left with nothing. They are not adapted to the needs of the job market by having no skills whatsoever.

It seems that the system adopted in just a few countries, notably Germany and Switzerland, may be the answer to that serious problem mentioned above. Briefly speaking, these countries are just a few examples in Europe, and maybe in the world, who have a comprehensive system of the so-called VET (Vocational Education and Training) the

essence of which is quite simple. Namely, a large part of young people, maybe more than a half, even about 70% in Switzerland, of young people participate at a join program in which they spend part of their time at school, taking normal courses, and part as apprentices in companies, being paid some salary. What is important, this system encompasses a large spectrum of fields, from those usually attributed to the so-called white collar jobs (like in the banks or other offices) to those usually attributed to the so-called blue collar jobs (like in industry, workshops, etc.). The students upon graduation, enter therefore the job market with some specific qualifications and skills, and practice, as opposed to the graduates of general type secondary schools. Moreover, they can also pursue higher education, usually at the so-called universities of applied sciences, but not only. Therefore, in addition to a possibility to acquire useful and sought after skills they do not have a limitation in their personal and professional career. Moreover, many sociologists and psychologists emphasize that for young people the ability to get a "real" job with own money make them more mature and better prepared for the future life. It should be mentioned that though in this paper the examples of Germany and Switzerland have been cited, one should be just and say that the European Union has for a long time advocated in their treaties and various policy documents a necessity to properly develop an effective and efficient VET (Vocational Education and Training) system but, unfortunately, this has not resulted in a broader acceptance of those ideas and their implementation.

The conclusion of this note might be quite simple. The euphoria about a "wonderful development" of our European higher education system that can provide so many well educated young people, even with PhDs, and provide them with so many opportunities for personal and professional development, and their related carrier prospects, is – in my honest view – highly exaggerated as has been proved by still high jobless rates among young graduates in a majority of European countries, even now when the economic crisis seems to be to a large extent over or at least relaxed. A proper, effective and efficient solution, may be to

come back to basics, that is to a more traditional and realistic solution, that is to re-establish and reinforce the old and good system of VET (Vocational Education and Training), and do not pretend to assume that such a high percentage of young people like is now is really capable of getting the real higher education of a high level. This will have for sure a very positive effect both from the economic and social points of view.

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IURII KONDRATENKO
Profesor de la Petro Mohyla Black Sea State University, Mikolayiv (Ucrania)

DR. IURII KONDRATENKO

IURII KONDRATENKO
Profesor de la Petro Mohyla Black Sea State University,
Mikolayiv (Ucrania)

MODEL-ORIENTED APPROACH AND FUZZY DECISION SUPPORT SYSTEMS FOR EVALUATION OF SCIENCE-ECONOMIC REALITIES AND PERSPECTIVES IN S2B AND B2S

Your Excellency, President Dr. Jaime Gil Aluja and Members of the Royal Academy of Economic and Financial Sciences of Spain, Distinguished Guests, Ladies and Gentlemen, I would like to thank you very much for your kind invitation and for great opportunity to take part in this X International Act "Science and the Economic Realities: the Challenge to Investigation in the Post-Crisis World".

Let me cordially deliver a great friendship's feeling from the professors and students of Petro Mohyla Black Sea State University Ukraine, from Regional Inter-University Centre in Mykolaiv, and from colleagues of Department of Electrical and Computer Engineering at Cleveland State University (USA), where I am conducting research in the framework of Fulbright Scholar Program for 2015/2016 academic year on the project "Advanced Soft Computing Algorithms and Optimization of Fuzzy Systems: Evaluating, Development And Implementation".

The problems, which we are discussing today (right now), deal with very wide aspects of human life and social activity, including science

and economic realities, their interconnection and correlation, as well as a search of efficient research methods for their invesigation in the post-crisis world.

I think that today, according to total globalisation in different areas of human activities, a lot of the same challenges are common for different countries in science and economic realities' evaluation and in development of new theoretical approachers, computerized tools and diversed software for solving abovementioned problems.

The topic of our X International Act is very important for analysis of current state in different scientific areas and for invesigation of its impact to economic realities and to sustinable development of each society and world values in whole.

First of all it concern creating modern decision support systems (DSS) which can help us in: (a) recognition of various conflict situations, (b) efficient big data processing, (c) fast search of the best solutions on the set of alternatives (d) and optimisation of control and decision-making processes in non-stationary and uncertain conditions.

Special attention, taking into account challenges to investigation in post-crisis world, should be paid to development of DSS for activisation/optimisation of the collaboration processes in S2B (Science to Business) and B2S (Business to Science) directions [25,39,50,51].

The main focus of this presentation deals with model-oriented approach and fuzzy decisión support systems for evaluation of science-economic realities and perspectives in S2B and B2S cooperation, especially in IT-industry [13,14,15,19].

While performing the tasks of organizational control in the S2B and B2S areas there always happen such situations when the original

conditions of decision making are not clearly defined and characterized by insufficient awareness of the person who makes decisions, particularly in conflict situations or under extreme conditions.

For mathematical formalization of processes and systems of this class there appeared a need to create a new mathematical approach such as a theory of fuzzy sets [4,59,60].

The method of fuzzy logic, suggested and developed by Prof. Lotfi A. Zadeh (University of California, Berkley, USA) 50 years ago [59], is a successful basis for synthesis of fuzzy DSS based on the elements of fuzzy inference engine and fuzzy reasoning.

Since the theory of fuzzy sets appeared, the specialists have had a great interest in it in terms of new theoretical investigations [5,48,52,54] and practical applications of new artificial intelligent methods in the different fields of science and technology.

The scientists around the world made a great contribution [1,2,3,5, 7,31,33,35,41,44,46,50,52] to fundamental theoretical developments in the theory of fuzzy sets and fuzzy logic.

Among them are such distingvished professors as Arnold Kauffmann [12], Jaime Gil Aluja [5,6], Hans-Juergen Zimmermann [60], Ronald Yager [58], Janusz Kacprzyk [11,35], Michio Sugeno [52,53], Ebrahim Mamdani [38], Weldon Lodwick [35,36], Daniel Simon [46-49], Ana Maria Gil-Lafuente [1,7], Rainer Hampel [9], Brigitte Werners [56,57], Witold Pedrycz [43], Mo Jamshidi [10], Didier Dubois [4], Oleksandr Rotshtein [45], Volodymyr Gostev [8] and others.

Scientific world currently has multiple examples of how fuzzy controllers are applied to different types of control tasks.

Among them are [8,40,52,53]:

- blenders in systems of water-preparation;
- nonlinear electric drives with series excitation at speed control;
- steam-electric generating set, complexes of type hot-water boiler + heated building;
- control of heat-exchanger pilot plant;
- control of a pressurized water nuclear reactor;
- active systems of vibration suppressor, processes of gas drainage by absorbing, electrodynamics processes on the basis of fuzzy-control systems for regulators of a replaceable voltage control;
- semi-conductor converters of electromechanical systems, cruise control for vehicles etc.

It is also necessary to analyse the last years' achivements in the development of efficient fuzzy systems for different decision making processes.

Let us consider just small part of successful examples from the scientific literature [40,41,61], which deals with new theoretical investigations and implementation of fuzzy logic approach for specialized fuzzy DSS in management science, transportaion science, medicine, enviromental science, technical diagnostics and others.

Among them are [32,61]:

a) *in the theoretical field*:

- Risk assessment method based on fuzzy logic;

- Hybrid approach for incoherence detection based on neuro-fuzzy systems and expert knowledge;

- A multi-criteria decision-making approach that combines fuzzy TOPSIS and DEA methodologies;

- Application of fuzzy inference engine as an automatic switch between ensembles of clustering methods;

- Fuzzy risk sets for decision making;

- Robust adaptive fuzzy tracking control for pure-feedback stochastic nonlinear systems with input constraints;

- H∞ consensus and synchronization of nonlinear systems based on a novel fuzzy model;

b) *in the different applied fields*:

- Fuzziness in healthcare-associated infection monitoring and surveillance;

- A decision support system based on fuzzy specialized rules for the Alzheimer disease;

- Fuzzy model identification of dengue epidemic in Colombia based on multiresolution analysis;

- Automatic fault diagnosis of environmental control and life support systems;

- Human health and safety risks management in underground coal mines using fuzzy TOPSIS;

- Application of adaptive neuro-fuzzy inference system in the process of transportation support;

- Fuzzy decision support software for crisis management in gas transmission networks;

- A fuzzy decision support system for the environmental risk assessment of genetically modified organisms;

- A situation risk awareness approach for process systems safety, which includes an evidence preparation and a situation assessment components based on the fuzzy partitioning and a fuzzy risk estimation methods;

- A fuzzy logic based decision support system for evaluation of suppliers in supply chain management practices;

- Approach for group decision support for the supplier selection problem by integrating fuzzy Analytic Hierarchy Process and fuzzy goal programming for discriminant analysis;

- Fuzzy logic-based adaptive decision support in autonomous vehicular networks;

- Energy-efficient locomotive operation for Chinese mainline railways by fuzzy predictive control;

- Fuzzy decision support system for solar tracking optimization;

- A fuzzy nearest neighbor neural network statistical model for predicting demand for natural gas and energy cost savings in public buildings;

- Fuzzy expected value analysis of an industrial grinding process;

- Fuzzy inference mechanism for recognition of contact states in intelligent robotic assembly;

- Decision support system for optimization control in shield excavating process;

- Fuzzy decision support system for the determination of the set points of relevant variables in the virgin olive oil elaboration process;

- A collaborative fuzzy CPN system for conflict solution of flexible manufacturing system;

- A data driven approach using Takagi-Sugeno models for computationally efficient lumped floodplain modelling;

- Assessing emergency department crowding based on fuzzy logic;

- Decision support system based on fuzzy logic to aid winemaking decisions;

- Fuzzy decision support system for ship lock control;

- Automated fuzzy decision and control system for reservoir management;

- A fuzzy logic based decision support system for evaluation of suppliers in supply chain management practices;

- Decision support system to control the quality of education;

- Decision making support system in multi-objective issues of quality management in the field of information technology.

In particular, the group of scientists [42] considers the definition of "world crisis" as continuous process of two types:

a) First type - "gradual crisis", if this event happens slowly; this type of crisis is usually due to management weakness and mainly has organizational reasons;

b) Second type - "sudden crisis", if changes happen rapidly; this type of crisis may happen to any organisation and is often exert-

ed from outside of organisation and causes the manager to lose control.

In the crisis management discussion, the "sudden crisis" (second type) is still a challenging problem and it is main research direction for corresponding scientists in decision making theory and practice.

The authors [42] develop a fuzzy decision support system (FDSS) with a new decision making structure, which can be applied to manage the crisis conditions in any large scale systems with many parameters. After receiving both functional variables of the system and fault signals, the FDSS makes proper decisions to make up and repair the distorted situation and the affected elements of the network according to its data base established through experience gathered from expert managers and decision models properly developed. These decisions are expressed in the form of some scenarios with different desirability degrees, which are determined by some properly developed fuzzy multi-criteria decision making methods, helping the manager choose the best one according to his discretion.

The Ukrainian scientific community also made a great contribution [2,8,16,22,24,27] to development of soft computing algorithms and efficient fuzzy systems design.

Among the top leading Ukrainian universities in the corresponding field are:

- Kharkiv National University of Radioelectronics,
- Petro Mohyla Black Sea State University,
- Vinnitsa National Technical University,
- Kyiv National University of Food Technology,

- National Aviation University and others.

No doubts, that information technology (IT) and applied IT-industry are most important fields for S2B and B2S efficient interaction [13,26,28].

The Internet, World Wide Web, and related information and communication technologies (ICTs), have rapidly spread [17,18] to a large number of countries.

The essential influence on the general development and integration level of informational technologies into any national economy and into world market's segments is done by results of high-efficiency and mutually profitable cooperation of universities and IT-companies [29,30,34].

Herein implementation of the new models of cooperation [14,15,37] requires consideration and preliminary processing of large amount of input data, in particular, based on analysis of preliminary cooperation experience of involved parties, their main achievements, competitiveness, advantages and directions for the development, scientific and educational levels of participants of future academic-industrial consortium, employment level of students, university professors and IT-companies, etc.

Incorrectly chosen model of cooperation as well as non observation of relevant conditions of collaboration within the consortium such as "University – IT-companies" can lead to undesired and unexpected consequences, including the loss of significant amount of intellectual and/or material resources, lowering educational-qualification level of specialists, appearing of limitation in education and development of ability to creative thinking.

Increase of cooperation efficiency can be influenced by model-oriented decision support systems, which can be developed on the basis

of the latest methods, technologies, and approaches of system analysis, forecasting, fuzzy logics, neural networks, artificial intelligence, etc.

Usage of the abovementioned methods when designing modern DSS allows to process the essential amount of different-type information on a new level of intellectual cooperation of a decision maker (DM) and computer system [26,28].

Nowadays there is still an unsolved question of selecting partnership models based on developing the system of multicriterion assessment of possible level of cooperation between universities and IT-companies. Usage of such class DSS in some specific practical cases makes it possible to select the best variant of the model of consortia development such as "University – IT-company".

So, development and research of model-oriented DSS based on fuzzy logic to increase the efficiency of multicriterion decision making processes for choosing a model of cooperation within consortia such as "University – IT-company" is very perspective directions for scientific investigations [29,30].

Preliminary researches and analysis of successful cooperation experience within different-type consortia prove that nowadays solving the task of estimating the level of cooperation between universities and IT-companies involves the selection of one of the four formed alternative models [14,15,26,28] as alternative decision variants $\{E_1, E_2, E_3, E_4\}$, where:

- decision variant E_1 corresponds with the model A1 (cooperation between university and IT-company in the sphere of education and study organization, knowledge sharing, targeted personnel training for IT-industry);

- variant E_2 corresponds with the model A2 (organization and support of certification processes of cooperation results);

- variant E_3 – model B (creating collective center of scientific researches, developing collective scientific projects);

- variant E_4 – model C (creation of student research groups with business orientation and realization of startups).

Herein the efficiency of process of selecting cooperation model essentially depends on chosen indicators or criteria, which characterize each partner of the relevant future consortium "University – IT-company".

Usage of fuzzy logics and hierarchical structure of input data (coordinates) when developing model-oriented DSS of such type allows to increase efficiency of multicriterion selection of cooperation model between universities and IT-companies, which is achieved by simplifying the process of formation and processing knowledge, taking into account significant amount of quality indicators and selection of optimal solution for a large amount of input expert information.

The experience shows that with one-level structure of DSS in cases of large dimension of input coordinates' vector a sensitivity of their fuzzy rule bases to changes of input coordinates (criterion) reduces.

Hierarchically-organized fuzzy DSS [23,26,28,29,30] can be used for increasing decision-making processes efficiency, in particular, for selecting optimal model of partner cooperation in the framework of such S2B and B2S consortia as "University – IT-company".

A model-oriented DSS for selecting model of cooperation between universities and IT-companies is developed in our University

(PMBSSU) [26,28,29,30] according to preliminary proposed and defined 27 criterion-indicators.

Input data for modular DSS characterize performance indicators of university (of relevant IT-department) and IT-companies, which are part of academic-industrial consortia.

Some of input data are quantitative, and some – qualitative.

Quantitative input indicators can be created on the basis of results of statistical information processing, and qualitative – on the basis of results of expert evaluations (using individual and group assessments).

For example, the developed subsystem of fuzzy DSS for assessment of level of professional orientation of students in relevant university is being created on the basis of four input coordinates: experience of work in IT-sphere, participation in international programs of students exchange, level of students cooperation with IT-companies, success in study [26].

The developed fuzzy DSS creates on its output consolidated signal, which recommends corresponding future partners (specific University and specific IT-company) to choose optimal model of cooperation [26,30].

Aprobation of the developed model-oriented DSS proves its high efficiency, that is confirmed in solving practical tasks of selecting model of cooperation within consortia "University – IT-company", and in solving different-type tasks of transport logistics, in particular when selecting the best transport company from the set of existing alternative variants, etc.

Scientists from different countries, including Spain and Ukraine [1,20,21,41], conduct research in this very important scientific field – S2B and B2S.

For example, this X International Act "Science and the Economic Realities: the Challenge to Investigation in the Post-Crisis World" confirms paying a great attention to discussed problem from the President and members of Royal Academy of Economic and Financial Sciences (RACEF, Spain) and from the distinquished participants from Algeria, Azerbajan, Greece, Italy, Jordan, Marocco, Poland, Romania, Spain, Ukraine and other countries.

Other examples are:

- International Seminar for higher education and research institutions "Funding Strategies and Sources for International Research Cooperation", Berlin, January 28-29, 2016;

- Battle of IT-Start-Up projects in the fields of Green-IT and Safe-Secure-IT that took place in Mykolaiv, Ukraine in the framework of three TEMPUS-projects (CABRIOLET, GreenCo, SEREIN) in September 5-10, 2015 with participation of 13 students' teams from different Ukrainian universities, including National Aero-Space University "Kharkiv Aviation Institute", Khmelnitsky National University, Odessa National Polytechnic University, Chernivtsi National University, Chernihiv State University, Black Sea State University, National University of Shipbuilding, Institute of Technology of East-Ukrainian National University and experienced experts from different research institutions and IT-companies (Institute of Cybernetics of National Academy of Sciences of Ukraine, Newcastle University (United Kingdom), Global Logic, AMICO, Ltd., NPC "Radiy", GrowthUp Business Accelerator, Ukrainian Hosting /UH.ua).

It is clear to everyone that we should consolidate our scientific and economical cooperation in the different S2B and B2S fields for mutual benefit and for sustinable development of our societies, taking into

account current science and economic realties and specific pahase of current world crisis.

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VIKTOR KRASNOPROSHIN
Académico Correspondiente para Bielorrusia
Profesor de la Universidad Estatal de Bielorrusia

DR. VIKTOR KRASNOPROSHIN

VIKTOR KRASNOPROSHIN
Académico Correspondiente para Bielorrusia
Profesor de la Universidad Estatal de Bielorrusia

DECISION MAKING IN THE GLOBALIZED WORLD: INNOVATIONS AND MONITORING

Abstract

The paper deals with problems of decision-making intellectualization in management of business processes and assessment of their efficiency in today's globalized world. As a means of intellectualization it is proposed to use the so-called "subject collections" (SC), which contain innovative expertise from various branches of science and industry. Algorithms for the formation and use of subject collections, mechanisms of permanent evaluation of the negative impact of innovations on society and the environment are described.

Keywords: decision making, subject collections, monitoring.

INTRODUCTION

As a result of market globalization, the internationalization of labor and the rapid development of technologies, the level of competition between all business entities has significantly increased [1]. Currently, chances of the survival get only entities that were quicker to use organizational and technological innovations in their business processes. A clear example is modern China.

Innovations are the latest scientific and technological achievements (methods, inventions, discoveries, technologies) that ensure the best solution of a problem at the moment. Innovative knowledge is considered as a formalized description of innovations, ensuring their understanding, replication, use, evaluation and updating.

Nowadays, the life time of innovations, as well as innovative knowledge, is short, because new and better solutions are constantly appearing under world globalization [2]. With the introduction of insufficiently tested innovations into production, problems may occur associated with the negative impact of the results of technological processes on the environment and life quality of the surrounding population. Examples are accidents that took place on certain innovative projects: the fire at the oil platform Deepwater Horizon (Gulf of Mexico, USA, 2010), the accident at the Fukushima I nuclear power plant (Japan, 2011), explosions of highly toxic chemicals in Tianjin (China, 2015), and others.

As a result, there are two related and poorly investigated problems in the theory of decision making: how to quickly introduce innovations into companies with a large number of distributed staff [3,4], and how to control the possible negative impact of modernized business processes on the environment and the population [5]. The paper presents a solution of these problems on the basis of the synthesis of decision-making theory, pattern recognition and fuzzy sets.

1. PROBLEM STATEMENT

Suppose there is a distributed company (N), comprising a center (C) and the personnel (P), which implements business projects (S) on the basis of innovative knowledge (Z) in a natural-territorial complex (Env). Knowledge Z is acquired from experts (E) of various research centers, probably, not included in the structure of the company. To ensure multiple applications of the knowledge it is necessary to transform the knowledge into a public resource available to company employees regardless of their geographical location. The results of innovation introduction may affect the performance of the company and the state of the environment, so it is necessary to assess the impact of modernized business processes on the environment. There is a need to develop a technology for building an innovative resource Z and an objective mechanism for monitoring activities of the company N and the state of environment Env.

The solution of the problem should give answers to the following questions:

- who is involved in typical scenes of decision making with the use of innovative knowledge;
- what structure should be used for the formal representation of innovative knowledge, guaranteeing its effective implementation;
- where and how to store the formalized knowledge to ensure regulated access of the company's personnel;
- how to conduct an objective (independent) evaluation of innovation effectiveness when solving practical problems;
- how to register proposals for improving innovative solutions derived from the experience of their application;

– how to assess the possible impact of constantly updated business processes on the efficiency of the company, the quality of the environment and the population [3].

Let's consider a solution of these issues well-proven in the implementation of several projects in Belarus, the Netherlands and Finland.

2. SUBJECT COLLECTIONS

Typical solution scene. In the contemporary world, decision-making scene includes at least three actors: the center (C), initiating solution to the problem, experts (E), having innovative knowledge for the solution, and the company's personnel (P), using the knowledge. Data exchange between actors is carried out by means of global communication (com). For the identification in the information space, actors should have attributes, including an e-mail address (Adr) and other information (Inf). Accordingly, a typical scene can be described as the tuple:

$$Scene1 = (<C, AdrC, InfP>,<E, AdrE, InfE>, <P, AdrP, InfP>, com) \quad (1)$$

For the practical implementation of the scheme, first of all, it is necessary to develop a model of expertise representation.

Subject collection model. Traditionally, intellectualization of decision making is associated with costly specialized systems and local knowledge bases containing expert knowledge, formalized in the form of productions, frames, semantic networks, etc. The approach, implemented mainly in expert systems, was quite effective for companies with the staff solving scheduled tasks in a well-researched conditionally permanent subject area. The main disadvantage of this approach is the complexity of expertise formalization to be introduced for thousands of employees located in different countries. The problem is particularly

acute for software companies and start-ups, working with a great number of experts and rapidly updating technologies.

To solve the problem, it is proposed to use the so-called "subject collections" (SC). A subject collection is a structure for expertise representation. The structure ensures formalization, application, independent evaluation and updating. The conceptual model of SC can be described as the tuple:

$$Z = (code, scene, title, task, alg, guide, tech, exp, ind, deltaZ) \quad (2)$$

where: "code" is an innovation code in a company database; "scene" is data about the company and experts; "title" is a short name for the problem; "task" is a detailed statement of the problem and conditions for the solution; "alg" is a theoretical solution; "guide" is description and experience of the solution; "tech" is a solution means (e.g., a program); "exp" is application experience; "ind" is solution utility; "deltaZ" are suggestions for the improvement of the expert solution.

For the simple application of the model (2) it's enough to have two algorithms: 1) SC formation; 2) content usage, including utility analysis of innovations and suggestions for the improvement.

SC formation algorithm. The model (2) is intuitively understandable, so the expert simply forms its content according to the following algorithm:

Input: task. Output: Z.

Step 01: Analysis of the problem (task) by the center (C);

Step 02: Formation of Title, Text by the center;

Step 03: Choice of an expert E, having, perhaps, the best solution;

Step 04: Formation of a message <adrC,adrE, Title,Text> to the expert E;

Step 05: Preparation of components Alg, Guide, Tech by the expert;

Step 06: Formation of <adrC,adrE, Title,Text, Alg, Guide, Tech> by the expert;
Step 07: Sending the result from the expert E to the center C;
Step 08: Resource formation
<code,Title,Text,Alg, Guide, Tech, <C, AdrC, InfP>, <E,AdrE,InfE>
Step 09: Placement of the resource into the database of the site;
Step 10: Informing the company's personnel about the new decision.

Algorithm for SC application, evaluation and updating (improvement). After the implementation of the algorithm, each employee of the company P, involved in the project, can take advantage of innovations, express an opinion on their usefulness and may offer a better solution. The algorithm for realizing these opportunities is quite simple:

Input: task, Z. Output: ind, deltaZ.
Step 01: Analysis of the problem S' by an employee of the company P;
Step 02: Site access and search for the solution Z;
Step 03: Checking access rights to Z;
Step 04: Reading Z;
Step 05: Application of Z for solving the problem S;
Step 06: Evaluation of the usefulness index (ind);
Step 07: Possible suggestion for a better variant (deltaZ).

Thus, there is a feedback between the center, experts and knowledge consumers. The feedback helps to maintain a high level of the competence of the staff and timely define the obsolescence of innovations and replace them with more advanced ones. To implement the model and algorithms a variety of approaches can be used: local, network, multi-agent and others.

Usage example. The simplest approach for constructing a decision support system (DSS), based on SC, is to build a site that will carry out all operations with innovative knowledge. Actors will get access to the

site resources by a password, and will implement functions of building, application, evaluation and updating of SCs. Additional site services ensure automatic SC formatting as pdf-books or the local DSS on CD. Site workflows are shown in Figure 1.

Fig.1 DSS development scheme based on SC

This approach has been successfully used for the implementation of the following DSS: “Atlas van de Parodontale Diagnostic”, “Orthopedishe Casuistiek”, “Atlas Mond -& Kaakziekten”, “Atlas Mond -& Kaakziekten” and others.

Fast implementation time and rotation of innovations sometimes result in emergency situations, adversely affecting company’s business processes and the natural environment. Therefore, the most important factor in business stability is constant fixation and analysis of parameters, ensuring an objective, diverse assessment of the company’s performance and timely decision making, neutralizing emergency situations at an early stage of their occurrence.

2. Company performance monitoring

Unfortunately, in practice it is not always possible to determine how business processes affect the health of the company's personnel, the environment and population. At the initial stage of production an adverse effect may be absent, but the damage of equipment or the change of ingredient composition within production may produce harmful effects very quickly. Especially it concerns the production of chemical fertilizers, building materials, waste management, etc. For example, a change in the process technology at the factory of fertilizers in West Texas led to an explosion that destroyed not only the plant, but also about a hundred of nearby buildings. Therefore, an actual problem is evaluation of business processes not only in terms of company management, but all directly or indirectly related entities.

Problem statement. Suppose there is an object (comp), managed by the center (C) with the use of expert knowledge (E); business processes are implemented by the personnel (P). The results of the facility operation may affect interests of various concerned parties and can be evaluated by numerical values of X parameters, defined by experts. Depending on X values, an object can be in one of the states V = V1, V2, ..., Vm, each of which corresponds to the control solution U = U1, U2, ..., Um. It's necessary to develop a monitoring system (sys), accumulating expertise in business processes, implemented at the facility, and ensuring decision-making support by a top manager, taking into account views of all concerned parties.

Monitoring scene. The solution of any practical problem begins with the construction of the scene and defining the roles of actors. In this case, the scene for monitoring the company's performance (comp) includes all persons who can fix the value of certain parameters of business projects of the company, or feel their influence. The persons, as a minimum, are: company's managers (C), environmentalists (Eco), doc-

tors (Med), mass-media representatives (Pres) and the population (Pop) of the region. The opinion of the population is usually reflected in social networks. Each actor has identification attributes similar to (1). Accordingly, the scene can be described as the tuple:

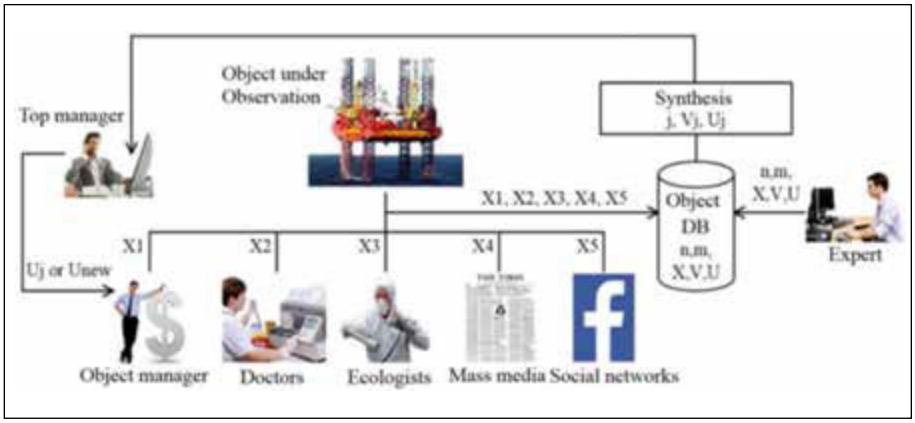
$$\begin{aligned}\text{Scene2} = (&\langle C, AdrC, InfP\rangle, \langle E, AdrE, InfE\rangle, \langle Eco, AdrEco, InfEco\rangle,\\ &\langle Med, AdrMed, InfMed\rangle, \langle Pres, AdrPress, InfPres\rangle,\\ &\langle Pop, AdrPop, InfPop\rangle, com)\end{aligned} \quad (2)$$

Monitoring parameters. Each actor has his/her own opinion about the company. The opinion can be represented, according to the theory of fuzzy sets, as a range of [0..1], thus ensuring the use of mathematical methods [6]. Accordingly, a comprehensive opinion about the company can be described by the vector:

$$X = (comp, X_C, X_{Med}, X_{Eco}, S_{Pres}, X_{Pop}) = (X1, X2, X3, X4, X5) \quad (3)$$

General monitoring scheme. The monitoring scheme of technology-related objects can be represented as the classic scheme of management with feedback control (Fig. 2).

Fig. 2 The scheme of comprehensive assessment of the object state



To implement this scheme, complicated (for large companies) or simple approaches (for small and medium-sized companies) can be used [7].

Typical algorithm for the scheme implementation. The implementation of the scheme in Fig. 2 includes the following steps:

Input: obj, X, V, U. Output: obj, <X>, Vj, Uj.

Step 01: Defining initial properties of the object and the environment;

Step 02: Construction of the solution scene (scene2);

Step 03: Choice of X parameters, V states and control solutions U;

Step 04: Construction of a comprehensive subject area for solving the problem;

Step 05: Defining parameters <X> = X1, X2, X3, X4, X5;

Step 06: Determining the state <Vj> and the control solution <Uj>;

Step 07: Sending a message <X>,<Vj>,<Uj> to the top manager;

Step 08: Approval of <Uj> or formation of a new solution <Unew>;

Step 09: Sending the solution of the top manager to the object manager;

Step 10: Implementation of the received solution by the manager;

Step 11: Moving to Step 05.

The algorithm has a rigid structure, but allows flexible implementation of each step in any modern programming language. In the IT market, many diverse detectors and sensors can measure multiple parameters of the biosphere and human being down to the molecular level, thus ensuring the completeness and accuracy of observations.

Application example. As an example of the algorithm implementation, let's consider the solution of the following problem.

Suppose there is a cement plant. The plant is located on the outskirts of the city and is a potential air pollutant, producing carbon dioxide,

sulfur dioxide and other harmful chemicals. The activity of the plant is assessed according to different criteria: amount of profit (facility managers); level of morbidity (doctors); composition and volume of the emissions (ecologists); impact of the enterprise on the quality of life in the city (media and social networks, reflecting the views of the residents).

Managers evaluate all the parameters and use the solution (Uj) proposed by the system. It is necessary to develop a monitoring system that should reflect opinions of all concerned parties on the activities of the plant.

Let's consider the simplest possible solution of the problem in C#.Net in the text mode Console. First of all, experts build the subject area, e.g.:

```
using System; using System.Linq;
namespace ConsoleApplication15
{class Program { static void Main(string[] args) {
string name = "Cement factory";
int n = 5; int m = 5;  // the number of parameters and conditions
 string[] X = { "Manager", "Doctors", "Ecologists", "Press", "Social networks" };
// the possible state of the object
 string[] V = { "Excellent", "Good", "Average", "Bad", "Emergence" };
// the possible decisions
 string[] U = { "Continue to work.", "Run up service.","Replace the filters.",
        "Overhaul of the equipment.", "Install new equipment."  };
```

Then, reference samples are automatically generated for each state:

```
// etalons construction
  double[,] E = new double[m, n]; object[] a = new object[m + 2];
  a[0] = n; a[1] = m;
  for (int k = 0; k <= m - 1; k++)
 { for (int t = 0; t < n; t++) { E[k, t] = 1.0 * k / (m - 1); } }
```

The subject area is formed. Now we construct the vector of parameter values characterizing the object at the moment:

```
// current image of the observed object
  double[] Xin = { 0.00, 0.75, 0.00, 0.00, 0.00 };
```

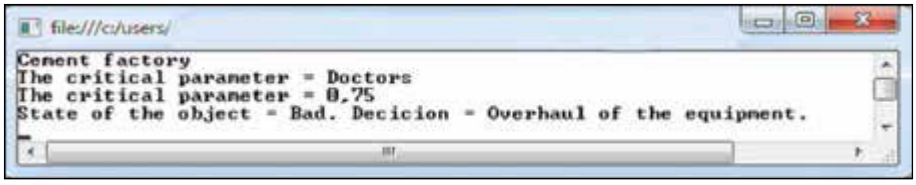
We determine the current state of the object and the corresponding control solution using the following algorithm:

```
// the synthesis of the status and management
  int i = Array.IndexOf(Xin, Xin.Max());
  Console.WriteLine(name);
  if (Xin[i] != 0.00)
{ Console.WriteLine("The critical parameter = " + X[i]);
 Console.WriteLine("The critical parameter параметра = " + Xin[i]);
  if (Xin[i] == 0.00)
{ Console.WriteLine("State of the object = " + V[0] + ". Decicion = "
+ U[0]); }}
  if (Xin[i] == 0.25)
{ Console.WriteLine("State of the object = " + V[1] + ". Decicion = "
+ U[1]); }
  if (Xin[i] == 0.50)
{ Console.WriteLine("State of the object = " + V[2] + ". Decicion = "
+ U[2]); }
```

```
  if (Xin[i] == 0.75)
{ Console.WriteLine("State of the object = " + V[3] + ". Decicion = "
+ U[3]); }
  if (Xin[i] == 1.00)
        { Console.WriteLine("State of the object = " + V[4] + ". Deci-
cion = « + U[4]); }
        Console.ReadKey();
} } }
```

The program is ready, we launch it on execution and get the following result (Fig.3).

Fig.3 Monitoring results



At first glance, Xin vector indicates a good state of the object (if calculations are made using the Euclidean metric, for example). In fact, the value $X_{Med} = 0.75$ indicates the presence of hidden problems in business processes. Probably, it is necessary to replace filters or adjust equipment to reduce highly-dispersed emissions, negatively affecting the health of people in the nearby districts. The described version of the program can be rather easily modified (e.g., with the help of .Net.WPF library) into a system with such properties as: quick adjustment to a particular object; graphical user interface; invariance to the number of input parameters, states and control solutions.

Conclusion

The paper deals with two relevant and interrelated issues: representation of innovative knowledge and its integration into business processes; monitoring of the results of innovative knowledge application.

A version of the innovative knowledge representation in the form of subject collections, oriented to applications in geographically distributed companies with many employees, is proposed. A model of the subject collection, supporting the entire life cycle of knowledge, and a typical scene, ensuring its implementation, are proposed. Typical algorithms for the construction, objective comprehensive assessment and updating of subject collections are developed. An example of their application for the construction of a network system to work with subject collections is given.

A model of the object under observation, a typical scheme for comprehensive monitoring of business processes and the algorithm of the model implementation are proposed. The peculiarity of the algorithm is that it takes into account opinions of all groups of persons, on which business processes can have a negative impact.

An example of the program implementing the full life cycle of monitoring, i.e. from the creation of a subject collection to the synthesis of a control solution, is considered. The usage of such programs helps to record the appearance of problems in business processes at an early stage of their occurrence and to take appropriate preventative solutions to exclude possible accidents.

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MOHAMED LAICHOUBI
Académico Correspondiente para Argelia
Ex Ministro de Argelia

DR. MOHAMED LAICHOUBI

MOHAMED LAICHOUBI
Académico Correspondiente para Argelia
Ex Ministro de Argelia

LA SCIENCE ENTRE GÉOPOLITIQUE DE PUISSANCE ET PARTAGE DE LA CONNAISSANCE

La science est la capacité perpétuelle de l'homme à se remettre en question, en analysant et à en évaluant de façon critique son existence pour enfin se transcender. Cette capacité qu'il a de s'élever, ce dépassement de soi, lui permet d'impulser de nouveaux Univers qui modifient le comportement des sociétés et créent de nouvelles réalités économiques.

Mais la Science est également et surtout une incroyable rencontre de l'homme avec lui-même. C'est un miroir qui reflète la nature profonde de l'homme, son ambivalence entre narcissisme et démence ou dévouement au progrès de l'Humanité par la Connaissance.

C'est ce qui, dans cette même problématique qui m'apparait essentielle, fait dire au philosophe Francis Bacon que début de citation: «La Connaissance est en elle-même puissance»

Ou encore à l'écrivain britannique Aldous Huxley, que début de citation:

«Toute découverte de la Science pure est subversive en puissance».

Au vu de ces interrogations, la tentation est grande de penser qu'il y'a une sorte de fatalité qui impose la violence, et la confrontation comme compagnes de la création et de la progression scientifique.

Dès lors le questionnement qui s'impose, s'exprime en ces termes : La grandeur de la Science se nourrit-elle à la source des conflits et des confrontations de Puissances.

Certains en sont convaincus comme Alexis Toulet lequel, s'appuie de façon contestable, sur David Cosandey.

Ils estiment que sans les rivalités de la guerre froide et donc sans une géopolitique de la Puissance, l'Humanité ne bénéficierait pas des satellites avec toutes leurs applications : l'observation au sol pour l'agriculture, l'Environnement, le GPS, l'exploration de l'espace avec tous ces corollaires, etc.

Et ils rappellent que le premier lanceur spatial Semiorka (R.7) n'est autre que le missile destiné à lancer la bombe à Hydrogène (sur les USA).

Que le microprocesseur et le développement exponentielle de l'informatique sont dus au fait que les premiers ordinateurs sont issus des programme militaires notamment le programme Apollo. Ce dernier programme a été en effet conçu pour une lutte de prestige, mais surtout pour s'assurer une supériorité technologique sur l'adversaire. Tout comme le réseau internet né d'un programme militaire américain.

C'est donc cette Idée Centrale qui s'est imposée à une partie de la société mondiale ces deux derniers siècles et, qui consiste à penser que l'aspiration à la domination est le moteur de l'économie mondiale et un facteur de progrès des Sciences.

Or c'est bien cette approche cynique qu'il faut réfuter, c'est cette équivoque majeure qu'il faut lever, c'est ce concept ambigüe qui pèse de façon insidieuse sur une partie des espaces Scientifiques mondiaux et sur les relations internationales.

En fait ceux sont les politiques de puissance et de suprématie qui ont privilégié le financement de ces programmes. Il suffirait que d'autres philosophies politiques soient édictées pour que d'autres priorités apparaissent. Le potentiel disponible d'intelligence et de recherche étant le même, c'est en fait la définition des objectifs qui l'orienteront.

D'ailleurs Alexis Toulet transgresse totalement la thèse audacieuse de David Cosandey, (Docteur en physique théorique à l'Université de Berne et charge de modélisation mathématique financière à Zurich), développée dans son ouvrage " Le Secret de l'Occident du miracle passe au marasme présent ".

Celui-ci évoque la présence d'Etats stables et d'une concurrence stimulante qui a permis le développement scientifique en Europe. Il introduit à cet effet l'hypothèse de la thassalographie articulée et utilise l'outil mathématique de fractale pour soutenir sa thèse.

Il faut ainsi donc rappeler et affirmer comme une conviction fondamentale :

Les dynamiques de développements Scientifiques s'enrichissent plutôt dans les périodes post-conflictuelles c'est-à-dire lorsque les termes de la coexistence commencent à s'établir entre les différentes parties, lorsque les échanges s'organisent et se structurent.

L'Inventivité de l'homme doit plus au Génie de la paix qu'au génie de la guerre.

Les guerres continuent à marquer la mémoire collective de l'Humanité comme des catastrophes terribles, des périodes traumatisantes à jamais pour les sociétés, guerres mondiales, guerres civiles, guerres de décolonisations.

Posons la question aux Européens, aux Algériens, aux Vietnamiens, aux Irakiens, à tous les peuples amputés d'une partie de leur corps social, de leurs élites, s'ils sont convaincus que leurs sacrifices sur l'autel des dieux de la guerre sont nécessaires au progrès de la Science. Ce serait là, emprunter aux sociétés primitives leurs démarches de sacrifices aux différents Dieux (Dieu du soleil, du vent, etc.), ce serait la régression de l'humanité toute entière

Et donc le Dieu de la Science n'a pas à exiger ces immenses tragédies pour consentir à l'Humanité des avancées scientifiques.

Si cela était, la naissance de l'Europe serait un concept absurde.

Et les Etats et Peuples qui veulent construire un espace de Paix et de Prospérité ont alors choisi la mauvaise démarche; en créant des mécanismes institutionnels de concertation, des programmes communs de coopération avec pour finalité le progrès collectif, alors que selon cette thèse aberrante, ils devraient plutôt revenir aux démarches de confrontations qui ont ensanglanté l'histoire de l'Europe.

Cependant, il est vrai que cette persistance des relations conflictuelles dans le monde distille un doute quant à l'Ethique des acteurs internationaux et aux crédos réels qui les animent.

D'autant que de graves distorsions et incohérences dans les modèles de développement sont mises en évidence, par les impacts de la crise économique mondiale et par l'actualité internationale, récessions économiques, catastrophes écologiques (Fukushima, marée noire aux

Etats-Unis, réchauffement de la planète, gaz à effet de serre, …), montée du chômage, immigration clandestine, famine, terrorisme etc.

Les contestations relatives aux modèles de développements mis en place s'accentuent et révèlent qu'il faille édicter de nouvelles approches et, proposer de nouvelles démarches technologiques.

Energies alternatives au lieu d'énergies fossiles, nouvelle agriculture tournant le dos à l'exploitation intensive (engrais, insecticides polluant les nappes…).

Or la crise économique mondiale est venue s'insérer non pas de façon incidente, mais bien au contraire, elle semble révélatrice de profonds changements dont on retarde l'échéance mais, qui vont devoir s'imposer.

Notre conviction est qu'une grande partie des stratégies définies dans le contexte des deux guerres mondiales ont atteint leur asymptote et arrivent à leurs limites.

Dans cette même logique, des courants contestataires de plus en plus importants prônent des approches en totale rupture avec les visions et stratégies qui ont cours.

Ils mettent non seulement en évidence la nécessité de nouveaux modes industriels et technologiques, mais ils contestent également les Instruments de Gouvernances internationales définies au siècle dernier et concluent à leur obsolescence, tout en remettant en cause les philosophies qui les inspirent.

Dominique Wolton Directeur de Laboratoire au CNRS à propos du Pari Scientifique et dans la revue Hermes estime que : début de citation «l'immense et superbe défi est de rapprocher plus de 350 millions

d'européens, qui las de se déchirer au nom de Dieu, du Progrès, de la Science, du Peuple ou du Parti, essaient d'inaugurer une forme nouvelle de coopération politique et culturelle.

Une coopération généralement conforme à cet idéal de la «Communauté Internationale», que les hommes épuisés à la sortie de la barbarie de la deuxième guerre mondiale ont rêvé de bâtir (…). Le progrès européen est né de ces millions de morts (…) à l'heure où ce projet passe à un degré supérieur d'intégration en s'attaquant à la politique (…) signifie être fidèle au message des pères fondateurs, c'est à dire avancer (…) en intégrant toutes les sources culturelles.» Fin de citation.

Ceux sont là des principes d'Ethique qui doivent sous tendre l'action scientifique, mais surtout des concepts fondamentaux remettant en cause la Géopolitique de la Puissance, réalisée à travers des démarches belliqueuses, guerrières et prônant la négation de l'Autre.

Le marché mondial de l'armement a atteint en aout 2007 un sommet historique avec des échanges se chiffrant à 78 Milliards d'Euros.

Dans cette compétition hystérique, d'Aucuns pensent construire leur puissance alors qu'en fait ils réalisent leur précarité. Cela a été le cas dans la démarche de la financiarisation excessive qui a abouti à la fragilisation du système financier et de l'économie mondiale.

Ceci d'autant que comme à l'après deux Guerres mondiales (Yalta) de nouvelles recompositions géopolitiques entamées à la fin de la Guerre froide apparaissent maintenant plus clairement.

En effet une nouvelle appréhension de l'espace international à l'instar des compétitions sur la maitrise de l'énergie nucléaire, s'impose y compris à l'œil du profane.

Les hiérarchies sont bouleversées de même que le Monopole de la force de dissuasion nucléaire est remis en cause.

Une nouvelle répartition des forces scientifiques et techniques se dégage progressivement.

Pierre Papon, professeur d'université, ex DG du CNRS estime que la crise économique a fourni l'occasion pour de nombreux Pays développés de réaffirmer le rôle de la Recherche & Développement dans les stratégies de sortie de crise tout en ayant comme objectif de préserver leur compétitivité face aux Pays asiatiques.

Cependant, il précise qu'il n'est pas certain que ce discours renverse la tendance.

En 2007, la part des dépenses mondiale de R&D (1145 Milliards $) dans le PIB mondial était la même qu'en 2002 (1,7%) mais en augmentations de 30%.

Quatre grands ensembles réalisaient 80% de la dépense mondiale (de R&D en 2007), USA (36,2%), Pays UE (24,1%), Japons (13,5%) et Chine (9,1%).

Sauf que si les dépenses de Recherche de l'Europe ont augmenté d'un tiers, celles des Pays asiatiques ont cru de près de 75%.

Plusieurs Pays émergents ont fait un effort considérable de rattrapage pour leurs investissement de R&D notamment la Chine avec un rythme de croissance annuel de 20% (de dépense mondiale de R&D) sur la dernière décennie.

Ce dernier Pays est devenu le second plus grand Pays manufacturier du monde. Il totalise 15,6% de la valeur totale de la production mondiale contre 19% pour les USA.

Les statistiques chinoises affichent également 1,6 Millions de chercheurs (en 2008) ce qui fait que la Chine compte désormais le plus de chercheurs dans le monde devant l'Europe et les Etats-Unis.

En effet celle-ci ambitionne de devenir le premier Pays en R&D au monde.

Mais l'ensemble de ces compétitions restituées viennent s'inscrire dans un contexte historique particulier où l'immense tache de remise en ordre de l'économie mondiale prélude d'une longue crise qui intervient à des fins de cycle pour les modèles les plus fondamentaux de la planète.

Modèle énergétique saturé, modèle industriel polluant, modèle agricole gaspilleur d'eau et tournant le dos à l'écologie, modèles alimentaires contestés, menaces de graves pénuries d'eau, insécurité alimentaire.

Tous ces chantiers colossaux imposent à l'évidence des remises en cause dans les orientations et les démarches globales.

A ce propos, les Japonais eux même procèdent à un renversement capital d'une tendance lourde. Ils estiment que dorénavant la Science et la Technologie devront être mises au service des besoins sociaux, en se rapprochant de la demande sociale. L'Allemagne, la Scandinavie et bien d'autres n'engloutissent pas des dépenses incommensurables dans leur budget de défense.

C'est donc bien les philosophies politiques qui sous-tendent la R&D qui sont contestées par de nombreux courants scientifiques et Politiques et dans de nombreux Pays.

Il est par conséquent fondamental que s'organise au plan international une responsabilité collective et solidaire sans laquelle les chantiers précédemment énumérés ne seraient que partiellement traités.

L'Organisation Institutionnelle mondiale doit être revisitée.

La Gouvernance de la mondialisation en marche est gravement menacée par les fractures sociales et technologiques de plus en plus importantes et par les compétitions géopolitiques meurtrières.

Il faut que les démarches de stimulations saines s'imposent.

Les TGV européens sont nés de cette philosophie. Le TGV Français rapide dans les lignes droites, le Pendoline Italien destiné aux lignes sinueuses s'incline dans les courbes pour passer plus vite. L'IE Allemand pressurisé et blindé pour passer les nombreux tunnels. Les projets Airbus, Ariane, CERN, sont le fruit d'une collaboration collective qui contredit les chantres des compétitions belliqueuses.

Les Continents en développement représentent les quatre cinquième d'une humanité solidairement confronté à des défis de changement global, de préservation de la biodiversité et des ressources naturelles, de santé, de démographie, de commerce et circulation des connaissances.

De tels enjeux exigent une mobilisation collective, la coopération scientifique et technologique étant une carte stratégique.

Les chantiers répertoriés à cette coopération internationale entre les différents pays du nord ou du sud sont le Sida, la santé urbaine, l'agronomie du maïs, la sylviculture tropicale et la gestion des ressources halieutiques.

Finalement, c'est vraie et il faut le rappeler qu'effectivement l'évolution culturelle et scientifique est un patrimoine commun nourri par ce formidable potentiel créateur de l'humanité.

La Science et la Culture ne doivent pas être patrimonialisées, ils sont un bien commun de l'humanité.

L'innovation ne peut s'apparenter à un banal chapitre de droit commercial excluant toutes les logiques de responsabilité vis-à-vis de l'évolution de l'espèce humaine.

Et l'on tort de se persuader que les espaces de richesses actuels sont inscrits à jamais dans la postérité. Schéma manichéen que la réalité du quotidien peut très vite contredire.

DOMENICO MARINO
Universidad de Reggio Calabria (Italia)

DR. DOMENICO MARINO

DOMENICO MARINO
Universidad de Reggio Calabria (Italia)

RETHINKING ECONOMICS: COMPLEXITY AND DYNAMICS

1.- Introduction

Economics has been undergoing major changes in recent years. Economic analysis and microeconomics have assumed increasing importance whereas the traditional approach has concentrated on macroeconomic points of view. Within this framework, the search for the microeconomic foundations of macroeconomics is proving productive ground for analysis and implications studies. Increasing formalization and use of mathematical models is, without doubt, also a characteristic of this new way of describing economic phenomena. Economics is getting increasingly closer to the so-called *hard sciences*, albeit while maintaining its hard core social scientific nature with its preoccupation with behaviours and individual choices. In this sense there will always be a major and ineradicable epistemological difference between economics and exact sciences such as physics and chemistry. Electrons and particles, as well as molecules do not have "degrees of decisional freedom". They cannot be rationalized according to categories of discretionality

but according to categories of necessity. From the philosophical point of view the world of exact sciences is the realm of negative freedom, based on the principle of necessity. Anything that is not prohibited by some law usually happens. Electrons, therefore, cannot but behave like "electrons". The realm of social sciences, on the other hand, is the domain of positive freedoms, where there is space for the possible and where even the irrational has rights of citizenship.

Succeeding in incorporating behaviours, by their intrinsic nature psychological, into exact mathematical models is as arduous as it is necessary.

This means abandoning an interpretation of economics based on linear variables and equilibrium behaviours and embracing all the implications of the non-linearity of phenomena. The emergence of chaos is one of the most important consequences of this new way of interpreting economic phenomena.

Correct descriptions of reality, however, require us to take one step further and to consider the dynamic nature of phenomena. To do this it is necessary to define the concept of time. Time is one of those ideas with which we have such familiarity that we would expect anybody to be able to describe it accurately and exhaustively. Careful scientific examination of the concept of time, however, reveals that we in fact have very little to say about it. The simple concept of time passing in one sense carries with it a whole series of consequences. Is it, above all, true that a time arrow exists? And if it does exist, as experience would seem to confirm, then we must recognize that we find ourselves in the presence of a break in temporal homogeneity. What, then, stops time flying backwards? As we will see later, this apparently philosophical question, not at first sight entirely dissimilar from a learned dissertation on the sex of angels, also has considerable implications for economic sciences. Many economic models so far developed de-

scribe a world in which time can be imagined to mean anything. When we aim to produce models in which a certain degree of reversibility is present, we are describing a world that has no time arrow. When we admit that opposite sign economic policies can simply cancel out the effects of other previously applied policies bringing the economic system back to its original state, we are using the previously described categories. The real world, unfortunately is a world which has its own arrow of time, a world in which virginity cannot be recovered once it is lost, a world made up of irreversible phenomena, a complex world in which all interaction irremediably alters the scenario and makes it impossible to rebuild it ex-post in any way. Complexity, which will be covered in detail later, with this meaning is closely tied to this break in temporal homogeneity.

When dealing with the dynamics of phenomena, we immediately run into the problem of instability. Warped minds and cultural stereotypes commonly incline us to approach phenomena in or near their equilibrium phase. In reality, there is a whole class of far more interesting phenomena which don't have these characteristics of equilibrium. To examine these phenomena and to take instability into account is, therefore, a new result of contemporary dynamics. What ties these concepts to the theory of information and chaos is entropic magnitude. In equilibrium phenomena there is no increase in this magnitude. In non-equilibrium phenomena there is a continuous increase in this magnitude. As physicists well know, real phenomena are all non-equilibrium phenomena.

Until a while ago it was thought possible, in principle, to establish the predictability of phenomena if sufficient quantities of information were collected and processed.

The revolution, started by the theory of chaos, concerns the fact that, even if the future is determined by the past, in the dynamic case, small

differences in the observed data can become amplified and make long-term assessments unpredictable even when short-term predictability is good. In modern history the concept of chaos has taken on a distinctly negative meaning probably as a result of the enlightened claim to be able to build the world and control things according to a principle of order such as that offered by reason. Rationalism and its favourite child determinism have relegated chaos to the darkest backwaters almost as if, as a principle of disorder, it was the personification of Evil. The concept of chaos was quite different in classical Greece. It was seen as one of the forces of nature and a vital and creative principle. All classical cosmogonies ascribe the origins and the creation of the world to chaos and, as will be seen, a basic truth can be discerned in this. Oriental cosmogonies also recognise the role played by chaos as being that of motor force of the universe. Nevertheless the damage and prejudices introduced by the enlightened and rationalistic vision into the scientific arena have had their negative effects on the last two hundred years of science which persist even today. Indeed not until half way through the twentieth century, with the birth of statistical thermodynamics, were chaos and disorder able to reoccupy their rightful place in the Olympus of science. This deterministic prejudice has also tainted the formulations of quantum mechanics, which, though based on assumptions that are far from deterministic, such as uncertainty and probability density, nevertheless remains deterministic in its evolution. But what does this deterministic bias amount to?

It is basically a claim to be able to accurately describe the behaviour of a system, any system, after dividing it into its elementary components.

This quotation from Laplace constitutes the archetype of all deterministic convictions:

"If I could solve a system of 2n differential equations and succeed in assigning opportune conditions to the outline, I would be able to describe the evolution of the universe at every instant - past, present and future."

This is what is known as a reductionist and rationalist claim - an absolute faith in deductive capacities and in the possibility of solving any problem by breaking it down into its most basic components. Only the early successes of statistical thermodynamics and Lorentz's studies of many body dynamics were able to undermine the stronghold of rationalistic certainties and lay the foundations for what is now known as complexity science.

Description of chaos requires new mathematical instruments. It is not simply a question of semantics. Describing the structure of a complex reality requires methods of analysis more capable of identifying interrelations. The simulation aspect acquires greater dignity and, in a certain sense, "a place in the sun" within the field of economic sciences. It constitutes not a Copernican revolution, but the evolutionary path of a science, economics, which having experienced the birth of certainty and the subsequent emergence of doubt, is ready to augment its capacity to describe and interpret reality.

One way of introducing chaos and complexity into economics is to take into consideration models of choice with different levels of rationality.

Models based on the concept of absolute rationality presuppose that all agents, besides having free access to all information about the market and the agents operating in it, have unlimited ability to process this information.

The unreality of absolute rationality of behaviour is due to the impossibility of these two basic assumptions.

In reality agents do not have unlimited ability to process information and do not have at their disposal all the information theoretically available.

If we consider a real economic system, what we can easily observe is the existence of irrational and sometimes erratic behaviours on the part of agents as a consequence of the presence of asymmetrical information of behaviour shaped by experience.

When we examine the behaviour of real systems, what is most irrational is to presuppose absolute rationality of behaviour.

Therefore, it is appropriate, alongside absolute rationality to also introduce the concept of *limited rationality* as described by Simon (1957).

Aspects of limited rationality are such phenomena as the imitative effect which arises when operators have asymmetrical information or the effects of learning in models of choice involving assimilation. The development of theory of non-linear models in economics has been directed towards the search for a microeconomic foundation and towards identifying the economic causes of the emergence of chaotic behaviour. In particular the incompleteness of markets, the non-ergodicity of systems *(increasing returns)*, limited rationality, incomplete information and endogenous uncertainty are the causes that can lead to complex and chaotic dynamics.

This essay aims to outline the new ideas and new visions of the world underlying concepts of complexity and chaos. The world of economics seems very different in this light; certainly more real and more human. The unreality of models of absolute rationality lies in

their expectation of consistent behaviour from economic agents capable of processing all the information they have available to them correctly. To describe reality it is necessary to build into models of behaviour irrational, erratic and imitative behaviours - all things which are part of human experience and cannot be excluded from economic models. Chaos and complexity are therefore fascinating areas of research of extraordinary potential.

This essay proposes to reinterpret, in some ways originally, what is meant by economics when in the description of economic phenomena time assumes an important role and when the non linearity of functions makes its presence felt.

This approach is intended to reject an interpretation of economics in terms of linear and equilibrium variables to investigate all the implications of non-linearity and the dynamicity of phenomena. The emergence of chaos is one of the most important consequences of this interpretation of economic phenomena and could, in some ways overturn tried and tested ways of describing and interpreting economic phenomena.

2.- Dynamics, Complexity and Chaos: Methods of Analysis

What we wish to elaborate in this essay is a description of an economic system in its characteristics of complexity. Economic systems will, to all intents and purposes, be considered as economic systems which evolve in complex ways.

The paradigm of complexity has thrown traditional interpretations of economics and economic policy into crisis.

The concept of a dynamic system with complex behaviour has become the unifying theme of numerous areas of research (Krugman,

1994) and, within this conceptual framework, economic systems can be considered dynamic systems with interacting agents (Arthur, 1988). These systems present interesting properties such as: learning, self-organisation and self-reinforcing mechanisms.

The introduction of complexity can be developed in relation to two different analytical aspects. The first, of a strictly theoretical nature, examines the functioning of markets in the light of some hypotheses relating to the microeconomic behaviour of agents. The second, of an empirical nature, is based on the use of special instruments such as neural networks and cellular automata to build interpretative models of behaviour and to effect analyses of microdata.

As regards the first level of analysis, it must be noted that interpretative systems based on the concept of equilibrium and rational expectations have long been in a state of crisis. More recent approaches identify the incompleteness of markets, the limited rationality of agents and the asymmetry of information as important variables in the description of the workings of markets. An economic system, thought of in these terms, obviously presents the characteristics of a complex system and to describe it correctly it is necessary to use non-linear dynamic models.

As regards the second level of analysis, it must be noted that the application of instruments of prediction and simulation, such as neural networks and cellular automata, is now commonplace in the study of a vast range of economic problems, some of which are of considerable complexity. The capacities and characteristics of neural networks enable them to be used in a whole host of applications, from the very simple to the more complex.

In this essay we treat only the theoretical aspect.

3.- Causes of the Emergence of Complex Behaviour: Erratic Behaviour, Limited Rationality and Uncertainty

The emergence of complex behaviours within the market is due to behaviours that are erratic and/or involve limited rationality and to the presence of uncertainty.

As concerns the first aspect, as already hinted at in the first paragraph, we must begin by recognising that standard models of consumer behaviour and models of choice presuppose that all agents, besides free access to all information on the market and on the agents operating within it, also have unlimited ability to process information.

If we consider a real economic system, what can easily be observed is the existence of non-rational, and sometimes erratic, behaviours in agents as a result of the presence of asymmetrical information or behaviour dictated by experience.

Important work in this field is described in an article by Benhabib-Day (1982) which demonstrates the existence of the erratic behaviour of agents operating in a stationary environment and whose preferences are dictated by experience.

In reality agents do not have unlimited ability to process information and do not have at their disposal all the information theoretically available.

As already seen, a weakening of the concept of absolute rationality and the introduction of lower levels of rationality is necessary to explain reality correctly.

Limited rationality, non-rational behaviours and uncertainty are factors which generate complex behaviours in agents and markets.

In the traditional approach, all operators' decisions could be formulated in scenarios of certainty or which were at least describable in terms of probability distributions. It was possible, that is, in all circumstances, to decide using the logic of certainty or following the laws of probability. Uncertainty turns this view of the world upside down in that the decision-maker is faced with various states of nature to which he can assign no probabilities, but about whose chances of materialisation he can only make conjectures. The logic of decision-making in conditions of uncertainty is obviously radically different from that of decision-making in conditions of certainty.

Conditions of uncertainty make it necessary to measure operators' greater or lesser degrees of aversion to risk so that decisions are a function of this greater or lesser degree of aversion to risk. In conditions of uncertainty, the criterion for decisions is that of greatest expected utility, utility here being as defined by Von Neumann-Morgenstern. Another way of describing the decision-making criterion in conditions of uncertainty is the mean-variance criterion. Of two possible investments, operators will choose that which has the greatest expected rate of return, compatible with a certain level of risk.

The concepts of risk or uncertainty, as described before, are essentially exogenous concepts. Since uncertainty necessarily leads to fluctuations in the variables, to consider uncertainty exogenous is to consider all fluctuations as being caused by forces which are exogenous to the economic system and which no policy can in any way alter. In this sense modern theory of general economic equilibrium provides a logical conclusion to the conclusions of the theorists of rational expectations[1] as regards

[1] The term 'rational expectations' means the assumption which guarantees that all agents have what is defined as "structural knowledge".

the business cycle and economic policies. In the presence of *structural knowledge*[2] all uncertainty can be reduced to uncertainty surrounding an exogenous state.

A different and in many ways innovative way of thinking is to consider uncertainty endogenous.

A recent approach to the problem of uncertainty is that described as "endogenous uncertainty" (M. Kurz, 1994).

Keynes had assumed that no kind of *structural knowledge* could exist within the economic system. In chapter 12 of his "General Theory" he states:

"...our knowledge of the factors which will govern the yield of an investment some years hence is usually very slight and often negligible. If we speak frankly, we have to admit that our basis of knowledge for estimating the yield ten years hence on a railway, ... amounts to little and sometimes to nothing." J. M. Keynes (1936) pages 149-150.

"... since philosophically speaking it cannot be uniquely correct, since our existing knowledge does not provide a sufficient basis of mathematical expectations". J. M. Keynes (1936) page 152.

Consequently no model of rational and self-fulfilling expectations can be formulated. If we hypothesize an absence of structural knowledge, then all agents will make the decisions they *believe* to be the best. The rules of decision-making are not known to the other agents who, therefore, form their own beliefs about the future behaviour of the variables of interest. Belief is based on past data and beliefs are said to be

[2] The term 'structural knowlege' means that agents understand the function of supply and demand and are able to extrapolate present and future equilibrium prices and the laws of the motion of the economy. In a game 'structural knowledge' means an understanding of the structure of the game and (chance) equilibrium strategies (M. Kurz, 1993).

rational if they cannot be contradicted by observed facts. Diversity of beliefs is the heart of endogenous uncertainty. The consequence of this is that results achieved in the area of rational expectations are simply reduced to a specific case and that two agents with the same levels of information can have two different models of rational assessment.

Complexity and chaos are inseparably linked to endogenous uncertainty. A model which presents chaotic behaviour is without doubt a model which generates endogenous uncertainty due to the typical unpredictability of these systems which does not allow uncertainty to be treated in exogenous terms. On the other hand a system which presents any form of endogenous uncertainty can evolve towards chaotic states.

4.- Attractors, Dynamic Trajectories, Cycles, Bifurcations: the Topology of Chaos

The topology of chaos is the means by which complex dynamics can be illustrated. It has to be made use of to be able to describe reality in terms of complexity.

The ingredients of this topology are: phase space, attractors and bifurcations.

Attractors are classified in four major categories which, in turn, identify four different possible "states" of the system.

However, before describing the concept of attractors it is necessary to introduce the concept of phases space. What is meant by this is the set of possible states of a system and continual reference will be made to this space in this essay. Attractors can be static, periodic, chaotic and hyperchaotic. We should begin by describing the static attractor. This attractor traps the trajectory in a cycle of states which are repeated at

regular time intervals. The system, in short, assumes an oscillatory behaviour. A special case is the quasi-periodic attractor which has a toroidal trajectory. Chaotic attractors, in turn, determine chaotic behaviour in which the system neither quietens down nor stabilizes into an oscillatory motion, but continues to display erratic behaviour. The chaotic attractor is worth lingering over since it can represent two different levels of chaos: deterministic chaos and hyperchaos. The former, described by Lorentz in the course of his studies of hydrodynamics, manifests itself in the non-periodicity of a fairly simple system such as a three-body system. A system with three degrees of freedom is, therefore, sufficient to generate an asymptotic instability or an uneliminable dependence on initial conditions. By hyperchaos we mean the description of those phenomena which can be characterized by deterministic chaos in the specific conditions in which background noise is superimposed on them. The double fortuitousness which results from this is called hyperchaos. In this situation there can be a jump between the various basins of attraction.

It is now appropriate to define Hopf's concept of bifurcation too.

A fixed point x_0 or a periodic solution, if they exist, usually depend on the whole set of p parameters of the system. Also the eigenvalues of the linearized system of the monodrome matrix W(T). A g(s) curve can thus be parameterized so that the corresponding curve of eigenvalues intersects the imaginary axis in the case of the fixed point or unitary circle, in the case of periodic solution for increasing values of the s parameter. The parameterization of the curve can be chosen so that the fixed point or periodic solution is stable for $s<0$ and unstable for $s>0$. Essentially two curves that are symmetrical to the real axis are constructed. Hopf's bifurcation is a typical phenomenon in the case of excited or dissipative dynamic systems. The transversal intersection of eigenvalues on the imaginary axis (which occurs at point +1 in the case of bifurcations or turning points and at point +2 in the case of period

doubling in periodic solutions) takes place mainly in Hamiltonian systems or differential dynamic systems with discontinuities that can be described by recursive functions.

5.- Dynamical systems.

By dynamic systems we mean systems characterized by non eliminable dependence on the temporal variable, or systems where the configuration of the system, at a given moment in time, depends on the whole of its previous history.

In formula:

$$y = f(x(t)) \quad (1)$$

Dynamic description differs very greatly from the comparative static description on which, until today, most economic analysis has been based. Comparative statics studies the variations in economic variables at two moments in time. Such description is obviously limited because it makes no effort to give information about what has happened in the period between the two moments in time taken as references. Or rather it supports the hypothesis that the behaviour of the system between the two points in time is linear in type. In this case the principle of correspondence guarantees that dynamic description will not appreciably differ from static description.

Specific examples of dynamic systems are Markoffian systems, where temporal dependence is limited to the moment in time immediately previous and supposing that at every moment in time the system loses all memory of its previous configuration.

By considering discrete dynamics, the core of dynamic analysis consists of a system of finite differences equations which will inform us about the evolution of a vector of state as time passes. The general form of this system of finite differences equations is:

$$y_{t+1} = F(x_t) \quad (2)$$

where y_t is the vector of state.

This set of equations enables us to analyze discrete dynamic systems. A linear system can be written as follows:

$$F(x_t) = K x_t \quad (3)$$

where K is a square matrix.

It is possible to obtain an analytical solution to describe the temporal evolution of the variable of state. The trajectories that can emerge from the evolution of a linear system are convergence to a stationary state, asymptotic divergence, periodicity or cycles. It is by studying the K matrix, and in particular by studying the roots of the characteristic equation, that indications can be gathered about the type of behaviour of the system. A complex root leads to oscillatory type dynamics; on the other hand, a system is stable when the dominant characteristic root module is less than one and unstable when it is otherwise. Because their assumptions are easy to work with and extremely universal, linear systems have been widely used in economic analysis. This has led to the widespread conviction that linear systems represent an explanation of the world. In reality most phenomena are non-linear and non-equilibrium phenomena.

Relatively few studies have focused on non-linear dynamics in economics. This is because there are no straightforward methods available of solving these kinds of problems. When dealing with non-linear problems it is often impossible to find an analytical solution and we have to be content with numerical solutions. As a result, only recent progress in the field of simulation has made it possible to study the behaviour and characteristics of non-linear systems. It is, above all, the predictions that can be different in the two different, linear and non-linear,

approaches. If a non-linear system is represented by means of a linear system, then we speak of the introduction of an error of approximation. Non-linear systems display dynamic behaviour which is qualitatively different from that of linear equations since it cannot be approximated by the use of linear models. Here we find ourselves in the field of chaotic behaviour.

6.- Dynamical systems and Hamiltonian systems.

A mechanical system free of friction and not subject to outside forces has a temporal evolution which can be described in terms of Hamilton's equations:

$$\dot{q} = \frac{\partial H}{\partial p} \qquad (4)$$
$$\dot{p} = \frac{\partial H}{\partial q}$$

The evolution takes place in a 2n-dimensional space, called phase space, parameterized by means of generalized coordinates q and generalized moments p. The Hamiltonian equation thus constructed comes to depend on the 2n coordinates, but not explicitly on time. The whole n is the number of degrees of freedom of the Hamiltonian system. Since H is a constant of motion, the phase space can be broken down into a series of families of sets characterized by the property H=cost., which are invariant in relation to the temporal evolution of the system. The element of volume $dq_1..dq_ndp_1...dp_n$ is also retained in the course of temporal evolution (Liouville's theorem). Hamiltonian systems, also called conservative systems, have really peculiar dynamic properties. Hamilton's equations can be derived starting from a variational principle and using a technique known as variations calculus.

Variations calculus aims to establish a y(x) function for which the integral:

$$J = \int_{x_0}^{x_1} f(x, y, y')dx \quad (5)$$

assumes an extreme value, where y represents dy/dx.

The search for the extremes of j can be bound by various conditions. For the sake of simplicity let us consider only the search for extreme values under the condition that y(x) values are assigned at the extremes of integration. We can thus study the family of all y(x) curves which assume assigned values in x_0 and x_1 and classify them using the values of an arbitrary parameter a chosen to cancel itself out for the y(x) curve which makes j extreme. In this way the generic curve of the family can be indicated as y(x,a) and j then becomes a function of a:

$$J(\alpha) = \int_{x_0}^{x_1} f(x, y(x, \alpha), y'(\alpha, x))dx \quad (6)$$

The extreme of j(a) will then be determined by the condition:

$$(\frac{dJ}{d\alpha})_0 = 0 \quad (7)$$

With simple derivation operations we get:

$$\frac{dJ}{d\alpha} = \int_{x_0}^{x_1} (\frac{\partial f}{\partial x} - \frac{d}{dx}\frac{\partial f}{\partial y'})\frac{dy}{dx}dx \quad (8)$$

From which, by imposing the zero equality of the expression in parenthesis, we get the well-known Euler-Lagrange equations:

$$\frac{\partial f}{\partial x} - \frac{d}{dx}\frac{\partial f}{\partial y'} \quad (9)$$

From the explicitation of the functional f it is possible to obtain two different approaches: the Lagrangian approach and the Hamiltonian approach. If, in particular, f is defined as:

$$f = p(t)\dot{q}(t) - H(p(t),q(t),t) \qquad (10)$$

Imposing the usual zero equality condition of the variation, we obtain:

$$\dot{q} = \frac{\partial H}{\partial p}$$
$$\dot{p} = \frac{\partial H}{\partial q} \qquad (11)$$

These are the well-known Hamiltonian equations which ensure a solution to the problem of finding the extremes of function f.

7.- The Hamiltonian Approach in Economic Dynamics

The Hamiltonian approach has been applied in the study of economic dynamics. As already mentioned, the most important work in this field has been done by Cass and Shell (1976). It is appropriate, at this point, to try to schematize their contribution.

Let us consider a problem of optimal control, with continuous time, where D is a convex whole, x(t) is a time-dependent vector, x'(t) is its derivative in relation to time, r is a discount factor.

We can define a Hamiltonian H:

$$H(x,q) = V(x,\dot{x}) + \dot{x}(t)q(t), s.t.(x,\dot{x}) \in D \qquad (12)$$

This expression can be interpreted as the current value of GNP estimated at price q (Cass, Shell, 1976).

The solution can now be written in the usual form of Hamiltonian equations, i.e. in the form of a system of 2n partial differential equations of the first order:

$$\dot{x} = \frac{\partial H(x,q)}{\partial q}$$
$$\dot{q} = \frac{-\partial H(x,q)}{\partial x} + \rho q \qquad (13)$$

It is, at this point, necessary to briefly digress about this system of equations. The latter can be seen as an disturbance of the usual Hamiltonian system.

In mathematical terms the function H(x,q) is Fechel's transform of a concave function.

To consider the optimal solutions of the modified system it is necessary to add a condition of infinite transversality which can be written:

X(t)q(t)exp (-rt)à 0 (14)
when tà ¥

8.- The Stability of a Dynamical System

There are three ways of defining the concept of stability.

According to *Lagrange* a trajectory is stable for the future after an initial time t if, and only if, it remains limited after t.

According to *Poisson* a trajectory is stable for the future if, and only if, it always returns to roughly its past position.

Liapunov's definition of stability is very well-known and is linked to the behaviour of a solution near an X(t) solution of interest.

Periodic and quasi-periodic solutions enjoy stability according to Poisson and Lagrange, but do not necessarily conform to Liapunov's definition of stable.

Let us now consider quantitatively the concept of stability and bifurcation in the case of a periodic solution. $A\ \Phi_{\xi}:[0,\infty] \to TM$ solution, where TM is the phases space, of a dynamic system with $\xi \in TM(\Phi(0) = \xi)$ initial point is said to be asymptotically stable if:

$|\Phi(\xi)|t > 0$ is limited with respect to the norm in a vector in TM, an e>0 exists such that:

$$\forall \Phi_{\xi} con \left\| \xi - \xi \right\| < \varepsilon$$

$$\lim_{t \to \infty} \left\| \Phi_{\xi}(t) - \Phi_{\xi}(t^*) \right\| \qquad (15)$$

t function such that
$t^*: R_+ \to R_+$ *is defined by*

$$\left\| \Phi_{\xi}(t) - \Phi_{\xi}(t') \right\| := \min\left\{ \left\| \Phi_{\xi}(t) - \Phi_{\xi}(t') \right\| / t' > 0 \right\} \qquad (16)$$

For t=t* the system is stable as in Liapunov's definition.

9.- Stability and Bifurcation of a Hamiltonian System.

Let us now consider a conservative Hamiltonian system and study its conditions of stability and bifurcation.

If z_0 is a fixed point in a Hamiltonian system, the linearized system around z_0 is described by:

$$\dot{y} = \underline{j}\frac{d^2}{dx^2}H(z_0, p)y \qquad (17)$$

since **J** is a simplectic matrix the following property is valid:

$$\det \; \underline{j}\, D^2 H(z_0, p) - \lambda E) = 0 \Leftrightarrow \det(\underline{j}\, D^2 H(z_0, p) + \lambda E) = 0 \qquad (18)$$

thus -L is an eigenvalue, if L is the other.

A consequence of this property is that a z_0 fixed point is unstable if the system linearized around it has eigenvalues with a real part that doesn't cancel itself out. Therefore a Hamiltonian system only has stable fixed points in the limit or unstable fixed points. Limit stability occurs when all complex eigenvalues are conjugated. These systems can present bifurcations towards periodic solutions and the T period, immediately after the bifurcations, derives from the eigenfrequency of the linearized system around the fixed point. In other words, a bifurcation in a Hamiltonian system, stable in the limit with a fixed point, always leads to a periodic eigenmode of the linearized system at the fixed point. This bifurcation can be considered as a primary Hopf bifurcation of a Hamiltonian system. The stability of a solution is determined by the distribution of the eigenvalues of the monodrome matrix W(T). For a Hamiltonian system the eigenvalue of the matrix W is l/L, if L is the eigenvalue of the system (with |L|=1). Both the eigenvalues, then, lie in the unitary circle K and are symmetrical with respect to the K circle. An eigenvalue can abandon the K circle if L or -L joins the real axis, or if the other eigenvalue is encountered in K. In a Hamiltonian system the monodrome matrix always has two L-eigenvalues. If P are two invariants of a periodic solution, produced by variation in an h parameter,

then an arbitrary curve G : $[h_1,h_2]$ -->P can be defined on P so that it passes for the periodic solution of transversality. The set of intersection points of G with periodic solutions defines an initial point of the periodic solution, i.e.:

$$\Gamma(h) := \Phi_{\Gamma(h)}(0) \qquad (19)$$

for every h of the $[h_1,h_2]$ range, F_G is a solution such that:

$$\dot{\Phi}_{\Gamma(h)} = f(\Phi_{\Gamma(h)}(t), P) \qquad (20)$$

from which, after some manipulations, we get:

$$\frac{d}{dh}\Gamma(h) = W(T)\frac{d}{dh}\Gamma(h) \qquad (21)$$

which means that G'(h) is an eigenvector of W(T) corresponding to the eigenvalue L and, because of the transversality of G and F_G, the vectors G(h) and f(G(h)) are linearly independent. The presence of a second eigenvalue means the Poincarè's map *P*: W ® W always satisfies conditions for bifurcation. The periodic solution loses stability, since the eigenvalues can abandon the unitary circle on the real axis. In this case a small disturbance can cause the periodic solution both to converge and to diverge. Therefore the solutions of a Hamiltonian system are both stable at the limit and unstable.

10.- Complexity and Economic Policies

In economics, as in many other disciplines there exists basic disagreement between determinists and non-determinists. The determinists see reality as being constituted and governed by deterministic mechanisms in which fluctuations are seen as exceptional occurrences. They

suppose, that is, that in the absence of outside disturbances the system will evolve naturally towards a state of equilibrium with a regular trajectory in the phases space. The non-determinists, on the other hand, begin by assuming that even a system not subject to outside disturbances can develop irregular fluctuations. In Business Cycle theory these two different approaches become, respectively, the theory of exogenous shock and the theory of the endogenous cycle. The idea of the endogenous cycle is not new to economics. The first Business Cycle models, elaborated by Kaldor, Goodwin and Hicks contained this assumption. However, from the 1950's onwards, the predominant approach became that attributable to Slutsky, Frisch and Tibingen who modelled the cycle by means of a system of stochastic differences equations. One variable, therefore, possesses a cycle of a given frequency, which is equivalent to the condition that the non-stochastic part of the differences equation has a pair of complex roots with argument equal to frequency. Exogenous shocks are transformed into characteristic oscillations by means of a propagation mechanism. The basic assumption of endogenous theory, on the other hand, is that the mechanism governing the workings of the market is essentially unstable so, even in the absence of exogenous shocks, it might not converge towards a steady state. In addition, endogenous models are essentially non-linear. Only recently (contemporaneously with the discovery of chaotic behaviours in economic systems) has interest in phenomena of an endogenous nature been rekindled and has their explanatory theory become fashionable again. A subject of great interest linked to this debate and which still commands widespread attention is the relationship between stabilization policies, complexity and chaos. Whether, that is, in the presence of non-linearity and chaos there is space for stabilization policies or, conversely, these economic systems necessarily evolve towards Pareto optimal states. Indeed, if this happened, no outside intervention would be necessary.

Non-linear models develop at a time when the general economic equilibrium approach constitutes the dominant part of economic theo-

ry. The first models to show chaotic behaviours are precisely the ones belonging to this class. It is fairly obvious that, among the assumptions of general economic equilibrium, Pareto optimality is in a certain sense assumed and chaos looks like simple destabilization of the dynamic trajectories in the phases space caused by exogenous shocks. In these kinds of models there is patently no room for any form of outside intervention and this is perfectly consistent with their classical nature. It must, however, be said that chaos enters into these models almost *per accidens* in the sense that its appearance does not affect the microeconomic foundations of the model. Criticisms that have been made of these early models are partly justified. Chaos and non-linearity still remain outside the economic context and can be considered a pure mathematical exercise. The subsequent development of the theory of non-linear models was directed towards the identification of a microeconomic foundation and the economic causes which can lead to the emergence of chaotic behaviour. As we have in part already said, the incompleteness of markets, the non-ergodicity of systems (increasing return), limited rationality, incomplete information and endogenous uncertainty are all causes that can lead to the emergence of complex and chaotic dynamics (Brock, 1988). If we accept these assumptions, it is clear that government intervention and stabilization policies are necessary to stabilize an economic cycle subject to endogenous fluctuations. As shown by Grandmont (1985, 1986), in these cases the system does not evolve towards states of Pareto optimality but endogenous fluctuations direct it towards non-optimal Pareto states. Marino (1998) studied conditions of stability and bifurcations in a Hamiltonian system in the absence of exogenous shocks in relation to the impact on economic policies.

In relation to the labour market, neoclassical[3] type equilibrium models are not able to satisfactorily explain either pro-cyclical variations in real salary, in employment and in production or the effect of variations in aggregate demand on employment and production levels.

[3] The term neoclassical is used here as distinct from neo-Keynesian.

Neo-Keynesian economics postulates the existence of rigidities in prices and salaries. As a consequence of the fact that individual prices and salaries respond slowly to an increase in aggregate demand, price adjustment on an aggregate level is slow. There is therefore no reason to expect any specific covariation between salary and employment in response to shocks on demand. Neo-Keynesian models are also called disequilibrium[4] models because they abandon the idea of market-clearing which had constituted a cornerstone of general economic equilibrium models. The most recent developments in neo-Keynesian economics are based on the assumed existence of specific market imperfections and they attempt to derive price and salary rigidity from the analysis of optimizing behaviours in the presence of these imperfections. In particular, and in contrast with general economic equilibrium models, which postulate the existence in the market of price-taking businesses, neo-Keynesian models assume that businesses are price-setters and that competition is of a monopolistic kind. What is worth emphasizing about neo-Keynesian type models is their acknowledgement of economic policies and the endogenous nature of the economic cycle.

The models underlying the neo-Keynesian approach, in abandoning the idea of market clearing, are therefore well-suited to complexity. Such economic systems are defined as dissipative and their peculiarity is that they present temporal asymmetry and therefore basic irreversibility. This means that effects generated by single economic policies irreversibly disturb the economic system, hence it simply isn't possible to cancel out the effect produced by a particular policy with opposite sign interventions.

[4] The terms equilibrium and disequilibrium obviously need to be defined. Equilibrium (and consequently disequilibrium) has two meanings. The first describes the consequence of certain conditions imposed on the market materializing; the second is a synonym for 'steady state'. Here we use the term in the first sense and with reference to Walrasian equilibrium.

11.- A Simple Example of a Model with Complex Behaviour

In this section we wish to demonstrate how a macroeconomic system can manifest complexity of behaviour characterized by destabilization of the dynamic trajectory and the emergence of fluctuations which grow progressively in extent. In particular, we will demonstrate that the presence of non-linearity in functions leads to complex behaviour even in models traditionally considered stable. Non-linearity of functions can, as already seen, have a different origin and can be due to increasing returns, to the incompleteness of markets, to endogenous uncertainty and to erratic behaviours.

To this end let us consider a dynamic model whose general form can be expressed by a differences equation written as follows:

$$x_t=Q(x_{t-1}) \qquad (22)$$

where Q is a generally non-linear function whose non-linearity is determined by previously described causes.

Hahn and Solow studied a superimposed generations model which, with a strictly classical type hypothesis and the introduction of salaries rigidity, is able to justify economic policies and leads at equilibrium to a differences equation of the type:

$$x_t= ax_{t-1}+bx_{t-2} \qquad (23)$$

where a and b are parameters which generally depend on technology.

Salaries rigidity is introduced by a parameter a constructed thus: a = 0 corresponds to perfect flexibility, a = 1 to absolute rigidity.

In this work we introduce a cause of non-linearity to be found in increasing returns.

The general form of the model will be of the type:

$$x_t=Q_a(x_{t-1}) \qquad (24)$$

In this case map Q presents dependence on the parameter a. To study the stability conditions of the map it is necessary to study eigenvalues. If Q is linear, then it can be represented in the form:

$$x_t=Ax_{t-1} \qquad (25)$$

where A is an appropriate square matrix. The study of the stability conditions for this system leads us to draw attention to the following possibilities: in the case of A being real, if detA>1 there will be divergent motion, if det A<1 the motion will tend to the steady state, if detA=+1 the system will remain at point z_o, if detA=-1 there will be an oscillation of period 2. In the case of A having complex elements, then the stability condition will have eigenvalues remaining inside the unitary circle in the complex plane.

If Q_a is not linear, to study stability conditions it must be linearized with respect to the steady state and and the Jacobian matrix of the linearized system must be studied. The stability condition is that the eigenvalues of the Jacobian matrix lie inside the unitary circle. The presence of the parameter a implies that the local stability condition might not be valid. In the previously illustrated case, it is the presence of non-constant returns that causes the passage from absolute flexibility of salaries to a certain level of rigidity to involve the destabilization of the dynamic trajectory.

Such dynamic trajectory destabilization behaviour was covered in the previous when the case of a Hamiltonian system was dealt with.

The consequence of this is simply, firstly the non-equivalence of the concepts of steady state and equilibrium, the need for stabilization policies and, finally, the irreversibility of economic policies.

This last point is extremely important.

In the presence of complexity economic policies are irreversible, i.e. there is the possibility of multiple equilibria, path-dependence, lock-in. In other words, no actions are necessarily capable of bringing the system back to its original condition once it has been disturbed by an external stimulus, which means that the effects of faulty economic policies cannot simply be cancelled out by opposite sign interventions.

A new way of interpreting both economic policy and its effects would seem to emerge. The essentially mono-directional approach of economic policy is being replaced by an "interactive" approach in which the economic system reacts actively to policies amplifying or frustrating their expected effects in unpredictable ways.

13.- Is the Complexity of Markets the Cause of a Revival in Keynesian Thought?

Neoclassical thought is based on two assumptions, which are in fact nothing more than axioms. The first assumption is that the object of this study, the system, does not present an aggregation bias, the second assumption is the Walrasianity of the model based on the maximization of a utility function bound only by budget constraint and by technology. In such a world any economic problem must be seen as a problem of inter-temporal maximization, with an infinite horizon, of a single representative agent. Thus, we will obtain an Arrow-Debreu type competitive equilibrium with complete information. This programme, which is fascinating from a formal point of view, is at odds with a profoundly different reality characterized by incomplete markets, asymmetrical information, irrational behaviours and strategic interactions.

Hence we return to Keynes from the failures and unreality of models in the neoclassical mould when the economy is required to deal with endogenous uncertainty, beliefs, erratic behaviours and asymmetrical information.

In such a conceptual scheme the classical economy would become a special case of the functioning of an economy in which there is complete information, an absence of endogenous uncertainty and in which all agents behave according to a principle of absolute rationality.

What seems to emerge from this analysis is that Keynesian thought, mistakenly believed dead, reveals a greater capacity to explain reality if interpreted in complex, non-ergodic and non-linear models.

Keynesian thought seems, then, to be the only approach capable of confronting the complexity of the market.

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CARLO MORABITO
Vicerrector de la Università Mediterranea di Reggio Calabria (Italia)

DR. CARLO MORABITO

CARLO MORABITO
Vicerrector de la Università Mediterranea di Reggio Calabria (Italia)

INNOVATION, CREATIVITY, CROSS-DISCIPLINARITY, AND OPEN PARTICIPATION: HOW TO WIN THE CHALLENGES OF POST-CRISIS EU

Abstract

Post-crisis Europe proposes to us all a novel set of challenges that we must face in the years to come. In this contribution, it is argued that science and research can be the keys for coping with those challenges, for preparing ourselves for future challenges, and to achieve a social condition more equitable, sustainable and responsible towards EU citizens. This role is because science implies creativity and open participation at the highest level and by virtue of the cross-disciplinarity of modern science that is now ready to drive the knockout of walls. In addition, the actual possibility of introducing innovation in both products and services depends on science. Indeed, we think that science can favor the development of a citizen-centered innovation society, where citizen's engagement is considered a key driver of innovation, as fostered by many documents of the EU commission.

Introduction

We are starting to see the light at the end of the tunnel of the most relevant economic crisis of the post-war world. This crisis has left many lessons to be learned, particularly at the European Union (EU) level. Many initiatives and policy measures have been launched in the period of 2008-2014 to stimulate a growth, which is based on innovation that might in turn generate long-term effects rather than just a short-term management of the crisis.

The challenges of the post-crisis EU are not limited to the sustainable growth in the EU countries, but they imply coping with the grand societal challenges of our millennium upon which the future human well-being and the sustainable socio-economic development largely depend:

1) The demographic changes in terms of both the ageing of our society and the continuously growing world population, particularly in countries where the available resources are mostly limited or still lacking;

2) The ability to manage the reducing resources in terms of sustainability (water scarcity, renewable energy and its nexus, efficiency and resiliency in resource consumption, climate change, etc.);

3) The development of a competitive but equitable "knowledge-based" society that can boost and stabilize employment in the years to come.

The EU nations are, of course, linked to other continents and their different ways to deal with those emerging problems: to cope with the critical points and thus to win the challenges, it is needed to favor suitable policies both at country level (single node) and at network level (in

particular, at the *hubs* of the EU central organizations). These policies must aim to boost innovation through the support of ideas and creativity that are the typical "*weapons*" of the EU inhabitants.

In the next paragraphs, we will discuss about some relevant aspects that, in our opinion, should be considered in order to guarantee a successful impact of the EU policies on the growth and ultimately on the well-being of the future EU young generations.

Directions to win the challenges

The human capital and the creativity of atomic actors, its adaptability to different frameworks must be boosted particularly when directed to develop or enhance entrepreneurship; this can be really realized only through a simple and transparent regulatory framework. We know how difficult it is to be successful in the calls of EU: it seems that Horizon 2020 further complicates the accessibility to EU funds for groups, cities, Universities, and SMEs that are not within the circle of "very well-known" actors. Unfortunately, this policy continues to enlarge the divide within countries and within areas of the same country in Europe. This is surely a point to be focused on at the Central EU Government level, since, with this trend, the gap between different areas and regions is consequently expected to grow in the next years, and perhaps also as a consequence of the EU programs and complex regulations.

As a practical example, let us analyze the results of the ERC grants. The EU Ideas program (ERC) has been originally conceived to support frontier research in Europe through competitive, investigator-driven grants. The EC report on the ERC Funding Activities (2007-2013) highlights geographic hotspots of success: in particular, the geographical distribution of ERC grants is highly concentrated and uneven: only 10 micro-regions alone account for 38% of the total number of ERC

grants. Are grants really an opportunity for growth? Does innovation coincide with knowing how to write proposals? Today, in some relevant institutions, most of the time is devoted to the preparation of projects not to develop novel ideas and researches. In our opinion, there should be a way to cross boundaries and favor links for those who have low chances of getting ERC grants. We think EU should consider the opportunity to include in research networks some groups belonging to less competitive regions: this just means to find a breakeven point to distribute resources among the excellent centers and the good ones in less favored areas.

In recent years, EU Member States certainly tried to integrate concrete research and innovation policy measures in their effort to sustain growth and to give economic stimulus. These measures include the improvement of resources to support human capital and mobility in R&D, and the support to business innovation in the fields of ICT, like broadband infrastructures, renewable energy and green technologies. However, these actions are long-term investments and their impact cannot be made evident in the short-term.

Internationalization and innovation are key drivers of competitiveness and growth and are considered as basic tenets in the EU 2020 strategic actions for achieving the defined goals. Internationalization is at the basis of EU programs, and it is an obliged way to build stronger groups that can compete (or cooperate) with other economies all over the world. However, it seems that innovation should be redefined to take into account its possible important role also in enhancing social cohesion because of the consequent improvement of the services provided, e.g. in health, energy management and in a smarter distribution of resources. One of the major challenges today seems to be able to extend services to the unserved, thus forcing socio-economic development, which, in turn, can stimulate a demand growth.

Innovation is not to be exclusively intended just as an instrument to meet major societal challenges, but it plays a role in designing attractive products that can be more consumer-friendly in many fields to meet the demand of technology, leisure, culture and entertainment. Accordingly, a novel concept of innovation is to be considered: ideas should be successfully applied in practice also at the organization and system level.

To enhance the innovation content of products and services, which appears to be a pre-requisite for strengthening the competitiveness of the EU system, we need to enforce somehow a tighter cooperation between research centers, education/university actors, and governments and citizens at a capillary level. The education system needs to be truly internationalized, and to be successful we need simpler rules easy to apply. An easy way to do so is to establish networks and platforms where it would be direct to share relevant knowledge and fresh ideas. This sounds like a statement of principles more than a direction for action if we are not able to introduce a shift in thinking towards entrepreneurship. We are now obliged to understand that research and innovation should pervade small "start-up" where the impact of novel ideas is easier than in big firms and where the single action of the single person is relevant.

Effects of the crisis

It is clear that, at first, to achieve our goals, we need to invest more in Science, Research, and Education both at a local (single nation) level that at the network level. The indicator used in the EU reports regarding the question we pose here is the "*gross domestic expenditure on R&D*", that shows the proportion of GDP dedicated to research and development in EU. It is also referred to as "*R&D intensity*" and reflects the extent of research and innovation undertaken in a country in terms of resources input. If we analyze the available data, it shows a relative

stagnation at around 1.77% of gross domestic product (GDP) for the period 2004 to 2007. At the onset of the economic crisis, R&D intensity increased to 1.94% in 2009, and it has continued to grow marginally since 2011, reaching 2.02% in 2013. The reasons for the increase between 2007 and 2009 include GDP falling more rapidly than overall R&D expenditure and the actions taken by individual EU Member States to step up public R&D investment. In 2009, many Member States sustained nominal growth in public R&D expenditure to counteract the impacts of the crisis on private investment. However, a rather varied picture of EU Member States' R&D expenditure as a percentage of GDP is clearly readable. In 2013, R&D expenditure ranged from 0.48 % to 3.32 % across the EU (1.5 % in Italy, 2.0 % in Spain). Northern European countries such as Finland and Sweden share a pattern of high expenditure, and have the most ambitious national targets. In 2013, Denmark achieved its national target of 3 % and Germany came very close to meeting its target. Countries with lower R&D expenditure levels, below 1 %, were mostly in Eastern and Southern Europe, for instance Romania, Bulgaria, Cyprus, Malta and Greece. The financial crisis and its adverse impact on GDP growth in the following years, along with an increase in nominal government spending on R&D, led to an increase in R&D intensity in most Member States (with the exception of some countries including Croatia, Luxembourg, Portugal, the United Kingdom and Sweden). Germany has experienced the fastest growth, exceeding the EU average since 2011. This analysis, based on EU official documents, showed that the European Commission and the individual Member States put R&D investment as a high priority on the agenda for beating the crisis, but the efforts made are largely insufficient with respect to other countries (like South Korea, for example). At the same time, another indicator generates worries: the number of people getting into the university system and the number of young people getting a University Degree. Just to give a figure, in Italy it accounts for less than 50% of the population; it has reduced in recent years, while in South Korea it has grown to more than 80%!

Digitalization as a counterexample

The EU and many documents at country level often indicate the digital revolution as a way to beat the crisis and to ease the competition with emerging countries that appear to be more dynamic also thanks to their investments in digitalization. In May 2010, indeed, the EU commission communicated a report titled "*A Digital agenda for Europe*" on this subject. Unfortunately, the experience of citizens and public employees is rarely convincing about the positive effect of what has been referred to as "digitalization". The common experience is that everyone is asked to fill lots of pages in different databases for different aspects of social life, often requesting repetitive information, sometimes as a duplicate of paper documents without having the possibility of knowing the next steps of those data entry tedious procedures, apart from the more dedicated fiscal controls. In submitting candidacies and project proposals, or just fiscal data, the counterpart appears as a voracious agent that does not respond to any queries, just asking each time more detailed information. What seems needed is a correct policy of data management that is in favor of citizens, that reduces interaction time and simplifies the interface with public administrations. Digitalization can be a factor of success, but we need to change the way in which this is used sometimes as of today. In particular, the scientific information in the digital age should be accessible, transparent, continuously disseminated and preserved. However, information is not exactly knowledge; as Thomas Eliot has said, in the transformation of knowledge into information, a part of knowledge can be lost. We would develop a knowledge society not a society shaped by media and information.

An example from Science

Maxwell's equations can be indicated as an example of how science can have a great impact on the real world around us and, at the same

time, of the difficulties to overcome in their practical development. The equations fully describe the realm of electromagnetics (i.e., including light, lasers, communications, networks of sensors, etc.). They represent an excellent synthesis of previous experimental works carried out by many pioneers (e.g. Ampère, Faraday, Oersted, etc.), but they also manifest the creative genius of James Clerk (Maxwell), through many intuitions, among which the idea of including the current displacement term to preserve the symmetry. They also imply an error: the indication of the presence of the "*aether*", i.e. a medium that does not really exist, but that was considered necessary to convey the fields' action. This error was mainly due to the adhesion to the "spirit" of the epoch. The consequences of Maxwell's Equations are around us in terms of technology, innovation, patents, and novel products. We believe that we can consider them as a prototype of what the science can yield to the benefit of the social community also through their strong impact on markets: the objectives of EU resolutions should aim at the strengthening of the scientific and technological bases through an EU "research" area in which to circulate freely both knowledge and technology. EU cannot just force a monetary union or a free circulation of people. The next step is free circulation of ideas and knowledge exchange.

Adaptability and uncertainties

To unlock the potential of EU culture and creativity in business that can improve competitiveness of EU industries and companies some other aspects should be taken into account. First, it is needed to conceptualize and implement a shared strategy for the key enabling technologies, by also ensuring sustainability in the long term. For example, the lack of suitable access to broadband network in large areas of some countries is a big problem for small firms, start-ups, and citizen. Second, it is imperative to make a strong effort for simplification, particularly to raise the attractiveness of EU research programs. Third, it is needed to involve more and more relevant actors in the decision-mak-

ing processes by introducing a novel culture of taking risks. Eliminating risk from economic actions is impossible: we just need to manage it by exploring suitable ways. The risk is in large part determined by the uncertainties of the social context, of the effects of global events, but it is "statistically" measurable. Many instruments and tools exist that allow managing uncertainties, most of which have been developed in Europe in the last decades. This Royal Academy has many times promoted discussions on the theme. Another aspect of interest is the adaptability to a changing external environment: decision-making is more difficult in the case of changing contexts. Also in this case, there are, luckily, instruments, for example, derived from the theory of machine learning, that allow us to synchronize the behavior of a system to the changing external conditions. As it is now well known, in the theory of adaptation, in the presence of concept drifting, the system is asked to react in due time for preventing the rapid obsolescence of any available models. The system models that permit to implement adaptability are not academic exercises, but can help to prevent unexpected big crashes.

Lesson Learned

Creativity and innovation are abilities that map into processes; they should (and can) somehow be cultivated or enhanced. This means that we have to drive our educational systems to include innovation and creativity to a greater level in the High School system and in the University courses that must also be internationalized at growing levels. This can be done also by recognizing successful examples and disseminating the best practices regarding educational curricula at the Member States level. We need to favor a culture of curiosity and self-learning: the EU educational system must put efforts in developing a change of mindset pointing at curiosity-driven thinking. Innovation is normally closely tied to market but it develops usually through informal ways that depend on the given education.

In the EU countries, because of history, stratified culture, and attitude towards social care, the creativity is spread, and common people are able to help improve their surroundings, and lives. There is a diffuse sense of social innovation that paradoxically contributes to the success of technologies developed outside the EU (let us think to the applications for the iPhone). Many employees can suggest how to improve efficiency of work processes, when involved personally in the design of services. What's more important is that consumption drives innovation. Therefore, consumers exert influence and are inevitably involved in the transition of the EU countries to equitable and sustainable societies. For example, in a truly "smart" grid, the consumer at local level can generate renewable energy or use small machines for waste transformation and reuse. This is just a small example of a sort of micro-scale source of innovation, at least in terms of services, that ultimately forces the design and the production of objects embedded with technological innovative solutions. In turn, this can induce changes in behavior and mindset: in such a way, the consumption can drive innovation.

The Role of Science

Science has been sometimes considered as a secondary instance with respect to ordinary questions: on the contrary, as we have tried to show in the previous paragraphs, science plays an evidently growing role in the foundation of the "knowledge society" we need to build in order to reinforce the competitiveness of the EU system at a global level. Science means ideas, because ideas may only emerge in a substrate of purposeful education, proper mindset, and attitude to thinking. Science indicates a possible way to act in order to solve crucial global problems, like resources reduction. It produces good technology and stimulates innovation. It also helps to grow a more informed and aware young generation.

Conclusions

Demand for resources (i.e., energy, novel technology, water, food, knowledge, etc.) will increase significantly in the coming decades. This increase will pose big challenges in nearly all countries, including the EU, but especially in emerging economies. Resources are not only limited and sometimes strongly reducing, but they are interdependent. To win the global battle, policy-makers, planners, and stakeholders must take steps to overcome the barriers (often, just fictitious) that exist between their respective domains. A surplus of innovation and pragmatism in the national policies is required to lead to more efficient and cost-effective actions. These actions must take into account their socio-environmental impacts without undermining the basic requests of the disadvantaged. Public institutions and the private sector can play a fundamental role in deciding and realizing the required infrastructure investments and in ensuring their continuous monitoring, maintenance and adaptation to the dynamic changes of the society. The EU must develop actions pointing at an open access world that interacts in a global network: walls, cages, closures, barbed wires, and defense of our borders are not a solution in the long run. They accelerate the decadence and isolation of our world, refuse cultural diversity, and might possibly lead in the long run to catastrophic wars. The opportunities given to all for research and development through both private sector involvement and central governmental support are crucial for developing the "knowledge society" that might lead to peace and prosperity.

Accordingly, there is a need for considering the impact of funding science in the EU programs at the highest possible level and spread. A coherent policy, which means an adequate public response to the interconnectedness of science, cross-disciplinarity of innovation, technology, production and consumers, requires a hierarchy of actions. These include, in our opinion:

1) Developing "local" coherent national policies affecting the above-mentioned aspects within the global EU perspective;

2) Favoring the development of the institutional frameworks to promote these coherent actions;

3) Ensuring the availability and timeliness of reliable data and statistics to make and monitor decisions;

4) Encouraging awareness by investing in education, training, lifelong learning, and through the internet and the public information media;

5) Really supporting creativity, innovation, cultural diversity and research focusing on their technological consequences;

6) Ensuring availability of funding and allowing markets and related businesses to develop.

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CONSTANTIN ZOPOUNIDIS
Académico Correspondiente para Grecia
Universidad de Creta

DR. CONSTANTIN ZOPOUNIDIS

CONSTANTIN ZOPOUNIDIS
Académico Correspondiente para Grecia. Universidad de Creta

THE ECONOMIC CRISIS AND RETARDANTS OF GROWTH IN GREECE

Abstract

Small interest groups have disproportionate organizational power of collective action (demands). Large groups such as the poor and unemployed, despite being composed of many members, do not have selective incentives to enable them to organize themselves to achieve demands or to face their exploitation from the lobbies of small interest groups. The reason is that any benefit resulting from organized demands will be split among too many members so the benefit of each member is infinitesimal. Unlike the few large companies or the few wealthy individuals and small professional groups etc., although they comprise a smaller number of people, they can organize themselves as a lobby with relative ease since the benefits for each team member can be quite significant. The activity of special interest groups can be detrimental to economic growth, full employment, prudent governance, equal opportunities and social mobility.

The development of special interest groups may alter the structure of incentives and the direction of a society's development. Governments are systematically influenced by special interest groups, the demands and pressures of small groups which are able to organize themselves rather quickly and efficiently. The slowdown in the adoption of new technologies, the non-adjustment of the economy, and the focus on the distribution of the "pie" rather than the enlargement of the "pie" due to the activity of the interest groups lead to a certain rigidity in society, a lack of reforms and a lack of competitiveness, which altogether have resulted in a progressive decline of society and the economy. Any attempt to change, reform and adjust society fails because of the strong resistance of these lobbyists until the inevitable occurs for both society and the economy. Awareness of the perverse role of interest groups by more and more people, but mainly by public policy makers, will significantly reduce the losses suffered by society from their activity. This is an expectation of all who espouse a society that will gradually minimize economic and social inequalities. The unveiling of the role of special interest groups and the removal of privileges will transform Greece into both a healthy society and economy.

1. Introduction

There are growth retardants in some countries, and some time periods impede economic growth, while the dissolution of these retardants or their absence in other countries push them rapidly towards economic growth.

These retardants are private special interest groups such as: similar ventures (cartels), lobbies (even without formal recognition), trade unions, professional associations, agricultural organizations, labour unions, etc., which are struggling to achieve favorable changes and leg-

islation that protects their interests, in order to prevent legislation that reduces their privileges, and to enforce a higher price or wage for their members at the expense of the societal whole (Olson, 1982).

Interest groups can be found at any level, but those who can profit either through a lobby or through a cartel at the national level are usually those small groups of important businesses or some rich and powerful individuals.

It is taken for granted that if everyone in a group of individuals or businesses has a common interest, then the group will try to promote this interest. The paradox is that large groups, at least those composed of rational individuals, will not act in the interests of their group. This paradox is the logic of collective action. This is the behavioural paradox of a large group (Olson, 1971). Groups with a large number of members, like the poor or the unemployed, or taxpayers, do not have selective incentives that enable them to organize themselves to deal with their exploitation from the lobbies of small interest groups. The reason is that any benefit resulting from organized demands will be split among too many members so the benefit for each member is infinitesimal. However, a few large firms or a few wealthy individuals, or small business groups, despite comprising a small number of members, can be organized in a lobby with disproportionate organizational power, since the benefit for each member of the group can be quite significant.

The greater the number of individuals or companies that would benefit from a collective claim, the smaller the share of the benefits from the activity for the collective interest that would arise for the individual or business that takes action. Thus, the lack of selective incentives, the motivation for group activity, declines with the size of the group; therefore, large groups are less able to act on their common interest than smaller ones (Margolis, 1982; Lohmann, 2003; Trumbull, 2012).

Because of the lack of selective incentives, there is greater inequality in the opportunity to create interest groups than there is in the inherent capacities of individuals. This inequality of opportunity results in large groups such as, for example, the unemployed being unable to organize themselves to form their own interest group and to ward off the damage suffered due to other organized groups. This explains paradoxical phenomena such as 'the exploitation of the bigger by the smaller'. Society will not be able to achieve efficacy because some societal groups (which represent the majority of society) - due to a lack of organization - are too weak to prevent changes that are detrimental to them, or to process negotiations with others in a mutually beneficial way. With some groups being excluded from the negotiations, the results will certainly be biased in favor of other groups (Olson, 1966; Sandler, 1980).

The small groups that can organize themselves or participate in collusion will have different interests in different countries at different time periods. At a certain time they may be oligarchic landowners, at another time they may be manufacturing enterprises, and at others bureaucratic groups, etc. In one country they may have a legitimate interest in exports, in another it may be the substitution of imports, in yet another it may be the prevention of the creation of new businesses, and others it may be the selective access to public expenditures etc.

The logic of the collective assertion of special interest groups is not immediately obvious to those who have not studied the topic. The reason for this is that the average person has no incentive to spend a lot of time studying many of the choices concerning collective demands.

Governments are systematically influenced by special interest groups, the demands and pressures of small groups that are able to organize themselves rather quickly and hamper the work of prudent governance. The slowdown in the adoption of new technologies, the non-adjustment of the economy, and the focus on the distribution of the

"pie" rather than the enlargement of the "pie" due to the activity of the interest groups lead to an inelastic society, a lack of reforms and a lack of competitiveness, which altogether have resulted in a progressive decline of both society and the economy. The great difference in productivity among countries is due to the role of these groups (Olson, 2000).

Unemployment is rising, social inequality is widening, prudent governance is being prevented. Even when some temporary economic growth is achieved, it is accompanied by high unemployment. Any attempt to change, reform and adjust society fails because of the strong resistance of these lobbyists until the inevitable occurs for both the economy and society.

Special interest groups are detrimental to economic growth, full employment, prudent governance, equal opportunities and social mobility.

2. Special interest groups are detrimental to economic growth

The development of special interest groups - motivated by conquering a larger share of the national income - the increasingly more complex regulation and the influence of state action which the groups promoting special interests encourage, combined with the increasing negotiation and complexity of the perceptions that these groups create, postpone the incentive to reform and the direction of societal development.

The activity of interest groups has resulted in the incentive for production to decline while the motivation to pursue a higher income share via protection laws increases. Instead of developing healthy competition for the production and satisfaction of customer needs, perverse competition is developed with legal protection and income distribution through protective regulations for group members. The reward that

comes from the pleasure of those to whom goods or works are sold decreases, while the reward for avoidance or exploitation of measures, policies and bureaucracy, together with the demand for the enforcement of rights through negotiation or complex concepts, becomes greater.

These changes in the structure of incentives in their turn divert the direction of the development of a society. Each society, regardless of institutions and governmental ideology, gives greater rewards to the most appropriate - the most qualified for that society. What is required to be favouritised varies from society to society, but no society rewards those who are poorly placed to prosper under its reforms. If a society primarily rewards production or the ability to meet those with whom one engages in free exchange, it stimulates the development of productive features. If the accumulation of special interest groups increases the incentive for a distributive struggle, magnifies regulatory complexity, encourages the domination of politics, diverts negotiation and intensifies the complexity of perceptions, then it encourages the development of different trends and properties.

What we vaguely call intelligence or inclination to learn will probably be favored as much, or even more than before, because those who are capable of expressing themselves clearly, together with the well-educated, have a comparative advantage in reforms, in politics and in complex perceptions. This, in turn, may restrict the extent to which intellectuals are opposed to the development of interest groups since most people would belong to some such group.

The competition for the distribution of income isn't better than the competition for production or customer satisfaction. Thus, life is not more moderate due to the lobbyists; it is instead less productive, especially in the long term. Private interest groups retard the ability of a society to adopt new technologies and to redistribute resources in response to changing conditions, and for that reason, they reduce the rate of economic growth.

In addition to changes in consumer preferences, resource discoveries, etc., the most important sources of change today are technological breakthroughs which the advance of scientific knowledge gives us in the form of innovations and production methods at a lower cost. A healthy economy must adapt to these changes if it wants to maintain its efficiency and exploit opportunities for economic development. Otherwise it will stay dormant and counterproductive, so that it would not be able to survive because it will lose its competitiveness. The environment in which lobbyists operate is also changing because of the incentives in innovation which businesses related to the economy are facing, particularly companies in sectors that are not influenced by cartels or lobbies.

In a country when there are markets without restrictions, this means that there is normally no entry barrier in an industry or economic sector and there is also no obstacle in copying any profitable activity model, provided however that there is no agreement on cartels or government intervention due to lobbies or other factors. If there are greater than normal profits or returns of any kind in an industry or sector of activity, there will be an incentive to enter this sector, and this motivation will be maintained until enough resources enter the sector, so that the profits will no longer be higher than normal. If interest groups are absent in any market, abnormal long-term gains or performance cannot be secured; hence unreasonable economic disparities will not be created (Schmalensee, 1981). This avoids the accumulation of wealth in the hands of just a few individuals.

Free entrance also implies that no business will be able to avoid a Darwinian struggle for survival, so nobody can remain dormant or be counterproductive and continue to survive. Free entrance eventually neutralizes all the refuges and monopolist profits, but does not need to create perfect competition (product differentiation may remain), nor does it need to secure perfect (according to Pareto) efficiency. The

absence of entry barriers and replication actually ensures that every product or service which creates abnormal profits will attract entry or replication, so that at the very least there will exist some very close substitutes for this product or service; with such very close substitutes, the degree of monopolisation and the extent of any ineffectiveness in terms of resource allocations will be limited.

Entry barriers are imposed by tariffs and restrictions to foreign companies or the creation of new domestic businesses, which interest groups have reasonably elicited among the existing domestic companies. If there were no such obstacles, there would be an embarkation point for excess profits by multinational companies. For a certain period, there are above-normal profitability rates for some businesses, even in industries with free entrance. The reason is that it may take some time before the opportunity is discovered as to how to acquire 'supernatural' profits by entry or replication, and an even longer period of time may be required for someone to learn the 'tricks' of a new field of activity and to purchase or generate the capital required for this.

But what gives rise to these temporary gains? This comes mainly from innovations of one sort or another – discoveries of new technology in previously unmet consumer requirements, lower-cost production methods, and so on. The larger the extent of the profits due to entry and replication difficulties, the greater the reward in innovations, which mainly explain economic growth and progress! Indeed, barriers to entry, which are created by interest groups, interfere with the ability of an economy to adjust to change and to produce new innovations and, therefore, to actually reduce the rate of economic growth. If an innovation that saves costs is available to a company, the use of this innovation will mean that the difference between revenue and production costs will grow, so that there is more money to share between the company and the workers.

Special interest groups also slow down growth by reducing the rate at which resources are distributed from one activity or sector to another in response to new technologies or conditions. An obvious way to do this is by demanding government guarantees on debt redemption for businesses in recession, delaying or preventing the transfer of resources to areas where they would have higher productivity rates (Hicks, 1983). Increasing productivity means that resources should be reallocated if they are to maintain economic efficiency, and society should fully exploit the rise in productivity. Required resource reallocations will be prevented or they will be delayed by entry barriers. Even if there is no accumulation of special interest groups over time, barriers for reallocation of resources that are created by such groups would reduce the growth rate and the absolute level of income.

The slower adoption of new technologies and entry barriers can often remove a lot more from the total production capacity of a society than that which the special interest group removes, particularly in the long term.

Greece has a large number of special interest groups which have developed various entry barriers; they slow down the adoption of new technologies, particularly in the public sector, and have diverted the development of incentives in society. The prices of many goods and services are very high compared with other European countries due to a lack of healthy competition. Interest groups have altered the development of Greek society, making the dream of every young person to get a highly paid position in privileged state companies with the main privilege being early retirement. It is no coincidence that in Greece, because of early retirement which special interest groups were capable of demanding, one employee corresponds to one pensioner (there are 2.7 million employees in the productive economy and 2.7 million pensioners), while in progressive European countries there are four employees for every pensioner.

3. Special interest groups are detrimental to full employment

In the case of an unexpected decline in demand or due to unexpected deflation or some other unexpected blow, because of the slow rate of decision-making, hyper-loaded agendas and overloaded negotiating tables, considerable time may be needed in some societies for prices to change to newly adjusted levels, which this difficulty will bring about. The result is a reduction in demand for goods, labor and other production factors throughout the economy: in other words, there is a recession or a crisis.

The outcome of cartels by the special interest groups increases price inelasticity, over time, in a stable society, with the result that there is more unemployment and greater production loss for any given reduction in overall demand. In addition, in cases of a reduction in aggregate demand, many prices, especially in manufacturing, will not decrease immediately or in proportion to the reduction in demand because of the cartel. Indeed, statistics show that while rural and other flexible prices subside dramatically, the majority of prices, especially in consolidated and organized industrial areas, decline slowly and relatively less.

Special interest groups intervene in markets by adjusting prices and wages to supposedly "fair", "reasonable" and "full cost" levels - that is, to levels that would be profitable for businesses and employees that were already safely established on the market, but would render as unprofitable the hiring of additional workers or the sale of additional goods that would bring back factories to full production levels and the economy to a state of prosperity.

If in the event of a reduction in aggregate demand, it were directly possible to reduce prices and wages by the same proportion, the consumers would then continue to buy the same quantities of goods, so the factories will still produce the same quantities of goods, with the result

that the same number of workers would be needed. So redundancies would not need to be made; hence involuntary unemployment would not be increased. But special interest groups hinder the immediate adjustment of prices and wages.

Involuntary unemployment can be explained only in terms of the interests and policies that exclude mutually beneficial negotiations between those who have work or other goods to sell and those who would benefit by buying what is offered. The core group that may have an interest in preventing mutually profitable transactions between the involuntarily unemployed and the employers is the workers with the same or competitive skills. They are the ones that have a substantial interest in preventing such transactions, because their salaries would have to be reduced since additional work will push down the marginal income of a product. The employed can prevent mutual beneficial transactions only if they are organized into cartels or lobbies or (as often happens) if they informally, in one way or another, exercise collusive pressure. The only other group that could have such an interest would be a cartel or lobby of employers, which would hinder mutually beneficial transactions between individual employers and workers in order to keep wages below competitive levels.

According to the theorists of imbalance, such as Edmond Malinvaud (Phillips, 2015), the price that does not liquidate the market (ie does not complete all the mutually beneficial transactions) in a specific product market may also contribute to the unemployment of the workforce or to overcapacity in other product markets. The more extensive the special interest groups are and the non-liquidation of prices for the market brought about by lobbies and cartels, the greater the fluctuations in the rate of return for similar workers and for capital. Those prices which are determined by special interest groups at monopolistic levels and above the levels at which the market liquidates before unexpected deflation or an unexpected blow will now tend to be even higher than before, not

only because of the direct effects of deflation or shock, but also because of a reduction in demand in real terms due to the effects of the general equilibrium which have been highlighted by Clower (1964) and other theorists of imbalance.

This in turn makes long-term investment risky, so the cost of investments can also quickly subside, resulting in a lack of job creation (Clower, 1954). Each one of these developments will aggravate the other, so there may be a dangerous downward spiral, despite the trend of special interest groups and cartels to adjust their prices to the new situation, and it will eventually offset the forces that reduce the real outflow. In general, it is the additional unemployment that is caused by the reduction in the amount of goods purchased on the product market due to prices that do not liquidate the market, which in turn reduces business demand for work and multiplies employment losses because wages are above market liquidating levels.

In other words, an economy that does not have special interest groups, and the procedures and legislation they bring about, would behave to a great degree in the way that the less cautious monetarists and balance theorists claim that all economies behave. When an economy reaches the point where special interest groups are ubiquitous and the fixed price sector (where prices are not decreasing due to cartels) is large in relation to the flexible price area (where due to the absence of cartels, prices subside), the macroeconomic situation will be different.

Unexpected deflation or a deflationary policy would result in widespread losses and suffering from the forced displacement of the fixed price sector to that of the flexible, due to falling prices in the flexible price due to the unemployment of those who cannot or do not want to move on, from the increases involved in the cost of searching and waiting in queues, and simultaneously substantial losses in actual demand, which further aggravate the problems because, due to main-

taining high prices and shrinking disposable income, the purchasing power has decreased for that particular society. The economy which has a dense network of narrow special interest groups will be vulnerable to recession or stagflation during periods of deflation or a deflationary policy.

When the 1929 crisis appeared in the US, a barrage of measures followed, which were designed to intervene in markets by adjusting prices and wages to supposedly "fair", "reasonable" and "full cost" levels. In fact the arrangements favored only special interest groups. Greater quantities could not be sold at lower prices so that additional workers could be hired. In short, the event of a recession led to the official promotion of business and labor interests in legislation and regulation that banned to a greater extent unemployed workers and other resources from drawing up mutually beneficial contracts: more and more workers, consumers and businesses were prevented from concluding agreements among themselves In this way, the recession continued and worsened for four more years until 1933 (Chandler, 1970).

If the markets of the entire economy are dominated by special interest groups and the government constantly intervenes on behalf of their special interests, there is no macroeconomic policy that can fix things. The inevitable becomes a fact.

In Greece a large number of interest groups prevent prices from liquidating at levels that are mutually beneficial for both sides. The prices of many products and services are not adjusted accordingly to reduce salaries with the result that consumers buy smaller quantities of goods, and businesses have to produce smaller quantities; thus they only maintain the staff necessary for decreased production and lay off excess staff. But if prices and wages were directly adjusted, consumers would buy the same amounts as before the crisis, with the result that companies would require all their employees to produce the same quantities as

before the crisis; hence, they would not lay off staff and there would not be the high levels of unemployment that there are today.

4. Special interest groups are detrimental to prudent governance

Just as special interest groups lead to unequal distribution of resources and divert attention from production to distributional conflict, in this way creating political instability, they divert funds - which would otherwise have been allocated to productive long-term investments - towards forms of wealth that are more easily protected, or even to capital flight to other countries with more stable environments.

Characteristically, unstable countries are often ruled intermittently by unstable non-democratic governments, with democratic breaks or at least some relatively pluralistic governance. An unstable society will have fewer and weaker mass organizations than stable societies, but small groups can participate in collusion more easily, enabling them to promote their common interests more easily. Groups can be of any level, but it is usually the case that those which can profit either through a lobby or through a cartel at national level are small groups of important businesses or some rich and powerful individuals.

The more unstable a society, the more a government can be systematically influenced by the interests, appeals and pressures of small groups that are able to organize themselves rather quickly. The economic policy of such countries resembles a leaf that is blown by the wind, as each gust can suddenly turn in any direction, but over time, gravity will pull it to the ground.

In unstable societies, for someone to understand a systematic element of economic policies, the general interests of the small groups that are capable of timely collective action must be understood. In most developing nations the largest companies and wealthiest individuals are

involved in the production of import substitutes and goods which foreign companies can also provide. In other words, they produce goods and services that are available at a lower cost on the world market or that could be provided more economically by local branches of foreign companies. In companies involved in import substitution in some developing countries, heavy industry is included, but other countries may simply manufacture textiles. Often, the more affluent families will own banks or insurance companies that provide services which could also be provided by foreign companies. And of course, these businesses and families will also tend to be located in large cities with easy access to the government.

When the most important companies belong to the import substitution sectors and the replacement of foreign firms, a peculiar syndrome of irrational policy develops in society. The key to this policy syndrome is clearly that of disproportionate power among small groups in unstable societies. Large companies and wealthy families in the above-mentioned situations have an obvious interest in protective legislation against imports and discriminate against foreign or multinational firms with which they compete. Cartels use the coercive power of governments to impose restrictions that protect them from competition. This increases prices for consumers, but consumers belong to latent groups that are unable to organize themselves so that their voice could be heard.

In Greece the existence of many strong interest groups put pressure on the government to impose coercive force in the form of restrictions on competition in order to protect their interests. For example, the de-industrialization of Greece was due primarily to the banking cartels, which granted loans with more than double interest rates compared to other European countries. Thus, domestic enterprises with expensive money costs could not compete with other foreign companies in the export trade. The interest groups use their power to present their often

exorbitant privileges as being socially beneficial. They prevent the use of experts in the creation of laws, so that the legal paragraphs that favour the special interest groups are not disclosed.

They have ensured that any business initiative requires excessive time and costs, both legal and illegal. These costs comprise the revenues of the lobbyists, who are defended in any which way and with great passion. They interfere with the decisions of the state concerning distribution, subsidies, grants and any other state provision, ensuring that special interest groups receive the lion's share. They threaten and politically 'kill off' politicians who are likely to reform their privileges. Politicians who work with interest groups are richly rewarded with long lasting political careers, with immunity from prosecution often provided to them by the slow and flexible operation of the judicial system.

In this way, they hinder prudent governance which should protect the majority from the damage imposed by the actions of lobbyists (Mitsopoulos, 2009).

5. Special interest groups are detrimental to equal opportunities

It is well established - both among economists and the general public - that competitive markets create a considerable degree of inequality. It is further suggested that government action - or in some versions, the operation of unions, professional ethics, and so on - is necessary to reduce inequalities generated by the market.

The orthodox case of both the Left and the Right, that the market creates more inequality by the government and other institutions that "mitigate" the effects, are the opposite of the truth. In fact, inequality in the markets and economic inequality enforce the actions of the government when it succumbs to the demands of the special interest groups.

Most countries in the world are unstable developing nations and in most of these cases, their policies on international trade, foreign investment and many other issues make their societies generate huge inequalities and inefficiency.

Current entrenched beliefs of both the Left and the Right assume that nearly all of the income redistribution that is noted is inspired by balancing incentives, and that it goes from the non-poor to the poor. In fact, many, if not most of the reallocations, are inspired by completely different motives, and most of them are the result of quite arbitrary rather than equalising effects on income distribution - in many cases, revenue is redistributed from lower-income people to higher-income brackets. Much of the activities of governments, even in developed democracies, offer no special assistance to the poor, and many of these activities are actually harming them. For example, the contribution of freelancers and the government in the healthcare system helps mainly health providers, most of whom are wealthy, without improving the provision of health services.

There are laws for the minimum wage and compensation scales for union members, which prevent employers and workers from concluding labor contracts with lower wages during periods of recession, resulting in increasingly broad segments of the population being unemployed, especially in times of recession. The result is that the unemployed do not have equal opportunities to access the labor market.

There is greater inequality in the opportunity to create special interest groups than there is in the inherent capacities of the people. Almost all large enterprises are represented by trade unions, with liberal professions being represented by professional associations, etc. However, large groups such as consumers do not have selective incentives to organize themselves and make demands. Thus they are deprived of opportunities to organize themselves and prevent the losses suffered by the strength of small organized special interest groups.

If the accumulation of capital is not hindered, and if policies do not bestow so much power on special interest groups, the return on capital will subside as more capital is accumulated, and labour wages, which capital is connected to, also increase. It is no coincidence that salaries are higher in countries that have enjoyed maximum capital accumulation due to direct investment from abroad. If economic nationalism does not prevent capital to bypass national boundaries, more and more capital will have an incentive to move to areas with lower wages and thus significantly increase the wages of the poorest, so that the unemployed will have the opportunity to work. The opportunity for a wage increase is prevented by special interest groups which prevent the accumulation of capital.

Unfortunately, regimes, policies and institutions that retard growth are the rule rather than the exception, and the majority of the world's population lives in poverty. This ignores the fact that nowadays the poor nations can borrow the technologies of more developed nations, some of which will be directly adapted to their environment and improve their production technologies very quickly.

Great Britain, during the Industrial Revolution, could improve on its technology only through inventions that occurred at that time which required long periods until the new technology become a marketable product. Accordingly, most highly developed nations today can improve their technology only if they exploit the current progress in technology, something which takes time to research, etc. The poorest of the developing nations can collapse the cumulative technological progress of centuries to just a few decades, simply by introducing readily applicable technology. It is not just a simple obvious possibility – it actually occurs in countries such as Korea, Taiwan, Hong Kong and Singapore.

The nations of continental Europe and Japan were lagging behind significantly in terms of technology compared with the United States at

the end of the Second World War, but they borrowed American technology, developed much faster than the United States, and nearly caught up with the delay in both their technology and their per capita income in less than twenty-five years. Interest groups, by hampering the borrowing of new technologies, hinder the ability of their citizens to escape poverty.

Imports and foreign companies are normally a source of competition because they have lower costs. Since those that could initially become organized sooner were in fact the more affluent, private individuals and larger companies, and since the mobilization of large amounts of capital and the acquisition of scarce specialization implies wealth, in most cases, protection clearly favors the wealthy. Wealthy owners – which, in every developing nation, involve the poorer workforce - not only deny access to cheaper imports due to protection measures, but also receive a lower price for their work as well as for the products they have to sell.

In Greece opposition to special interest groups against foreign direct investment by protected cartels has deprived the opportunity for unemployed people to find work in their own countries, which would create companies coming from abroad to set up shop in Greece. The result is that the unemployed migrate as they do not have employment opportunities in Greece and often work abroad in the same companies which could have created jobs in Greece if domestic cartels were not reined in.

Furthermore, interest groups, by hindering the arrival of foreign investments, deny the opportunity for increasing salaries due to the increase in demand for work that foreign investment will bring. They deprive the ability to sell domestic products at increased prices due to higher demand. Moreover, interest groups, by preventing the introduction of new technologies, condemn Greece to a lack of competitiveness, under-development, endless bureaucracy, job losses and loss of national income.

6. Special interest groups are detrimental to social mobility

Trade unions bear upon themselves the telltale signs of a cartel: in other words, participation restrictions, tariff arrangements, restrictively long apprenticeships from which are often excluded the offspring and relatives of members, and rules limiting production and innovation.

Protected markets which enjoyed a period of stability acquire a cartel, at least if the number of firms in the market is small enough to allow each company to receive a significant share of the benefits of the collective action.

The political leader Nehru (1944) in his book «The Discovery of India» explained the disintegration of India by way of the "static nature of Indian society that refused to change in a changing world, because every culture that resists change declines." He concluded that "perhaps this was the inevitable result of the increasing rigidity and exclusivity of the Indian social system as represented primarily by the caste system." The caste system, he wrote, was a "fossilization of classes" that "gave rise to depravity" and constitutes "a burden and scourge." Beyond the impacts on efficiency, the caste system is a source of profound inequality, both in terms of opportunities as well as the results. One of the most famous cases in the creation of the caste system is that it emerged from unions or similar organizations: most castes take the names of professions - there are data for guilds in early Indian history. Traditionally, however, the castes were not only primarily professional, but they exhibited all the characteristics of cartels and other special interest organizations. They controlled entry into occupations and business activities, they made a secret of their art, they determined monopolistic prices, they used boycotts and strikes, and they frequently traded as a group rather than individually. The caste system has many features that one would expect from interest groups. One of these is that a change in social status refers to the group rather than the individuals. A caste

that enjoys prosperity will rise gradually to a higher social status and perhaps even decide collectively to adopt more restrictive ceremonial rules, rising in this way under the terms of the religious concepts of purity and contamination.

Morality, in other words, is not determined in a universal manner but in terms of obedience to the rules of the caste or someone's position – it is therefore similar to the professional ethics that exclude competition in a free profession.

The promotion of prejudices about race, ethnicity, culture and inter-group differences in terms of lifestyles make interest groups work better. The exaggeration of these prejudices will increase the chance of members voluntarily following the inbreeding rule and strengthening selective incentives, interacting socially only within the group. This prevents social mobility, precluding the introduction of new members to already privileged groups.

In Greece we encounter numerous settings that block entry to new members in gainful occupations and jobs. Several provisions promote inheritance rights so that these remain among the members of the family.

7. Addressing special interest groups

7.1 Transfer of decision-making centers to a higher level

The Common European Market, in 'uniting' territories, created an extensive area in which there was such a concept of approaching free trade. It allowed for unfettered movement of labor, capital and business within this region and transferred decision-making powers on tariffs and other specific issues from the capitals of each of the six nations in the European Economic Community as a whole. Considering these

characteristics, we realize immediately that the creation of a new or larger country instead of many smaller territories involves exactly each one of these three fundamental characteristics: unfettered labor movement, capital and enterprises.

The founding of the United States of America by thirteen independent former colonies presupposed the creation of an area of free trade and mobility of production factors, as well as a change in the governmental decision-making institutions. Indeed, the adoption of the Constitution cancelled the tariffs that New York had established for specific imports from Connecticut and New Jersey.

We also know that the creation of efficient territories in Western Europe resulted in the commercial revolution, and the Industrial Revolution in Britain. In all cases where a much broader area of free trade was established, a correspondingly broader range of relatively free entry was created in terms of production factors and the taking of at least some decisions in terms of economic policy shifted to a new institution, to a new place.

The consolidation of territories also means that political decisions are now taken by different people in a different institutional framework in a place that is potentially located far away from the local decision makers. Additionally, the amount of political influence policy required to change the policy of the unified domain will be significantly greater than the amount required previously based on parochial domains. Generally though, special interest groups lost both monopolistic power and political influence, when local jurisdictions were replaced by economically integrated, nationwide territories.

Since the commercial and industrial revolution took place during and after the remarkable reduction of trade barriers and other restrictions of special interest groups, occurring mainly in new towns and

suburbs relatively free from guilds, it seems that there is a causal relationship.

Each cartel or lobby in the United States before the 20th century had to face the fact that significant new areas were constantly being added to the country. Competition could always come from these new areas, despite the high tariffs at national level, and the new areas even increased the size of the administrative state, so that they would need even larger clusters to create or cartels or lobbies. Extensive migration also worked against the cartelization of the labour market. In addition, the United States, like all border areas, could make a fresh start without a historical past of special interest groups and rigid social classes.

Hence, a union of provinces or regions or countries weakens special interest groups that are detrimental to society. This weakening comes from the non-participation of interest groups in decision-making as the center is moved to another level which group members cannot access. This brings about a collapse of any kind of morally unacceptable privileges acquired in the past.

7.2 Reform policies with a social consensus

Smart solutions for the problem of societal decline due to the perverse role of interest groups may arise from the withdrawal of favorable laws that gave interest groups the socially and morally unacceptable role of distributing income dividends to their members at the burden of the rest of society. At the same time the implementation of strict laws is required against cartels and collusion, which use their power to achieve prices or wages above competitive levels in the economy. This will halt the cumulative loss that is created by special interest groups in society and the economy. These solutions require no financial cost to implement; all that is needed is smart and decisive public long-term policies on the role of interest groups, which could effectively address

the exclusion of young people in labor markets, stagflation, unemployment, reduced growth and social inelasticity. Alone, they bring about significant social and economic development in whichever country they are applied.

The withdrawal of protective legislation should be made by common accord at least among most political parties. The broadest consensus should be guaranteed so that there are no political parties that will promise to restore privileges in exchange for votes. Parties which openly or surreptitiously support special interest groups should be revealed and denounced by citizens. Citizens should be informed responsibly about the real benefits of the reforms that will remove the privileges of special interest groups; at the same time, the privileges of special interest groups, which their propaganda mechanisms misleadingly present as socially beneficial, should be revealed.

8. Discussion

In Greece there is a high number of special interest groups in operation, which have "diverted" from their real role and turned into covert income redistribution organizations for their members at the expense of the entire society, particularly against those groups that, despite having many members, cannot organize themselves into one single group to protect themselves. They have gained such a strong foothold in passing favorable legislation that, even in the present deep economic crisis, they are still pushing "weak" politicians to pass laws that protect and increase their income at the expense of society and the economy. They consume time and money in influencing politicians (who may in fact be members of their group) and the public administration to vote in bills that favor the creation of new revenue streams, which are indeed "legitimate" but are also morally reprehensible.

Special interest groups have formed a significant number of protected and semi-protected markets that create distortions and rigidities in every type of market in Greece, such as the purchase of goods and services, the labor market, the tax system etc. They force the state to intervene with extensive regulations that limit competition in the markets and impose taxes on third parties, which in reality constitutes indirect income for their members.

The key to economic prosperity in a society as a whole is free access to all markets, even to its weakest citizens, so that neither private nor public groups in the form of oligopolies and monopolies can be created. Behind all obstacles to free access is a privileged interest group that is being protected.

In Greece hostility thrived against entrepreneurship, because the only enterprise that citizens had experienced was a state-fed diet, protected from free competition, which created monopolistic gains for some interest groups. That is, an entrepreneurship where wealth was earned by selling low quality products at high prices. An important role in this was played by the hostility of the banking cartel which granted loans to companies on the basis of political entanglement with a questionable capacity to operate and to repay the loans.

Interest groups misinform society so that their privileges are not revealed. The most popular tactics used to conceal their privileges are to devise an “enemy”, especially an “enemy” that cannot easily be understood, nor can it be “beaten”. All blame has been heaped on this vague enemy, for any damage the society suffers, to ensure that citizens are not worried, and will not realize how much they have been damaged by the treacherous plans and privileges of special interest groups.

Current action prevents the Greek economy from adapting to new circumstances and becoming a competitive economy with equal opportunities for all citizens. Other countries that have adapted rapidly to the changes have gone ahead of Greece in competitiveness (Greece's position is 96th in 144 countries) and attract investment. Moreover, these powerful interest groups essentially "govern behind the scenes" and do not allow the state to exercise prudent governance in order to create a rule of law that will defend the interests of the whole society against these special interest groups. They act behind the scenes before every act of new legislation, pushing for the adoption of favorable laws or regulations or to avoid arrangements that do not favor them, all of which are usually "morally unacceptable." The lack of transparency, the systematic reduction of the accountability of their members in the legislature, and the executive and judiciary powers enhance the power of interest groups since they recruit board members to preserve and expand their privileges. In most cases any new legislation favors an interest group to the detriment of the majority of citizens. Decisions are not taken on the basis of what is fair for the whole of society but by the pressure of a privileged group.

Sometimes privileges may be 'illegal', and take the form of corruption. Due to systematic undermining of fair and prudent state operations, interest groups may consider illegal proceeds as being just as attractive as legal ones. Thus, benefits can be obtained by morally unacceptable blackmail and raw deals by both legislative and executive powers (Tullock, 2005).

Essentially these groups managed to change the course of society by changing society's incentives, with the result that instead of engaging in its productivity and improvement, they engage in the covert unproductive demands of 'small group' interests at the expense of the majority of society. They consume the greatest part of their time and the influence they have available to them on defending their significant income,

which they guarantee, without providing work commensurate with income in quality and effort. These groups, even though some of them have lost a small part of the wealth they acquired through the recent economic crisis, still enjoy favorable regulations while society continues to be impoverished.

Using the coercive power of the government, they seek a state that interferes with the functioning of the market, in order to extract policies that favour their privileges. They work in various ways against the interests of unorganized unprotected groups in society, making income distribution more unequal.

They have managed to distribute the rewards and the various state benefits not on merit but on the basis of participation in various groups which are intertwined with the political establishment to create customer relationships. Furthermore the idea of individual responsibility is significantly degraded, while every problem is due to the vague notion of the "State".

It is noteworthy to mention the damage that interest groups have brought about in education. Education does not equip society with the necessary knowledge so that people can take advantage of opportunities or cope with the threats that exist in an open and globalized competitive environment (Mitsopoulos and Pelagidis, 2007).

Special interest groups have led to unequal distribution of resources and focused attention from production to distributional conflict, towards forms of wealth that are protected more easily or even to capital flight to more stable environments abroad; such resources would otherwise have been allocated to productive long-term investments that would have made Greece able to withstand the pressures of international competition. Essentially redistribution, complicity and corruption ensure success, which should have been assured by honest hard work, skills and talent.

Passage of legislation without any control and lack of transparency does not disclose the amounts that these groups collect without any effort or business value. Neither does it reveal the burden that these amounts put on the entire community to the benefit of the members of the favored interest groups, ensuring them a comfortable and easy life. Protecting the privileges of these groups increasingly strengthens them, restricting fair competition and requiring the consumer to pay high prices for goods and services, while excluding in particular young people from work.

The intervention of the state in favor of these small interest groups results in the already excessive costs of the government, distributing income without any transparency, which is being paid out as royalty income to certain interest groups, with the result that the state provides poor-quality services to citizens and no money for investment and development of infrastructure that could stimulate entrepreneurship to create jobs for young people.

Interest groups have succeeded in pushing Greek governments for more preferential benefits, increasing general government expenditure to 53% of GDP (data based on a 3% recession rate for 2015) compared to 39% for Ireland, 43% in Spain and 44% in Germany. Greece, with a very small tax base, almost no export companies and no multinational companies which in other countries bring capital from around the world and pay the greatest part of the taxes, should not have more expenses than Ireland which hosts a large number of huge multinational companies. Citizens cannot afford to pay so many taxes to cover the state's excessive expenses, while receiving poor-quality public services. The production base in Greece is too small, consisting of just 2.7 million employees. Of these 2.7 million, about 600 thousand are self-employed farmers, and about 700 thousand are self-employed in SMEs, 80% of which on average employ up to 5 people. The remaining 1.4 million workers are private employees of whom 350 thousand are part time

workers. On the other hand, pensioners amount to 2.7 million. The ratio between pensioners and workers is one to one, compared to Europe's ratio where pensioners are one in four. Civil servants number about 700 thousand, while the unemployed come to 1.2 million. These ratios, apart from being unsustainable, create more social injustice and more economic inequality.

Interest groups have pushed for increased expenses by the state in relation to GDP to redistribute them as benefits to their members. In 2009 state expenses amounted to 70% more than state revenues. In 2015 state expenditure as a percentage of GDP was about 53%. These excessive state costs led to the financial crisis and bankruptcy. They were the cause of all four previous bankruptcies in the country during the drachma period in the last 195 years. Excessive government expenditure destroys states, which is equivalent to a national disaster. Excessive government spending is the reason why excessive taxes are imposed, which citizens are ultimately unable to pay. In the past, overspending led to excessive government deficits covered by excessive taxes, which led people to rioting. World history is filled with examples of revolutions due to over-taxation, while 'fair' expenses promote countries.

This ratio was achieved by the perverse role of interest groups pushing for continued preferential treatment towards early retirement with the effect that the majority of employees were retiring prematurely with only a small minority who had not managed to organize themselves into a group reaching the higher retirement age. Early retirement costs are mainly responsible for high social security contributions and taxes in Greece. According to a recent OECD report, the cost of taxes and contributions amounts to 43% of a salary compared to 26% which is the EU average. This is a serious deterrence in attracting investment; the unemployed are still left without employment prospects and the already employed lack a decent salary which they could receive (increased by a minimum of 20%) if contributions and taxes were set at European levels.

Special interest groups were not content with the squandering and unfair distribution, in a privileged and destructive way, of taxpayers' money. Their greed squandered European subsidies and aid, and further led the country to outrageous borrowing. Amounts of about 120 billion euros in European funds in the last 40 years were squandered as special interest groups interfered with them and redistributed them to their members, creating customer relationships rather than creating infrastructure for exports of goods and services. The public debt of 320 billion (or 450 billion before the 2012 "haircut") was largely created by the pressure from the demands made by special interest groups for the redistribution of income to the benefit of their members. Hence, they were not invested in productive infrastructure but eventually they were put into imports and more significantly in job creation in the countries from which the products were imported. The relationship between the banks and the government also contributed to the financial overburdening of the state, when banks lent lavishly at high rates to the state, in exchange for state protection of the banking cartel from free competition.

Nobody could resist the greed of the special interest groups for privileged access to public money. They never allowed the establishment of an independent authority of a council for auditing the state's finances, which could have protected needy citizens from the squandering of public money and prevented waste of state revenues which, if utilized appropriately, could have turned Greece into one of the most remarkable European economies.

The privileges of these groups are now supported by a political party; in this way, interest groups are not revealed in the foreground, so it is difficult for the ordinary citizen to understand that the strategies of the party on a number of occasions are to protect the privileges of lobbyists who have joined the party and influence its management and strategies. Many times, when it becomes impossible for the party to promote or protect their privileges, they leave that party and join another one which

they believe will soon be in the seat of government. This role of political parties should be disclosed to the public and should be denounced in all manners because as long as there are political parties that foment and advocate interest groups, their devastating damage to society and the economy will grow.

9. Conclusions

Different approaches to economic development such as Olson (1982) suggest the withdrawal of any legislation or regulation that enables special interest groups which, having gained privileges, prevent the adoption of changes, liquidate high prices through cartel proceedings, abuse their power and harm society. This could reduce prices in order to compensate for reductions in wages, and to recover quantitative purchasing power in society. The economic disparities will also be reduced, the exclusion of young people from work and society will not occur and the economy will adapt by implementing the changes that have to be made to balance the genuine productive capacity to become more competitive and start attracting investments. Such investments alone can reduce unemployment, the most painful consequence of the economic crisis.

Special interest groups should be excluded from any lobbying action aimed at eliciting high prices for their members. They should turn to the development of the competencies and skills of their members to increase their contribution to the real productivity of an economy, thus reaping a share of the profits in the overall development of the economy.

It is now a well-known fact that lobbyists slow down growth. The economic crisis is an opportunity to restore the accumulated loss created by the above-mentioned groups which in turn created the economic crisis. Special interest groups have crept across the spectrum of political parties and even influence the strategic decisions of the parties.

Today parties compete among themselves as to which one better protects special interest groups in their destructive work against society, in exchange for their votes. These parties must be reported by revealing the groups that are being protected.

Responsible governments should put aside interest groups for the benefit of the entire society, and change the incentives of the development of society through the development of production and the reduction of economic inequality in society. They are required to tell citizens the truth about these interest groups and the political parties which protect them. Only in this way will the numerous weak large social groups be protected from the exploitation of small powerful interest groups and only then will the state ensure a sense of fairness for all citizens. In this way, according to Nobel Laureate North (1986), the operation of the rule of law will enhance the security of property rights, and therefore economic growth, by reducing transaction costs.

Obviously, interest groups will resist the revocation of privileged special interest legislation and policy enforcement against cartels, which deprive them of monopolistic profits that give them the ability to create cartel markets and to ensure privileges. They will relocate to other political parties which, for demagogic reasons, promise protection of their privileges in exchange for their votes and influence. In this way, political parties will not exercise political weakening in the power of interest groups because they will now have become their voters. In some cases, in order not to be criticized for protecting trade unions, political parties will attack those guilds, verbally at least, that rival political parties are protecting, but they will continue to protect the unions that voted them in.

The limited impact of the economic-financial education of the past suggests that interest groups often achieve their aspirations for preferential redistribution of incomes in favor of their members.

According to the above-mentioned, special interest groups are detrimental to economic growth, full employment, prudent governance, equal opportunities and social mobility. Interest groups in Greece have led to the inelasticity of society, the lack of reforms and the lack of competitiveness, which have resulted in a progressive decline of both the economy and society until the inevitable occurred.

Citizens should be informed that excessive government costs and waste have been created by small but powerful special interest groups which distributed gains preferentially to their members at the expense of unsuspecting citizens. Excessive government costs created government deficits. In the past government deficits were covered mainly by borrowing. Excessive borrowing to cover deficits led the country to the brink of bankruptcy. Now that the country cannot borrow, excessive government spending is being paid for by the over-taxation of citizens. Markets do not trust Greece to lend to her, because the country has such excessive government costs and so much government debt. We can only obtain more loans from other EU Member States but they require the reduction of excessive state expenditures as a percentage of GDP, which means reducing the privileges of special interest groups. For this reason these groups want loans to continue to enjoy their privileges but without commitments.

For citizens to be alleviated from the burden of over-taxation, excessive state costs need to be reduced, so that the taxes citizens have to pay will also be reduced accordingly, in order to stop state debt from increasing. But privileged interest groups, which are protected by the respective government, even after six years of being in recession, still do not allow the reduction of state expenditure. They continue to create excessive government waste, since other unsuspecting groups pay for the costs; thus they prolong state borrowing and the over-taxation of citizens. This over-taxation becomes even

more unfair as some groups pay more taxes than what should be accorded to them because of the existence of tax evasion. Over-taxation and borrowing reduce the individual freedom of citizens and the sovereignty of the country; all this is happening because some interest groups, because of the protection afforded to them by some governments, continue undisturbed to harm both society and the economy with their outrageous privileges.

Moreover, citizens should be aware of the fact that political parties should not have access to the management of their bank savings and deposits. Political parties cannot build customer relationships with special interest groups with citizens' savings, and then promise to grant favorable loans or present loans as gifts in order to get votes putting bank deposits at risk. So here too, special interest groups are involved, creating over-taxation and over-indebtedness to replenish savings.

It is reasonable to expect that scholars and those who draw up development policies become increasingly aware of this fact over time. This knowledge will eventually spread to ever wider sections of the population. This wider awareness will greatly reduce the losses in society from lobbyists, ie special interest groups. This is an expectation that concerns everyone espousing a society that will gradually minimize economic and social inequalities.

If this is achieved, the fastest growth will occur in societies which have not recently experienced upheavals but are expected to see stability in the near future. We hope the recent and upcoming transformation of the structure of society and the economy will be successful, to remove the retardants of development and to lead Greece to sustainable and stable economic development, free of the economic and social inequality that interest groups create behind the scenes. Public administration and other institutions can be reorganized on the criterion of being

beneficial to society, and not by the pressure of lobbying for preferential treatment. This will also improve the state's finances. Bad finances are fatal to republics. A Greece free of the harmful behavior of special interest groups will resemble a teenager. Maybe she will make some mistakes, but she will leap ahead with momentum towards sustainable development.

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MARIO AGUER HORTAL
Académico de Número de la Real Academia de Ciencias Económicas y Financieras

DR. MARIO AGUER HORTAL

MARIO AGUER HORTAL
Académico de Número de la Real Academia de Ciencias Económicas y Financieras

CIENCIA Y REALIDAD ECONÓMICA: RETOS DEL MUNDO POSTCRISIS A LA ACTIVIDAD INVESTIGADORA"

"Todo en la vida es inestable y el equilibrio es una inesperada propina".
Josep Pla (2004), Humor candor.

Abstract

El ser humano es inquieto y curioso por definición. Siempre lo ha sido y continuará siéndolo. En el siglo XXI se investigará más que nunca, porque el talento será más abundante y la información y el conocimiento más disponible a partir de una población más numerosa y mejor formada, con centros de investigación, universidades, *think tanks*, organismos públicos y privados que competirán por atraer y fidelizar talento. En este escenario, sistemas que manipulan grandes conjuntos de datos revolucionará el afán investigador. Los datos y la información serán inabarcables, igual que altos serán los riesgos asociados a errores en su procesamiento. La actividad investigadora determinará la posición que

cada uno ocupa en un ranking de potencialidades y será común en cualquier actividad o disciplina mínimamente estructurada. Los retos del mundo postcrisis en la actividad investigadora, tras la devastadora crisis económica de 2007, son muchos y variados. En este artículo, el autor apunta cuatro grandes áreas dónde se concentrará un gran esfuerzo investigador: el mundo *Big data*, el estudio del capitalismo y sus crisis económicas, los estudios sobre la desigualdad económica y la distribución de renta y todo lo relacionado con el impacto de la llamada Industria 4.0, o cuarta revolución industrial.

Predecir es un verbo que se conjuga mal, y en el medio y largo plazo peor. Se hace imposible. A estas alturas del siglo XXI, nuestros entornos han pasado de ser complicados a ser complejos. Complicado es aquello que se nos representa de forma inadecuada, incompleta o desordenada. Así, un puzle por montar, con todas sus piezas sueltas sobre la mesa, es complicado, la web de cualquier ministerio de Hacienda, también, como aprender, por ejemplo, el idioma inglés. Complejo es algo más, es la dificultad que se nos plantea ante algo que exige un esfuerzo intelectual mayor, porque es difícil de entender. La física cuántica es compleja de comprender, el universo o los modelos matemáticos también, así como el devenir del siglo XXI, o aprender el idioma cantonés para un occidental. A mi entender los grandes temas fundamentales del siglo XXI, aquellos que afectan a la colectividad, serán, fundamentalmente, complejos.

A partir de estas premisas y apreciaciones, trataré de hacer algunas aproximaciones a los retos de la actividad investigadora en ciencia económica en los escenarios postcrisis. Sin duda, son apasionantes. En las reflexiones siguientes quiero centrarme en algunas de las grandes áreas dónde considero que la labor investigadora ocupará un gran espacio en los próximos años y décadas. El entorno *Big data* y la modelización matemática, el futuro del

capitalismo y sus recurrentes crisis económicas, la desigualdad económica y la distribución de renta y la nueva revolución tecnológica a partir de la cuarta revolución industrial.

Matemáticas y algoritmos

Con el *Big data*, los macrodatos, en un futuro inmediato, la profusión de datos será de tal magnitud que atraerá a investigadores, entidades financieras, universidades y centros de desarrollo de todo el mundo esforzándose por prever el comportamiento de las personas, de los grupos, o de los mercados. Modelizar proposiciones y relaciones entre variables, con el fin de estudiar las conductas y tendencias de sistemas complejos, cada vez será más común.

El mundo seguirá yendo muy rápido, generando datos y más datos. Técnicos cada vez más cualificados e hiperespecializados realizarán abrumadores esfuerzos por organizar datos y procesarlos de forma inteligente. Las predicciones económicas, climáticas, o de cualquier tipo, serán un filón importante de trabajo cualificado. La idea que atraerá a muchos matemáticos, economistas, ingenieros o físicos, no será sólo para predecir huracanes, tornados o hambrunas, quién ganará o perderá una final de básquet, sino, particularmente, cómo se comportarán los mercados, la bajada y subida de los valores, detectar burbujas especulativas o predecir el precio de la energía, de las materias primas, o la probabilidad de que un país con una alta tasa de corrupción siga teniéndola en el futuro. Máquinas, robots, ordenadores y algoritmos darán pistas a los humanos en el curso de decisiones o, simplemente, decidirán por nosotros. Todo ello concentrará el interés de miles o millones de investigadores.

Los modelos probabilísticos se erigirán como la quintaesencia derivada del procesamiento de miles de millones de datos de todo tipo.

Un ejército de profesionales altamente cualificados, tendrán a su alcance una información ingente, casi incomprensible a nuestro modesto cerebro. Esto, que en sí y de forma absoluta, es una ventaja, a partir de un determinado punto puede devenir un problema. Así lo sugiere Nate Silver, cuando indica que cualquier incremento en la capacidad de información por encima de nuestra capacidad de procesarla supone un peligro. La avalancha de datos puede aturdir, deformar su procesamiento y distorsionar, indefectiblemente, la distinción entre el ruido y la señal, llegando a conclusiones equivocadas, insustanciales, espurias o casuales. Aunque la solución a las incógnitas sólo pasa por el estudio, la comparación, el contraste y el análisis multivariable, a la predicción le acechan grandes problemas.

Nadie, ningún economista, matemático o estadístico, organismo internacional de prestigio, o institución financiera de renombre, fue capaz de prever, no sólo la caída del muro de Berlín, o las diferentes crisis económicas que han aturdido la economía internacional, sino algo tan prosaico como determinar que en el momento que escribo estas líneas el barril de petróleo Brent está sobre los 45 dólares, impensable hace 4 años, cuando estaba a 110 y con una demanda a la alza que se ha mantenido a pesar de la reciente crisis económica. A los humanos nos apasiona especular sobre el futuro, pensar qué sucederá. En pleno siglo XXI buscar respuestas y adivinar tendencias, para avanzarse a ellas y jugarlas en beneficio propio o corregir sus impactos negativos, mueve centenares de millones de dólares. Me refiero a los informes de coyuntura de grandes organismos internacionales, públicos o privados. Por lo que venimos viendo, en la predicción tendemos más a equivocarnos que a acertar. A raíz de esta idea, me parece interesante recordar el teorema de Bayes que, más allá de ser una fórmula matemática, nos indica que debemos ser capaces de pensar de forma distinta sobre nuestras propias ideas y de la forma cómo las validamos. El matemático británico del siglo XVIII Thomas Bayes indicaba que era preciso considerar a fondo los prejuicios individuales y colectivos, además de las convicciones, a

la hora de abordar problemas. Al hilo de esta idea, lo que propongo, en suma, no es una cerril crítica al manejo de datos, o a la proliferación de algoritmos, sino un llamamiento prudente a recordar que los datos, por sí sólo, no hablan, no nos dicen nada, somos nosotros los que les damos significado. El error número uno es hipertrofiar nuestra inteligencia analítica, menospreciar la exposición selectiva y el peso de nuestro punto de vista y ver patrones donde no los hay.

Capitalismo y crisis

El capitalismo, tal y como indicaron los historiadores Fernand Braudel y Joseph Needham, es una invención genuinamente occidental. Observar su evolución, las externalidades que genera, y su capacidad adaptativa seguirán estando en la primera línea de interés de muchos estudiosos. El capitalismo es el rey león de los sistemas económicos. Se ha extendido y ha ocupado todos los rincones del mundo. A la vista de todo, resultaría ingenuo pensar que siempre será así, que todo es inmutable, que el equilibrio de hoy, sea cual sea éste, es el equilibrio del mañana y que lo que funciona hoy, también lo hará mañana. Nuestro sistema económico, sin duda, es un sistema vencedor. Se ha sobrepuesto a todo tipo de adversarios y de crisis coyunturales. ¿Será siempre así? Es difícil de prever la evolución que tomará, pero cada vez interesará más saber y combatir sus debilidades y averiguar su tendencia para sobreponerse a las crisis que recurrentemente le afectan.

Las diferentes crisis económicas han sido estudiadas de manera pormenorizada y seguirán estudiándose en el futuro. Las crisis han registrado formas diversas en función de su magnitud. Las más comunes, las que tienen una duración corta, tienen una forma de "V" con una caída y recuperación rápida; con forma de "U" cuando la recuperación es más lenta; con forma de "W" cuando, tras una lenta recuperación, se produce una nueva caída, y en forma de "L" cuando hay un periodo

muy largo de estancamiento. Estas son las peores y las que amenazan seriamente el modelo. Históricamente, estas crisis sistémicas han durado, aproximadamente, una década, aunque sus efectos pueden haber sido mucho más largos. La de 2007 se está extendiendo bastante más y sus efectos se han amortiguado, no sin altísimos costes materiales y humanos, a través de instrumentos monetarios y financieros que, aun así, han dificultado la rápida recuperación, debido a la inmensa deuda que las Administraciones públicas, empresas, bancos, familias y consumidores han venido acumulando. Deudas que amenazan el pago y que drenan los escasos recursos de que disponen los empobrecidos actores económicos. La clave viene siendo el papel (físico o virtual). En el capitalismo actual la economía se basa en el papel, donde el apalancamiento, el endeudamiento, lo es todo. Existe más riqueza financiera que real. En un mercado interactivo, interdependiente y planetario, por muchos amortiguadores globales o cortafuegos que se puedan pactar, los riesgos de accidentes nucleares financieros no desaparecerán y la volatilidad e instantaneidad de sus impactos volverá a poner en peligro todo el sistema, tal y como ha venido sucediendo en todas las crisis sistémicas. Creo con (casi) total seguridad que esto volverá a ocurrir. La pregunta clave es saber qué magnitud tendrá y si afectará letalmente al propio sistema. Estudios sobre el análisis de variables con impacto sistemático que afectan a la economía mundial estarán encima de la mesa de muchos investigadores y organismos públicos y privados.

Como bien sabemos, el capitalismo sufre crisis cíclicas que ocurren con diferente intensidad cada determinado periodo de tiempo. Siempre ha sido así y probablemente no dejará de serlo en el futuro. Forma parte de su ADN. Durante cualquier periodo de crisis se generan ajustes adaptativos que, en el mejor de los casos, perduran escasos años dejando una población noqueada, una economía empobrecida, y una sociedad desorientada; y en el peor, como sucedió en 1870, 1929 y 2007, pone en jaque la propia viabilidad del modelo económico, cortocircuita las arterias financieras y amenaza la vertebración de las sociedades. Decenas de millones de parados, empobrecimiento, pérdida de confianza

y una ruina generalizada es el resultado final. ¿Será el capitalismo de este siglo XXI diferente? Veremos. Buena parte de la investigación de política económica, seguirá estudiando el modelo económico y su comportamiento.

Todos los debates actuales más visibles sobre el capitalismo se centran en las desigualdades. Son muchos los que alertan que mucha gente se está quedado *out*, fuera de juego, más ahora que en el pasado, y no sabemos si serán más aún en el futuro, pero todo apunta en esa dirección. La pregunta clave es: ¿llegará a implosionar el capitalismo a causa de esa disfunción? No lo sabemos. Dependerá de los reguladores que utilice el modelo para minimizar o atemperar las pérdidas que provoca. Dependerá del número y de la actitud de los perdedores, aquellos que se quedan fuera de la dinámica económica, víctimas de las diferentes crisis, o por pura incapacidad de poder competir en los mercados. Dependerá de la conciencia que tengan los perdedores sobre las causas que provoca esa situación, de si se conforman o no, o de si están entretenidos con cualquier otra cosa. Así de llano. Dependerá de hacia dónde se dirija la ira de los *outsiders*, de los que se quedan en la cuneta. Si lo viven como un fracaso individual, la reacción será la vergüenza de ser pobres, como recoge Owen Jones en su libro *Chavs. La demonización de la clase obrera*, también el aislamiento y la autodestrucción. Si el problema se entiende como una derivada de problemas sociales de mayor alcance, se focalizará hacia otros actores, como políticos, gestores económicos, instituciones financieras o al propio modelo económico, aunque también puede que a inmigrantes y otras minorías estigmatizadas. Así de sencillo de explicar, cómo imposible de prever. La investigación en este campo resulta necesaria para corregir disfunciones.

La ciencia económica y la ciencia política afinarán su afán investigador para poder entender qué medidas -si es que las hay- son las más apropiadas para contrarrestar las crisis sistémicas que recurrentemente sufre el sistema económico, y en particular la forma en cómo se ceba

en determinados países más expuestos al riesgo o con malas prácticas económicas previas. Los ejemplos de México en los años noventa, Argentina a principios del siglo XX con su corralito o recientemente Grecia en la Unión Europea van en esa línea. Temas como la refinanciación de la deuda externa, las reformas estructurales, la participación de entes supranacionales, como el Fondo Monetario Internacional, el Banco Mundial u otros regionales, estarán en la agenda de técnicos, investigadores, políticos o economistas.

Desigualdad económica y distribución de la renta

La globalización y la dinámica del sistema capitalista intensificarán en el futuro las desigualdades económicas que, posiblemente, tenderán a acentuarse dentro de las sociedades, pero, previsiblemente, se reducirán entre unos países y otros. Habrá una convergencia macroeconómica agregada entre Estados y una divergencia económica por grupos de población dentro de ellos. En función del Estado en que te halles y del grupo al que pertenezcas, la casilla de salida será una u otra y las metas estarán más cerca o más distantes del inicio. Relacionado con esto, recientemente ha recobrado un nuevo interés el tema del salario mínimo. No me parece caprichoso. Tiene interés por ser oportuno y controvertido. Un ejemplo inmejorable de cómo una medida económica provoca o puede provocar un impacto diferente del que persigue. El salario mínimo es una cantidad, comúnmente medio-baja, por debajo de la cual no está permitido pagar legalmente a los trabajadores. El debate se centra en su utilidad y en su magnitud. Para unos, un salario mínimo es una garantía de dignidad que asegura una relativa remuneración por el trabajo. Para otros, en cambio, es innecesario, puesto que es una traba que dificulta la creación de empleo y la inversión. Las partes enfrentadas en esta disputa tienden a coincidir en que los trabajadores que se hallaban en peores condiciones para encontrar trabajo, porque eran menos productivos y generaban poco valor, paradójicamente se ven siempre per-

judicados por un salario mínimo medio-alto, ya que nadie los contrata si producen poco, menos de lo que se está obligado a pagar, con lo que el fin que persigue se desvanece. Esto que, por sí mismo, y más allá de un debate ético, no es bueno ni malo, puede comenzar a ser malo si hay una sustitución acelerada de activos humanos con poca cualificación-productividad y se convierten en inempleables y *desechables*, por muy bajo que se fije el salario mínimo.

El salario mínimo ha superado el estricto marco de la confrontación política al uso para abrir un debate académico y económico de primer orden. La idea de salario mínimo, impulsado por el capitalismo originario de los territorios situados a orillas del Rhin en la primera mitad del siglo XX, buscaba, junto con otras medidas, actuar de contrapeso al capitalismo más desregulado. Dignificar una remuneración mínima se hacía con una doble justificación: la moral y la ideológica. La primera para dignificar la condición humana, la segunda para reforzar la vertebración de las sociedades europea y norteamericanas post crisis. En el siglo XXI el debate se retoma con renovado interés. La idea es clara: un país de mileuristas, en la terminología europea, resulta un mal asunto, para muchos. Un país, como EEUU, donde el salario mínimo es irrisorio, es un país con riesgos de futuro. Si son muchos los que tiene poco, poco pueden consumir, poco pueden aportar a la caja común y poco pueden beneficiarse de prestaciones presentes o futuras. Si para vivir decentemente no te llega con el salario que percibes por un trabajo a tiempo completo, es que algo va mal. Las reflexiones entre economía y política irán de la mano en los siguientes años para entender un debate global que aunque no puede establecer parámetros globales, no esconde el carácter positivo que tiene, particularmente, en las economías maduras. En palabras de Miquel Puig, autor que defiende el valor del salario mínimo para el aumento de la productividad empresarial, para llevar a cabo este proyecto hay que saber encontrar un mix entre la prosperidad, o la capacidad para crear riqueza, y la equidad, es decir, la igualdad interna. Este tipo de estudios y otros asociados, como la renta mínima,

las ayudas sociales a los menos favorecidos, los estímulos económicos a las escuelas mejor situadas o la agrupación de estudiantes por nivel cognitivo, continuarán ocupando un interés importante en las revistas de investigación más destacadas. A hilo de esta idea, recientemente, Branko Milanovic, economista jefe del Banco Mundial, nos indicaba en su libro *Los que tienen y los que no tienen* que el 80% de los ingresos de una persona depende de dónde haya nacido y de la clase social a la que pertenecen sus padres. Según él no queda mucho margen para la política para promover la movilidad social. En el caso concreto de España, considera que, globalmente, los ingresos, sean cual sean éstos de una persona, están condicionados en un 50% por nacer en España, el 20% por quien sean sus padres y el 30% restante está relacionado con el esfuerzo, la suerte, la etnia o el género. Concluye, que lo que más pesa son elementos exógenos que no tienen que ver con la meritocracia. Con ello se abre todo un campo de reflexión, y de nuevas incógnitas, muy fértil para los nuevos investigadores.

La cuarta revolución industrial

La idea de Industria 4.0 es un concepto relativamente reciente. Desde hace escasos años se apunta la necesidad de entender la cuarta revolución industrial (la primera fue la del vapor; la segunda, la producción en masa; la tercera, la electrónica y las tecnologías de la información) a partir del concepto de fábrica inteligente, donde operan software dirigidos a la fabricación informatizada en procesos interconectados por el internet industrial de la cosas. El *Big data*, o la infinidad de datos procedentes de todo tipo de fuentes y de sensores, es el gran manantial de información para los nuevos procesos.

La industria 4.0 será un factor determinante de mejora de la productividad basada en la optimización de procesos y en la predicción. La inteligencia artificial es el contrapunto de los cambios que se suceden y se sucederán con más ahínco en los próximos años y décadas.

Ingenieros informáticos, programadores, psicólogos, expertos en marketing, economistas, médicos, farmacéuticos, o sociólogos, entre otros, formarán equipos multidisciplinares (no estables) con un gran peso en el diseño de productos y servicios personalizados.

La innovación aplicada a sistemas ciber-físicos, a partir del *Big Data*, generará productos y servicios inteligentes. El concepto de Industria 4.0 es la inter-conexión de máquinas y de sistemas. Nos hallamos ante procesos no sólo de digitalización de fábricas o centros de distribución, también en la flexibilidad y la personalización de la producción en poco tiempo. Para todo ello nuevas herramientas logísticas y de simulación estarán al orden del día, la robótica industrial, la mayor adaptabilidad a las necesidades y a los procesos de producción, las *smarts factories*, las *smarts cities,* fábricas o centros de distribución inteligentes, o ciudades inteligentes, formarán parte del universo familiar de muchos investigadores. En la era del talento y de las emociones, serán miles las personas que investiguen y programen, que busquen saber el por qué de las cosas, de los comportamientos humanos, el por qué de sus deseos y cómo avanzarse a ellos para satisfacerlos.

Cuando analizamos secuencias acumuladas de las diferentes revoluciones científicas y tecnológicas y el impacto que provocan en la sociedad, comprobamos que eliminan trabajos mecánicos y repetitivos, aquellos que generan poco o ningún valor. Hasta hace bien poco, el 98% de la población activa del mundo trabajaba en el sector agrícola. Ahora, en los países ricos, ese porcentaje se ha invertido. El 98% de la población activa *no* trabaja en el sector agrícola, pero, en cambio, se alimenta razonablemente bien. La tecnología destruye trabajo, pero crea riqueza. El debate es saber cómo se reparte esa riqueza creada y cómo la tecnología impacta en el mercado de trabajo. Alvin Toffler ha teorizado sobre el tema. Para él, la sociedad se encuentra en una nueva ola, tras la revolución agrícola y la industrial, donde el conocimiento y el talento son ahora la pieza central de la civilización.

Las creencias de las personas y las actitudes ante la vida son creaciones humanas y colectivas, y están determinadas por la sociedad en la que nacemos y vivimos. No pensamos de forma *natural*, sino que lo hacemos *artificialmente*. Es una construcción. Sabemos que las decisiones que tomamos son tributarias de nuestros prejuicios, emociones e ideas y que la ignorancia y la soberbia casi nunca tienen miedo a nada. Si esto es así, por tanto, la prudencia y la humildad, la contrastación y la verificación de hipótesis a partir del método científico no pueden quedar ofuscados por el tiempo acelerado en que vivimos o por los infinitos datos a los que tenemos acceso. Los investigadores del siglo XXI deben continuar teniendo claro estos principios.

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MUGUR ISARESCU
Académico Correspondiente para Rumanía
Gobernador del Banco Nacional de Rumanía

DR. MUGUR ISARESCU

MUGUR ISARESCU
Académico Correspondiente para Rumanía
Gobernador del Banco Nacional de Rumanía

REFLECTIONS ON THE FUTURE OF CENTRAL BANKING

Before the outbreak of the global financial crisis, the conventional lines of thought advocated the idea that markets do self-correct always. The overconfidence in the infallibility of the invisible hand of the market generated a widespread belief that ample interventions by the authorities were not warranted in order to contain economic and financial imbalances at an early stage.

Moreover, there was a prevailing view in the academic world that inflation was the main culprit for financial instability. By way of consequence, safeguarding price stability was looked upon as an almost sufficient prerequisite for promoting financial stability. Against this background, central banks' core contribution to preserving and strengthening financial stability consisted in delivering low inflation rates.

However, not everyone agreed. Prior to the outburst of the crisis, several economists had publicly expressed doubts on the viability of mainstream economic thought or had warned against some of its vulnerabilities. Special mention deserves Andrew Crockett, who claimed

ever since 2003 that the "peace dividend" yielded by the successful war against inflation had not lived up to expectations and therefore the battlefront against financial instability should not be overlooked. Also worth mentioning is Jaime Caruana, who pointed out in 2005 that, while a highly-developed decision-making framework was in place for pursuing monetary policy, financial stability was less deeply looked into.

At the end of the day, it was the global crisis that invalidated once and for all certain elements of mainstream economics. Nothing new, as a matter of fact: economic thought has always been influenced and spurred by major crises.

It became readily visible that threats to financial stability do not necessarily go away once inflation is brought down to a low level – they merely change their nature. And this has been shown at a global level by the detail that the financial crisis broke out in an economic environment with relatively low inflation rates. In other words, the price stability that set in during the Great Moderation could not prevent the start of the Great Recession.

In light of the above, it is safe to assume the crisis also shattered the illusion that the great challenges to the monetary policy decision-making framework have been overcome at least in part. Reality proved much too complicated to be managed based strictly on ideal theoretical schemes. In other words, textbook economics was no longer in tune with financial market realities. This also calls for rethinking the connections or retracing the boundaries between price stability and financial stability.

Still, I do not believe the crisis has shattered the consensus on what central banks should be pursuing – central banking has always been about the preservation of, to quote Charles Goodhart, "the three aspects of stability", namely price stability, (external) currency stability and fi-

nancial stability. Nor has the crisis brought about the sudden realisation that these aspects of stability do in fact condition each other – central bankers, maybe even more so emerging-market central bankers, have long been keenly aware that failure to ensure one kind of stability is bound to jeopardise the achievement of the others. What the crisis has indeed challenged is the widespread conviction that meeting one particular stability criterion, while necessary in order to achieve the others, is also a sufficient condition to do so – after all, maintaining price stability, while valuable in itself, has proved insufficient to ward off major financial or macroeconomic instability.

Nevertheless, it is widely accepted that price stability should remain the overriding objective of a central bank and I do not see this consensus changing in the future, at least in Europe. It is expected, however, that central banks will make more explicit their concern for all the "three aspects of stability" in their policy decisions, realising that price stability and financial stability are much more intertwined than we used to think. This development has farther-reaching consequences when it comes to the future of central banking. One can easily imagine, some years down the road, a more "normal" world in which unconventional monetary policy tools are a thing of the past, since their relevance is ultimately circumstantial, but a future where the explicit concern for financial stability and the macroprudential policy are not central banking fixtures is hardly conceivable.

I consider the agreement that central banks should be more actively involved in safeguarding financial stability as the second consensus which is presently emerging in relation to the mandate they have been entrusted with. This agreement focuses mainly on attaching greater importance to the macroprudential or systemic dimension of the regulatory and supervisory action, with the caveat that the central bank cannot act alone on this front, as the effectiveness of the promoted measures is conditional on proper cooperation with financial market supervisory

authorities and the government. At micro-level, although the convergence of opinions is not as clear, a return to the view according to which it is better to assign banking supervision to the central bank is taking shape, acknowledging the fact that the ongoing complex challenges to financial and economic stability call for identifying, using and corroborating tons of information to which only the central bank, by its very nature, has access.

In the case of Romania, the way the mission of central banks is seen today applied to a certain extent even before the crisis. Unlike other central banks, the NBR has never had the luxury of being concerned exclusively with price stability and interest rate setting in the belief that financial stability and exchange rate stability will follow. In a world with freely moving capital, the idea of being able to manage aggregate demand exclusively via interest rates would have been an illusion: the interest rate hikes required to manage aggregate demand and anchor expectations would have entailed further capital inflows and an unsustainable nominal appreciation, thus boosting foreign currency lending and creating vulnerabilities on the financial stability front.

That is why, when introducing inflation targeting in 2005, the NBR opted for the "light" version of the strategy, which meant retaining the managed float feature of the exchange rate regime. The actual form inflation targeting took in Romania thus matched the "managed-floating plus" concept introduced by Goldstein in 2002, considered the most suitable choice for an emerging-market economy involved in the global capital market, as it combines the managed float part, allowing for FX market interventions in order to smooth out excessive volatility, with an inflation targeting monetary policy strategy and an active pursuit of measures to limit the degree of currency mismatches in the economy.

Coming back to the way central banking is likely to evolve in the future, I think we should explore the challenges of adding explicit con-

cern about financial stability to the standard objective of price stability and whether monetary policy should lean against the wind sooner and possibly harder than it would normally. Even though now, with the benefit of hindsight, one could say that higher interest rates in the run-up to the crisis may have alleviated some of the issues that led to it, monetary policy should, in my opinion, be allowed to focus on price stability and deal with the objective of financial stability via dedicated macroprudential policy instruments. Doing otherwise is likely to severely complicate communication with the public, complicating expectations management and ultimately undermining monetary policy credibility and effectiveness.

It is indeed of critical importance to make sure that the tasks entrusted to the central bank are feasible. Not as clear-cut or simple as before the global crisis, but feasible. Otherwise, if the monetary authorities are overburdened with possibly conflicting goals, the major risk is to render them inefficient and unable to deliver a single one of their objectives.

Before the crisis, when talking about the policy mix, anyone would think of the coordination between monetary and fiscal policies. Afterwards, when financial instability has undermined macroeconomic stability, despite low and stable inflation, it became obvious that additional tools are needed in complementing monetary policy in countercyclical management. With macro-prudential tools emerging as the most important candidates, it makes sense to assign the objective of financial stability to the central bank, if the central bank is given control of the supervisory and regulatory instrument.

In the recent period some economists have asserted that central banks tend to fuel speculative bubbles by keeping monetary policy rates too low. This behaviour can create incentives for banks to over-leverage or reduce efforts in screening borrowers, or can lead other economic agents to seek more risks in order to yield higher returns. The effects are

likely to be worse if monetary policy is too accommodative for too long during expansions. This led to the conclusion that other instruments, which can directly affect leverage or risk taking, are required.

Because the cost of cleaning up after an asset-price bubble burst can be very high, as proved by the recent financial crisis, early interventions by the central bank might be needed when a severe bubble is identified. In this context, macroprudential instruments are the best option, without excluding *de plano* the recourse to monetary policy instruments.

Given the fact that the policy rate is an inadequate tool to deal with over-leverage, excessive risk taking, or apparent deviations of asset prices from fundamentals, there are other instruments at the policy-maker's disposal: countercyclical regulatory tools. Thus, if leverage appears excessive, regulatory capital ratios can be increased; if liquidity appears too low, regulatory liquidity ratios can be introduced and, if needed, increased; to dampen housing prices, loan-to-value ratios can be decreased; to limit stock price increases, margin requirements can be increased.

As mentioned earlier, the NBR has always had to juggle the "three aspects of stability" and that called for the deployment of alternative instruments, such as the full use of the reserve requirement ratios and recourse to administrative measures. Reserve requirement ratios were increased up to 20 and 40 percent for lei- and forex-denominated liabilities respectively, and the list of administrative measures included: enforcing a maximum loan-to-value ratio, introducing debt service ceilings relative to households' monthly disposable income, setting limits on banks' forex exposure vis-à-vis unhedged borrowers, using differentiated coefficients in stress tests (higher for exposures to EUR than lei, with even stricter coefficients for CHF- and USD-denominated credit).

Even though at the time our modus operandi was seen as deviating from the orthodoxy of central banking, macroprudential instruments are now part of the mainstream and forex interventions have re-entered the arsenal of many central banks, including some of those using a free floating regime before the crisis.

If the importance of macroprudential instruments was revealed by the global crisis and the forex interventions of central banks went back in fashion during the same period, there is a fact well known from the conventional economic wisdom, but highlighted once again by the crisis: the countercyclical stance of both monetary and fiscal policies is essential for ensuring a smooth trajectory of the economy. We all saw how unsustainable public finances and high levels of debt have impeded the effectiveness of a stability-oriented monetary policy. This was also the case of Romania, where the fiscal impulse was positive during the period of rapid growth before the financial crisis, contributing to the overheating of the economy and fuelling the imbalances accumulated in the economy. Moreover, the pro-cyclicality of the fiscal policy during the pre-crisis period exhausted the fiscal space needed to stimulate the economy in recession, leading to the need to reduce the budget deficit during the crisis (primarily due to financing constraints) and to perpetuating the pro-cyclicality of fiscal policy. As stated by Fritz Zurbrügg (2012), successful monetary policy is predicated on healthy fiscal policy, and vice versa, and to achieve stability and prosperity in the long term, fiscal and monetary policies must both focus on sustainability.

In the past, the high fiscal deficit has resulted in the fiscal dominance of monetary policy with its inevitable monetisation of the government debt, but nowadays most central banks no longer directly finance government expenditure. Today, this kind of dominance is manifested through the inability or unwillingness of fiscal authorities to control long-run expenditure/GDP ratio. The recent period has outlined a dif-

ferent form of dominance: financial dominance, defined as the inability or unwillingness of the financial sector to absorb its losses. The presence of financial dominance constrains the manoeuvre room of both fiscal and monetary policies, due to the fact that fiscal authorities and/or central banks have to bail-out the financial sector. As pointed out by Benoît Cœuré (2015), for monetary policy, the problem stems mostly from inadequate supervision, at both micro-level (if supervisors show too much forbearance to under-capitalised banks, they can end up effectively shifting the burden onto monetary policy) and at macro-level (if supervisory policies allow banks to grow too rapidly, and then deleverage too slowly, it can also push the central bank into doing more), which can turn out in the ineffectiveness of monetary policy transmission mechanism.

After more than a decade in which central bank independence was virtually uncontroversial, this attribute is now being questioned in the context of required cooperation with the government in the post-crisis world. From a historical perspective, the prevalence of central bank independence is a relatively new institutional development, seen as a solution to the problem of time inconsistency of monetary policy and the stagflation of the ’70s. Is the post-crisis reality likely to dissolve the consensus about central bank independence? After all, the danger of inflation is hardly a pressing concern nowadays (but rather the lack of it) and the pursuit of financial stability is ultimately a shared responsibility, since it implies close cooperation with the government and other authorities and may ultimately involve recourse to public funding.

As Stanley Fischer pointed out in 2010, it would be a costly mistake to give up central bank independence. That would mean “the benefits of having a central bank that can take a longer term and apolitical view of what is good for the economy and take actions in support of that view will be lost”. If a long-term perspective and a shield against political pressure are required for achieving price stability, these may be even

more important if explicit concern for financial stability is added. The need for close cooperation with the government should not be viewed as something that implies abandoning central bank independence, but rather as a pre-requisite – which has always been there – for promoting effective policies. Irrespective of how well-designed the policies of the central bank may be, they cannot substitute for a consistent macroeconomic policy mix, and in the absence of this consistency they are likely to achieve at best sub-optimal outcomes.

Having said that, there are a few questions worth asking, the answers to which are likely to play a key role in shaping the way central banking will look in the future, although what a central bank can or cannot due will remain a topic of heated debate for many years.

- **Would it be necessary to promote a certain tactical flexibility in the conduct of monetary policy, so that central banks might carry out adjustments in terms of objectives as well, not only instrument-wise?** Such an approach would diminish the predictability of monetary policy, but would allow, when need be, for financial stability considerations to prevail over the inflation objective.

- **Is the reassessment of the desirable level of inflation suitable? How low is too low?** The same as for capital inflows, we can ask ourselves in the case of price stability as well: how much of a good thing is too much?

- **Will the policy instruments which have been resorted to in the context of the global crisis become an integral part of the new conventional framework?** If macroprudential tools are here to stay, the future of non-conventional monetary policy instruments is less certain. Will the central banks keep using these instruments or will they abandon them at some point in time? As Luis Linde

(2013) pointed out, monetary policy - conventional or not - cannot solve the ultimate causes behind the loss in investors' confidence or the tensions in financial or banking markets; in fact, its main role is to provide time to adopt the necessary measures to reform and/or adjust.

– **How much room for trade-off among different goals is available?** The answers to these questions are still pending, but it is of the essence to learn as much as possible from past mistakes, and not only from the recent past. The lessons of the last 7 years, while important, should not wipe out the lessons of the last 50 years, among which, to name but three, are the following: (1) accommodating other objectives should not endanger price stability in the medium run; (2) inflation expectations cannot be ignored; (3) the independence of central banks is connected with their performance in delivering price stability.

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CLAUSURA
X SESIÓN INTERNACIONAL

JAIME GIL ALUJA
Presidente de la Real Academia de Ciencias Económicas y Financieras

CIENCIA Y REALIDADES ECONÓMICAS: RETO DEL MUNDO POST-CRISIS A LA ACTIVIDAD INVESTIGADORA

A lo largo de esta Solemne Sesión que ahora finaliza hemos podido escuchar a un grupo de científicos que desde varios continentes han confluido en esta ciudad, Barcelona, y en este espacio, la Real Academia de Ciencias Económicas y Financieras de España, con el objetivo de aunar esfuerzos en la búsqueda de un futuro mejor para la comunidad internacional.

Y lo han hecho partiendo de perspectivas científicas diferentes y desde ideologías y formaciones académicas distintas. Esta es una de las vertientes más enriquecedoras de la actividad investigadora del mundo académico, que nuestra institución cuida con especial atención.

Desde la Europa del Este hemos tenido la satisfacción de contar con el Dr. Viktor Krasnoproshin de Bielorrusia y el Dr. Iurii Kondratenko de Ucrania; desde la Europa Central con el Dr. Valeriu Ion Franc de Rumanía y el Dr. Janusz Kacprzyk de Polonia; desde el Continente Asiático con el Dr. Gorkmaz Imanov de Azerbaijan; desde la cercanía del Continente Africano con el Dr. Andre Azoulay de Marruecos y el Dr. Mohamed Laichoubi de Argelia; desde la Europa mediterránea con el

Dr. Constantin Zopounidis de Grecia y con el Dr. Alessandro Bianchi, el Dr. Carlo Morabito y el Dr. Domenico Marino de Italia.

Este prestigioso grupo de científicos ha sido acogido por los Excmos. Académicos de nuestra Real Corporación, quienes se han unido a ellos para, aunando esfuerzos, conseguir, en el mayor alto grado posible, aquellos resultados que más útiles puedan ser a quienes tienen el deber y la tarea de conducir hacia el nuevo mundo que nos espera, a las empresas, a las instituciones públicas y privadas, así como a los altos órganos de los Estados.

La tarea que nos hemos encomendado no está exenta en sí misma de dificultades, pero estas se multiplican cuando el contexto en el que se han situado los trabajos es el universo de la dura post-crisis actual.

Sin embargo, creemos que, después de cuanto acabamos de oír, los resultados son altamente esperanzadores.

Sería una audacia, no exenta de inconsciencia, pretender resumir en unos pocos minutos, la sabiduría volcada por tan ilustres académicos a lo largo de esta Solemne Sesión. Cuanto en ella se ha dicho será recogido en un volumen, que se va a poner a disposición de la Comunidad Académica Internacional.

Nos vamos a permitir, únicamente, unos breves, muy breves comentarios, cuya responsabilidad asumimos personalmente, y que no buscan otro objetivo que colaborar, muy modestamente, a entreabrir puertas para ser traspasadas por quienes, con mayor capacidad, tengan la fuerza suficiente para romper las barreras que la inercia y la rutina han levantado frente aquellos que se sienten acomodados en los éxitos del pasado.

Desearíamos destacar, a este respecto, la importancia del marco institucional, cuyo diseño es determinante para el eficaz movimiento de las fuerzas económicas de un sistema. En la sociedad actual, pero sobre

todo en la que se vislumbra en un futuro ya muy próximo, percibimos una degradación de las instituciones, sin que hayan sido relevadas por otras nuevas competentes y equilibradas.

En el ámbito que nos es propio, se observa un fenómeno altamente preocupante: existen países que realizan investigaciones que desembocan en importantes hallazgos, que, sin embargo, no transforman la ciencia creada en riqueza adecuadamente distribuida.

No es una novedad. En efecto, si para alejarnos de nuestras propias preocupaciones y tomar distancia en el espacio y en el tiempo con objeto de evitar "contaminación" no deseada, centramos nuestra atención en la Unión Soviética, resulta a todas luces evidente que difícilmente se encontrará un país que haya colocado más recursos en ciencia y tecnología que la patria soviética. Pero tampoco se hallará un país que haya sido más torpe en el diseño de los elementos necesarios para convertir esa ciencia en bienestar compartido por la ciudadanía. No hace falta recordar que la Unión Soviética ha sido la madre de grandes científicos, pero también la madrastra de millones de ciudadanos empobrecidos por el comunismo de estado.

El razonamiento expuesto es aplicable, "mutatis mutandis", a los países en donde se exhibe el capitalismo salvaje, con grandes matemáticos, físicos, economistas y otros hombres de ciencia los cuales no consiguen a través de metodologías adecuadas aproximar los procesos formales a las realidades económicas complejas.

Quizá se olvida, en uno y otro espacio, que los mejores modelos formales, sean o no matemáticos, proporcionan una coherencia muy estricta en la relación de parámetros y variables entre sí. Sin embargo, con demasiada frecuencia se olvida que unos y otros representan muchas veces a personas. Personas que sufren y lloran, progresan y ríen en función de los hallazgos científicos transformados en decisiones políticas.

Todo cuanto acabamos de señalar en esta primera reflexión no impide que estemos convencidos de que la economía, como disciplina científica, ha salido reforzada de esta crisis. Sin el arsenal de conocimientos almacenados a lo largo del pasado siglo XX hubiera sido, así lo creemos, mucho más difícil utilizar los instrumentos existentes y crear otros nuevos capaces de alumbrar una salida de la depresión. Un claro ejemplo es el acierto de Ben Bernanke, Presidente de la Reserva Federal americana y conocido estudioso de la Crisis del 29, que no nos duele reconocer como el gran piloto de la nave de la economía mundial, sorteando no pocos obstáculos aparecidos en medio de la gran tormenta financiera.

Permítasenos, en este contexto, subrayar, una vez más, el hecho de que una mayor inversión en ciencia por parte de un país con respecto a otro no comporta automáticamente una mayor prosperidad en relación al que invierte menos: las estadísticas lo confirman. Se trata, en cierto modo, de una condición necesaria, pero no suficiente. Además del volumen de inversión, resulta determinante, a la postre, la capacidad de los sistemas de investigación y empresariales de transformar adecuadamente los hallazgos surgidos de los primeros en un incremento de la rentabilidad de los segundos.

Surge, entonces, la pregunta obligada de cómo conseguir esta transformación. Difícilmente se puede aceptar que ésta surja de manera espontánea. Y es aquí cuando parece recomendable la segunda reflexión. Y, a este respecto procede, creemos, una consideración previa: es necesario un marco institucional en el que se hallen sólidamente asentados unos principios que conforman la democracia, la libertad, la igualdad y la seguridad jurídica.

Porque es cierto que un país prospera con “p” minúscula en la medida que es capaz de transformar los avances científicos en incremento de resultados económicos, pero sólo progresa con “P” mayúscula cuando además de esta transformación tiene lugar una segunda que convierte

los resultados económicos en incremento de las retribuciones a los ciudadanos y en aumento del volumen de la recaudación de impuestos que permitan mejorar los servicios sociales, la educación y la sanidad. Se trata de un círculo virtuoso que, en el pasado, ha llevado a la humanidad a ejercer un dominio sobre el planeta y que, ahora, tenemos el deber de replantear.

Conseguido este marco institucional capaz de sostener los avatares propios de una sociedad en ebullición, aparece ante nuestros ojos el concepto de innovación como fruto de la investigación básica y aplicada. Con ello, y sólo con ello, nuestros centros de docencia e investigación, así como nuestras empresas e instituciones, serán capaces de integrarse en las redes internacionales del conocimiento y del progreso económico.

Como todo el mundo sabe, la innovación comporta un proceso inversor que, en muchos casos, exige desembolsos iniciales importantes de los que se espera el posterior retorno monetario. Son necesarios, entonces, un conjunto de incentivos de índole diversa. En el ámbito laboral, cuanto mayor sea el incentivo que se ofrezca en forma de salario y reconocimiento y prestigio social mejores serán los resultados. En el aspecto macroeconómico se puede destacar, entre otras acciones la desgravación impositiva, de la que la Administración Pública sólo parece acordarse en los períodos que preceden a las elecciones.

Por parte del estamento investigador debemos asumir el reto de diseñar unos modelos de incentivación susceptibles de superar el sistema de crecimiento basado en la acumulación de los factores clásicos, trabajo y capital, que están conduciendo, todavía hoy, a una concurrencia desigual a los países emergentes. La mejor inversión se consigue a través de la fuerza multiplicadora de las ideas. En definitiva, se trata de transformar las ideas en procesos y que su utilización sea adecuada a la realidad de la vida económica.

Finalmente, no desearíamos olvidar otra importante tarea que compete a la investigación económica. Nos referimos al problema de la falta de movilidad de los talentos, ideas y recursos que frenan la innovación. Porque es la adecuada combinación de estos tres elementos en movimiento la que permite unos mejores resultados creativos.

La creatividad ha sido, a lo largo de la vida académica de este humilde investigador, objeto de estudio y divulgación a través de la elaboración de modelos de potenciación del nivel creativo. Una obra aparecida en España en el año 1994 da fe de ello, y el interés suscitado quedó patente por su publicación en español, francés, inglés, ruso, rumano…y hasta en catalán.[1]

Desearíamos acabar, en fin, con una nota de optimismo, porque la mayor parte de investigadores deseamos seguir aprendiendo cada día. Si esto se hace extensivo a todos los campos del saber, el conocimiento acabará convirtiéndose en progreso compartido.

Estamos convencidos de que todos cuantos hayan escuchado o lean estas palabras se unirán en el compromiso que hemos adquirido de llevar a buen fin esa misión de lograr un planeta más justo, más libre y más próspero para una humanidad mejor.

[1] Kaufmann, A., Gil Aluja, J. y Gil Lafuente, A. M.: "La creatividad en la gestión de las empresas". Ed. Pirámide, 1ª Ed., Madrid, 1994.

FOTOGRAFÍAS DE LA X SESIÓN INTERNACIONAL

"CIENCIA Y REALIDADES ECONÓMICAS: RETO DEL MUNDO POST-CRISIS A LA ACTIVIDAD INVESTIGADORA"

Los Académicos y público asistente al X Acto Internacional de la RACEF, guardan un respetuoso minuto de silencio en recuerdo de las víctimas del trágico atentado ocurrido en París el 13 de noviembre de 2015.

Mesa presidencial del X Acto Internacional. De izquierda a derecha: Dr. Alfredo Rocafort, Dr. Lorenzo Gascón, Dr. Jaime Gil, D. Jordi Cabré (representante de la Generalitat) y Dr. Alfonso Rodríguez.

El Excmo. Dr. André Azoulay, Académico Correspondiente para Marruecos y Consejero del Rey Mohamed VI, en conversación con el Presidente de la RACEF Dr. Jaime Gil Aluja y su esposa D.ª Ana María Lafuente.

El Dr. Janusz Kacprzyk, Académico Correspondiente para Polonia y Miembro de la Polish Academy of Sciences, en un momento de su intervención titulada *Higher education system in Europe: should we go back to basics?*.

Los Académicos Doctores Ramón Poch, Francesc Granell, Arturo Rodríguez, Enric Arderiu y Juan Llorens, junto al selecto público que asistió a la X Sesión Internacional de la RACEF, bajo el epígrafe *Ciencia y realidades económicas: reto del mundo post-crisis a la actividad investigadora*.

El Dr. Carlo Morabito, Vicerrector de la Università Mediterranea di Reggio Calabria (Italia), durante la lectura de su discurso cuyo tema fue *Innovation, Creativity, Cross-Disciplinarity, and Open Participation: How to win the challenges of post-crisis EU.*

Foto de familia de los participantes en el X Acto Internacional de la RACEF, de izquierda a derecha y de abajo a arriba: Dr. Viktor Krasnoproshin, D. Jaime Lanaspa, Dr. Jaime Gil, Dr. André Azoulay, Dr. Mohamed Laichoubi, Dr. Valeriu Ioan- Franc, Dr. Juan Llorens, Dr. Carlo Morabito, Dr. Rovshan Akbarov, Dr. Alfonso Rodríguez, Dr. Korkmaz Imanov, D.ª Mimi Laichoubi, Dr. Iurii Kondratenko, Dr. Janusz Kacprzyk, Dr. José Daniel Barquero y Dr. Alfredo Rocafort.

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