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The Economists' Quartet - A Game, not a Theory

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The Economists' Quartet
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The Economists' Quartet

A Game, not a Theory

SANDRA GRUESCU AND NIELS PETER THOMAS¹

Abstract

In this paper we introduce a new card game called *The Economists' Quartet*. Its aim is twofold: it is designed to make students interested in the life of contemporary and former economists and their most important ideas, as well as be an entertaining pastime for 'grown-up' post graduate economists.

We will describe three different versions of the game, their rules and strategies, and add some interesting parallels to life in the academic world of economists. The first version is a two-person noncooperative game, where the achievements of two economists are compared to each other. The second version is a multiple person game where the players have to collect complete quartets (i.e. set of four economists) by drawing cards from each other. Although every version has its specific advantages, we especially recommend the third version of the game which is a multiple person game with bargaining, where the players have to find corresponding pairs of two economists. This third version of the game is the most demanding one, since winning the game depends largely on knowing much about the economists, their work and ideas.

We conclude with some considerations about playing the game and an outlook to future versions of *The Economists' Quartet*. To avoid misunderstandings, we want to point out that we do not examine any specific economic question here, we just want to provide a card game about economists made by economists for economists.

1. Introduction

In their groundbreaking and unparalleled *Theory of Games and Economic Behaviour* John von Neumann and Oskar Morgenstern proceed from well-known games to create a new theory of economic behaviour.² Our approach is from the

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² See VON NEUMANN/MORGENSTERN (1953), e.g. the 'poker example' in section 19, pp.186.

opposite point of view, as we will proceed from well known theories about behaviour with the aim to create a new 'economic' game.

The idea to invent *The Economists' Quartet* was born from teaching experiences with undergraduate students of economics. We have partly used macroeconomic simulation games in our courses and have learnt that motivation and attention increases significantly, if a lecture is accompanied by any kind of interactive game.³ With this effect of students' behaviour in mind, we designed *The Economists' Quartet*. But, since we like to play games ourselves too, we are mindful that the game should meet all of the following three demands:

1. Students should be able to play the game with rudimentary knowledge of the economists involved,
2. the game should nevertheless be both entertaining and challenging for post graduate economists and
3. when post graduates play with students, there should be a high probability that the post graduates win,⁴ whereas when playing with professors, it may be wise to let them win.

These three demands lead us to formulate the game, which will be described in detail in sections 2 and 3. Section 4 will give preliminary conclusions from playing the game and some additional remarks.

The Economists' Quartet is a card game. All you need to play the game is provided in appendix C. We have achieved best results by printing appendix C on paper of 160g/m², which is about twice as thick as normal printing paper but still can be used in ordinary inkjet or laser printers. All cards are printed with the face and the back, which makes sticking necessary. We recommend cutting the cards along the thin black lines first, fold the cards in the middle, sticking them, and then cutting outside the thick grey lines to guarantee an optimal shape for the cards. If you like to have a card case to store the cards, a model can be printed out from appendix C too. We consider it self-explanatory how to put it together.

2. Card Properties

The deck of cards needed to play *The Economists' Quartet* consists of eight quartets of economists and a Joker, as you can see in appendix C. Since every quartet itself (called quartet A to H) as the name implies consists of four cards, the total number of cards including the joker is 33.

³ For similar experiences, see: KEIM (1999) and MERZ (1993).

⁴ This demand obviously cannot be concluded from the above motivation, but is added to increase our personal welfare level.

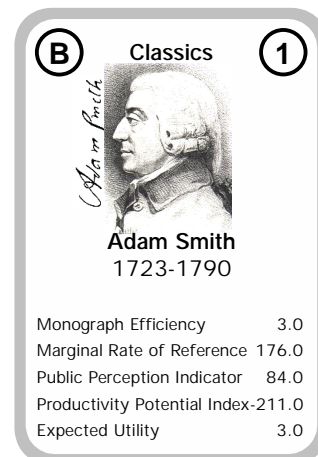
Every card represents a person of greater or lesser importance in the world of economics.⁵ The quartets group these economists according to their fields of study, period of study, or other significant attribute. These groupings can be summarised under the research fields "Game Theory", "Classics", "Critics", "Institutional Economics", "Ethical Economics", "Keynes & Co.", "Growth Theory" and "Public Choice".⁶ Some economists are qualified to fit into several fields. E.g. John C. Harsanyi was placed in the quartet of "Ethical Economics" because he has contributed some interesting new thoughts to the ethical theory of Economics. He could just as well be included in the group of "Game Theory" for which he won the Nobel prize. Being placed in a certain quartet does therefore not necessarily indicate a sole affiliation to a certain school of thought or specialisation.

As you can see in picture 1, on every card is printed a portrait of the economist and some attributes, indicating her or his economic achievements. For every attribute (from now on called indicator) a numerical value is given, indicating the economist's relative strength in the respective indicator. These indicators include attributes relating to productivity, academic importance, future potential, etc..

From a theoretical point of view, it is very difficult to assign value to indicators to measure subjective assessments, e.g. the outcome of scientific research. If such an indicator is to be used to compare the relative strength of two economists, it needs to meet two criteria: a substantially similar achievement in a certain field must result in the same amount of points (criterion of horizontal justice) and a greater achievement must result in a correspondingly greater allocation of points and vice versa (criterion of vertical justice). Five indicators which meet these criteria are introduced here:

2.1 Monograph Efficiency

The total number of monographs n_M published by an economist is an important indicator for her or his productivity. But since some economists died early or are still young, we have to take into account the number of years n_Y concerned, which is the number of years the economist has lived or is still living. Therefore,



picture 1: front side of card

⁵ Not every person included would have termed her- or himself an economist, but since each has contributed important ideas to economic theory (or will hopefully do so in future), all 33 persons will for purposes of this game be called economists.

⁶ The list does not claim to be complete. For alternative sets of quartets, see section 4.

we formulate the *Monograph Efficiency* e_M , which is the number of monographs published per year, multiplied by the constant factor 100:⁷

$$e_M = 100 \times n_M / n_Y \quad [1]$$

Monographs published by more than one person are counted $1/n_P$, with n_P being the total number of authors. We do not count works, if the economist is only the editor.

2.2 Marginal Rate of Reference

Some economists have great impact to scientific discussions even long after the original occurrence of their ideas. As a measure of the continued relevance of certain economists in contemporary discussion, we take the number of additional citations Δn_c of this economist in major journals of social science in the last unit of time Δt , which we call the *Marginal Rate of Reference* MRR:⁸

$$\text{MRR} = \Delta n_c / \Delta t, \text{ with } \Delta t = 1 \text{ week and } \Delta n_c = n_{c, t=1} - n_{c, t=0} \quad [2]$$

The marginal rate of reference is therefore an indicator of the current importance of a certain author in the economic community. We are aware of the fact that being cited and being understood is something different, but even if someone is completely misunderstood, he is at least discussed.⁹

2.3 Public Perception Indicator

Apart from being cited in scientific works, economists are perceived and recognised to a greater or lesser extent by the non-scientific public. This recognition is likely to differ substantially from the recognition by other economists, but it is as well necessary to have this kind of indicator, as it is difficult to estimate. Here we help ourselves by assuming that the public is interested in acquiring all available information, so that the demand equals the supply of information offered to the public (assumption 1).

We consider the number of internet web-pages, where a certain key-word can be found, being an adequate measure for the supply to the public of information about that key-word. Hence, we are able to take the number of internet-hits h_i

⁷ The factor 100 is taken purely to achieve a practicable range of points. Assuming a constant productivity, we could also interpret e_M as being the number of monographs, which would have been (or will be) published by this economist in a lifetime of 100 years.

⁸ For details about the sources for the cards' data see appendix C.

⁹ As Coase already observed by stating that he was "much cited but little used", COASE (1972), p.63.

(divided by 1000)¹⁰ stated by a major internet search-engine e at time t as the *Public Perception Indicator* PPI:

$$PPI = h_l(t, e) / 1000 \quad [3]$$

The key-word will be the economist's name without the middle initial as stated on the cards. We are aware of the problem, that there might be doubles (different persons with the same name), but from assumption 1 it follows logically, that the public knows that, which leads to the conclusion that even these (false) hits in the long run contribute to the public perception of that economist.

2.4 Productivity Potential Index

The first three attributes derive from past or present achievements of the economists, whereas the potential of future work is not yet considered. This future potential is to be estimated by the *Productivity Potential Index* I_P . But unfortunately we do not have any information about the intelligence, diligence and career plans of all economists, and therefore it seems appropriate – even if quite strict – to assume all these factors to be the same for all economists (assumption 2). It remains a proportional connection between the remaining lifetime and the economists' expected future output.¹¹ The estimated number of years to live $E(YTL)$ then meets all criteria for being an appropriate indicator:¹²

$$I_P = \begin{cases} E(YTL) & | YTL > 0 \\ -(2002 - Y_D) & | YTL \leq 0 \end{cases} \quad [4]$$

Dead economists get an I_P of the negative number of years they are not alive anymore (with Y_D being the year he or she died). This we interpret as a decreasing possibility of finding still unknown and important material of this economist as the time after her or his death increases.

2.5 Expected Utility

The *Expected Utility* $E(u)$ is a very subjective indicator to characterise economists. It is the sum of the important factors not yet mentioned.

First, every economist gets an utility of $u = 1$ for being an economist. But she or he deserves additional points if characterised by one of the following features:

- being a Nobel price winner,
- having a reputation as an outstanding teacher,
- having published during pregnancy,

¹⁰ Since there are hundreds of thousands internet pages where economic superstars like Adam Smith (and others) are mentioned, we divide by 1000 to achieve a more convenient range of points. This does not affect the two criterions of justice.

¹¹ You may argue that the authors of this paper have introduced this kind of index just not to have the smallest number of points in every single attribute. We do not deny.

- having a most original homepage,
- suffering from a sympathy deserving fate like heavy illness, unfair life circumstances etc.,
- being extremely good looking, or
- any other outstanding quality.

The economist can also get one point subtracted from her or his utility, if convicted of having done something undeserving of a typical economist i.e., mean, illegal, discriminating or stupid.

Since some of the correct values of each economist's utility are unknown (because some of the characteristics in the list above are not observable to us), we can just provide information of the Expected Utility $E(u)$, which we expect every economist to have. For a complete list of all Expected Utilities see appendix A.

3. The Rules of the Game

We will describe three different games, all of which can be played with the same deck of cards described in the previous section. The most suitable version to play may depend on the number of players, their knowledge about economists and the time they wish to devote to the game.

3.1 The Economists' Quartet as a two-person noncooperative game

This is a relatively simple comparison game for two players. One player (player 1) is chosen to deal. He takes the deck of all 33 cards (eight quartets and the Joker), shuffles them, and deals all cards one at a time, starting with the other player (player 2). Since all cards are to be dealt out, player 1 then has 16 cards in his hand and player 2 has 17. Neither player is allowed to change the order of their cards. They both take the first card of their hands and player 2 starts by selecting and announcing one of the five properties given. Both players then compare the scores of this property as reflected on the card and the player with the highest score wins both cards with the losing player handing his card to the winning player (in case the scores are equal, player 2 has to select another property). The cards are put behind the last card in his hand, and the winning player is then allowed to announce a property from the next card in his hand. This process is continued until one of the players runs out of cards. The other player, now with all cards is the winner.

¹² For details about the sources for the cards' data see appendix C.

This version of *The Economists' Quartet* is especially proposed for beginners to get introduced to the names and attributes of the economists. It is obvious that the more a player knows about the relative strengths of the cards, the greater chance that player has to win the game. If both players are very familiar with all the economists and their attributes, this version of the game can take quite a long time.

Apart from getting known to some well-known economists, the didactical target of this game is to demonstrate that you can be an important member of the economic community even with low scores in some of the properties described in chapter 2. Some economists publish many monographs, some have a higher public profile, others have new revolutionary ideas and others again are good teachers. Very few of them are top in all of these fields.

3.2 The Economists' Quartet as a n-person game

This version of The Economists' Quartet is known in some countries by the name "Go Fish", "Happy Families" or "Authors". It is best played by 3-5 players (number of players defined as n , with $2 < n < 6$). This time, only the first 32 cards (all cards from appendix C except for the Joker) are needed. Player 1 deals all cards beginning with his left neighbour, player 2, disregarding the fact that with $n=3$ and $n=5$ some players will have one card more than others.

The goal of this game is to collect complete quartets, e.g. all economists belonging to the "Game Theory" group. If a player already holds a quartet after the cards are dealt, he should lay it face up in front of him. Player 2 then starts. He asks another player of his choice for a card of a specific group (of which he must already have at least one card). If the selected player has one or more cards of this quartet, he has to give one of them to the asker. In this case, the asker continues with his turn by asking the same or another player for another card. If the asked player does not have a card of the specified quartet, the turn passes to the asked player.

When a player gains a complete quartet during the game, he immediately has to place it face up upon the playing surface in front of him. If a player runs out of cards by completing a quartet, the turn passes to the player left of him. The game continues until all eight quartets are found and placed on the table. The player who has accumulated the most quartets wins. If any m players ($2 \leq m \leq n$) have accumulated the same (highest) number of quartets, they will be declared winners in equal parts.

A player can increase his probability to successfully collect quartets if he notices and remembers exactly which kind of card is collected by the other players. Only by making accurate assumptions about the special fields of all n players it is possible to successfully complete the own quartets. This is quite

similar to real life in an academic research institute, where it is very helpful to know the specific interest fields of all of your colleagues. Every time you have a question on a certain topic, you will then know instantly whom to ask. But, as in the game, in the long run it is not always advantageous to finish your paper or dissertation thesis early (here: get rid of all of your cards first thus terminating your involvement in the game), but rather it is better to gain more knowledge by exchanging with others (here: collect more quartets).

3.3 *The Economists' Quartet as a n-person game with Bargaining*

The bargaining version of *The Economists' Quartet* is the ultimate discipline of this game. It is to be played by $1 < n < 7$ players using the complete deck of cards (eight quartets plus the Joker). To play this game effectively, all players need to have some knowledge about the card's economists, their lives and works.

A player is chosen to deal (player 1). She takes the cards, shuffles them and deals out 16, 11, 8, 6 or 5 cards to every player (depending on the value of n now every player has the same amount of cards) one by one. The remaining cards (if any) are not needed and will be discarded face down. No player knows which cards are discarded.

As all card players are assumed to be economists in some sense and to appreciate the importance of maximising utility, the aim of this game is stated to be the maximisation of each individual player's utility. The nominal utility to be gained by holding a specific card is printed in the last line of each card (expected utility property). But, since economists are assumed to be more productive in teams, the utility of each economist can only be added to the personal utility of a player, if that player holds a pair of corresponding economists. This corresponding pair (in analogy to the name of the game called duet) is formed through the presence of one or more corresponding factors unrelated to whether or not the two economists are classified in the same quartet. There are several reasons why two economists might form a duet, *some of them* being:

- having won the Nobel price together (in the same year),
- having written an important book or article together,
- having developed similar ideas in the same field of study,
- one having been the student of the other, or
- both of them teaching at the same university at the same time.

In appendix B, some duets of economists are introduced. The list of duets (as well as the above mentioned list of reasons) is not complete or conclusive at all. In fact, there are many more possible pairings – and players will need to know or establish many more to win the game.

At the beginning, all players will look at their cards and starting from the left of the dealer each player may place down any pair they have (face up). Whenever any player discards a pair of economists, she has to explain to the other players why this pair is a valid one. This may be seen as a kind of a bargaining process (hence the name of the game), since all players have to agree unanimously that these economists match. If there is any doubt or disagreement from any other player regarding the validity of any pair, the player who proposed a certain pair of economists has to give evidence by referring literature that supports her arguments.

Now the other players may give other reasons why these two economists are a duet and the player with the most sophisticated or most detailed reason gets the two cards and hence their points. A reason is considered more sophisticated or more detailed if more knowledge about the two economists is needed. E. g. if player 1 proposes Harsanyi and Nash to be a duet because of their joint Nobel prize, another player may take over the duet by adding that this was in the year 1994. Or if a player proposes Morgenstern and von Neumann because they are both working in the field of game theory, another player can get the points by knowing that they together wrote the book 'Theory of Games and Economic Behaviour'.

After this initial turn, player 2 (the player to the left of the dealer) may draw a card from her left neighbour (player 3). To do this, player 3 offers her cards spread face down to player 2. She will select a card from player 3's hand without seeing it and add it to her hand. If the drawn card matches any in her hand, she may place and claim a new duet as described above. In any case, it is then player 3's turn to draw a card from player 4 – and so on. The game ends either when all the cards have been paired or the players agree that the game ends because they consider it being impossible to find more valid pairs. At the end of the game each player will add up the individual utility of each card which she has managed to pair with another.¹³ The player with the highest utility wins the game.

This is the most demanding version of *The Economists' Quartet*. Winning the game needs less luck and more knowledge than any other version. This version is recognised as the ultimate one not only due to the high degree of difficulty but also due to the fact that the underlying economic model is somewhat outstanding: Within this model (i.e. the game) economists only contribute to social welfare (here: increase the total amount of utility) when they find a partner to cooperate with (here: when a player forms them to a pair). This is designed to make players aware that as in many other social sciences in Economics it usually

¹³ This rule of calculating each players utility assumes an additive composition of the utility function. Players might agree to a multiplicative one. If this affects the dominance of strategies to win the game is subject to further empirical work.

is very promising to cooperate with others to gain an increase in value by use of synergies.

4. Conclusions and Outlook

The Economists' Quartet is a dynamic game, even in the conclusions the reader or player can draw from. But it is too early to draw ultimate conclusions about the success of the game or the degree of meeting its demands, without observing the behaviour and knowledge progress of the players for a longer period.

At this point, we only can provide first indications of experiences we gained from playing the game and observing others doing so.

First, it is a an apparent contradiction that most players rightfully doubt the possibility of indicating the outcome of scientific performance on a numeric scale, but at the same time eagerly compare economists and their achievements. We interpret that as a successful spagat between an entertaining game and a mechanism of introducing serious thoughts about the measurement of scientific research.

Second, we recommend playing the game in a well-equipped library or close to a computer with internet access, especially when playing the bargaining version of *The Economists' Quartet*. This will decrease the transaction costs you may have persuading the other players about the validity of the pair you have found.

Third, according to the feedback we already got, we expect heavy opposition to our choice as to which economists have been included, to which quartet they belong and what number of points they get in the different categories (especially the *Expected Utility*). If you disagree with our choice of economists or want to make a proposal about future versions (or maybe in other words: if you want to be included in the quartet or if you think you deserve more points), we would really appreciate your input.

Please send an email to includeme@TheEconomistsQuartet.org or visit our website <http://www.TheEconomistsQuartet.org/>, where we will provide regular updates of the game which will include new quartets and stories about the cooperations of members of the exciting profession called economist. We already plan the next edition of *The Economists' Quartet* where the following economists will be added: Ken Binmore, Bruno Frey, Milton Friedman, Vilfredo Pareto, Francois Quesnay, Paul Romer, Xavier Sala-i-Martin, Joseph Schumpeter, Nancy Stokey, Beatrice Webb and many more.

Have fun with *The Economists' Quartet* and feel free to send us your opinion about it.

Appendix

A. Complete List of Economists and their Expected Utilities

As explained in section 2.5 every economist has an utility of $u = 1$ for being an economist. But she or he deserves additional points which are introduced below.

<u>Economist's name</u>	<u>Expected Utility</u>	<u>Short explanation</u>
Philippe Aghion	3	Despite his age, he has quite a good card profile. We expect him to be a rising star (worth 1 point) and he is the most handsome economist in the game (1 point).
Armen A. Alchian	1	¹⁴
Aristoteles	5	He is really a universal genius, and although longer dead now than any other economist in this game by far, people are still talking about him – look at his Public Perception Indicator. If this is not worth 4 points, what else?
Kenneth Arrow	3	Nobel laureate 1972 (1 point) and inventor of the Arrow-theorem ¹⁵ (1 point).
James McGill Buchanan	2	Nobel laureate 1986 (1 point).
Ronald H. Coase	3	Nobel laureate 1991 (1 point) and inventor of the Coase-theorem ¹⁶ (1 point).
Marquis de Condorcet	2	Probably poisoned himself after prosecution in the chaos after the French revolution (1 point). ¹⁷
Sandra Gruescu	2.5	Publishing one article while pregnant ¹⁸ (1 point), and co-inventor of <i>The Economists' Quartet</i> (0.5 point).
Alvin Harvey Hansen	1	(see Armen Alchian's explanation).
John C. Harsanyi	3	Nobel laureate 1994 (1 point), having faced most difficult life circumstances in his youth in Hungary (1 point).
Sir John Richard Hicks	2	Nobel laureate 1972 (1 point).

¹⁴ We are very sorry that we are not able to give some economists additional points, but the game does not make much sense if everybody gets them – and after all, it *is* a game.

¹⁵ See ARROW (1964), although the famous theorem was not called 'arrowian' by himself.

¹⁶ Actually, he never published what we now call the Coase-theorem, see COOTER (1998), p.457.

¹⁷ See ELSTER ET AL. (1926), p.202.

¹⁸ See DITTRICH (2001)

John Maynard Keynes	2	Probably the most influential economist since Adam Smith – well deserving a Nobel prize (1 point).
Rosa Luxemburg	3	Murdered in 1919 (1 point) and one of the most underestimated personalities (1 point).
Thomas Robert Malthus	1	Keynes would give him an additional point for his work, Marx would subtract it – we are indifferent.
Jane Marcet	4	One of the most influential writers of the 19 th century (1 point) who today is almost totally forgotten ¹⁹ (1 point). Her <i>Conversations on Political Economy</i> ²⁰ displayed an innovative approach in teaching economics (1 point).
Heinrich Karl Marx	1	Most of the people in the "East" have read him, most of the people in the "West" have not. Unfortunately we did not read him either, so we cannot add or subtract the points he may deserve (this may change in a future edition of this game).
Oskar Morgenstern	1.5	Co-inventor of the Neumann-Morgenstern utility function ²¹ (0.5 points).
Dennis C. Mueller	1	(see Armen Alchian's explanation).
John F. Nash, Jr.	5	Nobel laureate 1994 (1 point), first economist to be protagonist of a Hollywood movie ²² (1 point), genius (1 point), inventor of the Nash-equilibrium ²³ (1 point).
John von Neumann	1	Important interdisciplinary scientist (economics, mathematics, physics and computer science, +1 point), but participated in the development of the atomic bomb ²⁴ (-1 point).
Douglass C. North	2	Nobel laureate 1993 (1 point).
David Ricardo	2	developed influential economic ideas without having had a conventional schooling (0.5

¹⁹ See CANNAN (1998), pp. 309.

²⁰ See MARCET (1824).

²¹ See VON NEUMANN/MORGENSTERN (1953).

²² The film 'A beautiful mind' with Russell Crowe as John Nash got eight academy award nominations, see <http://www.abeautifulmind.com> for details.

²³ See NASH (1950)

²⁴ See MACRAE (1992).

	points) ²⁵ and is "co-inventor" of the Ricardo-Hayek effect ²⁶ (0,5 points).
Joan Violet Robinson	4.5 gave birth to two daughters while working as an economist (1 point), deserved the Nobel prize (1 point), made as a "many-ideas-person" fundamental contributions to so many different economic problems (1 point) and is co-inventor of the Robinson-Amoroso-relation (0.5 points).
Paul A. Samuelson	4.5 Nobel laureate 1970 (1 point), author of the most successful principles textbook ever ²⁷ (1 point), co-inventor of the Samuelson-Bergson welfare-function ²⁸ (0.5 points) and well, he's the Joker (1 point)!
Reinhard Selten	2 Nobel laureate 1994 (1 point).
Amartya K. Sen	2 Nobel laureate 1998 (1 point).
Herbert A. Simon	3 Nobel laureate 1978 (1 point) and has an unparalleled bibliography ²⁹ with almost 1000 (!) books and articles (1 point).
Adam Smith	3 More or less all economists' "daddy" (worth 2 points).
Robert M. Solow	2 Nobel laureate 1987 (1 point).
Piero Sraffa	2 Since the pages written about Sraffa exceed the pages written by Sraffa by a multiple, he obviously must be important (1 point).
Niels Peter Thomas	2.5 Co-inventor of <i>The Economists' Quartet</i> (0.5 point) and creative and entertaining teacher using (not only) decision games in his lectures (1 point).
Peter Ulrich	1 (see Armen Alchian's explanation).
Thorstein Bunde Veblen	3 for being an outsider in the economists' scene (1 point) and being the inventor of the Veblen effect ³⁰ (1 point).

²⁵ We just give 0.5 points here because he nevertheless had private teachers. See DE VIVO (1998).

²⁶ See HAYEK (1942).

²⁷ See SAMUELSON (1948).

²⁸ See BERGSON (1938) and SAMUELSON (1947), chapter 8.

²⁹ See <http://www.psy.cmu.edu/psy/faculty/hsimon/HSBib-2000.html>

³⁰ Described – but not called 'Veblen-Effect' – in VEBLEN (1899).

B. Proposal For Some Duets

Selten, Nash and Harsanyi: any two of them form a valid pair because in the year 1994 they won the Nobel prize "for their pioneering analysis of equilibria in the theory of non-cooperative games".³¹

Morgenstern and von Neumann in 1944 wrote the book "Theory of Games and Economic Behaviour"³² where the foundations for using game theory in economics were introduced. Together they can be called the inventors of Game Theory.

Arrow and Condorcet: In the first edition of his "Social Choice and Individual Values", Arrow regards the "paradox of voting" (an essential part of his considerations) being first mentioned by E. J. Nanson in 1882. In the second edition he rightfully admits that the paradox was already known by Condorcet in 1785.³³

Gruescu and Thomas are the inventors of *The Economists' Quartet* and therefore form a valid pair.³⁴

Marcet and Ricardo were close acquaintances. Marcet's "Conversations on Political Economy" were published one year before Ricardo's "The Principles of Political Economy and Taxation", but already contained a lot of new thoughts, which later Ricardo became famous for.³⁵ We do not accuse Ricardo for plagiarizing her book, but the new thought may have been developed together in their numerous conversations.

Smith and Ricardo: David Ricardo is often called a disciple of Adam Smith. We doubt this in detail, but at least both of them made important contributions to what is known nowadays as classical economic theory.

Sraffa and Ricardo: Pierro Sraffa (together with M. H. Dobb) is co-editor of the works of David Ricardo.³⁶

Marx and Luxemburg: In a few words: they were both socialists.

Luxemburg and Robinson: In some points they would agree to each other, in others they would not. But at least both of them wrote a book called "The Accumulation of Capital".³⁷

Keynes and Robinson: Joan Robinson propagated Keynes' theory and was a very important contributor to the Post Keynesian school.

³¹ See <http://www.nobel.se/economics/laureates/1994/index.html>.

³² See VON NEUMANN/MORGENSTERN (1953).

³³ See Arrow (1964), p. 3 and p. 93.

³⁴ This is only true in the game: In real life, Sandra forms a pair with Radu and Niels with Barbara.

³⁵ See MARCET (1824) (first edition 1816) and RICARDO (1817).

³⁶ See SRAFFA/DOBB (1951).

³⁷ See LUXEMBURG (1913) and ROBINSON (1956).

Veblen and North: Among the New Institutionalists, maybe North kept closest to the spirit of Veblen, one of the founders of the "Old Institutionalism".

Hicks and Hansen can be considered as the fathers of the IS-LM model. Hicks first introduced the basic idea in his article "Mr Keynes and the Classics: A suggested interpretation"³⁸, which was later popularized by Hansen.

Sen and Robinson: Sen was a student of Robinson in Cambridge.

Samuelson is not the Joker by chance. With his outstanding contributions to economic theory in so many different fields we consider him being able to form a pair with every other economist. But as said in section 3.3, you have to make up your mind and find many more pairs to win the game.

C. The Deck of Cards

As the deck of cards will be updated regularly, and for best results is to be printed on different paper (see section 1 for details), please download it from the file: <http://www.theeconomistsquartet.org/cards.a.2001.pdf>

The following data was used as the basis for this version of the cards: For calculating the *Marginal Rate of Reference* we took the Social Science Citation Index, which is provided by the Institute for Scientific Information, Pennsylvania (<http://www.isinet.com>). The marginal unit of time for this version is the last week of November 2001 (19. to 25. of November 2001). Basis for the *Public Perception Indicator* is the number of internet hits provided by the search engine <http://www.google.com> on November 25th, 2001. The *Potential Productivity* of the economists was calculated with the estimated remaining lifetime of german people (provided by the Federal Statistical Office of Germany)³⁹, assuming that it will not differ substantially from other industrial countries.

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³⁸ See HICKS (1937).

³⁹ See FEDERAL STATISTICAL OFFICE (2000), p. 74.

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