

# *Complex economic systems: using collective intentionality analysis to explain individual identity in networks<sup>1</sup>*

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## **Abstract**

One approach to the analysis of economies as complex systems investigates interaction between individuals in local networks or neighborhoods that are subsets of larger economies. Rejecting the traditional microfoundations view of the relation between individual and aggregate economic behavior, network approaches explain individual and aggregate behavior as mutually influencing. This paper investigates the network conception of the interactive individual as employed in Alan Kirman's (2001) analysis of loyalty relationships between buyers and sellers in the Marseille fish market using the identity test framework I previously applied to the standard atomistic conception of the individual (Davis 2003c). To do so, the paper interprets the interactive individual in terms of collective intentionality analysis and joint commitments, as understood by Margaret Gilbert. It then, first, gives an explanation of how buyers and sellers can form joint commitments and yet still remain distinct individuals, and, second, argues that over time individuals thus understood can also be re-identified as distinct individuals. The paper thus presents the network framework as offering a viable account of individuals understood in terms of social relationships that emerge out of joint commitments.

**Keywords:** complex economic systems, local networks, interactive individual conception, Marseille fish market, loyalty, identity tests, collective intentionality, joint commitments

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Previously I examined the standard preference-based conception of the atomistic individual in neoclassical economics (Davis, 2003c), and argued that this conception fails two basic identity tests that are reasonable to require of any viable conception of the individual as an independent economic agent. From a different perspective, namely, the 1970s Sonnenschein-Mantel-Debreu (SMD) results, it has been shown that the neoclassical conception of the atomistic individual is problematic in that it cannot support the standard microfoundations explanation of aggregate economic behavior in markets, such as is employed in comparative static analysis (Kirman, 1989; Rizvi, 1994). One consequence of the latter development has been a number of efforts to re-conceptualize individual economic agents as actively interacting with one another, rather than as simply responding indirectly and passively to one another through the mechanism of the price system. One new research programme which does this investigates economies as complex adaptive systems in which aggregate and individual economic behavior are mutually influencing, unlike in Walrasian, methodological individualist models which rather sum across independent individuals as a means of explaining aggregate market behavior as fully a product of individual behavior. At the same time, in contrast to most game theory models in which interaction tends to be pervasive in the sense that players need to know each other's (likely) strategies, this research programme understands individual interaction to be limited in scope in that individuals only interact with select sets of individuals, or individuals interact in local networks or neighborhoods that are subsets of larger economies. In the limit, this more narrow sort of interaction might be pairwise, as in Alan Kirman's analysis of loyalty relationships between individual buyers and sellers in the Marseille fish market, which shows how a market can exhibit simple aggregate properties (such as down-sloping demand) without individuals also exhibiting the same type of behavior (Kirman, 2001).

One challenge that this research programme faces is whether it can to develop an explanation of individual behavior underlying individual interaction and the observed aggregate properties of markets. Indeed, if the standard neoclassical conception of the independent

individual no longer applies, and if aggregate properties of markets can be explained in terms of individual interaction, then can it still be said that individuals are distinct economic agents, or should we conclude that groups of individuals in networks are the relevant economic agents? Of course not only has economics historically made explanation of individual behavior central, but one also seems to presuppose that individuals are distinct economic agents when one asserts that individuals interact. So this question might be better re-phrased to ask whether the particular conception of the individual interacting with other individuals in networks can still be said to satisfy basic identity tests that may be reasonably required of any conception of the individual as a distinct economic agents. The two tests that I have previously applied to the neoclassical conception are (i) the individuation test (whether individuals in a given conception can be shown to be distinct and independent of one another) and (ii) the re-identification test (whether individuals shown to be distinct when identified in some way can be re-identified in that same way across a process of change that may alter many of their other characteristics). These two tests are meant to capture how individual economic agents can be said to have the equivalent in economic analysis of what philosophers refer to as personal identity, though I emphasize only a ‘personal identity’ with respect to economic life and not life as a whole. Personal identity concepts, it should be added, are different than social identity concepts. The latter generally concern how individuals identify themselves with others in social groups or simply with social groups. Thus, while individuals in loyalty relationships may be said to identify with those to whom they are loyal, the question I rather attempt to address here is whether in identifying with others they nonetheless still sustain personal identities as distinct individuals. The motivation for this question is a general concern with establishing the types of agents appropriate to economic analysis. Thus I proceed by asking a skeptical question: were there not a way to understand how individuals retain a status as distinct agents, might it not be better for economics to regard groups as economic agents, and give up its long-standing attention to individuals?

In this paper I apply both the individuation and re-identification tests to the conception of the individual implicit in Kirman's account of the Marseille fish market taken as representative of network analysis, and then argue that, in contrast to the standard atomistic conception of the individual in neoclassical economics, the network conception can be understood to employ a viable conception of distinct, re-identifiable individuals. Thus I answer my skeptical question in favor of economics maintaining attention to individuals, though not on the traditional, methodological individualist view of individuals. I take this to be important both for thinking about individuals in economics, and for understanding networks as economic systems in which individual and aggregate behavior is mutually influencing, where this means employing a more complex account of economic agency than is currently available in either individualist or holist frameworks. That is, whereas traditional individualist frameworks too often assume that only individuals are agents and holist frameworks too often assume that only groups of individuals are agents, in the network conception both individuals and groups of individuals exercise agency, and moreover do so in a mutually influencing manner. This richer view of agency, it is hoped, will offer points of tangency with parallel reasoning in contemporary economic sociology.

The first section of the paper sets out a rationale for identity analysis of individuals in terms of an analogous relation between personal identity arguments in philosophy and the fixed-point approach to equilibrium existence proofs in economics. Here I attempt to set forth a view of personal identity appropriate to economic analysis that perhaps departs in one key respect from thinking about personal identity investigated by many philosophers. The second section of the paper turns to Kirman's Marseille fish market analysis as a paradigm example of the network conception to describe individual behavior in terms of loyalty relationships that develop between individual buyers and sellers. An important issue his approach raises is, how are we to understand the behavior associated with the reinforcement mechanism he employs to explain loyalty in his simulation analysis? The third section applies Margaret Gilbert's philosophical account of loyalty behavior between pairs of individuals developed in terms of the idea of

collective or shared intentions rather than individual intentions. Central to this account is that shared intentions depend on individuals forming joint commitments to one another that may conflict with their individual goals. The fourth section applies this collective intentionality analysis to the network conception of individuals to explain interactive individual behavior. This section argues that both the individuation and re-identification tests necessary to an identity analysis demonstration that such individuals exist can be said to be satisfied. The fifth and last section briefly concludes by returning to the analogy between personal identity arguments in philosophy and equilibrium existence proofs in economics and the position taken in the paper that establishing the existence of individuals and existence of equilibrium are conjoint projects.

## **1        Parallels between Fixed point theorems and personal identity analysis<sup>2</sup>**

Fixed point theorems constitute the primary method employed in economics for establishing the existence of solutions to equilibrium systems of equations or inequalities (Giocoli, 2003).

Brouwer-Kakutani-type fixed point theorems have been used to demonstrate the existence of a set of equilibrium prices for a Walrasian competitive economy and the existence of an equilibrium point of  $n$ -tuple strategies in a many-person non-cooperative game.<sup>3</sup> A fixed point theorem is a mathematical proposition which states that a mapping  $f$  that transforms each point  $x$  of a set  $X$  to a point  $f(x)$  within  $X$  has a fixed point  $x^*$  that is transformed to itself, so that  $f(x^*) = x^*$ . Thus a fixed point theorem demonstrates the existence of some system of relationships by anchoring that system in one self-identical relationship within that system. This bears important resemblances to the logic employed in much philosophical personal identity analysis to establish the existence of a person in terms of one unchanged or self-identical characteristic amidst change in other characteristics of the person. The mapping  $f$  that transforms each point  $x$  of a set  $X$  to a point  $f(x)$  within  $X$  can be understood as some process of change in the person understood in terms of a set

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<sup>2</sup> This argument is also advanced in Davis (2003b).

<sup>3</sup> Also see Leonard (1992) for John von Neumann's original application of fixed point methods to games.

of that person's characteristics  $X$ . The fixed point  $x^*$  that is transformed to itself, so that  $f(x^*) = x^*$ , can be understood as that unchanging or self-identical characteristic of the person that allows us to say that the person exists despite change in other characteristics. From this perspective, philosophical personal identity analysis that focuses on personal continuity by re-identifying the individual in some way is a form of existence analysis, and philosophical theories that aim to demonstrate personal identity could be said aim to demonstrate the existence of the person much as fixed point theorems aim to demonstrate the existence of an equilibrium set of prices or n-tuple strategies. This suggests two conclusions, the first pertaining to economics and the second to philosophy.

First, if we are to say, based on the application of fixed point theorems, that an economy exists when represented as a system of equations, then extending that same fixed point logic to the personal identity of economic agents requires that we also demonstrate that the agents in that economy exist when represented in terms of collections of characteristics. That is, contrary to standard thinking in economics, economic equilibrium depends not just upon demonstrating the existence of a set of equilibrium prices or an equilibrium point of n-tuple strategies, but also on demonstrating the existence of market agents themselves. Note, then, that on the standard neoclassical conception of the individual, while non-identity preserving change occurs in one set of individual characteristics as individual pre-trade endowments are transformed into post-trade commodities the individual holds, the individual's preferences – which are normally taken as unchanging – can be construed as that particular characteristic of the individual which acts as a self-identical fixed point assuring the individual's existence. While I have argued that this implicit account of personal identity is not successful, nonetheless it may be construed as offering such an account (Davis, 2003c, chap. 3), thus creating the parallel between existence proofs and identity arguments in economics.

Second, the comparison between fixed point theorems and personal identity analysis offers an important insight into how we might think about the latter in economics. To say that a

fixed point  $x^*$  is transformed to itself, or that  $f(x^*) = x^*$ , is to characterize  $x^*$  in self-identical, reflexive terms. That is, in all transformations,  $x^*$  always reproduces itself and only itself. Thus a personal identity analysis understood specifically in fixed point terms would explain the existence of the person or individual in terms of one specific type of characteristic, namely, one exhibiting reflexivity. Put somewhat differently, what would be unchanging about individual economic agents amidst change in their other characteristics is a characteristic of individuals that exhibits their self-reference. Much existing personal identity analysis in philosophy, however, ignores reflexivity and self-reference, and simply focuses on various individual characteristics that might be thought to be unchanging, for example, such as that a person might always have psychological continuity. Applying fixed point thinking to the identity of individual economic agents, however, leads us to rather interpret unchangingness specifically in reflexive terms. Thus, to make use of this different perspective, I apply it in the conclusion to section four in which collective intentionality analysis is applied to the Kirman's network conception of the individual.

## **2 Complex Economic Networks: Kirman's Marseille Fish Market Analysis**

Complexity in economics can be defined in the broadest sense in terms of economic systems in which endogenous processes do not lead asymptotically to fixed points, limit cycles, or explosions (Day, 1994). A narrower view of economics complexity may be set forth in terms of the following (Arthur, Durlauf, and Lane, 1997; cf. Rosser, 2004): (1) dispersed interaction among heterogeneous agents acting locally; (2) no global controller able to exploit all opportunities or interactions in the economy; (3) cross-cutting hierarchical organization with tangled interactions; (4) continual adaptation by learning and evolving agents; (5) perpetual novelty with new markets, technologies, behaviors, institutions that create new niches in the ecology of economic systems; (6) out-of-equilibrium dynamics with zero or many equilibria and the system unlikely to be near a global optimum. Economic networks, finally, are one type of complex economic system based on this narrower type of view.

Economic networks have been investigated by both economists and economic sociologists (cf. Rauch and Casella, 2001), and though they understand networks in different ways, broadly speaking economic networks, or the “network form of organization,” may be defined as “any collection of actors ( $N \geq 2$ ) that pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange” (Podolny and Page, 1998, p. 59). Economic networks may also be classified in various ways, such as whether they involve concentrated or patterned forms of exchange (Zuckerman, 2003, p. 551). Generally, however, networks are seen as a departure from atomistic trading relationships in that individuals show a preference for trading with certain other individuals rather than engaging in arm’s length type of trade characteristic of competitive markets. From a price theory point of view, this difference is significant in that it generates distinct patterns of trade, prices, and other economic variables different from what is holds for competitive markets.

I treat Kirman’s Marseille fish market analysis as a paradigm example of the economic network, concentrated exchange conception, because of its focus on minimal interaction in the form of pairwise combinations of individual buyers and sellers.<sup>4</sup> The analysis is also valuable in virtue of its empirical foundation in extensive evidence regarding buyer-seller interactions over a period of time.<sup>5</sup> In addition, the fish market case represents an especially simple market type in that with a perishable product there are essentially no stocks to carry over from one day to the next, so that the basic mechanics of the market and their results can be isolated and effectively frozen at a point in time.<sup>6</sup> Finally, the market application itself is particularly important as a

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<sup>4</sup> Alban Bouvier comments that one might focus on ‘local exchange systems’ in which certain communities play a central role in loyal trade relationships. For example, in Marseille and elsewhere the Mourid community (Muslim Senegalese) play such a role. One advantage of this approach is that it places individuals in an historical community, and thus deepens the analysis of their motives. My discussion, however, is restricted to the case of individuals not apparently attached to such communities.

<sup>5</sup> The data run from January 1, 1988 to June 30, 1991, and include a total of 237,162 transactions between buyers and sellers.

<sup>6</sup> This additionally allows changes in supply to be considered the outcome of a stochastic process.



framework in which to examine the network conception of interactive individuals since clearly individuals in markets are relatively autonomous, whereas it can be argued that individuals in social groups such as firms and households are submerged in an interaction with one another that makes the group the relevant agent. Thus the market setting arguably provides an ideal framework for assessing whether network interaction offers a new way of understanding individuals that is alternative to the standard atomistic conception.

What, then, are Kirman's main results? First, the evidence marshalled from the Marseille market is inconsistent with the idea that the "behavior one observes in the aggregate in such markets corresponds to some enlarged version of the behavior of the individual in the classical competitive market" (Kirman, 2001, p. 159).<sup>7</sup> Second, while down-sloping demand curves obtain for individual kinds of fish at the aggregate level, these markets are organized in a such way that considerable price dispersion precludes their being regarded as 'single price' type competitive markets (Härdle and Kirman, 1995). This distribution in prices can be explained by a process in which individual traders strike bargains among themselves that permit sellers to discriminate between buyers, with successive prices being charged for the same kind of fish to different buyers differing by as much as 30 percent (Kirman and Vignes, 1991). Does the market, thus understood, exhibit equilibrium characteristics? Since tests for the stability of the resulting price distribution turn out to exhibit a high degree of constancy over time (Härdle and Kirman, 1995), it seems fair to say that the market does achieve some sort of equilibrium, if not one that is characterizable in classical competitive terms.

How, then, does the market actually get organized? What was observed in the pattern of trading relationships in the Marseille market is that "On the one hand, there are buyers who regularly buy from the same seller and are extremely loyal, and on the other hand, there are people who shift between sellers all the time" (Kirman, 201, p. 177). Since individuals who participate in such trading relationships appear not to behave as optimizing agents, at least in the

standard way, Kirman proposes that we say individuals use simple rules to make their choices, and that trading relationships then emerge from a random matching process that operates between buyers and sellers who are aware of each others' identities. This situation was subsequently modeled in such a way as to simulate buyers developing relationships with sellers on the basis of previous experience, where their probability of re-visiting sellers depends on profit received from past visits (Kirman and Vriend, 2000; Weisbuch, Kirman, and Herreiner, 2000). The framework employed involves a type of learning process known as reinforcement learning commonly used by psychologists and evolutionary and experimental economists.<sup>8</sup> Basically what the modeling shows is that the stronger the reinforcement mechanism or parameter, all other things equal, the more likely it is that buyer-seller loyalty relationships will emerge.

One interesting aspect of buyer-seller loyalty relationships Kirman emphasizes is that the behavior of the class of buyers is highly bimodal: they either remain quite loyal to particular sellers or they continually visit many sellers.<sup>9</sup> It also turns out that 90 percent of both buyers and sellers get a higher profit when dealing with their loyal counterparts. This is interesting in that loyal buyers pay higher prices than those that visit many sellers. But loyal buyers still earn higher profits, because sellers learn to give them priority in service.<sup>10</sup> As loyal sellers earn higher profit, then, the market does not function as a zero sum game. As the volume of transactions that goes through loyalty networks increases, the returns to the participants increases. We might take this to reflect the idea that the relation between the individual level and the market level is complex, where in contrast to the standard Walrasian strategy of aggregating across independent individuals, the way in which the market is organized mediates and complicates this relationship. The modeling strategy described above provides one view of this complexity in its reliance on learning and reinforcement as dynamic, endogenous processes that generate loyalty matching. In

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<sup>7</sup> This had been theoretically demonstrated in the SMD results (Kirman, 1989).

<sup>8</sup> See Kirman (2001, pp. 178-9) for references).

<sup>9</sup> E.g., 48 percent of all buyers bought 95 percent of their cod from one seller.

<sup>10</sup> Buyers earn profits on re-sale.

the following section, I attempt to go behind this reinforcement mechanism analysis to explain how buyer-seller loyalty relationships might be understood in terms of individuals forming shared intentions regarding loyal trade.

### **3 Collective intentionality analysis and complex individual behavior**

Collective intentionality analysis examines first person plural intentions (that the individual expresses in ‘we’ language) as opposed to the more traditionally investigated first person singular intentions (that the individual expresses in ‘I’ language). What sets the former apart from the latter is their stronger success conditions. While individuals can express first person singular intentions in a relatively autonomous manner, being constrained mostly by the need to only communicate effectively, an individual’s first person plural intentions implicate others to whom the ‘we’ applies, and are thus additionally constrained by the requirement that these other individuals in some manner agree to the content of the individual’s we-intention. Thus, following the widely accepted analysis of conventions (Lewis, 1969), we-intentions have been explained by some contributors as iterated sets of reciprocal attitudes between individuals who are said to share a given we-intention (Tuomela, 1995). When an individual expresses a we-intention she generally believes that those other individuals to whom her expressed ‘we’ assertion applies would largely agree with her assertion. But she also believes that they believe she believes this, that they believe she believes that they believe this, etc., so that the reciprocal attitudes in question across the individuals concerned constitute an iterative, many-layered set of reciprocal attitudes, such as are employed in game theory’s common knowledge assumption.<sup>11</sup>

It is important to emphasize that collective intentionality analysis is ‘individualistic’ in the sense that individuals have we-intentions rather than groups of individuals, so that any reference to a ‘group intention’ is merely a shorthand way of referring to a structure of reciprocal

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<sup>11</sup> I put aside non-typical cases of deceitful use of ‘we’ language and expression of we-intentions. I also ignore whether this formulation produces infinite regress problems.

attitudes across separate individuals who happen to share and agree to some we-intention. Strictly speaking, only individuals have intentions. Different individuals, of course, can express the same we-intention, but in each instance that shared intention is decomposable into a set of reciprocal individual intentions. Note, then, that while the scope of I-intentions is basically the independent individual, that is, the single individual's own plans, even if they apply to others, the scope of we-intentions is those plans that the individual shares with other individuals. We might accordingly say that whereas an older holistic type of reasoning tends to explain individuals as social beings by *subsuming individuals in social relationships*, collective intentionality analysis rather explains *individuals as social beings by subsuming social relationships in individuals*.

A fair question is how does the treatment of individuals in collective intentionality analysis differ from their treatment in traditional economics thinking about individuals. Thus on some especially strong methodological individualist interpretations of the latter individuals alone really exist and social groups are regarded as constructions or mere concepts.<sup>12</sup> But other views of the individual in economics either allow that non-individual, group-type agents exist – such as firms, unions, households, governments whose behavior does not need to be decomposed into or reduced to the behavior of their members – or are agnostic about whether individuals alone exist. Similarly, contributors to collective intentionality analysis vary in their views from supposing only individuals exist to allowing that social groups exist as well. In this paper I seek to put these ontological issues aside in order to provide an account of the individual alternative to the standard one in economics that sees individuals as always concerned strictly with their own welfare. The paper consequently asks whether network analysis may be interpreted to include a conception of individuals as distinct and re-identifiable, irrespective of whether pairs of individuals in loyalty relations *also* constitute supra-individual agents. My own view happens to be that both groups of individuals and single individuals can be economic agents, but I do not pursue this matter here.

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<sup>12</sup> “Society, after all, is just a convenient label for the totality of individuals” (Arrow, 1984, p. 80).

Of the recent contributors to collective intentionality analysis, in this paper I draw on Gilbert who has focused on pairwise shared intentions as one paradigm case (Gilbert, 1989, 1996).<sup>13</sup> One of Gilbert's favorite examples is of two individuals going for a walk together. On the one hand, it is odd to treat only two individuals as akin to a group. Indeed there are important differences between pairs of individuals forming shared intentions and the way that shared intentions are formed in groups of many individuals. But on the other hand, the two-individual case clearly exhibits how individuals can share non-personal intentions – a matter central to their importance. Moreover, the small-scale, informal nature of the case can be compared to the scale of interaction involved in the matching process Kirman uses to model buyers and sellers in the fish market. Whereas social interaction is often explained by sociologists and others in connection with enduring social groups possessing complex forms of organization understood in terms of institutions and norms, in this instance we have social interaction that may be seen as elementary and informal in nature. Might two individuals, then, find themselves on a walk together by accident, that is, unintentionally? Gilbert thinks not, and explains the case of two individuals taking a walk together by saying that a necessary and sufficient condition for it to be a walk they take together is that it be common knowledge between them that they each intend to take a walk together, where this common knowledge concerns a shared goal, and where their having this shared goal entitles us to regard the two separate individuals as a “plural subject” (Gilbert, 1996, p. 179). This plural subject is nonetheless still made up out of two distinct individuals who are linked together only with respect to whatever particular shared we-intentions they happen to have.

It is important to emphasize that Gilbert supposes that two people may constitute a plural subject with a shared goal *without* each individual also having that goal as a personal goal.<sup>14</sup> That

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<sup>13</sup> For a collective intentionality bibliography, see <http://www.helsinki.fi/%7Epylikosk/collint/>. For a different application of collective intentionality analysis, see Davis (2003a).

<sup>14</sup> E.g., “we may, as a body, accept the goal of improving our department's status in the university, without each of us having the improvement of our department's status as a personal goal” (Gilbert, 1996, p. 2).

is, an individual may be attached to a shared goal that is not necessarily in the individual's own goal or interest. What this possible tension between individual and shared goals brings out is that individual involvement in a plural subject and shared goals is founded on the formation of a joint commitment. In other words, when two individuals' personal goals may be at odds with their shared goals, each must be committed – jointly committed – to sustaining the latter vis-à-vis the former. Commitment thus understood is a normative concept in that it includes an idea of obligation, though as commitments themselves vary in character, so joint commitments can vary in character from the moral to the pragmatic. Thus in some cases having a joint commitment can imply that individuals have moral rights and obligations stemming from their shared goals, while in other cases having a joint commitment can simply be based on prudential or pragmatic considerations without any moral connotation. Ordinary experience, of course, is often ambiguous in this respect, and indeed so much so that individuals with shared commitments may disagree as to whether their basis is moral or prudential. Similarly, apart from the question of their basis, the degree of bindingness individuals perceive to attach to shared commitments can also vary. But in any event Gilbert seems to be right in saying that shared goals involve commitment and some form of obligation. I take this difference between shared goals and personal goals to be especially important for thinking about behavior in economics, because it shows us how individual behavior in circumstances of shared intentionality has a non-instrumental or, we might say, deontological character in contrast to standard treatment of individual behavior in economics where individuals are seen to act exclusively in instrumental terms.

Suppose, then, that individual behavior in economic life is understood both instrumentally, or in terms of individual goals, and deontologically, or in terms of individuals' shared goals, and that the balance between these two types of behavior is seen to be determined empirically in terms of the extent of each of these types of goals and behavior in the sum total of individual activities. One way this might be captured is by determining the extent to which I-

intentions and we-intentions are expressed in normal speech in different spheres of activity. This would then be a way of treating individual behavior as complex in not being subject to a single type of explanation, but rather as alternately employing incommensurable sorts of decision-making procedures according to relevant circumstances. In terms of trading relationships involving concentrated exchange as in the Marseille fish market, individual behavior, then, might be characterized as complex in that individuals act instrumentally in circumstances in which they move from seller to seller, but deontologically when loyalty dictates repeated transactions with particular sellers. The learning-reinforcement analysis which Kirman employs to explain these loyalty relationships could then be said to constitute a summary or external representation of the effects of individual decision-making to then be further explained in terms of whether individuals adopt shared goals and express shared we-intentions regarding continuing transactions.<sup>15</sup>

Note that Kirman explains complexity somewhat differently than this when he says that the relationship between individuals and markets is complex in virtue of the way in which the latter's organization mediates and complicates the way individuals relate to one another to produce the outcomes that explain the aggregate level of the market. The view of complex behavior above, however, is actually quite similar to what is suggested in the previous paragraph. Joint commitments, of course, are a form of aggregative behavior. So just as for Kirman market behavior complicates and mediates individual behavior, joint commitment behavior as deontologically rational complicates and mediates instrumentally rational individual behavior. Collective intentionality analysis, however, brings an emphasis to this understanding of complexity that it seems should not be overlooked, namely, its individualist character. Whereas the juxtaposing of individuals and aggregative relationships that markets reflect suggests a juxtaposing of individualist and holist ontologies, collective intentionality analysis, as noted above, puts the social into the individual via the way in which we-intentions operate. It is

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<sup>15</sup> Also note that in contrast to Kirman's analysis which sets out to explain how simple rules generate a learning process which matches certain buyers and sellers, the argument here puts this dynamic emphasis

consequently fully individualist in nature – so ontologically more simple – while at the same sufficient to explain complexity for individuals in social settings. But this leaves the question of whether the conception of the individual in network theory is itself viable in terms of satisfying basic identity requirements appropriate to thinking about individuals. I turn to this issue in the following section.

#### **4 Individuation and re-identification of interactive individuals**

First, then, supposing that individuals who develop loyalties to one another in networks and concentrated exchange form joint commitments understood in collective intentionality terms, can those individuals still be seen to be distinct and independent from one another – thus satisfying the individuation test? Applying the individuation test to the conception of individuals in networks now understood in the collective intentionality terms is a matter of asking whether such individuals using ‘we’ language somehow distinguish themselves from one another in the process of doing so. I have argued more generally that ‘socially embedded individuals’ can be understood to distinguish themselves as independent individuals if one attends to the way in which they interact with others in the process of using ‘we’ language, and I essentially summarize that argument here (Davis, 2003c, ch. 7). When individuals form joint commitments, and use ‘we’ language in doing so, they bind themselves to whatever they believe others take to be implied by the use of that language. At the same time, it should be emphasized, they bind themselves to such implications voluntarily, since their use of that language is intentional, and one cannot say that something that is intentional is involuntary. This combination of bindingness and voluntariness, then, might be said to involve individuals ‘self-imposing’ upon themselves whatever their collective intentions imply. Only an individual can ‘self-impose’ something upon himself or herself. Others cannot ‘self-impose’ on another individual, but can only ‘impose’ upon an individual. and then in a manner contrary to that individual’s intentions. Thus the use of ‘we’

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aside to characterize loyalty as an outcome, however achieved.



language involves individuals being both ‘socially embedded’ in networks and yet also being distinct vis-à-vis others at one and the same time. That is, loyal individuals who are linked together in networks are nonetheless independent and distinct individuals, and moreover are so specifically in virtue of their relationships to others to whom they are loyal.

This conclusion is consistent with the general framework developed in the first section above as being appropriate for understanding agent identity in economics, namely, the fixed-point framework of equilibrium proofs in economics. That is, just as fixed-point proofs depend on the idea of there being one self-identical or reflexive relationship to demonstrate the existence of equilibrium, so here also the existence of (distinct) individuals depends upon there being one self-identical or reflexive relationship that individuals possess. Or, along with all the relationships individuals have to others, there is also that unique relationship individuals have to themselves in their being able to ‘self-impose’ joint commitments upon themselves in the use of ‘we’ language in interaction with others. This unique relationship accordingly explains individual existence essentially on the same model as fixed-point theorems explain equilibrium existence.

Second, then, can individuals in networks understood in this way to be distinct and independent from one another also be thought to be re-identifiable as such through a process of change – thus satisfying the re-identification test? Kirman’s evidence from the Marseille fish market covers a period of three and a half years, and it is fair to ask whether individuals who are distinct and independent in virtue of their ability to form loyalty relationships to one another eventually lose their distinctness over time, as they perhaps become ‘oversocialized’ (Granovetter, 1985) or habituated to these sorts of ties. Does loyalty, that is, ultimately become habitual, consequently submersing individuals in the bonds they form to others? Note that according to Kirman’s evidence at any one time not all buyers and sellers enter into loyalty relationships, but some rather shop around, and behave in an instrumentally rational way, so that there are always two classes of individuals, loyal traders and ‘free’ traders. Moreover, while the network conception requires that relative sizes of the two classes of individuals in the Marseille

fish market remain relatively the same over time, this does not imply that the memberships of these two classes remains constant over time. All individuals, we might then suppose, not only act as loyal traders on some occasions, but also as ‘free’ traders on other occasions. Further, it also makes sense to suppose that individuals in the capacity of loyal traders might vary the trading particular partners to whom they are loyal, if not perhaps as frequently as ‘free’ traders change their trading partners.

What this all suggests is that in markets in which loyalty networks develop individuals need not necessarily become habituated to trading with always the same individuals. To the contrary, variability in the membership of the two classes and in loyalty relationships themselves would seem to involve individuals needing to continually re-learn or re-establish the conditions of loyal trade. That is, individuals would only have the sense that they are ‘self-imposing’ their shared commitments upon themselves if they were continually able to perceive loyalty as a departure from the ‘free’ trade case. This, however, is just what is required for us to be able to say that individuals are re-identifiable in terms of what makes them distinct individuals – namely this capacity for imposing commitments upon oneself – and thus that the network conception of the interactive individual meets the re-identification test. In terms of the pairwise formulation which Kirman investigates – and for which Gilbert explains shared intentions – individuals who rely on loyalty relationships in trade are distinct and re-identifiable through change in the varying pattern of those relationships.

## **5 Individual identity and equilibrium as conjoint properties of economic systems**

Section one above noted the parallel structure of personal identity arguments and fixed point proofs of equilibrium existence. Taking personal identity arguments to be existence proofs for individuals, it thus seems reasonable to suppose that adequate analysis of an economic system ought to explain existence of equilibrium and individuals as simultaneously obtaining. Or, an economic system should not be thought to be in equilibrium if existence can be attributed to the

system as a whole while it cannot be attributed to the individuals who occupy it. Recall that the 1970s Sonnenschein-Mantel-Debreu results, or SMD theory, bring standard economics' methodological individualist microfoundations approach into question by demonstrating that a pre-given conception of the individual as an atomistic being renders aggregate excess demands arbitrary. It is also argued in Davis (2003b) that this same pre-given conception of the individual does not satisfy an identity test evaluation needed to attribute existence to individuals on that conception. Thus from both vantage points the standard view of the individual is problematic because of its attachment to a questionable conception of the individual.

Network theory rather begins by explaining individual and aggregate behavior as mutually influencing, and thereby abandons the notion that individuals can be explained in a pre-given way apart from their interaction with one another. Put differently, it gives up the notion that one can develop aggregative relationships out of individualist microfoundations, and rather seeks to explain economic systems in terms of mutually consistent conceptions of the individual and the market. The collective intentionality interpretation in this paper of loyalty relationships in Kirman's Marseille fish market case thus treats individual and market as consistent with one another by explicitly making the economy's 'microfoundations' social-individual, where this is a matter of incorporating social dimensions in individual behavior. Aggregate economic behavior, as seen in the stability of a large share of the market being carried out by loyal buyers and sellers, is then explained in terms of an underlying social-individual economic behavior, as seen in individuals repeatedly forming joint commitments to one another as buyers and sellers. Thus equilibrium existence and individual existence simultaneously obtain, and are mutually influencing.

This paper began with a skeptical question: if there is not a way for us to understand how individuals retain a status as distinct agents, might it not be better that economics regard social groups as economic agents, and give up its long-standing attention to individuals? The answer to this question can now be seen to be negative, since on the view that individuals and aggregate

behavior are mutually influencing, a comprehensive explanation of an economic system still requires an explanation of individual behavior, albeit one different than employed in the standard view of the individual in economics.

In closing, note that the discussion in this paper does not explain the mutual influence of individuals and markets or aggregative behavior upon one another dynamically or in terms of it comes about, but rather only as an outcome. It is fair to say, however, that the pathways individuals follow to loyalty relationships are also important for understanding the nature of those relationships. Thus, since an important emphasis in network theory generally is on seeing economies as complex *adaptive* systems in which individuals undergo a series of adjustments to arrive at certain outcomes, a further development of the analysis here could be thought to involve developing an explanation of how individuals learn to form joint commitments to trade with specific partners, to whom they are then loyal.

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