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Folk-economic beliefs: An evolutionary cognitive model

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Abstract: The domain of "folk-economics" consists in explicit beliefs about the economy held by laypeople, untrained in economics, about such topics as, for example, the causes of the wealth of nations, the benefits or drawbacks of markets and international trade, the effects of regulation, the origins of inequality, the connection between work and wages, the economic consequences of immigration, or the possible causes of unemployment. These beliefs are crucial in forming people's political beliefs and in shaping their reception of different policies. Yet, they often conflict with elementary principles of economic theory and are often described as the consequences of ignorance, irrationality, or specific biases. As we will argue, these past perspectives fail to predict the particular contents of popular folk-economic beliefs and, as a result, there is no systematic study of the cognitive factors involved in their emergence and cultural success. Here we propose that the cultural success of particular beliefs about the economy is predictable if we consider the influence of specialized, largely automatic inference systems that evolved as adaptations to ancestral human small-scale sociality. These systems, for which there is independent evidence, include free-rider detection, fairness-based partner choice, ownership intuitions, coalitional psychology, and more. Information about modern mass-market conditions activates these specific inference systems, resulting in particular intuitions, for example, that impersonal transactions are dangerous or that international trade is a zero-sum game. These intuitions in turn make specific policy proposals more likely than others to become intuitively compelling, and, as a consequence, exert a crucial influence on political choices.

Keywords: cultural beliefs; cultural transmission; economic psychology; evolutionary psychology; folk-economics; heuristics and biases; political psychology

1. The domain of folk-economic beliefs

1.1. What folk-economic beliefs are

The term *folk-economic beliefs* denotes a large domain of explicit, widespread beliefs, to do with economic and policy issues, held by individuals without systematic training in economic theory. These beliefs include mental representations of economic topics as diverse as tariffs, rents, prices, unemployment, and welfare or immigration policies, as well as mental models of interactions between different economic processes, for example, inflation and unemployment.

Our perspective on the origins and forms of folk-economics is based on two major assumptions. First, we argue that folk-notions of the economy should not be described solely in terms of deviations from normative economic theory. That has, unfortunately, been the common approach to the subject. Folk-views are generally described as the outcome of "biases," "fallacies," or straightforward ignorance. But describing how human cognition fails to work according to some norm of rationality tells us little about how it actually works. Second, we propose to make sense of folk-economic beliefs by considering the environment in which many, if not most, human cognitive mechanisms evolved.

The study of folk-economic beliefs should be distinguished from other domains of investigation. Microeconomics addresses actual choices of agents in conditions of scarcity, independently of whatever mental representations trigger these behaviors in actual individuals, and also of the representations they may form of their behavior upon reflection. Another field, behavioral economics often uses experimental designs as a way to elucidate tacit motivations and capacities that direct economic choices in contexts where experimenters can manipulate incentives and information flow between agents (Plott 1974; Smith 1976). Finally, neuro-economics elucidates the brain systems involved in appraising utility and making economic decisions (Camerer et al. 2007; Loewenstein et al. 2008).

The scope of a study of folk-economics is quite different from these three fields (see Figure 1). It focuses on people's deliberate, explicit beliefs concerning economic

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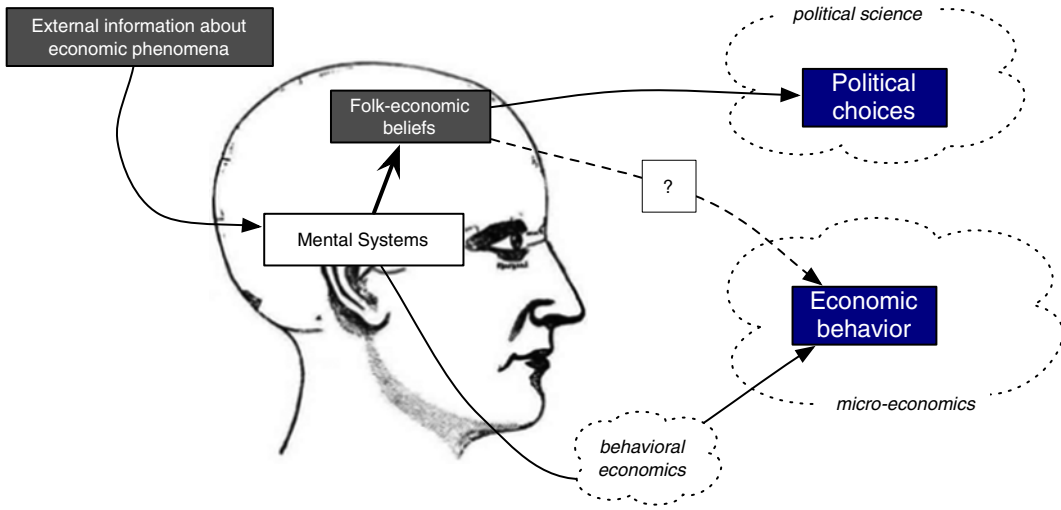


Figure 1. A summary of the systems and representations involved in forming folk-economic beliefs. External information about economic matters triggers activation of specific mental systems, which results in both economic behavior and explicit folk-economic beliefs. The latter's effects on behavior cannot be assumed. Different fields, represented as clouds, focus on different parts of these processes. The model presented here is about the causal arrow linking specific mental systems to the occurrence of folk-economic beliefs in people's minds.

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facts and processes, for example, that foreign prosperity is good or bad for one's own nation, that welfare programs are necessary or redundant, that minimal wages help or hurt the poor, and that rent controls make prices go down or up, and so forth.

One should not assume that folk-economic beliefs (henceforth FEBs) have direct and coherent effects on actual economic behaviors. Many FEBs are about macro-economic processes – for example, the level of unemployment, or the need for foreign trade, or the need for a nation to balance its budget – that are unrelated to people's everyday transactions. Also, even FEBs that do bear on micro-economic realities, for example, on "fair" prices or wages, may remain insulated from the psychological processes that drive actual economic behavior, as we explain below, which is why people may recommend specific policy outcomes and behave in ways that contradict that choice (Smith 2008, p. 165).

Figure 1 summarizes the different domains of thought and behavior and the research programs involved.

1.2. Why folk-economic beliefs (FEBs) matter

Understanding FEBs is of crucial importance, even if they do not govern people's economic behavior, because they play a critical role in political choices. Perceptions of macro-economic developments influence how favorably people view the government and how they cast their votes (Nannestad & Paldam 1994). The translation of inflation, unemployment, and income dynamics into political choices is mediated by people's beliefs about the economy, for example, whether rising unemployment is affected by government policy (Peffley 1984; Rudolph 2003a, 2003b). Similarly, economic beliefs underpin people's answers to such questions as: Is it a good idea to

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increase welfare benefits, impose tariffs on imports, cap rent increases, or institute minimum wages? Folk-economic beliefs constitute a largely unexplored background against which most information about policy is acquired, processed, and communicated among nonprofessionals (Rubin 2003).

1.3. A different approach to the study of folk-economic beliefs

It is a matter of common knowledge that most people, including the educated public in modern democratic societies, do not think like economists (Smith 2008, pp. 147–66). It is, for instance, a familiar finding that people are overinfluenced by consideration of sunk costs (Magalhães & White 2016) or fail to consider opportunity costs (Hazlitt 2010) in evaluating possible courses of action. More important for social and political debates, people often also express views on economic processes that seem misguided, if not downright fallacious, to most professional economists. There is a growing literature documenting this divergence (see, e.g., Blinder & Krueger 2004; Caplan 2006; Haferkamp et al. 2009; Hirshleifer 2008; Rubin 2003; Sowell 2011; Wood 2002; Worstall 2014). However, there is still very little research on why such beliefs appear, and why they are so widespread.

We argue that many folk-views on the economy are strongly influenced by the operation of non-conscious inference systems that were shaped by natural selection during our unique evolutionary history, to provide intuitive solutions to such recurrent adaptive problems as maintaining fairness in exchange, cultivating reiterated social interaction, building efficient and stable coalitions, or adjudicating issues of ownership, all within small-scale groups of foragers.

The inference systems we describe further on are not specified as ad hoc explanations for folk-economic beliefs. All of these systems have been independently documented by evolutionary biologists, psychologists, and anthropologists who focus on such issues as the evolution of exchange and trade, its form in the small-scale societies in which humans evolved, and its consequences for psychological dispositions and preferences that can be observed in experimental studies on individuals in modern societies; for an overview, see Buss (2015). So, we are not proposing a new description or interpretation of the human evolved psychology of exchange, but rather, using prior findings to illuminate the emergence of folk-economic beliefs in modern contexts.

1.4. Models of folk-economic beliefs are not normative

The model described here is emphatically not a normative proposal. That is, we do not intend to suggest that there is a right way to consider economic processes, and to evaluate folk-economic beliefs in terms of their validity or coherence. This deserves mention, for two reasons.

First, as discussed below, most descriptions of these beliefs, in the literature, were originally motivated by the realization that people do not think like economists, and that they often commit what trained economists would describe as fallacies. By contrast, we argue that this is not a promising way of approaching cultural beliefs in this domain, as the validity (or lack thereof) of these beliefs do not explain their spread.

Second, because FEBs are politically consequential, readers may wonder whether studying them is by itself a political project. That would be the case if, for instance, widespread beliefs were contrasted with a supposedly true picture of the economy, and if that picture was associated with a particular kind of political project. But we suspect (and to a certain degree, the evidence confirms) that individuals of all kinds of political persuasions are equally likely to entertain beliefs that are, in some sense, misguided or incoherent.

Indeed, one could argue that the epistemic value of FEBs is largely orthogonal to their political import. That is, the economy is not a political end in itself but a political means to ends that are essentially contested. In principle, even completely misguided FEBs might give rise to outcomes that are, by some other standards, "good" or "just," at least as far as some specific social group is concerned.

Our more general point is that we believe that the question of whether FEBs are correct or incorrect is orthogonal to the importance of studying them. Few individuals receive formal training in economics and, hence, if they happen to hold correct beliefs, this is as much in need of an explanation as when they generate incorrect ones.

2. Some folk-economic beliefs and possible explanations

Evidence for folk-economic beliefs is still scattered and unsystematic. Some FEBs are widespread and well-documented, either through surveys of attitudes such as the General Social Survey (see General Social Survey 2011), or by more-specific, smaller-scale investigations such as the Kaiser Foundation's *Survey of Americans and Economists on the Economy* (see Kaiser Foundation 1996). Others are less systematically documented, being inferred from the platforms and common phraseology of political operators, as well as from common journalistic discourse (Wood 2002; Worstall 2014).

2.1. Examples of folk-economic beliefs

In the following, we present a few examples of widespread beliefs about the economy, selected for their potential influence on political choice. Given that such beliefs are often expressed in vague or emotional terms (e.g., "markets are bad for society," "trade will make us poorer and others richer"), what we propose here are, by necessity, reconstructions of possible beliefs as implied by people's explicit statements or questionnaire responses.

FEB 1. *International trade is zero-sum, has negative effects.* The notion is expressed in many forms in everyday conversations and in political discourse, and it was also a recurrent theme in early political economy (Hiscox 2006). This belief may take many forms. For instance, trade is said to create unemployment at home because foreigners instead of locals are making the things we need (Wood 2002, pp. 53–55). Also, it is claimed that a nation should always try to export more goods than it imports (Worstall 2014, pp. 29–32). This belief is often associated with the assumption that the wealth of nations is the outcome of a zero-sum game. As a consequence, the assumption that foreigners profit

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from trade entails that "we" are losing out. Consistent with this assumption, many people believe (against possible comparative advantage) that trade cannot be beneficial if "we" import goods that we could manufacture ourselves (Baron & Kemp 2004, p. 567). After the 2008 recession, many Americans interpreted increased unemployment as an effect of international trade and feared that continued trade would worsen their conditions (Mansfield et al. 2016).

FEB 2. *Immigrants "steal" jobs.* Beliefs about the negative economic impact of immigration lie at the center of many policy debates. It is a consistent finding among political scientists that immigration, especially of low-skilled immigrants, is viewed as threatening (Hainmuller & Hiscox 2010), and a common formulation is that immigrants "take our jobs" (R. Simon & Lynch 1999). This view is associated with the assumption that there is a fixed quantity of jobs to share among people (Wood 2002, p. 23; Worstall 2014, p. 75).

FEB 3. *Immigrants abuse the welfare system.* Another belief, almost diametrically opposite but equally widespread, is that immigrants are a fiscal burden on the welfare system, using up common resources (Sniderman et al. 2014). So, immigrants are intuitively viewed as free-riding both on the jobs "we" created and the welfare systems "we" paid for (Alesina & Glaeser 2004). Given these beliefs, co-occurrences of immigration and fiscal stress can be viewed as causally linked, with important consequences in terms of both policy opinions and of holding immigration-friendly politicians accountable on Election Day.

FEB 4. *Necessary social welfare programs are abused by scroungers.* Welfare programs, for example, unemployment benefits, are the object of apparently opposing economic beliefs (Aarøe & Petersen 2014; Alesina & Glaeser 2004). Experimental studies show the coexistence of those contrary beliefs within individuals. On the one hand, welfare programs are viewed as desirable insurance schemes against unavoidable, essentially random misfortune. On the other hand, unemployment benefits are widely viewed as encouraging laziness and a culture of dependency (Aarøe & Petersen 2014; Kameda et al. 2002).

FEB 5. *Markets have a negative social impact ("emporiophobia").* Paul Rubin (2014) coined the term *emporiophobia* for the generally negative attitude towards markets observed in many modern societies and documented in many surveys. The belief is that markets as such produce negative outcomes for most participants. Surveys offer evidence that many people, against economists, see markets not as the encounter of buyers and sellers who mutually benefit from trade, but as a place of struggle between partners with unequal bargaining power. The anti-market attitude may also contribute to the rejection of market solutions for the allocation of "sacred" goods, like organs or children in need of adoption. Many people seem to consider more arbitrary allocations (lotteries, first come first served) as not just more fair than auctions, but also probably more efficient (Fiske & Tetlock 1997; Tetlock et al. 2000).

FEB 6. *The profit motive is detrimental to general welfare.* The profit motive is seen as an attempt to extract more from transactions than would be warranted by "fair" pricing. That is why there is a tendency to see private firms as less "caring" than non-profits, and therefore more likely to create negative externalities (Bhattacharjee et al. 2011). One version of this belief is that there is a special class of "excessive" profit that differs from the regular or fair allocation of profit to businesses (Wood 2002, pp. 10–12). Related to this assumption is the notion that regulation is required to limit the excesses of profit-driven businesses (Hirshleifer 2008). In general, then, the belief seems to be that if most economic actors act on the basis of maximizing their profits, non-economic social domains will be negatively affected, for example, by externalities such as pollution, or more generally through a decrease in solidarity, social trust, and so forth. Contra Adam Smith, the notion that private self-regard creates general welfare seems to be unintuitive (Rubin 2003).

FEB 7. *Labor is the source of value.* This is the assumption that the amount of labor necessary to produce a good is an essential (or the only) factor that determines its "value," a (generally undefined) quantity that is not necessarily expressed by market price. This assumption is not often expressed in such general terms, but the proposition is implicit in many widespread beliefs about labor and wages (Wood 2002, pp. 175–78; Worstall 2014, pp. 15–17). It is also present in opinions on the unfairness of low wages for hard or unpleasant jobs, especially those involving hard physical labor.

FEB 8. *Price-regulation has the intended effects.* The belief is that regulation generally does what it is supposed to do, as government policy can direct the economy towards desired results (Hirshleifer 2008; Wood 2002, p. 77). For example, in the United States, many cities imposed rent-control in the 1960s – and such measures were a major item in politicians' platforms (Dreier 1999, p. 211) – with the goal of creating an ample supply of cheap housing; see Schipper (2015) for similar processes in Israel. The FEB here is that such regulation efforts will work as intended, for example, that rents will stay low after the imposition of rent-control, or that minimum wages can affect wages without affecting the demand for labor (some people even think that the latter measure could boost employment rates (Haferkamp et al. 2009, p. 533). More broadly, regulation is often seen as an efficient way to protect people against undesirable market dynamics. Chinese respondents, for instance, believe that China was spared the worst effects of the 2008 downturn by its government regulations (Yuen & Greene 2011).

This is only a short list of widespread folk-beliefs about the economy. Because there is very little study of such cultural beliefs as of yet, we have scant evidence for the relative cultural spread of each of these FEBs, and of possible associations between them and various social or cultural variables. The beliefs in question may well vary between social classes, cultures, age-groups, and so on. One aim of this article is to demonstrate the importance and theoretical interest of this domain of cultural beliefs and motivate more detailed empirical research in the domain.

2.2. Common explanations: Ignorance, self-interest, biases

There are three main ways of explaining the divergence between laypeople's and economists' views: in terms of

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ignorance, in terms of self-interest, or as the outcome of specific biases that affect people's perception of economic facts.

2.2.1. Lack of economic knowledge or training. The ignorance hypothesis simply assumes that non-normative views stem from a lack of relevant information, similar to the widespread ignorance in the political domain, long lamented by political scientists (Converse 1964). It is certainly true that most laypeople are unaware of many fundamental principles of economic analysis. For instance, if people knew some rudiments of price theory, they would not be surprised that useful water is much cheaper than useless diamonds. If they knew about comparative advantage, they might see international trade in a different way (Haferkamp et al. 2009). However, this interpretation has one major defect – it predicts that people's common views will be non-normative, but it does not predict that they will be non-normative in any particular way. Not knowing about a domain would predict random, vague, or nonexistent opinions, as in popular conceptions of quantum mechanics, rather than the specific set of beliefs observed (Caplan 2008, pp. 9–11).

2.2.2. Self-interested beliefs. If beliefs are not random, that may be because they are influenced by people's perception of their interests. In this view, people adopt beliefs that would justify more resources being apportioned to them and less to their enemies or competitors (Dahl & Ransom 1999). One difficulty with this interpretation is that it accounts for only some of the beliefs described above. It can explain, for example, how industrial workers in the United States might feel they will lose out if their jobs move to China, and therefore consider that protectionism is overall a good thing. But beliefs are sometimes less clearly connected to self-interest. For instance, many people feel that markets are bad, even though larger, more competitive markets provide them with cheaper goods, which is clearly in their interest. So, self-interest is at best an incomplete explanation, and in general is not a straightforward predictor of economic beliefs, or indeed of political choices (Caplan 2008; Green & Shapiro 1994). It should be noted that one type of interest that does seem to explain some variation in FEBs is partisan interests. During economic downturns, for example, people are much more likely to ascribe the government responsibility if they identify with the opposition party than with the government party (Bisgaard 2015; Bisgaard & Slothuus 2018b). However, although partisanship provides a motivation to reach certain conclusions (e.g., "the government is responsible for this economic downturn" or "the government is *not* responsible for this downturn"), the question still remains as to how people generate the particular beliefs about the workings of the economy that allow them to reach their desired conclusion.

2.2.3. Cognitive biases. Finally, another alternative to the knowledge gap is to consider that people's views are the outcome of specific biases. The term denotes tacit patterns of reasoning that orient people towards a limited set of conclusions from the evidence. There is a vast psychological literature for reasoning biases (Gilovich et al. 2002). For example, the "confirmation bias" is the tendency to notice and remember instances of the hypotheses we hold and to ignore other cases as noise, with the result that prior assumptions seem ever more strongly confirmed.

In the domain of beliefs about the economy, Bryan Caplan, for instance, identified an anti-foreign bias (what is good for foreigners is bad for us), an anti-market bias (inability to see how markets would turn private greed into a social good), a make-work bias (if people work more, there will be more wealth), and a pessimistic bias (economies are heading towards less prosperity) (Caplan 2008). In a similar way, Haferkamp et al. argue that the divergence between economists' and laypeople's views does not reduce to self-interest or ignorance, but rather results from multiple biases, like the well-documented status-quo bias and omission bias (doing something detrimental is worse than not doing something beneficial) (Haferkamp et al. 2009, p. 530). Finally, people's selection of economic beliefs often reflects own-side partisan bias (Bisgaard 2015).

2.3. Proximate and ultimate factors

Models based on identifying particular cognitive "biases" have the merit of taking seriously the fact that the emergence of these beliefs may lie in the way information about the economy is processed in human minds, which is certainly the right starting point. However, we propose that the study of folk-economic beliefs should move beyond a description on terms of fallacies and biases. One major problem with bias-oriented accounts of cognitive phenomena is that a bias is often simply a re-description of the empirical phenomenon under investigation (Gigerenzer 1991; Gigerenzer et al. 1999). For example, when it is observed that people attend more to more recent and vivid information, this is explained by an "availability heuristic" that simply stipulates that people attend more to more recent information. In a sense, this is fine; after all, science requires the systematization of observations about the world. But explanations require causal models as well.

Within the biological sciences, researchers distinguish between "proximate" and "ultimate" explanations, where proximate explanations describe *how* a biological system works and ultimate ones explain *why* the system exists (Buss et al. 1998; Scott-Phillips et al. 2011). Bias-based models are largely equivalent to proximate explanations. To develop a scientific understanding of folk-economic beliefs, we need to attend also to the level of ultimate explanations, not just because doing so provides a more complete understanding, but also because we will then be able to develop more precise predictions about the psychology behind folk-economic beliefs.

3. Our model: Inference systems, beliefs, cultural transmission

In the model we propose here, the emergence and spread of folk-economic beliefs is influenced by specific intuitions about interpersonal exchange. These are not the outcome of explicit scholarly training. Nor are they the simple consequence of persuasion from political elites (politicians, journalists, pundits, etc.), or the straightforward absorption of particular cultural values. Rather, because of evolution in the context of small groups with intensive exchange, humans have developed an intuitive psychology of

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exchange, for which there is independent anthropological and psychological evidence (Cosmides & Tooby 2015a). This psychology consists of a collection of highly specialized inference systems, each of which is designed to solve one kind of exchange problem recurrent in our ancestral environments.

3.1. Properties of domain-specific inference systems

We can describe the mind as consisting of many distinct, specialized systems, each of which corresponds to recurrent adaptive challenges in human evolution, attends to limited domains of available information, is organized along specific inferential principles, orchestrates neural structures in a specific functional manner, and is the outcome of a specific developmental pathway (Boyer & Barrett 2015; Cosmides & Tooby 2015b; Hirschfeld & Gelman 1994a).

A few examples may help illustrate the relevant functional properties of this broad class of cognitive systems. In the auditory stream, the sound events identified as instances of lexical items are handled by a parsing system that assigns various syntactic roles to the different words (Pickering & van Gompel 2006). In the visual field, some configurations are identified as human faces by a face-recognition system that computes a holistic description of the face, which is then processed by other memory and affective systems (Doris & Margaret 2008; Kanwisher 2000; Solomon-Harris et al. 2013). Information from multiple modalities is integrated to compute the extent to which a particular person is attractive as a potential mate (Fink & Penton-Voak 2002; Grammer & Thornhill 1994).

However different the domains, there are some important functional properties common to these systems:

1. *Specific input format*. The face-identification systems respond to visual displays that include points or lines interpreted as eyes and mouth. Any such elements presented in the appropriate configuration trigger the system, which is why cartoons and other stylized renditions of human faces activate it, whereas displays with scrambled features, or features in the wrong alignment, do not. The parsing system responds only to words in the stream of speech. Other sounds are not processed. Sexual attractiveness computations only consider very narrow aspects of information about a person, for example, the pitch of the voice rather than prosody, skin-reflectance (an index of youth) rather than skin-tone, facial symmetry rather than facial length, and so on. In general, then, domain-specific inference systems may ignore information that might be relevant to an organism but fails to meet the input conditions.

2. *Automatic activation.* Specialized inference systems are neither initiated nor stopped by deliberate intentions. Once information with the appropriate input format is detected, the systems proceed to produce the relevant inferences, which are then passed on to other inference systems.

3. *Specific inference rules*. Each system operates on highly specific inferential rules. The computational principles that assign words to their syntactic roles are found only in that domain, and the same goes for the matching between faces and memories about persons, or the computation of sexual attractiveness.

4. *Unconscious computation*. The operation and inference rules of each system are generally outside conscious access. Only some outputs of these computational systems can be accessed, such as, for example, the meaning of a sentence or the general attractiveness of an individual.

5. *Intuitive output*. The output of specialized inference systems, when consciously accessible, consists of *intuitions* – that is, a description of a particular situation or a motivation to behave in a particular way – that do not include any indication of the computational steps that resulted in that particular description or motivation.

3.2. Intuitive systems output can lead to reflective beliefs

It is important here to keep in mind the difference between intuitive output on the one hand, and reflective representations on the other (Sperber 1997). Reflective representations add information to intuitions, explicate them, extend or restrict their scope, offer a comment on the intuitions, or link them to specific sources, as in, for example, "the reason this sentence is strange is that there is no verb," or "this person has the same round face as Humpty Dumpty," or "it is sad that this attractive person has a bad personality," and so forth. (Cosmides & Tooby 2000; Sperber 1997; 2000).

Most of our "folk-theories" of particular domains consist of explicit, conscious reflective beliefs about our intuitions. That is why we can better understand the diffusion of beliefs in social groups, if we follow closely the interaction between intuitions delivered by specialized inference systems, on the one hand, and their reflective interpretation, on the other.

Here, again, examples may be of help. Human minds include an intuitive physics, a set of assumptions that helps us predict the trajectory of objects, expect solid objects to collide when their trajectories intersect, and so forth. These expectations appear early in infancy long before language acquisition (Baillargeon et al. 1995; Spelke et al. 1995). But we can also entertain explicit thoughts that (to some extent) explicate and comment on these intuitions, for example, a belief that heavy objects have more momentum than lighter ones. Some of these reflective beliefs are wrong, others are too vague even to be wrong, and some are in agreement with physical science (Kaiser et al. 1986). In the same way, we have a set of intuitive biological expectations, for example, that all living things come in exclusive, taxonomically ordered categories (Atran 1995), and that they are propelled by internal energy sources (R. Gelman et al. 1995; Tremoulet & Feldman 2000). But we also have reflective and explicit beliefs, for example, that each species has unique essential properties that cannot change (S. A. Gelman & Wellman 1991); that there must be some "catness" about cats that makes them what they are. Here, the intuitive expectation (all cats share external features, their behavior is highly predictable, etc.) is explained by the reflective belief, which postulates a hidden, undefined essence inside organisms of the same species.

Folk-economic beliefs are widespread, culturally transmitted, explicitly held reflective beliefs about economic processes. These are to be distinguished from the intuitive thoughts that emerge as a result of the operation of specialized intuitive systems. We reserve the term "folk" for beliefs held by layfolk as a result of the interaction between information about the economy, and the operation of some

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inference systems. (This is in contrast to some parts of the psychological literature, where the term *folk-* has been sometimes, confusingly, used to characterize *both* the products of intuitive inference systems and the cultural beliefs that emerge as a result of their operation.)

3.3. Why we should not expect consistency or coherence in FEBs

Explicit reflective beliefs may be extremely vague in their implications. One may hold that there *must* be a special essence present in all cats that makes them different from dogs, without specifying what that essence consists of – in fact, that is the most common form of essentialism (S. A. Gelman 2004).

Also, reflective beliefs may be inconsistent or incoherent, mostly because they come in a meta-representational format. In contrast to the output of intuitive systems, for example, the intuitive belief that "there is a cat here on the mat," reflective beliefs consist in comments on intuitions, for example, "it is true in some sense that 'the market is bad.'" A meta-representational format allows one to be committed to a belief, without the contents of the belief being processed in detail (Cosmides & Tooby 2000; Mercier & Sperber 2009; Sperber 1997). That is the case for mystical or religious statements, for example, "the true path is not a path" or "three persons are one being," which people can hold to be true, in the form "the proper interpretation of 'p' is true," without processing their contents (Mercier & Sperber 2009; Sperber 1997).

This applies to the domain of folk-economic beliefs as well. A belief that markets are socially negative can be held true, without triggering specific representations about, for example, how markets would decrease social welfare, in what domains of activity, to what extent, through what economic mechanisms, and so forth, as long as it is held in a meta-representational format, for example, "It is true in some sense that 'markets are bad for society.'" For the same reason, one can hold that meta-representational belief, and also hold other beliefs that may seem to contradict it, for example, "It is a good thing that we have many butchers here, so they have to keep prices low." Finally, if folk-economic opinions consist of reflective, meta-representational beliefs, then different beliefs can be held in relative isolation from each other without ever being integrated in a general theory of the economy. So, we should not expect precision, consistency, or integration in the domain of reflective folk-economic beliefs.

3.4. Proposed mechanism: Intuitions, beliefs, cultural transmission

Folk-economic beliefs are cultural beliefs – which simply means that they are represented in roughly similar ways in the minds of different individuals in a group, as a result of communication between individuals. Folk-economic beliefs are communicated – between laypeople, but also between media and their customers, and between political entrepreneurs and the public. That is why it is important to consider the mechanisms that lead to their cultural spread, that is, the extent to which they are likely to be entertained, in roughly similar ways, by different minds.

An essential component of cognitive theories of cultural transmission is that prior psychological assumptions and expectations make certain representations easier to acquire, store, and communicate than others (Boyd & Richerson 1985; Sperber 1991). Cognitive dispositions make people transform input in such a way that it is more similar to the types that match these dispositions, an "attraction" process that results in the spread of highly particular mental representations (Claidière et al. 2014).

In section 4, we document the existence of various intuitive inference systems dedicated to representing social exchange. We then examine how these different systems make particular views of the economy, in general, particularly easy to acquire and represent, turning them into cultural beliefs.

4. Relevant cognitive systems

4.1. Relevant systems evolved before and outside markets

Evolutionary theory predicts that cognitive systems are geared towards solving specific, recurrent problems in environments in which humans evolved. Specifically, what evolutionary theorists call the *environment of evolutionary adaptedness* (or EEA) for a trait is a statistical construct, an aggregate of the conditions under which there was selection for or against that trait, weighted for frequency and time. In that sense, the EEA is not a particular time or place, but a collection of features. As an illustration, we can consider that optimization problems such as hunting, foraging, choosing the best mate, selecting nutritious foods, and garnering social support were present, and relevant to fitness, throughout human evolution. By contrast, urban life, mass-communication, rapid long-distance travel, and mass-market economies only occurred for a small duration and only in some places at first. So it is more plausible that human minds were selected for systems geared to the first kind of adaptive problems, than to the second.

One feature that is universally prominent in both modern and ancestral human societies is the exchange of goods (e.g., tools, food) and services (everything from back-up in conflicts to help with hunting, foraging, parenting, or shelter-building) (Brown 1991). Developmental psychology studies show that children readily engage in exchange in early years (Levitt et al. 1985). Exchange provides significant fitness benefits. It allowed our ancestors, as it allows us, to exploit cooperative positive-sum games, engage in collective action, and buffer against predicaments such as hunger and injury (Gurven 2004; Sugiyama 2004). For us and for our ancestors, engaging in exchange requires the existence of distinct, specialized cognitive mechanisms (Cosmides & Tooby 1992), including mechanisms for estimating costs and benefits of goods and services for the self and other; for comparing them in an abstract format (equivalent to utility in the vocabulary of economics); and for motivating exchange when the benefits of exchange exceed the costs for oneself.

The human mind, in other words, contains a rudimentary exchange psychology, evolved by natural selection to help facilitate transactions. Although it evolved within ancestral small-scale hunter–gatherer groups, the cues inherent in modern markets economies (transactions, bargaining,

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prices, etc.) also bring it online. However, market economies are a novelty at the scale of biological evolution, so we should not expect specific adaptations to their features, as the differences between ancestral exchange and the market are vast (Rubin 2003).

A crucial difference is that economic activity in nonmarket societies, and by extension during most of human evolution, does not and did not take place in isolation from other aspects of social interaction. Indeed, the clear separation between economic exchange and other forms of social interaction is a by-product of market conditions (Polanyi 1957/2001). Throughout human evolution, most transactions affected not only the agents' welfare, what they gained or lost on the spot, but also their reputation, their social standing, the nature of their relationship to exchange partners, the extent to which they could rely on others, the cohesiveness of the groups they belonged to, and so forth. That is why mechanisms for reasoning about exchange are designed to take in a whole range of social considerations that are not relevant in the impersonal modern market.

In the following pages, we examine some of the systems that evolved to facilitate exchange, the evidence for their operating principles, and their potential effects on the perception of modern market phenomena.

4.2. Detecting free-riders in collective action

In any exchange, it is crucial to monitor whether the implicit or explicit terms of the exchange are being followed. For example, if two individuals take turns helping each other forage, does one person provide less help than he receives? To solve this problem, human exchange psychology needs to contain specific mechanisms for detecting and responding to free-riders. There is considerable evidence that humans, in general, are attentive to potential cheating in social exchanges, so proximate psychological mechanisms are congruent with the ultimate fitness benefit of detecting and deterring free-riders. Indeed, a situation where some agent has taken a benefit without paying the cost for it is psychologically more salient than the opposite situation of an agent paying some cost but not getting the associated benefit (Cosmides 1989; Cosmides & Tooby 2005; Gigerenzer & Hug 1992; Sugiyama et al. 2002). Also, information that some agent received benefits from cooperation without contributing triggers punitive motivations, as a way of depriving them of the benefits of free-riding (Price et al. 2002). The ultimate rationale for free-riding detection is to preserve cooperation, including in the future. This would suggest that we do not intuitively classify as free-riders those individuals who make honest mistakes or whom accidents bar from cooperating. Indeed, Delton et al. have shown that the intuitive FREE-RIDER categorization is highly sensitive to intentions, rather than just tallying who contributed what to the collective action (Delton et al. 2012).

4.3. Partner-choice for exchange

To engage in exchange, one needs to choose among available social partners. Given the possibility of choice, human exchange and cooperation from ancestral times have taken place in the context of competition for cooperation (Noë & Hammerstein 1994), as each agent could advertise a willingness to cooperate (and signal how advantageous cooperation would be), and could choose or reject partners depending on their past and potential future behavior (Barclay 2016; Delton & Robertson 2012; Panchanathan & Boyd 2004). Cases of mutualism between species illustrate the efficiency of partner-choice for stabilizing mutually beneficial cooperation, for example, between cleaner fish and their clients (Bshary & Grutter 2005). Human communicative abilities allow this kind of mutualism to occur between conspecifics, with reputation as an essential factor in the selection of partners. Agents have access to information about other agents' past interactions as an index of likely future behaviors. In such conditions, there is of course a cost in engaging with free-riders, but also a cost in not cooperating with an honest partner (in terms of potential cooperative positive-sum games) (Krasnow et al. 2012; Milinski et al. 2002).

Competition for cooperation has specific consequences on fairness intuitions in the context of collective action. Given that two (or more) partners contribute equal effort to a joint endeavor, and receive benefits from it, an offer to split the benefits equally is likely to emerge as the most frequent strategy – anyone faced with a meaner division of spoils will be motivated to seek a more advantageous offer from other partners. So, to the extent that people have partner options, the constraints of partner-choice explain the spontaneous intuition that benefits from collective action must be *proportional* to each agent's contribution (André 2010; André & Baumard 2011; André & Day 2007).

The existence of partner-choice based on shared information and reputation may explain why people select partners, in the context of laboratory economic games, on the basis of criteria that may seem economically irrational, but that happened to be ecologically predictive in our environments of evolution. For instance, people prefer partners who express moral judgments in deontic (i.e., "moral" and emotional) rather than rational terms (Everett et al. 2016). They also prefer potential partners whose faces suggest productivity, prosocial attitudes, and relatively high social status (Eisenbruch et al. 2016).

4.4. Exchange and assurance by communal sharing

One important form of social relations is founded on communal sharing, where resources are pooled (Fiske 1992). This is found to some variable extent in all human groups, particularly in food provision, and seems crucial to social interaction in small-scale societies, especially in foraging economies similar to those in which humans evolved (Kelly 1995). That is why this form of apparently unconditional altruism has been the focus of so much research in evolutionary anthropology and psychology (Kaplan & Gurven 2005). A major result of those observations and models is that communal allocations is not the outcome of an indiscriminate motivation to share with others, but rather follows implicit rules that make sense given the conditions of human evolution.

For example, band-wide sharing in hunter-gatherer economies is generally confined to game, especially large game, whereas gathered and extracted foods are mostly shared with close kin. An explanation for this spontaneous preference in allocations lies in the differences in variance in the supply of these goods (Cosmides & Tooby 1992), as gathering typically produces low-variance resources, in

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contrast with hit-or-miss hunting expeditions. So communal sharing provides insurance against random bad luck such as the vicissitudes of hunting expeditions (Kaplan & Hill 1985b) or injury that prevents hunters from going on expeditions (Sugiyama 2004). This is reinforced by the low marginal value of food units when they come in large packages, like big game. Communal sharing, although typically presented as including all group members, is often in fact modulated by past or expected reciprocation. Even where there is a norm of unconditional sharing, those who give more freely also receive more (Gurven 2004; Gurven et al. 2000).

Communal sharing is founded on specific assumptions and principles, distinct from those that govern, for example, direct exchange or authority-based social relations (Fiske 1992). The norm of communal sharing is readily acquired by children, and intuitively deployed by adults in the appropriate contexts (Birch & Billman 1986; Hamann et al. 2011; Rao & Stewart 1999). In different places, different sets of resources and occasions are designated as proper goods to share. People notice (and are usually shocked by) the application of one type of inference system to the wrong domain according to the local norms, for example, offering to pay your friends for coming to dinner, or asking for a discount as a personal favor at a supermarket checkout.

The structure of the psychology for exchange resources through communal sharing implies that if people find that a need is caused by random circumstances beyond their own control, they intuitively represent that need as potentially alleviated through communal sharing. By consequence, they would think it as unfair if others try to profit from this type of need (i.e., turning the exchange into direct form of exchange rather than communal sharing).

4.5. Coalitional affiliation

Humans are special in that they build and maintain highly stable associations bounded by reciprocal and mutual duties and expectatons. Such groups – called *alliances* or *coalitions* – may be found at many different levels of organization, such as political parties, street gangs, office cliques, academic cabals, and groups of close friends, and can include thousands or millions of individuals when ethnic or national categories are construed as coalitions (Tooby & Cosmides 2010).

The psychology underlying coalitional strategies include the following assumptions: (a) relevant payoffs to other members of the coalition are considered as gains for self (and obviously, negative payoffs as losses to self); (b) payoffs for rival coalitions are assumed to be zero-sum – the rival coalition's success is our loss, and vice-versa; and (c) the other members' commitment to the common goal is crucial to one's own welfare (Pietraszewski 2013; 2016). These assumptions reflect two crucial selection pressures operating on human groups: First, that alliances are competitive and exclusive, because social support is a rival good. Second, that resources, status, and many other goods are zero-sum and, hence, the object for rivalry between alliances. As consequence, allied agents spontaneously share the intuition that achieving their goal requires avoiding or overcoming opposition from other, similar alliances and coalitions in a zero-sum fashion (Tooby & Cosmides 2010).

A vast literature in social psychology and behavioral economics documents the proximate psychological mechanisms involved in coalitional situations. For instance, people do indeed consider benefits for the coalition as (presumed) benefits for themselves (Baron 2001). Second, social psychology studies of in-group favoritism show how very subtle cues of group membership and coalitional rivalry can activate coalitional assumptions. In so-called *minimal group* paradigms, people favor fellow members of an arbitrarily constructed category (Tajfel 1970). This occurs when the categories in question are construed by participants as groups within which members can reciprocate favors (Karp et al. 1993; Kiyonari & Yamagishi 2004).

In human coalitions, members monitor each other's level of commitment, are motivated to demonstrate their commitment to the other members, and are also motivated to make defection less likely, notably by making it costly. Monitoring of other people's behavior is frequent, all the more so if the collective action is risky and success is crucially dependent on numbers. Such surveillance is manifest in voluntary groups and associations, and the extent to which monitoring is possible is a predictor of group stability (Hechter 1987b, pp. 146–56).

4.6. Ownership psychology

For exchange to happen over human evolutionary history, our ancestors needed an elaborate psychology of ownership. Who is entitled to enjoy possession of a good, and to exchange it? Ownership is expressed in all human languages (Heine 1997); in all human cultures, there is a principled distinction between mere possession and ownership; and ownership is associated everywhere with specific emotions and motivations (Brown 1991). At the same time, explicit norms of ownership and property rights differ from one place or time to another in terms of both scope (who can own things and what things can be owned) and implications (what one may do with specific types of property) (Hann 1998). Surprisingly, despite a long history of legal and economic reflection on property, there are only recent and relatively sparse experimental studies of our spontaneous intuitions about use, possession, and ownership (Boyer 2015; DeScioli & Karpoff 2015; Friedman 2010).

We must distinguish between intuitions and reflective representations about ownership. Adults and even very young children have definite intuitions about who owns what particular good, in a specific situation. For instance, they generally assume that ownership applies to rival resources (that is, such that one person's enjoyment of the resource diminishes another person's); that prior possession implies ownership; that extracting a resource from the environment makes one the owner; that transforming an existing resource confers ownership rights; and that ownership can be transferred, but only through codified interactions (Friedman et al. 2011). By contrast, people's explicit beliefs about ownership are often vague and sometimes incoherent (Noles & Keil 2011). Also, these explicit, reflective norms often do not even reflect actual legal practices. In fact, people who live in societies with legal systems generally (and often wrongly) assume that the law *must* somehow accord with their intuitions – see Ellickson (1991) for an illustration in the domain of externalities and tort.

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In terms of proximate mechanisms, this suggests that the inference system takes as its input information about specific connections between a thing and an agent and outputs an "owner" tag. In particular, this system is highly sensitive to such cues as first possession (Friedman & Neary 2008), but also to information about an object's history (e.g., past possession, transactions between past and present possessor) (Blake & Harris 2009; Friedman et al. 2011), as well as the work invested in the object by its current possessor; even young children consider that creative work that transforms an object creates, at least presumptively, a claim to ownership (Kanngiesser et al. 2010).

5. Effects of intuitive systems on folk-economic beliefs

In our model, folk-economic beliefs are a result of the activation of the intuitive systems for exchange described above (and many others). The processes are illustrated in Figure 2 below. Information about economic processes, from news media, political discourse, from occasional pronouncements by economists, from other individuals, or any other sources, sometimes happens to match the input conditions of some intuitive inference system. As a consequence, the system is activated and produces specific inferences in the form of intuitive representations. These intuitive representations, in some cases, become the object of explicit, deliberate reflections, which may attribute an intuition to a source, put together several intuitive inferences, or compare them, or provide an explanatory context for intuitions, giving rise to folk-economic beliefs.

In this context, it is also worth emphasizing again that a single belief need not be the product of a single, intuitive inference system. The more inference systems that are underlying a particular belief, the more cognitive scaffolding it receives (see Fig. 2).

In the following sections, we discuss the possible connections between specific evolved inference systems and specific folk-economic beliefs – that is, how activation of the systems may make a particular belief received from external sources more natural and compelling. The examples that we draw on are meant as mere illustrations of many potential connections, providing the first small steps towards an empirical research program.

5.1. Explaining FEB 1: International trade as coalitional rivalry

We begin with what we referred to above as FEB 1, the statement that international trade has negative consequences. This contains several pieces of information likely to activate specific inference systems. Let us consider a news headline like "China sells more to the U.S. than to Russia." Selling involves receiving resources and, importantly, resources in this case transfer from one nation to another. In psychological terms, nations are "imagined communities" (Anderson 1983) or, with the vocabulary presented above, nations are coalitions to the mind and, hence, mention of nations activates the coalitional psychological machinery (Gat 2006; Hechter 1987a). Nations are exclusive groups, citizens of a nation are assumed to have common interests, and nations are equipped with armies to fight each other. The activation of this machinery has

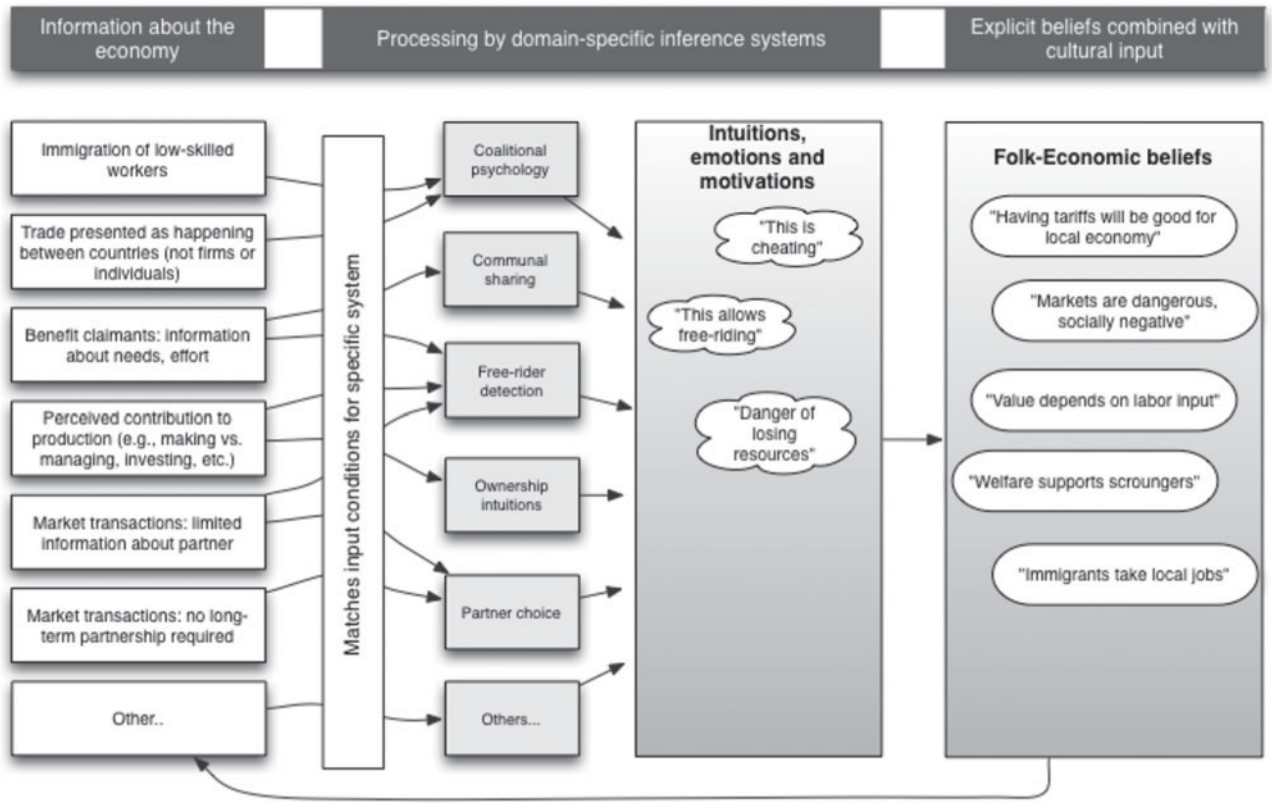


Figure 2. Illustration of the sequence of cognitive processes involved in the acquisition of economy-related information and generation of folk-economic beliefs.

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the downstream consequence, we argue, that Americans will evaluate the transfer of resources to China – and, hence, the headline – negatively. As argued above, one key assumption of the coalitional system, once activated about two categories or groups, is that there is a zero-sum interaction between the mutually exclusive groups. As a consequence, there is a strong prior belief that any advantage to another group is detrimental to one's own (Hiscox 2006). Any information to the effect that other groups are prosperous, or getting better, is equivalent to a threat-cue, indicating that our group stands to lose out.

It is relevant to note how this interpretation of FEB 1 (i.e., the disadvantage of trade) is different from the standard "fallacy"-oriented interpretation. According to our view, FEB 1 does not occur as a result of any cognitive or intellectual dysfunction. Instead, we argue that the zero-sum assumption is part of the *design* of coalitional reasoning. The resulting motivations are part of the architecture of this system. To maintain stable and efficient coalitions, humans in many different contexts must have assumed that other groups' advantage was a potential loss.

Viewing the "international trade is bad" belief as supported by coalitional psychology does not just explain the belief but also suggests novel testable predictions. In particular, we should expect the view that trade is bad to be particularly attractive when the trading crosses perceived coalitional boundaries. It is predicted to invariably occur in the context of, precisely, debates about trade between *countries*. American consumers may find it intuitive that the United States might suffer from Chinese prosperity, but, on this theory, they would find it less compelling that development in Vermont damages the economy of Texas. Similarly, the survival value of the belief might depend on the relationship between the countries. Trading between long-term allies (e.g., trading between Great Britain and the United States) should be viewed as less problematic than trading between rivals (e.g., trading between China and the United States), even if all else were equal.

5.2. Explaining FEB 2 and FEB 3: Immigration and the dual activation of the psychologies of coalitions and cheater-detection

In section 2, we outlined two FEBs about immigration. FEB 2 is the belief that immigrants "steal" jobs and FEB 3 the somewhat contrary belief that "immigrants abuse welfare systems." Although these two beliefs seem inconsistent (how can immigrants take both jobs and unemployment benefits?), they do share a key common assumption, a stipulation that immigrants use up valuable resources to which they are not entitled. This assumption, we argue, is what makes either of these ideas resonate with the evolved psychology of social exchange.

Specifically, the representation of recipients as not entitled to resources receives support from the interaction of two crucial inference systems: (a) coalitional psychology, and (b) cheater-detection. Immigrants are by definition newcomers to the community. Psychological research has shown that newcomers to groups activate this connection between coalitional cognition and cheater-detection, in particular, in situations where group membership is construed as conferring particular benefits. In such situations, newcomers are typically regarded with great suspicion. Cimino and colleagues interpret this in terms of cheater-detection. When new members join a group, they are in a position to receive some of the benefits of membership (e.g., becoming a Marine makes one a respected member of a prestigious military corps), without having (yet) paid any costs (e.g., risked one's life in action). This combination of features may activate cheater-detection mechanisms, as persons in this situation effectively meet the input criterion of Benefit Received without Cost Paid, which would explain the considerable hostility towards newcomers in many voluntary groups that is sometimes expressed in the form of painful hazing and initiation rituals (Cimino 2011). Experiments show that there is indeed an implicit concept of NEWCOMER that motivates such aggressive attitude, even when people consider membership in imaginary groups (Cimino & Delton 2010; Delton & Cimino 2010).

The tight relationship between the concepts of nation and coalition (see above) may explain the attractiveness of the statement that immigrants must be free-riders, scrounging on the past efforts of the host community. But, at the same time, the involved psychological systems leave open whether it is on job creation or on the welfare system that immigrants free-ride.

This interpretation suggests new research avenues. The argument is that the public's intuitions about the economic effects of immigration does not just reflect diffuse prejudice (Stephan et al. 1999) but is the outcome of very precise psychological mechanisms that work in tandem with beliefs about jobs, the welfare state, and so on, as collectively produced resources. As a consequence, it will be difficult for immigrant populations to behave in ways that increase acceptance by the native population. Any involvement with what is construed as a "resource" is likely to trigger intuitions of free-riding – see, for example, Guimond et al. (2010). Furthermore, our interpretation suggests that there is an intimate connection between the perceived motivations of immigrants and the presumed economic consequences of immigration. Only in instances where specific immigrant groups are seen as willing to sacrifice self-interest for collective goods – that is, the exact opposite of free-riding motivations – should the public view the economic effects as positive.

Finally, this shows that there is no one-to-one mapping from specific systems for social exchange and specific FEBs. When FEBs – sometimes contradictory ones like FEB 2 and FEB 3 – become culturally available, their acceptance depends on the degree to which they resonate with human exchange psychology. In this particular case, it is the dual appeal of the FEBs to both coalitional psychology and cheater-detection psychology that ensures their cultural survival in the minds of the public.

5.3. Explaining FEB 4: Social welfare and intuitions about free riding and communal sharing

FEB 4 refers to beliefs about the effects of economic investments in welfare programs. In fact, as laid out in Section 2, folk-economic beliefs about these effects consist of two separate and diametrically opposed beliefs. One belief is that unemployment benefit programs, for instance, lead to decreased economic activity because welfare programs benefit unproductive individuals. Another belief is that, in the long run, these benefits increase economic activity because they sustain productive individuals during periods

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of bad luck and, hence, facilitate the transition to new jobs. These opposite beliefs are not randomly distributed. In fact, their distribution demonstrates our key point about the relevance of FEBs: that they are associated with particular political positions. Support for welfare programs is strongly related to the belief that they sustain unfortunate individuals. Opposition to welfare programs is strongly related to the belief that they sustain unproductive – that is, lazy – individuals.

In our perspective, beliefs surrounding welfare programs – and, in particular, the link between beliefs about welfare recipients' productivity and support for welfare programs – are a key example of how psychological adaptations designed for social exchange shape economic policy views. What is surprising is not just the existence but also the strength of this link between perceived character of recipients and presumed economic benefits of welfare programs. In one of the most extensive studies of Americans' views on welfare, Gilens (1999) concluded that the perception of welfare recipients as "undeserving" is the strongest predictor of individual-level opposition to welfare programs. This, we argue, is a consequence of the way in which the cues surrounding welfare programs activates mechanisms designed for cheater-detection.

Debates about welfare programs contain a number of cues that should elicit cheater-detection psychology. Welfare recipients are in need, and welfare programs provide benefits to the recipients and does so at a cost for the collective. For a mind designed to scan the social environment for cheaters, this particular set of cues automatically raises the question: Have the recipients paid sufficient costs in order to be entitled to these benefits? (Petersen et al. 2012). Or, more specifically: Are the recipients valuable enough as cooperation partners to be included within the exchange system? This, then, motivates scanning for additional information about the cooperative motivations of welfare recipients, activating either cheater-avoidance motivations (if low) or communal sharing motivations (if high), and, in the end, providing an exceptionally fertile soil for infusing economic opinions with beliefs about whether or not welfare recipients are lazy.

This psychological process is one of the more well-studied aspects of folk-economics. The most direct test comes from a series of studies utilizing the memory confusion paradigm. They suggest that welfare recipients are mentally represented by activating the exact same psychological categories that people use to represent cheaters and reciprocators in everyday social interaction (Petersen 2012). The results show that memory processes confuse lazy welfare recipients with everyday cheaters and unfortunate recipients with everyday reciprocators (but not lazy recipients and everyday reciprocators or unfortunate recipients with cheaters). Participants in these studies even forget whether those specific individuals were presented in the context of economically relevant welfare debates or everyday face-to-face interaction. This process operates in a similar fashion, regardless of people's political ideology, their level of political engagement, and whether they live in a society with an expansive welfare state (Denmark) or a reduced one (United States).

This particular explanation for FEB 4 makes sense of empirical findings concerning the relationship between cultural factors and beliefs about welfare. Individuals with liberal or left-leaning views tend to view social welfare recipients as productive individuals. Individuals with conservative or right-leaning views tend to view welfare recipients as unproductive individuals. Similarly, in social democratic societies, the former belief tends to dominate, whereas the latter belief dominates in societies with minimal welfare states. As consequence, cultural explanations have largely dominated the literature. For example, Americans' perception that many welfare recipients are lazy, and the association with anti-welfare sentiments, has been argued to reflect an "individualistic" American culture (Gilens 1999). Similar arguments have been made with regard to right-wing ideology: that it contains an "ideological script" that binds together perceptions of laziness and welfare opposition in the mind of right-wing individuals (Skitka & Tetlock 1993). From the evolutionary cognitive perspective, however, this structure is imposed by evolved mechanisms for exchange that are operating flexibly on the available cues. As a consequence, it should be easy to reverse apparently stable cultural patterns in welfare beliefs, if the right cues are provided. Research shows that this is indeed the case. Among a sample of Danish political science majors (who should be able to reason ideologically), ideological differences in opinions completely disappear when the participants form views about the deservingness of recipients cast as either lazy or unfortunate (Petersen et al. 2012). Even more dramatically, cultural differences between Scandinavians and Americans in support for the welfare state completely disappear when participants from these populations have to form views about specific recipients. Two sentences of text that contain evolutionarily relevant cues for cheater-detection are enough to displace 150 years of historical experience with two very different welfare systems (Aarøe & Petersen 2014).

Another insight from the evolutionary cognitive perspective is that people's priority with regard to welfare economy is not so much to ensure a particular overall distribution of resources but more to ensure that resources go to the right individuals. Although the notion that people generally prefer equal to unequal distributions of resources (Fehr et al. 2006) has been popular, recent research suggests that people are much more concerned with a fair distribution. Unequal distributions are perfectly acceptable, if those who are bypassed are viewed as cheaters (Starmans et al. 2017).

5.4. Explaining FEBs 5 and 6: Impersonal markets and mechanisms for partner-choice

A common feature across numerous FEBs is the notion that markets are, in different ways, "bad" for general welfare. FEB 5 is an expression of what Rubin (2014) called *emporiophobia*. FEB 6 refers to the more specific notion that transactions on the market are somehow "unfair." There is a common thread in these beliefs, the role of perceived social motivations. In most cases, the perceived negative effects of the market are seen as originating from particular sets of social motivations, believed to be pervasive in market transactions. From a cognitive evolutionary perspective, we argue, these beliefs emerge naturally due to the way market interactions differ from the types of social exchanges we evolved to value.

Specifically, to explain these FEBs, we need to describe in cognitive terms, in what way market transactions are, as

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is often claimed, "impersonal." This description combines several features of potential relevance to our intuitive systems. First, people in modern conditions do not in principle need information about their exchange partners, beyond knowledge of their positions (seller, buyer), the particular goods they sell or buy, and their price. Second, there is no expectation that considerations other than price and utility should govern people's behaviors in such exchanges. That is, you may be interested in patronizing local stores because that helps keep the town pleasant, but that motivation is clearly extrinsic to the terms of exchange. Third, there is no expectation of reiterated transactions. One can in principle behave in opportunistic ways, patronizing Baker A when his prices are lower and defecting to Baker B when that is more advantageous.

These features all constitute advantages of market transactions from an economic standpoint. Yet, for intuitive inference systems designed for established, long-term, cooperative exchange, these same features will be interpreted in a different manner – as threat-cues. First, our partner-choice system requires that the parties in a transaction be identifiable as specific individuals. In small-scale interactions, the balancing of costs and benefits occurs over reiterated exchanges, and, in order to predict these long-term outcomes, information about the partner's reputation and past exchanges are key. Impersonal transactions, in contrast, are often anonymous, and therefore make it more difficult to track the reputation of one's partners. To a psychology designed for partner-choice, this is likely to trigger an alarm signal, indicating that such a situation should be avoided. Second, strictly impersonal exchange goes against motivations to generate bonds of cooperation with particular individuals, as a form of social insurance. This may reinforce the intuition that impersonal transactions involve, if not danger, at least a missed opportunity. Finally, systems for partner-choice are set up to avoid engaging in exchange relationships with individuals who are much more powerful, in order to avoid exploitation (Petersen 2013; Trivers 1971). In modern markets, however, many exchanges take place with corporations or business that seem exceptionally powerful from the perspective of the individual. While these corporations are actually affected by consumer choice, this only occurs at the aggregate level. As a result, each individual can form the perception that powerful corporations set the terms of exchange in potentially exploitative ways.

Such intuitive computations would provide the cognitive context in which the mind processes socially transmitted information, for example, to the effect that it seems true that "markets are cruel and selfish," or that "a free market makes wolves free to attack sheep." In such circumstances, external information provides a context in which some of the intuitions described here receive an explanation or a justification. Conversely, such explicit discourse about the economy is attention-grabbing for people to the extent that it matches some of these intuitions.

This perspective on the emergence of emporiophobia is a recent theoretical proposal (Rubin 2014). There is no specific test of the hypothesis as yet. However, a range of evidence on related phenomena is congruent with this psychological description. Behavioral economics studies show how trust and cooperation are inhibited when social situations are made anonymous (Bohnet & Frey 1999; Hoffman et al. 1996); neuro-economic studies show how monetary rewards elicit greater emotional responses if we experience the source as a human rather than, for example, an impersonal computer – for a review, see Petersen et al. (2009); and management studies show that more impersonal forms of interaction (e.g., e-mail rather than face-to-face interaction) reduce satisfaction with the interaction, in part because of a lack of emotional coordination (Baltes et al. 2002).

Future research could test the proposed explanation directly by utilizing an individual differences approach: Do individual differences in attention to cooperative positive-sum games in everyday life predict endorsement of emporiophobia-related beliefs? This would not only provide a test of the link between perceptions of the market and social motivations, but also could illuminate some of the political implications of FEBs. Emporiophobia is more outspoken among liberals than conservatives and, consistent with the proposed explanation, there is evidence that liberals in general are more oriented towards cooperative, positive-sum games, in particular with strangers (Hibbing et al. 2013). In this regard, it is important to note, again, that emporiophobia is a matter of stated, explicit beliefs, which may or may not reflect the intuitive principles that actually guide people's economic behavior. People who say that markets are "bad" may still behave as roughly rational agents in markets, and they may even detect the advantages of competition in their everyday economic behavior. But, if asked whether a given domain of activity should be left to a market of competitors, or when asked the extent to which markets should be regulated, they readily express the view that market outcomes are socially detrimental.

5.5. Explaining FEB 7: Wages, labor, and the effects of ownership intuitions

FEB 7 is the belief that labor is the source of "value." Experimental studies have carefully documented this effect. For instance, adults and even young children assume that working to transform an object carries a potential claim to ownership such that, for example, the artist, not the owner of the quarry, is the owner of a sculpture. This ownership claim is made stronger by the extent of the transformation (Friedman 2010; Friedman & Neary 2008; Friedman et al. 2011).

From a cognitive evolutionary perspective, human ownership psychology reflects the features of evolutionarily recurrent environments. Ancestrally, most valued and owned goods were previously unclaimed natural resources that time and effort turned into something useable (whether food, tools, or shelter). In such situations, labor is indeed the exclusive generator of both "value" and ownership. Features of modern economies that influences ownership and price, such as ownership of capital and consumer demand, were not crucial features of ancestral environments in the context of production. For example, claiming ownership over something processed by an unrelated person ancestrally would instead signal the existence of a clear dominance relationship.

Although good evidence exists for the importance of labor for intuitions of ownership and value, future studies should seek to directly test people's intuitions about the relative contributions of labor, as well as capital provision and consumer demands, in determining ownership. The prediction that emerges from the cognitive evolutionary

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perspective is that labor should be intuitively associated with ownership, while other factors are represented in explicit afterthoughts rather than through automatic intuitions. Studies utilizing measures of explicit and implicit processing could tease such effects apart.

This set of folk-economic beliefs (and, in particular, intuitions about value) illustrates an important point: that information that does not meet the input conditions of a system is simply not handled by that system. Here, our ownership inference system takes as its input the fact of original possession, the original state, and the amount of work that transformed a thing. These are the conceptual slots, the place-holders, to be filled by appropriate information. By contrast, the fact that there is, or is not, some demand for the work in question, does not fit any specific conceptual slot in our intuitive ownership system. So, it is simply not processed at all by the relevant intuitive system.

These beliefs also illustrate the political importance of FEBs. Intuitions about ownership and value resonate with arguments about large wage differentials between, for example, managers and frontline workers being unfair, and that the latter contribute more "value" than the former. Such arguments have particular appeal if used to argue in favor of higher taxation or the regulation of business. Historically, Marxian ideologies have also continuously framed owners of capital as exploitive. In this regard, the evolutionary cognitive model entails novel testable predictions: The underlying intuition that owners of companies or factories are exploiting workers may not ultimately stem from observed differences in wealth, or poor conditions for the workers. Instead, an important contribution may lie in the fact that workers are perceived as investing more effort, often in the form of more physically demanding labor. To the evolved mind, this may trigger the intuition that workers are natural owners of products. Future studies could directly test this by examining how different factors such as wealth differences between management and workers, differences in working conditions, and differences in effort, shape the view that particular corporations are exploiting their employees.

5.6. *Explaining FEB 8: Large-scale regulation and small-scale minds*

FEB 8 is the belief that regulation has the intended economic effects. Specific examples include the belief that rent controls drive down the average rent, that minimum wages increase average income, or that there is a fixed amount of work to be done, so that limiting the working hours will palliate unemployment by distributing that amount (Worstall 2014, p. 75). Economists generally point out that, even in the best scenario, unintended effects occur and, in some cases, reverse the desired outcome. Trust in regulation seems to be based on specific non-economic assumptions (Hirshleifer 2008) and, in particular, an assumption of stable supply. For example, people expect price-controls to affect market prices but have no effect on quantities supplied.

To explain this FEB, we need to take into account the fact that unintended consequences of this kind are second-order effects that occur in large-scale social systems. They reflect aggregate market responses to changes in costs and benefits (e.g., if the price of the good is regulated downwards, the market responds by decreasing quantities supplied). But our psychology of social exchange is designed for small-scale social systems, for personal exchanges between oneself and one or more identified others. The intuitive inference systems that evolved to deal with such situations do not, because of the small-scale nature of the situations, include any conceptual slots for aggregate dynamics such as origins of supply. In this way, FEBs about regulation do not emerge from a single set of intuitive inference systems. Rather, they emerge from the failure of particular pieces of information to be processed by *any* intuitive inference system.

Let us consider the specific example of rent control to illustrate this interpretation in more detail. To the evolved mind, rent control can be intuitively construed as a form of assistance that makes sense from a small-scale perspective, as it seems that resources are transferred from richer landlords to poorer tenants. It is likely that systems designed for cheater-detection provides the motivational impetus to support such policies. The situation can be mentally represented as including a generic landlord who intentionally takes an extra benefit (increasing rent) without incurring an extra cost (providing better housing), thereby meeting the input conditions for the "cheater" concept. In this context, the regulatory state appears to redress the situation; the rent ideally decreases, so that the situation no longer activates free-riding detection. Economists have pointed out that the adverse consequences of rent controls (i.e., a lower supply of rental units) may offset any positive effects, although there is disagreement over the size of these negative dynamics (Jenkins 2009). From an evolutionary cognitive perspective, people will fail to consider such aggregate effects, as the activation of evolved categories entails a perception of the situation as small-scale interaction. The cheater-detection system has no slot for information about the origin of supply and takes quantity supplied as a given. Indeed, in the exchange situations typical of our ancestral past, distribution typically had little effect on production. As described above, opportunity costs, insurance expectations, and reputation management made it possible for people to *both* distribute most of the game they caught *and* be motivated to hunt again. Since there is no conceptual slot for information about the origin of supply – for example, the incentives that make people offer housing for rent – this information does not enter into computations about regulations, thereby allowing a belief that regulation will have only the intended effects.

No existing studies have directly tested this argument, and there is only scant evidence at present concerning the psychological representation of regulation (Hirshleifer 2008). An initial set of evolutionary cognitive studies on regulation should test (1) whether the presence of evolutionarily recurrent cues (e.g., cues of cheaters) automatically induces the intuition that regulation in the relevant domain (e.g., rent) works, and (2) whether explicit information about second-order dynamics (e.g., decreased supply) are discounted in the face of such cues.

6. Transmission and effects of folk-economic beliefs

6.1. *Intuitive systems create cultural attractors*

So far, we have analyzed the ways in which various cognitive systems could affect the relevance of particular pieces of

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information about the economy, making some views about, for example, unemployment or trade, particularly salient because of their fit with the contents of intuitive assumptions. We can now examine how the agreement or discrepancy between intuitions and some explicit notions of the economy impacts the transmission of information between individuals, thereby creating culturally successful representations. Here we are extending the work of economists who emphasized some particular ways in which individual psychology may influence economic beliefs (Caplan 2008; D. D. Friedman 2004; Rubin 2002). Closest to the kind of model presented here, David Hirshleifer described what he called a "psychological attraction" account of popular opinion on regulation, arguing that "certain beliefs … are especially good at exploiting psychological biases to attract attention and support" (Hirshleifer 2008, p. 857).

Our model extends this form of explanation to most domains of folk-economic opinion. We predict that information about economic matters will be all the more widespread, easy to acquire, natural, compelling, and so forth, when it matches the input conditions of the inference systems described above, thereby creating widespread folk-economic beliefs.

Human communication does not consist in "downloading" representations from one mind to another. Rather, it consists of inferential processes, whereby a listener makes use of observable cues provided by a speaker to reconstruct that individual's possible communicative intentions (Scott-Phillips 2014; Sperber & Wilson 1995). Because of this interpretive quality of communication, cultural transmission will often follow unpredictable paths. We should not expect the contents of two minds from the same social group to be similar. And to a large degree, of course, they are not. Among the myriad mental representations created and sustained in individual human minds, only a minuscule fraction are shared with other individuals. Precisely for that reason, these common beliefs require special explanation. Why do people in a social group sometimes hold roughly similar representations? This question stands in contrast to the questions of classical social science, for which social change was the problem, while the continuity of traditions was taken for granted (Morin 2016).

A crucial insight of evolutionary anthropology is that cultural transmission processes are strongly constrained by the structure of human psychology (Sperber 1985; 1996). The mind is prepared to acquire certain representations more easily than others. As a consequence, these representations are found, in roughly similar forms, in many different minds, becoming what we call cultural beliefs. The combination of expectations from our domain-specific intuitive systems, with communicative input from other members of our group, form what anthropologists call *cultural attractors*, positions in the space of possible representations where many minds seem to converge (Claidière et al. 2014; Claidière & Sperber 2007). Cultural transmission creates stable representations, not just because people discard or forget material that is far from the attractors, but also because human minds actively distort fragmentary or deviant material. In other words, transmission is reconstructive rather than just selective (Claidière & Sperber 2007; Morin 2013).

This perspective on cultural transmission helps make sense of the cultural recurrence of some folk-economic beliefs, explaining for instance why the belief that imports from other countries are a bad thing, or the notion that immigrants are welfare-scroungers, are made more salient by their interaction with intuitions about coalitions and communal sharing. It is important to notice that the effect of intuitive systems on the spread of cultural beliefs are probabilistic. For example, our intuitive free-rider detection system, or our evolved set of preferences for partner-choice, do not by themselves directly generate particular views of the economy. The intuitive systems only provide a context against which external information, provided by mass media, economists, political entrepreneurs, or simply other individuals, is likely to become relevant, attention-grabbing, and therefore susceptible of cultural transmission.

Conversely, we are obviously not suggesting that the human mind is condemned to process only mental representations that are relevant to our intuitive systems. There are many circumstances in which humans have acquired and communicated thoughts that are entirely non-intuitive, in the sense that they do not match our evolved inference systems. People can, for instance, learn to think in terms of scientific physics, which often go against our intuitive physics. In the case at hand, people can learn economics and produce reasoning that diverges from the beliefs described here. However, acquisition of such non-intuitive thoughts requires effort, and in most cases institutional support for sustained learning (Boyer 1998).

6.2. Folk-beliefs do not reveal an implicit theory of the economy

Is there an economic system in the mind, a set of processes specially dedicated to economic transactions? It would be tempting, though in our view seriously misleading, to consider the set of folk-economic beliefs as a (spontaneous, popular, perhaps misguided) alternative to economic theory. In this view, FEBs would be the outcome of a particular vision of society and the economy.

We resist this interpretation, as there is little evidence for such an integrated, quasi-theoretical picture of the economy among layfolk. In fact, the few studies of lay models clearly suggest the opposite. For instance, Williamson and Wearing interviewed 95 individuals and extracted from this material their implicit views about economic processes. They conclude that "the outcome was 95 unique cognitive models" (Williamson & Wearing 1996, p. 3).

Indeed, folk-economic beliefs may vary not just between individuals, but also within the same person, at different times or in different contexts. That is, people do not seem to have stable economic beliefs, in long-term memory, that they could pull out on demand. In the field of public opinion, researchers have made a strong case that we should dispense with such "file-drawer" models of opinion formation (Wilson & Hodges 1992; Zaller 1992). People do not build and store stable, organized beliefs about the economy, ready to be made available when surveyed by a pollster. Instead, they make up their attitudes and beliefs "on the spot," by retrieving relevant cultural representations, and (in our view) activating the relevant intuitive inference systems. For most individuals in modern mass-societies, there is little monetary incentive to evaluate one's own beliefs about the economy or the political process (in contrast to many other domains in their everyday lives), and there is almost no price to pay

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for being factually wrong, which would explain why there is relatively little cognitive investment in evaluating their validity (Caplan 2008).

The exceptional range of different understandings of the model identified by Williamson and Wearing (1996) also suggests that, for each individual, the model might be different if surveyed in another context. Indeed, there is evidence for such systematic changes. In an analysis of British voters during the recent economic crisis, Bisgaard (2015) found that people rapidly shift their understanding of how much control the government has over the economy, depending on how the economy is doing and whether or not their favored party is in government. If the economy gets worse and people support the governing party, the government is suddenly no longer viewed as in control. From an evolutionary cognitive perspective, such partisan motivations most likely stem from the operations of coalitional psychology (Haidt 2012; Petersen 2016). People signal support to their coalition by construing beliefs that protect it against criticism. Experimental results show that, like national or ethnic identities, partisanship is processed as a coalitional affiliation to the evolved mind (Pietraszewski et al. 2015). Hence, it might matter for people whether they have the "right" FEBs from a coalitional perspective but not whether they have the "true" FEBs from an epistemic perspective.

The fact that folk-economic beliefs can change rapidly should not be surprising, as most of them are reflective, not intuitive beliefs. To illustrate this reflective nature of FEBs, consider "emporiophobia." Information about the fact that market transactions are one-shot interactions can lead to the intuition "there is danger here," because our evolved social exchange preferences include reiterated transactions with known individuals. This intuition of danger can then lead to forming, acquiring, or accepting explicit reflective beliefs of the form "the market is bad."

From an evolutionary standpoint, it should come as no surprise that human minds do not comprise a specific "economics" module. Decision-making under scarcity, traditionally described as the domain of economic models, is not a unified domain of social interaction, for which evolution would have given us specific inference systems. Instead, the evidence from experimental psychology studies suggests that human evolution resulted in specialized systems for scarcity in food provision (foraging), in mates (sexual preferences), in social support (coalitional psychology), and so on (see Buss 2015). Even in the domain of social exchange, as described above, we spontaneously activate diverse systems with different principles and potentially inconsistent responses.

6.3. Relationship between FEBs and economic behavior

The model presented here leaves a gap in our understanding, as concerns the connections (or lack thereof) between folk-economic views on the one hand, and economic behavior on the other. Many people in modern societies have explicit folk-economic views that do not just fly in the face of economic theory, but are also incompatible with their own behavior in markets. For example, people may both have the explicit belief that "markets produce negative outcomes" and an implicit trust in competition in their search for the best prices.

We propose here that economic beliefs are largely constrained by evolved, domain-specific systems concerned with social exchange. So, there might be connections between FEBs and economic behavior, to the extent that these same domain-specific intuitive systems are activated when people engage in actual economic transactions.

Unfortunately, this aspect of economic cognition is still very much a *terra incognita*. We can assume that economic decision-making is governed by a variety of intuitive systems, the aggregate output of which is an intuition that the transactions is desirable or best avoided, and that intuition motivates the eventual decision. Over the last decades, studies within behavioral economics have demonstrated how this intuitive output diverges, in relatively systematic ways, from the subjective utility maximization predictions of standard microeconomics (Plott 2001; Smith 2003).

However, we still lack a computationally precise and reasonably predictive description of the cognitive processes engaged (Ross 2005). Indeed, a large part of the behavioral economic literature assumes what could be called a person-level description of economic decision-making, in which information about possible strategies is combined and evaluated by a general-purpose, centralized utility-evaluating system – the difference from neoclassical models being that considerations of fairness, reputation, and other non-standard forms of utility are added to the classical *homo economicus* agent. This notion of utility as considered by a centralized agent corresponds to what Dennett calls the "intentional stance," in which we explain behavior in terms of reasons, knowledge, and intentions (Dennett 1987). This way of explaining behaviors is produced by our intuitive psychology, or "theory of mind." It is very successful in explaining and predicting other human beings' behavior. The operation of this intuitive psychology is so natural and invisible that it often seems difficult even to imagine another way of explaining behavior.

But there is an alternative, what Dennett called a "design stance," in which we consider behavior in terms of the various computational systems involved in acquiring information about the environment and motivating specific behaviors (Dennett 1987). Approaching economic decision-making in this perspective could make economic theory more congruent with findings and models from the cognitive sciences (Ross 2005). In that perspective, decision-making in any domain is the outcome of a competition between distinct computational processes – and this of course applies to economic decisions as well (Kenrick et al. 2013), a view that is supported by behavioral evidence (Ainslie & Monterosso 2004) and neurocognitive findings (Glimcher 2009; Loewenstein et al. 2008). However, it is still difficult to describe how these models and findings could be integrated with classical, and often empirically successful, descriptions of economic behavior in terms of rationality (Ross 2005) and utility (Burnham 2013). As a consequence, the actual connections between micro-processes of economic decision-making on the one hand, and folk-economic beliefs on the other, remain unexplored.

6.4. Political relevance of folk-economic beliefs

In this model, because of the activation of intuitive inference systems, some ways of presenting economic processes are more compelling than others. This would constrain political communication, not just from elites to the rest of the

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population, but also among layfolk, with important consequences for political debate. Importantly, this would imply that a particular economic issue is often *not* discussed in the format that provides most information about the causes and consequences of policy, but in the format that is intuitively compelling, even if that obscures a great deal of the relevant information.

FEBs are politically important because they act as a set of background assumptions that forms the basis of the formation of political opinions. One important area of opinions relates to political candidates. A wealth of research within political science has shown that incumbent parties or candidates are punished and rewarded for bad and good economic developments, respectively. When unemployment soars, incumbents are more likely to lose. Importantly, however, research also shows that the link between economic circumstances and voting behavior is mediated by the perceived responsibility of the incumbents (Rudolph 2003a; 2003b). Assignment of responsibility for macro-economic events necessarily relies on FEBs and an interpretation of the relationship between the actions of the candidate and the economic developments. Beliefs about the relationship between economic hardship, on the one hand, and international trade and immigration, on the other hand, could be influential. If the economy is doing badly and the incumbent government has increased immigration and trade, then our analyses suggest that it is more likely that the government will be held accountable on Election Day.

Such effects of intuitive systems are also relevant to policy choices. FEBs, and the intuitive systems underlying them, shape political behavior because they make certain ways of organizing the economy more compelling. Importantly, these compelling policies will in some cases be misguided, as the psychological systems were designed for small-scale exchange rather mass markets. For example, in the small-scale environments of our ancestors, helping was a matter of transferring resources to a needy individual. Arguments for welfare policy that are framed that way should be persuasive. In modern markets, however, the effectiveness of any social solutions is also affected by equilibrium considerations. Consider the difference between targeted versus universal welfare programs. From a small-scale perspective, targeted programs should be most effective in helping the needy, because they bring resources specifically to those in need. Yet, in market economies, comparative studies provide compelling evidence that welfare programs are more redistributive, and help the neediest people more, when they are universal rather than targeted. That is due, again, to macro-level dynamics ignored by our intuitive systems. Research shows that it is possible to sustain high levels of benefits from a welfare program, but only when the politically influential middle-class are among those benefiting from that program (Korpi & Palme 1998; Rothstein 1998). When they do not benefit, most voters are persuaded that the benefits should be scaled down. Because of this electoral dynamic, universal programs are on balance more redistributive than targeted programs. This net result arises from both their high benefit rates and the fact that higher-income groups contribute more to the program by means of taxation than low-income groups. But, again, evolved exchange intuitions would make people less likely to be persuaded by arguments that touch on such dynamics, compared to arguments that fit our intuitive systems for allocating benefits between individuals.

Folk-economic beliefs are politically important because they constrain how politicians can talk about policies to the public. Political scientists have documented the effects of "framing" on policy views (Chong & Druckman 2007). The model presented provides a more specific understanding of these processes. In our view, certain policy-related messages are more compelling or persuasive, not just because they are framed in more "concrete" or "simple" or "vivid" terms, as is often suggested, but also because they meet specific expectations from our intuitive systems. For instance, policies that increase international trade with rival countries or that allow more immigrants to enter the country can be more easily framed as economically problematic than as beneficial, not because the former description is "simpler" but because of the match it offers between intuitive inference systems and a particular constellation of arguments (Arceneaux 2012).

7. Conclusion

In 1922, the American journalist Walter Lippmann grasped the characteristic of modern mass societies when he wrote: "Our opinions cover a bigger space, a longer reach of time, a greater number of things, than we can directly observe" (Lippmann 1922, p. 42). If this was true in 1922, it is even more true in the twenty-first century. And if it is true about mass societies, in general, it is nowhere else as true as with the market. No citizen can ever observe each of the distant transactions that comprise the market economy. It is not just a matter of practicality. The market mechanism is in principle unobservable. Even if all transactions could be observed, one would still not observe the economy as such – such a claim would be a category-mistake in the sense of Ryle (1949/2009). The "hand" that governs the causal processes of the market is, as already pointed out by Adam Smith, invisible – that is, not just hidden but in principle difficult to detect (Nozick 1994). As consequence, laypeople, when forming their internal representations of the economy, cannot rely on much, if any, feedback from direct experience. And without external experiences as a reality-check on their beliefs, they are left with what others report and what they themselves can imagine.

We proposed a new explanation for the differences between laypeople and economists' views on a number of economic issues. Instead of considering folk-economic views as irrational deviations from normative understandings of economic processes, we explain them as the outcome of principled cognitive systems. These appeared in human evolution as adaptive response to specific challenges, and they are automatically activated whenever a situation meets their input criteria. The intuitions provide support for deliberate, explicit, reflective thoughts, among which are the culturally transmitted folk-economic beliefs considered here.

How and why people acquire and stabilize beliefs about the economy is, obviously, crucial to understanding political dynamics. Economic policies are central to the overt choices offered in most liberal democracies, but we are only starting to figure out the effects of intuitive systems, typical of all normal human minds, on the acquisition and transmission of people's explicit beliefs about the economy.

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Open Peer Commentary

Folk-economic beliefs as "evidential fiction": Putting the economic public discourse back on track

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Abstract: Folk-economic beliefs may be regarded as "evidential fictions" that exploit the natural tendency of human cognition to organize itself in narrative form. Narrative counter-arguments are likely more effective than logical debunking. The challenge is to convey sound economic reasoning in narratively conspicuous forms – an opportunity for economics to rethink its role and agency in public discourse, in the spirit of its old classics.

In their target article, Boyer & Petersen (B&P) offer a compelling explanation of the success and endurance of folk-economic beliefs, based on the influence of evolved, panhuman, cognitive modules. Folk-economic beliefs fit with our intuitions and expectations, and thus they have a cultural advantage with respect to other beliefs, independently of whether they are true. A question that emerges from the article is whether and how we can change these beliefs, given their intuitiveness.

Different approaches to cultural evolution (see Acerbi & Mesoudi 2015) propose that various factors can have a role in the cultural diffusion of beliefs. An important distinction in cultural evolution is made between content- and context-based biases. Content-based biases refer to intrinsic features of the cultural traits at stake, which is what B&P focus on. Context-based biases refer instead to contextual factors, independent of the content of the cultural traits, such as popularity (the majority of other individuals believe *x*) or prestige (experts, or famous individuals, believe *x*). It is an open question how content- and context-based factors interact in different domains, and whether context-based biases can overcome the intuitiveness of folk-economic beliefs.

Another framework, epistemic vigilance (Sperber et al. 2010), proposes that, under certain conditions, trust and argumentation can enable the spread of counter-intuitive beliefs against the intuitive ones – in this case, folk-economic beliefs. However, argumentation works better in long, face-to-face, interactions, and its strength is inversely proportional to the complexity of the topic. Moreover, trust in economic experts (Bookstaber 2017) and politicians (Tormey 2015) is at historical lows. The situation presents some analogies with counteracting anti-vaccination beliefs (Miton & Mercier 2015).

To understand the success of folk-economic beliefs, we can also characterise them as examples of the "evidential fictions" studied in the cognitive science of narratives (Oatley 2016). The importance of narratives for the social dimension of economic interactions has recently been acknowledged by economists (Shiller 2017). However, economists have so far largely ignored these issues and their implications for cultural transmission – and this is all the more surprising in view of the role of beliefs and expectation-formation processes (Shiller 2015) and self-fulfilling prophecies (Farmer 1999) in the assessment of the allocative efficiency of markets and of the effectiveness of economic policy. Not incidentally, Adam Smith's famous "invisible hand argument," which is a cornerstone of modern economics, is essentially a powerful narrative rather than a rigorous theorem, and significantly draws upon a complex cultural and even theological tradition (Harrison 2011).

The characterisation of folk-economic beliefs in terms of narratives also suggests possible ways in which they can be counterbalanced. Humans tend to organise their mental models of social situations and contexts in narrative form, and this cognitive strategy need not be regarded as a form of bounded rationality or a source of bias (Mar & Oatley 2008; Oatley 1999). It has been suggested that engagement in fiction has substantial developmental implications for empathy and theory-of-mind (Oatley 2016), and increases the likelihood of engaging in prosocial behaviour (Johnson 2012). Narratives can prompt individual changes through involvement in the story, including emotional participation and identification with characters, and through the content of the story, by simulating events and situations that are unlikely to be experienced in real life. Narratives, moreover, enable individuals to perform complex social computations that they would be unable to carry out in non-narrative form (Boyd 2009). Therefore, contents that are presented in narrative form elicit judgmental self-confidence in individuals, are felt as less threatening than technical ones, and elicit (possibly biased) non-reflective decision-making (Winterbottom et al. 2008). Highly technical content that is not cast into narrative form calls on the contrary for an act of trust in the epistemic authority of the proponent – for example, the economic expert (Trinkaus Zagzebski 2012). If such authority is challenged by the very narrative that supports folk-economic beliefs, its credibility is fundamentally disqualified and it becomes hard to counteract in non-narrative terms (Smith 2017).

For these reasons, insisting on the falsification of folk-economic beliefs on the basis of factual evidence, or even stigmatising such beliefs for their foundation on conceptual fallacies and "fake news" might be a generally ineffective strategy, from the point of view of B&P and from ours. However, cognitive science of narratives and fiction and cultural evolution could suggest possible ways in which intuitive folk-economic beliefs could be addressed, by providing alternative narratives that cast highly technical processes and events in real and financial markets into an intelligible and meaningful form, while being at the same time suitably designed and tested to control for biases. The use of metaphorical arguments and rhetorical tropes is deeply ingrained in the economic discourse (McCloskey 1998), and economics has an inescapable, although poorly acknowledged, narrative dimension (McCloskey 1990). It is not just for self-irony that George Akerlof (1984) gives to the collection of some of his major theory papers the title: *An Economic Theorist's Book of Tales*. In the book's introduction, he explicitly equates the single economic idea presented in a theory paper with the powerful narrative proposition of a good short story. The issue posed by folk-economic beliefs may be a healthy challenge for economics to rethink its role and agency in the public discourse, looking back to the teachings of its own old classics. Is it possible to convey good economic reasoning through emotional involvement, identification with characters, and simulations of events, so as to crowd out the deceiving simplicity and intuitiveness of folk-economic beliefs? This is, in our opinion, a promising avenue for future research, at the crossroads of economics, social psychology, cultural evolution, and the humanities.

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Beyond market behavior: Evolved cognition and folk political economic beliefs

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Abstract: Boyer & Petersen (B&P) lay out a compelling theory for folk-economic beliefs, focusing on beliefs about markets. However, societies also allocate resources through mechanisms involving power and group decision-making (e.g., voting), through the political economy. We encourage future work to keep folk *political* economic beliefs in mind, and sketch an example involving pollution and climate change mitigation policy.

In their path-breaking target article, Boyer & Petersen (B&P) lay out a theory of folk-economic beliefs. Primarily, their focus is on prototypical market transactions, linking evolved psychological abilities to beliefs about the processes and outcomes of immense numbers of freely transacting and exchanging people. Within a prototypical economic market, the choices of many anonymous and interchangeable people and firms determine the quantities and prices of goods and services. But the market is not the only mechanism through which resources are allocated. As future researchers build on the target article's insights, we would encourage them to study not just economic beliefs, but also political economic beliefs. Political economy focuses on the logic of group decision-making, power, and authority – notions not captured in the concept of a laissez-faire market (Mueller 2003). When political leaders change regulatory policies or when citizens vote in a referendum to enact a new law, citizens' pocketbooks are affected – though clearly not through the operation of market transactions. Folk political economic beliefs, we propose, can also be understood within B&P's evolutionary–cognitive framework.

Take, for example, their own discussion of emporiophobia. Just as humans are not adapted to large-scale transaction markets, they are not adapted to large-scale decentralized political systems. Unlike in small hunter-gatherer societies, where leaders are typically known directly by their subordinates, in modern nation states reliable data about potential leaders is difficult to find. Furthermore, citizens receive little usable feedback on whether or not their judgments are right (Kuklinski & Quirk 2000). Often this means citizens rely on cues that are inappropriate in the modern environment when selecting candidates, such as cues of physical strength (Riggio & Riggio 2010). Like agents in the free market, policy makers in the modern environment are impersonal and difficult to identify, as they act as individuals nested within legislative bodies and bureaucracies. These cues should trigger the same alarms as market transactions, that this anonymity may lead to exploitation (Petersen 2013). Results from the General Social Survey provide evidence this may be the case in the United States, as only 5% of respondents in 2016 had a great deal of confidence in the United States Congress and a majority of respondents had hardly any trust in Congress (see Smith et al. [2016] for General Social Survey datafile).

Consider a related example, again involving power and leaders. Throughout human evolutionary history, communities have been organized with some people having greater power and authority than others (Fiske 1992). In part, this is because there can be benefits for a group to cede power to a leader (Van Vugt et al. 2008). Nonetheless, powerful people can exploit their subordinates. To prevent this, subordinates, even if individually weaker, can band together in coalitions to thwart exploitive leaders (Boehm 2009). This suggests that the human psychology of power and groups includes mechanisms for assessing and responding to the potential of exploitive leaders. Some relevant cues might be whether there are large power differentials between leaders and subordinates and the extent to which the actions of the powerful benefit the subordinates. Because the government is impersonal and powerful, and citizens have little direct say in legislator behavior outside of voting, government regulation may activate intuitions related to exploitation by powerful leaders.

Although B&P review data showing that people often believe government regulation works, there may be circumstances in which contradictory folk political economic beliefs arise. First, the impersonal nature of the government may generate feelings similar to emporiophobia, where individuals worry that government regulation generates a social cost. Second, regulatory action taken by the government may activate fear of exploitation. Previous work has used rational choice theory to show the conditions under which citizens should be wary of government regulation and the provision of public goods (Miller & Hammond 1994). However, this wariness persists even in the face of well-structured regulation designed to solve important collective action problems.

Consider institutions designed to reduce pollution and mitigate climate change. Research attempting to design economically efficient and environmentally effective political institutions to combat pollution assumes that any solution which generates a revenue for the government will not be politically viable, tapping into the intuition that citizens may oppose large-scale government regulation (Franciosi et al. 1993; Ledyard & Szakaly-Moore 1994). Not surprisingly, this holds true when the revenue would be redistributed to the polluting industries being regulated (Noll 1982). But it also holds true when the revenue would be directed to programs for mitigating pollution (Goeree et al. 2010).

Though these complex institutions with many checks on government power ultimately use generated revenue to better mitigate climate change, they still may activate relevant cues for monitoring leaders. Because citizens have little direct say in revenue distribution, large-scale redistribution makes salient the power differential between citizens and the government. Furthermore, it can be difficult to attribute successful pollution reduction to individual policies, making it difficult for citizens to see the benefit of government redistribution. Together, these cues may activate fear of exploitation, and the rhetoric surrounding climate change mitigation often involves folk political economic beliefs that the government is wasting taxpayer money on mitigation efforts.

The authors emphasize how the characteristics of the market that make it an effective problem-solving system also activate evolved systems that generate distrust. Future research should aim to better understand how political institutions which share these characteristics similarly interact with human cognitive systems. Evolved cognitive systems surrounding leadership and power, as well as group decision-making and problem-solving, play an important role in how citizens respond to government intervention. Unfortunately, citizen responses often conflict with normative political and economic theory. The target article lays a strong foundation for a research agenda that connects folk-economic beliefs to evolved cognitive systems, and we encourage researchers to keep issues of power and group decision-making institutions in mind as they pursue questions about folk-economics.

Elaborating the role of reflection and individual differences in the study of folk-economic beliefs

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Abstract: Intuitions guide decision-making, and looking to the evolutionary history of humans illuminates why some behavioral responses are more intuitive than others. Yet a place remains for cognitive processes to second-guess intuitive responses – that is, to be reflective – and individual differences abound in automatic, intuitive processing as well.

By placing common economic folk-beliefs in an evolutionary framework, Boyer & Petersen (B&P) offer a very useful way for making sense of why people rely on particular heuristics and not others. People do not behave in ways that depart from classical economic theory because they are stupid. There is a rhyme and a reason to the departures, and in many cases, these departures helped minimize deadly mistakes that early humans faced (e.g., it is better to be leery than trusting of people from other tribes who are competing for the same scarce resources). It also points to why attempting to "educate" people about complicated economic systems is not a simple fix. After all, politicians can always gain from exploiting people's intuitive, but incorrect, understanding of the macro-economy. B&P's target article offers a helpful place to begin, and in the interest of providing constructive feedback to advance this project, I focus my comments on the role of reflection.

Intuition, rationalization, and reflection. In placing the emphasis on how intuition shapes beliefs, B&P seem to conceptualize reflection as merely a by-product of intuitive processes. In their telling, "Reflective representations add information to intuitions, explicate them, extend or restrict their scope, offer a comment on the intuitions or link them to specific sources" (sect. 3.2, para. 1). Although this describes what cognition can do with intuitions, it underestimates the dynamic role that "reflection" plays in refining intuitions.

Stanovich and West (2000; Stanovich 2011) offer a better way to conceptualize "reflection." In their theoretical model, intuitions also provide the starting point for cognition. Intuitions can be thought of as gut feelings about what we should do when we are faced with a decision (e.g., "don't let immigrants in to take our jobs"). At the same time, Stanovich and West put forward a more nuanced description of cognitive processes, in which people can do one of three things: (1) accept the intuitive response with little thought (go with the gut), (2) offer rationalizations for going with the intuitive response (motivated reasoning), or (3) second-guess the intuitive response and, if it is found faulty, override it and make a different choice (reflection). The third pathway is the most difficult and requires the motivation to reach an optimal answer.

People vary in their capacity and willingness to be reflective. Individual differences in reflection are not merely reducible to intelligence (Frederick 2005). Smart people can make the best motivated reasoners, coming up with brilliant (but wrong) rationalizations for their intuitive responses. Extant research shows that people who are motivated to second-guess their intuitive responses make more optimal economic decisions (see Frederick 2005). Research conducted by Ryan Vander Wielen and me (Arceneaux & Vander Wielen 2017) replicated these results and extended this area of research into the study of political attitudes. We found that people who are less likely to attach strong emotions to their attitudes and who enjoy thinking tend to be more reflective. These individuals, in turn, are more likely to make political decisions that are consistent with their ideological values and are more likely to hold elected officials from their own party accountable for bad decisions. In sum, reflective individuals are more likely to make decisions that are in line with the normative benchmark set by "rational choice" models in economics and politics. Our work and the body of work on which we build shows that even though many people gravitate to evolutionarily informed heuristics, they are not prisoners to them.

Stanovich and West's model also allows reflection to shape downstream intuitions, although it may take time and repetition for top-down processes to retrain bottom-up intuitions. For instance, once learned, it is hard to forget how to ride a bike, because the previously counterintuitive motion becomes intuitive. In a similar way, trained economists think and behave differently than laypeople in the domain of economics because they have retrained their intuitions to be in line with extant micro- and macro-economic theories.

Appreciating humans' capacity for reflection may help explain some of the mismatches we often observe between modern social structures and people's evolved intuitive responses. The codified legal systems that govern markets, for instance, were developed over time and through deliberative processes that draw on the reflective mind. They put in place a complex system that strikes a balance among various legal principles, which inevitably creates situations where what is legal fails to jibe with what feels fair or just. Modern institutions were built, in part, on a collective cognitive effort to tame and manage our intuitive responses.

Fairness, more than any other cognitive mechanism, is what explains the content of folk-economic beliefs

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Abstract: We applaud Boyer & Petersen's (B&P's) article on economic folk beliefs. We believe that it is crucial for the future of democracy to identify the cognitive systems through which people form their beliefs about the working of the economy. In this commentary, we put forward the idea that, although many systems are involved, fairness is probably the main driver of folk-economic beliefs.

We agree with the authors that seeing human cognition as a collection of biases is of little help to understand the logic behind people's folk beliefs and that it often amounts to re-describing the phenomenon that needs to be understood. What economists and psychologists need is a more mechanistic approach to the origins of folk beliefs, based on distinct specialized systems that, crucially, did not evolve to help humans to understand the market economy and the workings of modern politics.

But what are these evolved systems? Boyer & Petersen (B&P) put forward the idea that, just like religious beliefs (Boyer 2001), economic processes trigger a range of cognitive systems: cheater detection, communal sharing, partner choice, ownership intuitions, coalitional psychology, and so on (see Figure 2 in the target article). However, it is unclear to us to what extent these processes are really distinct from one another. In their target article, B&P mention the importance of fairness several times and describe it as the result of partner choice: When individuals are in competition with one another to be chosen as cooperative partners, they have no choice but to share the benefits of cooperation in a fair way (Baumard et al. 2013a; Debove et al. 2017). The goal of fairness mechanisms is to help individuals solve the following question: "Did I get as many benefits as others from the interaction given my effort, my talent, or my opportunity costs?" A range of empirical works have shown that, indeed, people are fine with unequal distributions of goods; what matters is whether resources are distributed in a fair way (Baumard et al. 2013a, Starmans et al. 2017).

In this perspective, it is conceivable that the different systems presented in the target article can in fact be traced back to a

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single fairness mechanism (see Figure 2 in the target article). For instance, B&P describe cheater detection as aiming to identify "a situation where some agent has taken a benefit without paying the cost for it" (sect.4.2, para. 1). But assessing whether the costs paid by an individual match the benefits she receives is precisely the function of the fairness system. Later, the authors give another example of cheating: "have the recipients paid sufficient costs in order to be entitled to these benefits?" (sect. 5.3, para. 3). Again, comparing the inputs brought by an individual with the benefits she receives essentially amounts to deciding whether the resources are distributed in a fair way.

More generally, detecting cheaters or free-riders presupposes the existence of fairness computations. Going back to the recipient of the welfare state: when does cheating start? Am I a cheater if I received unemployment benefits after only 3 months of work? How about 6 months? Or a year? Am I a cheater if I do not show-up at work when I have a cold? How about when I am pregnant? All judgments about cheating presuppose an anterior computation about the contribution of each individual to a common pool and the amount of resources she is supposed to receive if fairness is to be respected.

In the same way, communal sharing does not differ from fairness (Baumard et al. 2013b). As the authors note: "Communal sharing, although typically presented as including all group members, is often in fact modulated by past or expected reciprocation" (sect. 4.4, para. 2). Matching present distribution to past contribution, or present contribution to present distribution, is exactly the kind of output that the fairness system is supposed to produce.

About ownership, the authors note that "adults and even young children assume that working to transform an object carries a potential claim to ownership such that, for example, the artist, not the owner of the quarry, is the owner of a sculpture. This ownership claim is made stronger by the extent of the transformation" (sect. 5.5, para. 1). These observations about people's intuitions of ownership strongly suggest that the intuitions are an output of the fairness system because the more someone has contributed to producing or transforming an object, the more unfair it will be to take it from her (Baumard et al. 2013b).

Do these cognitive considerations matter for understanding folk-economic beliefs? We believe they do because they suggest that fairness, more than any other cognitive system, is what drives people's beliefs regarding immigration, trade, or the welfare state. We agree with the authors that markets are very counter-intuitive phenomena for which the human brain is ill-prepared. Yet, it is striking that the same (conservative) people who fail to understand that immigrants create jobs (FEB2) rather than take jobs (because they increase the demand for goods and services in their new country) have no problem understanding that price-regulations can have unexpected negative effects (FEB8). Similarly, the same (liberal) people who fail to understand the very same expected negative effects of price regulations have no problem explaining to their conservative friends that immigrants are dynamic and honest contributors who will foster economic growth.

In the face of these observations, we suspect that what prevents people from understanding the workings of markets and modern states is not their impersonal or abstract nature but first and foremost considerations of fairness (see, for instance, how fairness considerations prevent people from accepting utility-maximizing policies; Baron 1994). For many people, inequalities of talents, wealth, or nationality are unfair: nobody deserves to be born wealthy, smart, or a citizen of a first-world country. As a consequence, the products of these inequalities in the form of salaries or property rights are unfair. Acknowledging the benefits of free markets would amount to legitimizing the inequalities of wealth or talents that are magnified by free markets, hence emporiophobia.

In the same way, many people consider that, given the level of prosperity achieved in industrialized countries, every citizen should have a right to have an accommodation. In consequence, they consider unfair that some unlucky individuals lose their accommodation. Acknowledging that landlords have a right to expel people from their accommodation if they do not pay their rent would amount to negating people's right to an accommodation, even if ultimately, such evictions allow for the housing market to flourish and for more people to have decent accommodation. In other words, because humans evolved to respect others' rights (because of partner choice), and not to maximize the utility of (yet) nonexistent large-scale democratic entities, "rights trump utility," as Ronald Dworkin (1978) famously wrote. In this perspective, compensating the victims and the losers is possibly the best way for policy designers to make their policies morally acceptable and thus cognitively intuitive.

Not all folk-economic beliefs are best understood through our ancestral past

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Abstract: We applaud Boyer & Petersen's (B&P's) approach to a fascinating topic. Their arguments against understanding folk-economic beliefs (FEBs) in terms of economic ignorance or specific biases, however, are overly pessimistic. Economic theory is the reason beliefs about such disparate phenomena are labeled "economic" and "folk." More importantly, some FEBs are better understood by examining current rather than ancestral contexts of exchange.

Boyer & Petersen (B&P) provide a superb overview of folk-economic beliefs (FEBs) and identify their potential evolutionary origins. They suggest that ultimate explanations, by way of specialized cognitive inference systems that evolved as adaptations to ancestral human small-scale sociality, are the best way to understand the contents of FEBs. We agree with B&P that the evolutionary origins of FEBs are important and understudied. But their perspective is too dismissive of other explanations, namely ignorance of economic theory and specific cognitive biases, as foundations for the empirical study of FEBs.

The essential role of normative economic theory and biases. B&P state that "whether FEBs are correct or incorrect is orthogonal to the importance of studying them" (sect. 1.4, para. 5). We find this statement perplexing; systematic deviations from economic theory are what demarcates this area of research. Why are beliefs about such superficially disparate topics as trade, immigration, and domestic welfare programs unified under the umbrella of FEBs? Simply put, these topics are all informed by economic first principles and programs of empirical study. What else makes these beliefs "economic"?

It is further not the case that FEBs encompass lay beliefs about *all* phenomena addressed by normative economic theory. Rather, all of the FEBs that B&P describe are those that depart systematically from the consensus of economic science. Whether FEBs are rooted in economic ignorance, and thus qualify as "folk" beliefs, is more important than B&P acknowledge. Without normative foundations and evidence of systematic deviations from them, there would be no such paper searching for ultimate explanations of FEBs. The bias approach *defines* FEBs, and getting this descriptive science correct is a necessary first step in understanding them.

The knowledge that FEBs are biases may do little to explain their particular contents, however, as B&P note. In advocating the pursuit of ultimate rather than proximate explanations, they argue that biases are often simply restatements of the empirical

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phenomena in question. This may sometimes be the case, but the value of the bias approach is far from limited to re-description. For example, B&P's introduction of this approach references Caplan's (2007) taxonomy of biases about the economy. Yet a bias such as Caplan's anti-foreign bias not only encompasses several FEBs (including B&P's FEBs 1–3), but also identifies mistrust of foreigners as a unifying explanation, just as B&P do by invoking coalitional psychology.

Admittedly, anti-foreign bias cannot explain the *origins* of this mistrust. This is presumably why B&P argue that ultimate explanations can advance knowledge further than proximate explanations can: explaining the origins of FEBs allows for a better understanding of their cultural success and persistence. Although we tend to agree, even the veracity of this claim depends on the particular FEB in question, as we illustrate with the following example.

An illustration: Evidence for the mechanisms underlying anti-profit beliefs. B&P present FEB 6 as the belief that the profit motive is detrimental to general welfare. The authors explain this phenomenon (as well as FEB 5, the belief that markets negatively impact society) by way of modules for cheater and free-rider detection that are triggered by impersonal conditions of exchange (i.e., the absence of personal relationships with potential exchange partners). We cannot see why an ultimate explanation emphasizing impersonality is necessary or sufficient to explain these beliefs. If people observed personalized individual agents profiting disproportionately from exchanges, would they suddenly appreciate the benefits of the *profit motive* itself? Or how competitive markets harness it for good? Almost certainly not.

Our own research on anti-profit beliefs (Bhattacharjee et al. 2017) suggests that these beliefs are better understood by considering that in any isolated one-shot exchange, ancient or modern, profit *is* zero-sum. Greater surplus to one side entails less to the other. Since excessive profit indicates visibly unequal outcomes, it is easy to see why it is viewed with contempt.

On the other hand, the positive incentive effects of profit – motivating producers to make the goods that are most needed, deliver them where they are most needed, and do so efficiently – are literally invisible to the consumer. These value-creating, positive-sum aspects of profit result from consumers and competing producers changing their behavior in response to incentives. But these processes are dynamic, dispersed, and removed in space and time from any single transaction. Accordingly, the proximate explanation of the bias towards a zero-sum view of profit is simply that its zero-sum aspects are far more apparent than its positive-sum aspects.

Given the visible aspects of most exchanges for most people, it is no wonder that intuition persistently favors a zero-sum view of profit, regardless of our evolutionary past. Ultimate explanations provide a nice complement by further explaining why people are already inclined toward zero-sum views. But proximate explanations can sufficiently explain the persistence of these particular FEBs, as well as how people can be disabused of them. Even when they can track reputations across repeated exchanges and freely choose their partners, our studies find that, on their own, people fail to appreciate how these personalized conditions enable positive-sum exchange. We demonstrate that explicitly prompting people to think through how competitive market dynamics shape incentives, step by step, is necessary to attenuate anti-profit beliefs.

Looking ahead: Complementary perspectives. We applaud B&P's call to examine ultimate explanations for FEBs from our evolutionary past. This approach complements our own perspective on the nature and prevalence of zero-sum views of exchange, underscoring why people would be predisposed to these beliefs in the first place. But just as identifying an error in human judgment is of limited use in itself, knowing that FEBs are rooted in evolved inference systems may not be sufficient to understand and correct them.

Indeed, sometimes the proximate route of examining current contexts of exchange is a better path to understanding a particular FEB than examining ancestral contexts of exchange. More broadly, comparison with normative economic models can play an important role in inspiring and amending ultimate explanations. Both perspectives are mutually informative, and both may be essential to advancing the scientific discourse and improving human welfare.

Partisan elites shape citizens' economic beliefs

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Abstract: Competition between political parties is a fundamental feature of democratic politics, but it is underplayed in the target article. We argue that a more comprehensive understanding of "folk-economic beliefs" (FEBs) must consider the ability of partisan elites to both shape citizens' economic beliefs and connect them to political choices. We review recent empirical findings supporting this theoretical perspective.

Boyer & Petersen (B&P) offer an enlightening overview of citizens' economic beliefs and account of their psychological roots. Here, we advance a perspective that is underplayed in the target article: the importance of partisan elites in shaping citizens' economic beliefs. First, we offer a theoretical argument for why "folk-economic beliefs" (FEBs) – given the nature of democratic politics – must be understood within a context where political parties are center stage. This perspective is vital because B&P justify the importance of FEBs on grounds that these beliefs "play a critical role in political choices" (sect. 1.2, para. 1). Second, we review recent empirical findings supporting our theoretical perspective, highlighting why future work on FEBs must attend to the partisan nature of beliefs in the political domain.

Theoretically, our point of departure is that competition between political parties is a fundamental feature of democracy. Today, political parties provide the key link between citizens and democratic decision-makers (e.g., legislators, governments) (Aldrich 2011; Leeper & Slothuus 2014). Among their important functions, "parties simplify the choices that are open to voters, thereby reducing the policy complexity of modern government into a small number of options that voters can easily understand. Parties educate citizens into the advantages and disadvantages of the policy choices that are on offer. [Parties] mobilize citizens to actively participate in the political process" (Dalton et al. 2011, p. 6).

To see why these functions of political parties are crucial for understanding FEBs, consider B&P's Figure 1 (words in italic refer to concepts in their figure). First, political parties define the *political choices* FEBs are theorized to influence, as parties nominate candidates for political office and propose the policies debated prominently on the public and legislative agenda (Sniderman & Bullock 2004). Second, as prominent actors in the news media, partisan elites are the sources of much *external information about economic phenomena* feeding into *mental systems*. Third, as we will show, political parties sometimes directly shape *folk-economic beliefs*.

Fourth, and perhaps most important, political parties can powerfully condition the relationship between *folk-economic beliefs* and *political choices*. Leeper and Slothuus (2014, p. 131) note, "While humans are born with and socialized into predispositions, they are not born with the political information necessary to apply these predispositions to the specific tasks citizens are expected to perform in a democracy: forming policy opinions and candidate preferences." The relevance of this general notion for understanding FEBs is aptly illustrated by B&P's own examples (sect. 2.1). Considering FEB 2, for example, it is far from obvious whether the belief that "immigrants 'steal' jobs" should lead a citizen to support Policy A (e.g., closing the borders for foreign workers) or Policy B (e.g., stronger efforts to retrain domestic workers). We contend that the supply of information and arguments as part of

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the parties' competition for popular support helps citizens connect their predispositions (including FEBs) to political choices (Petersen et al. 2010). In essence, to adequately understand how and when citizens' economic beliefs are consequential for political choices, we need to consider the impact of partisan competition. Hence, we see political parties as ubiquitous in B&P's Figure 1.

Our recent research offers empirical support for our theoretical perspective. In one study, we show that messages from partisan elites can change the FEBs among citizens' identifying with that party (Bisgaard & Slothuus 2018b). With observational data from a quasi-experimental setting and randomized experiments conducted in Denmark, we find that partisans alter their interpretations of public deficits and unemployment levels (i.e., two examples of FEBs) in response to a changing message from their party. Our findings help advance a puzzle in B&P's framework by illuminating "how people generate the particular beliefs about the workings of the economy" (sect. 2.2.2). We agree with B&P that partisanship often motivates citizens to attribute political responsibility for economic circumstances selectively (Bisgaard 2015), but we suggest that partisan elites can even shape FEBs. In other work, we show that when partisan elites take positions on policy issues relevant to FEBs – such as international trade, contracting out public welfare services, unemployment benefits, immigration, pensions – partisans tend to support the same policy positions (Bisgaard & Slothuus 2018a; Druckman et al. 2013; Slothuus & de Vreese 2010). Taken together, these results show the power of political parties to shape citizens' policy choices.

As a final example, we have empirical results consistent with the suggested ability of political parties to help citizens connect their economic beliefs to specific policy choices. In this case, the Social Democratic Party in Denmark changed its policy position and proposed to cut down an early retirement benefits scheme (Slothuus 2010). In response to this shift in policy position, the supporters of the Social Democratic Party changed their policy opinion. However, only some partisans toed the party line: those partisans who were concerned about strains on public welfare budgets (i.e., a FEB). The point is that not until their party shifted policy position – and justified it with economic constrains – did these partisans see that the answer to their economic concern could be to cut down the early retirement benefits. On the one hand, this study (Slothuus 2010) seems to fit with B&P's argument that FEBs "are politically important because they constrain how politicians can talk about policies to the public" (sect. 6.4, para. 4). On the other hand, it also shows that partisan elites can link citizens' economic concerns to specific policy solutions (see Petersen et al. 2010).

In sum, although we are impressed by the scope of B&P's framework, we think they vastly underplay the competition between political parties as a fundamental force in democratic politics shaping the content and consequences of FEBs. Citizens do not automatically form economic beliefs and use them to make political choices; indeed, many FEBs are only remotely linked to political choices. We argue that a more complete understanding of the impact of FEBs on political behavior must consider the power of political parties to both shape citizens' economic beliefs and connect them to political choices.

Challenges of folk-economic beliefs: Coverage, level of abstraction, and relation to ideology

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Abstract: There are no clear criteria regarding what kind of beliefs should count as folk-economic beliefs (FEBs), or any way to make an exhaustive list that could be filtered through such criteria. This allows the target article authors, Boyer & Petersen, to cherry-pick FEBs, which results in the omission of some well-established FEBs. The authors do not sufficiently address a strong relationship between ideology and FEBs.

As Boyer & Petersen (B&P) acknowledge, "evidence for folk-economic beliefs is still scattered and unsystematic" (sect. 2, para. 1); and they initially present their list of folk-economic beliefs (FEBs) as "a few examples of widespread beliefs" (sect. 2.1, para. 1). However, they then proceed to treat that list as an adequate explanandum for their list of specialized inference system forged by evolutionary pressures. The target article's conclusion about the viability of this research program to a great extent depends on the authors' very particular choice of FEBs. If relevant cognitive systems can explain the selected FEBs, the argument goes, then this research program is at the very least viable and possibly quite fruitful.

However, the universe of FEBs has been "scattered and unsystematic" for a reason – there are no clear criteria regarding what kind of beliefs should count as FEBs, nor is there a way to make an exhaustive list that could be filtered through such criteria. This naturally creates problems for the overall theoretical strategy of B&P (list FEBs, list mechanisms, explain listed FEBs by using listed mechanisms).

One obvious issue is the adequacy of coverage: Are all possible or at least most widespread and best-documented FEBs included? The answer appears to be "no." For example, as the authors themselves acknowledge, Caplan (2008) identified several widespread and well-documented biases such as "pessimistic bias" and "make-work bias." Although B&P imply that explanations in bias-based research are circular, and propose a laudable goal of moving beyond "proximate causes," they do not offer any explanation – proximate or ultimate – for some of these well-documented biases. Thus, one is left wondering: Which of the listed relevant cognitive systems would explain a widespread doom and gloom in times of unprecedented safety and prosperity, or a belief that more work leads to more wealth in times of Siri and self-driving cars? These biases are as good candidates for FEBs as anything is. In fact, the authors do, through several FIBs, cover anti-foreign bias – the one bias from Caplan's book which lends itself to easy, almost obvious, evolutionary explanation. While the authors repeatedly stress that their article is just a beginning of a research program, it could also be the case that the FEBs picked for this exploratory exercise were the low-hanging fruit and that this line of research, rather than being fruitful, will quickly hit diminishing returns.

In addition to coverage, another big problem with ascertaining the relevant universe of FEBs is finding the proper level of abstraction. In other words, many beliefs which could plausibly be FEBs could be narrower (or broader) than the kind of FEBs that are listed by B&P. For example, FEB 3, "immigrants abuse the welfare system," likely depends on who the "immigrants" are – are they in the US legally or illegally; are they Mexicans, Asians, or Australians? At the same time, a large number of Americans believe that "third-world workers working for American companies overseas are being exploited" (Klein & Buturovic 2011), thus seemingly siding with foreigners over Americans. One explanation for this effect would be that different segments of American society see different "others" as members of their in-group, so while conservatives might feel that Australians are a part of their coalition, progressives might see poor "third-world workers" as part of their coalition. However, this apparent flexibility of FEBs – to the point where final, politically relevant opinions can be diametrically opposed depending on one's ideology – suggests that the usefulness of FEBs for understanding economic beliefs and attitudes is limited. Beliefs acquired through self-reinforcing, local, partisan coalitions appear so powerful that they greatly diminish FEBs' significance overall and make the FEBs stated at B&P's level of generality to be of little practical significance.

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Similarly, when discussing FEB 8 ("price regulation has the intended effect") B&P postulate, plausibly enough, that the illusion that rent control doesn't affect housing affordability stems from a mind-set accustomed to the simple causality of small societies and therefore unable to grasp the numerous unintended consequences of a given regulation in a complex society. However, tremendous differences exist (Buturovic & Klein 2010), depending on ideology, in degrees of beliefs in efficacy of an issue often related to rent controls: In this cited study, while 68% of progressive respondents disagreed with the view that "Restrictions on housing development make housing less affordable," only 18% of very conservative voters did so. This suggests that folk beliefs are either more granular than B&P's selection of FEBs (so they are not about price controls, or markets, or regulation in general, but a significantly narrower set of issues), or, even if they do start at the level of abstraction the authors are suggesting, they are easily overwhelmed by information coming from partisan political sources that direct participants' attention towards various facts and mechanisms. (It should be noted that at the time the housing development question was asked, it was not a hot political topic, so these do not seem to be fleeting effects.)

For whatever reason, economic beliefs, at least in the United States, are very strongly related to ideology – to the point that ideology largely overwhelms whatever end-beliefs folk-economic intuitions were supposed to land on. For example, very similar questions posed to the same respondents on the same questionnaire describing likely consequences of reduced supply ("Drug prohibition fails to reduce people's access to drugs" vs. "Gun-control laws fail to reduce people's access to guns") produce significantly different responses depending on the participants' ideologies (Klein & Buturovic 2011). Yet *ideology* is mentioned in the target article only a few times, and each time it is dismissed as an irrelevant variable. This dismissal appears to be based largely on two studies by Petersen (Aarøe & Petersen 2014; Petersen 2012). Given that both of these studies admit that their results go against large and robust empirical literature, this is not good enough. The authors need to explain more thoroughly why ideology is irrelevant for folk-economic beliefs or how it can be accounted for within their framework.

Fear of economic policies may be domain-specific, and social emotions can explain why

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Abstract: People are social animals who value social goods uniquely. In discussions about how economic policies are evaluated by the layperson, it is essential to consider how they may evoke repulsive social emotions such as disgust and anger. We propose that fear of economic policies is not general and that it is specific to items where markets tend to assault certain social values.

In the target article, Boyer & Petersen (B&P) provide an intriguing account of how intuitive systems that are evolutionarily adapted to facilitate cooperation in social exchange can be explanatory of our lay or folk beliefs about economic policies (FEBs). What is inevitably true (and seems to be underemphasized in the article) is that the essential outputs of these intuitive inference systems are a certain group of social emotions – more specifically in this context, emotions such as disgust and anger. The greater efficacy of using emotions to explain the FEBs is demonstrable using the phenomenon of *emporiophobia*, or fear of market economy. The authors mention that the "impersonal" nature of markets makes it difficult for us to know the reputation of the partner of our social exchange, and therefore serves as "threat cue" for such transactions. However, it can be argued that economic markets don't necessarily *prohibit* us from knowing the reputation of our exchange partners (we can know a seller's or a company's reputation), but that a strict market-economy functions on policies which deem such sources of reputation irrelevant. In this case, it is not the absence of social information and emotions that makes market-based transactions of goods repulsive, but that the policies of a market-economy stipulate that these emotions be disregarded – in spite of the good's socio-emotional significance.

Second, the authors say impersonal exchange, such as in markets, "goes against [our intuitive] motivations to generate bonds of cooperation" (sect. 5.4, para. 3) with others. The term "goes against" again needs clarification as to whether it implies that markets force people to not form cooperative bonds or that a strict market economy requires that cooperative bonds should not be taken into consideration in economic markets. The former possibility seems rather odd, as one would suppose that intuitive cooperative bonds (good or bad), by definition occur intuitively (without deliberation or control) with any form of social exchange – regardless of whether market economy allows it.

A market economy that is indifferent to cooperative bonds for specific issues which we are adapted to value differently (e.g., moral norms) (Stanford 2018) is, however, emotionally repulsive. Indeed, we are more adapted to cheater-detection in social domains than in other domains (Cosmides & Tooby 2005). It is likely that we are repulsed by economic markets in the same way that we find individuals of consequentialist decisions less trustworthy (Everett et al. 2016) or atheists less moral (Gervais et al. 2017) – insofar as they violate certain social contracts.

In light of these considerations, we propose that the fear of markets is not general and that it is specific to items for which markets tend to assault certain social values. *Emporiophobia* may be better explained by the intuitive moral emotion of disgust – an emotion elicited not only in response to physically revolting stimuli, but also by social and moral norm violations (Pizarro et al. 2011). For example, the supposedly impersonal market interactions (which differ from the types of *social* exchanges we evolved to value and process) occur primarily through the transfer of monetary assets from the buyer to the seller in return for some goods or services. But, as the authors themselves note in the target article, attempts to acquire certain goods of communal sharing through other means (such as money) would elicit shock. A similar idea, termed the *sacred value protection model* (Tetlock 2003), asserts that certain items in society have sacred value, and when these values are threatened or diminished by secular consideration, people respond with moral outrage (i.e., emotions such as moral disgust and anger).

These emotional reactions are not necessarily due to economic markets not allowing us to track the reputation of social exchangers or because market-based transactions are emotionally unsatisfying (and therefore do not satisfy the necessary inputs for our intuitive inference system), but because the very nature of some of these transactions may undermine social values. Obvious examples include leaving a tip on the pillow of a romantic partner for a job well done, or paying your grandchildren to visit you on your deathbed. Brennan and Jaworski (2015) discuss how disgust can act as a deterrent to market economy – essentially by saying that some people get automatic disgust reactions when considering the market-based transactions (that almost everything can be sold or bought from the market) of certain goods which have *intrinsic dignity* or social value. What indeed has such intrinsic value is culturally defined, and so are FEBs.

Market economics continues to spread into almost every sector of our life – medicine, education, government, law, art, sports, even family life and personal relations – and there are lesser things which money cannot buy (Sandel 2012). The marketization

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of sacred social items (i.e., they may be purchased with money), and that the resulting transactions of these items are competitive in nature (i.e., driven by notions of profit), may even strongly evoke our disgust response to such phenomena. There is also evidence to suggest that sensitivity to disgust explains significant variation in political ideology – political conservatives are more easily disgusted than liberals, especially regarding policies pertaining to the moral dimension of purity (Inbar et al. 2009). We argue that in considering FEBs about market economy as well as other socioeconomic policies, the role of intuitive emotional evocation in response to the interaction between economic transaction and social value must be emphasized.

How *Homo economicus* lost her mind and how we can revive her

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Abstract: The target article by Boyer & Petersen (B&P) contributes a vital message: that people have folk economic theories that shape their thoughts and behavior in the marketplace. This message is all the more important because, in the history of economic thought, *Homo economicus* was increasingly stripped of mental capacities. Intuitive theories can help restore the mind of *Homo economicus*.

For a long time, *Homo economicus* has lived and struggled to survive in the imaginations of economists. *Homo economicus* – let's call her Alice – is the main character in theories of economic behavior. As economists' ideas took some peculiar philosophical turns, Alice had to adapt and she eventually lost her mind. But cognitive science can help bring life back to the core of economic theory, first by restoring the natural intelligence of *Homo economicus*, and then by delving into the cognitive systems behind her economic thinking.

In the beginning, Alice lived in a vibrant world much like our own. She was a full-blooded human with thoughts, feelings, needs, motives, theories, imagination, compassion, and a lively social life. Adam Smith (1759; 1776), John Stuart Mill (1844; 1848), and other classical economists wrote about Alice as an intellectual equal with the full range of human experience (see also Smith 1998). Of course, Smith and Mill were especially keen on Alice's pursuit of wealth because this was the distinctive province of economics. But, these authors did not assume that Alice exclusively sought wealth, or any other singular goal like pleasure, happiness, satisfaction, or utility. Instead, Alice could pursue a mixture of different goals, just like real people.

> Economics aims at explaining the portion of society that corresponds to the market. Its conclusions are not applicable to those parts of society where wealth is not the main motive of human action. (Mill 1844, p. 589)

In the next wave of economic literature, Alice's situation dramatically changed (reviewed in Stigler 1950). Neoclassical economists insisted that Alice had to fit entirely into certain mathematical equations, no matter how small and uncomfortable they might be, for this was the only way to be rigorous and scientific (see also McCloskey 1991). Alice no longer needed thoughts, ideas, and reason; economic theorists would assume she knew everything. And she was permitted only one overarching goal – maximizing utility – that encompassed every sphere of life.

Strangely, though, neoclassical economists permitted Alice to derive utility from anything at all. If she liked, she could seek bankruptcy, poverty, starvation, injury, or death. "There's no accounting for taste," they said. However, Alice was not allowed under any circumstance to make choices that were inconsistent; this was deemed irrational in a most serious way. Since Alice could want anything, she became unhinged from the realities of life. She developed bizarre and arbitrary preferences about risk, time, equity, civic duty, and many other matters.

The situation got even worse. Some economists questioned Alice's experiences with extreme suspicion. When Alice said she preferred one thing twice as much as another, they demanded proof. They said her experience was not measureable, was merely subjective, and did not belong in rigorous theories. The only thing they could *observe* was her choices, which revealed only the order of preferences; anything more would be too speculative to indulge.

> Modern economic theory has insisted on the ordinal concept of utility; that is, only orderings can be observed, and therefore no measurement of utility independent of these orderings has any significance. (Arrow 1983, p. 75)

Another time, Alice shared one of two apples with a hungry friend, pointing out that the friend would enjoy it more than Alice would enjoy eating a second one. Some economists scoffed: It was impossible to compare one person's utility with another's. Some even extended this skepticism to all of society, saying the very notion of the common good is fallacious (Riker 1982).

> Interpersonal comparison of utilities has no meaning. (Arrow 1951, p. 9)

Alice had no choice. She emptied her mind of proper thoughts, concepts, theories, and reason; she replaced them with spontaneous knowledge and a few probabilities. Alice gave up her natural motivations to seek food, safety, and relationships, and she subsumed everything in one consistent utility function. She lost her sympathy for other people's pressing needs for food and shelter because she could not compare their utilities to her own.

Little by little, piece by piece, Alice lost her mind. *Homo economicus*, the economic actor, became a utility-maximizing zombie, an empty shell with little thought, no imagination, and arbitrary, unrecognizable motives.

> Economic theory has been much preoccupied with this rational fool decked in the glory of his *one* all-purpose preference ordering. (Sen 1977, p. 336, italics original)

Nowadays, behavioral economics has increasingly found that utility zombies do not always match real people's behavior. So, there is broad consensus that Alice needs at least some of her mind back. But the predominant approach is to add more and more irrationalities and arbitrary preferences to the utility zombie. The problem is that this still leaves *Homo economicus* with few cognitive abilities. A real mind that performs in the real world cannot be made of irrational errors and arbitrary preferences any more than it can be made of unadorned utility maximization (see also Todd & Gigerenzer 2007).

Instead, we need to rediscover the mind of *Homo economicus*. Cognitive science can help view people's economic thinking from a fresh perspective. Rather than neoclassical economics, it can begin with the ordinary idea that people theorize and learn about the world; they have multiple evolved motives related to health, reproduction, and biological fitness; their motives have different magnitudes; and they can compare different people's welfare in order to effectively cooperate and form relationships. Cognitive science illuminates these basic mental faculties, including how people theorize about causes, invent tools, seek food and shelter, court and assess mates, care for children, and reason about others' minds (reviewed in Pinker 1997). Building on this foundation, we can study the intuitive theories that allow people to theorize and learn about economics, like how to bargain with merchants, make a living, save resources for hard times, specialize in a profession, evaluate tax policies, and so on.

Boyer & Petersen's (B&P's) target article has made a bold and much-needed move in this direction by proposing some contents of people's folk economics, especially the different beliefs that shape citizens' political views about major economic policies.

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How does "emporiophobia" develop?

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Abstract: Boyer & Petersen's (B&P's) evolutionary approach to folk-economic beliefs is insightful, with far-reaching implications. We add to their discussion by positing a complementary developmental approach to the study of "emporiophobia" – studying children whose behaviors provide insight into developmental origins. We hypothesize that emporiophobia emerges early in childhood through proximal mechanisms and propose that emporiophobia develops alongside emporiophilia.

Boyer & Petersen (B&P) do a masterful job of identifying a suite of folk-economic beliefs that, though at odds with economic theory, have far-reaching consequences for politics and policy. As psychologists, we applaud the project of providing an evolutionary account that encompasses a rich empirical literature on habits of mind, and that boldly projects their implications for important societal issues. At the same time, distal (evolutionary) accounts require proximate mechanisms for behaviors to be transmitted and learned (Tomasello 1999). We therefore use this commentary as an opportunity to explore how B&P's evolutionary approach might inform, and be informed by, a developmental perspective. To illustrate, we focus on *emporiophobia* – the disproval of market-based (utility-maximizing) exchanges – and we turn to young children, as their intuitions and understanding of the world bear on questions of origins.

One key task children face is learning how to interact with others. B&P convincingly argue that individuals seek cooperative partners who can engage in long-term, repeated exchanges. On this account, humans are built for small-scale, local transactions, which are at odds with the utility-maximizing nature of market exchanges. (By "market," B&P seem to mean a large-scale system involving many actors who are unknown to one another, such as the stock market or the housing market.) Although the contrast between small-scale transactions and market transactions is striking, it is unclear how people come to intuit that "markets are bad." What are the cognitive capacities serving local, familiar, small-scale market interactions that, when scaled-up, yield emporiophobia?

Three developmental possibilities emerge as likely candidates: (1) Children could initially be suspicious of utility maximizing, which, when scaled up, results in a negative view of markets. This would be consistent with children's early-emerging altruism (Warneken 2018, attention to personal affiliations in resource allocations (Olson & Spelke 2008), and in-group favoritism (Baron et al. 2016). (2) In contrast, children could start out as utility maximizers and only later learn to consider extrinsic (social) exchange motives (Fehr et al. 2008). Consequently, utility maximizing could be viewed as childish, selfish, and morally suspect, even in adulthood. (3) Finally, from the outset, children could possess dual perspectives on exchange motives (at times maximizing, at times altruistic) and over time they could acquire culturally specific norms regarding what is appropriate in different contexts (i.e., markets have their time and place; Blake et al. 2016; McAuliffe et al. 2017).

We incline to the third possibility. As noted above, children are sometimes altruistic and motivated by affiliation, but they are sometimes "selfish" maximizers. In our own work, we find evidence for both motives. When children of ages 5–10 were asked to distribute resources to those who either did or did not offer money in exchange, their distributions followed market principles (i.e., resources were distributed differentially based on the amount offered in return) – except when recipients were unable to pay, in which case the youngest children were especially likely to give away resources without compensation (Echelbarger et al. 2018). Similarly, Rizzo and colleagues found that children accept market-based distributions for luxuries but not necessities (Rizzo et al. 2016). Thus, even young children have access to different frameworks for thinking about market norms, and flexibly treat them both positively and negatively.

What, then, are the consequences for the origins of emporiophobia? At minimum, these findings suggest the importance of examining the practices, contexts, and messages that children receive from others. If young children really are working out their local cultural norms for when market exchanges are appropriate, then we would expect them to make mistakes. Sometimes children will maximize self-interest when a market perspective is not appropriate, but sometimes they will make the opposite error – they will act altruistically when they "ought" to adopt more of a market perspective. Both sorts of errors leave children vulnerable – to censure or exploitation, respectively. Hence, parents may intervene to enforce norms of sharing and reciprocity (Lollis et al. 1999), to shield children from markets, and to shield children from those with whom they could engage in market exchanges (i.e., strangers). When interacting with friends and family – the most common context for young children – children may be praised for engaging in non-market behavior and censured for engaging in market behavior. The end result may be to reinforce the notion that "markets are bad," or at least that "being a maximizer is childish."

In general, then, although children eventually learn that, economically speaking, it is advantageous to maximize utility in market exchange contexts, we suspect they are also getting the message that doing so with friends and family (close affiliative partners) is particularly problematic. Under this interpretation, we propose that markets actually serve as opportunities to engage more safely with strangers – that is, "emporiophobia" creeps in when exchanging with familiar partners whereas "emporiophilia" takes over when exchanging with strangers. Current work, to our knowledge, cannot directly shed light on whether children modulate their opinions of market-based exchanges depending on the context. Thus, future work should examine the conditions under which children think markets are "good" and "bad" (see Fiske [1991] for one model by which we could evaluate how people track the utility of market-based exchanges).

In conclusion, we argue that the seeds of emporiophobia may be planted by experiences learning appropriate exchange norms in childhood. Adults may retain notions of immaturity (selfishness) and danger (interacting with strangers) when operating in market exchanges. However, we propose that in certain contexts – particularly those involving strangers – market-based behaviors may be viewed more positively, yielding emporiophilia. As well as learning not to be selfish, young children also have to learn that self-interest is an appropriate basis for social interaction. Such experiences should result in positive feelings about (certain kinds of) markets. Taken together, future work should examine the emergence and developmental course of these attitudes, keeping in mind the evolutionary antecedents and consequences of harboring emporiophobic and emporiophilic beliefs.

The mind of the market: Lay beliefs about the economy as a willful, goal-oriented agent

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Abstract: We propose an extension to Boyer & Petersen's (B&P's) framework for folk-economic beliefs, suggesting that certain evolutionarily acquired cognitive inference systems can cause modern humans to perceive abstract systems such as the economy as willful, goal-oriented agents. Such an anthropomorphized view, we argue, can have meaningful effects on people's moral evaluations of these agents, as well as on their political and economic behavior.

Boyer & Petersen (B&P) provide a compelling framework for a variety of folk beliefs about the economy (FEBs), focusing on biases attributable to evolutionarily acquired intuitive inference systems and certain cognitive dispositions that foster their cultural transmission. We propose an extension of B&P's framework, suggesting that people have specific beliefs about the economy *itself*, which may partly account for deviations from normative understandings of economic processes, and which may affect people's political beliefs and economic behaviors. Specifically, in line with Adam Smith's metaphor of an "invisible hand" that governs the market, we argue that people anthropomorphize economy-related constructs such as "the economy," "the free market," or "capitalism," and view them as willful, goal-oriented agents.

This phenomenon, we contend, arises as a side-effect of an intuitive tendency to perceive minds and bodies as separate entities, which in itself seems to be rooted in fundamental cognitive systems that humans acquired in their ancestral past (Bloom 2004; Forstmann & Burgmer 2015; 2017). When upholding social relations became a crucial factor in human survival (see Barton & Dunbar 1997), humans developed mentalizing capacities – that is, the ability to infer mental states of others and to use that information to explain observed behavior (Frith & Frith 2003). Assuming an unobservable underlying cause for others' behavior allows generalizing about how they will react to specific situations in the future – an obvious advantage over someone who lacks these capacities. Attributing goals, intentions, and motives to others (and actively seeking this information) thereby prevents a stressful state of uncertainty, and indirectly serves to satisfy "effectance motivation – the basic and chronic motivation to attain mastery of one's environment" (Waytz et al. 2010, p. 410).

Because of this evolutionary advantage, it is no surprise that humans possess what has in the past been described as a "hyperactive agency detection device" (Barrett 2000), an adaptive sensitivity for detecting human agency, which is so pronounced that it can produce a bias to perceive non-existent intentional agency in one's environment (Heider & Simmel 1944), a phenomenon Boyer (2001) refers to as a "hypertrophy of social cognition." Such a bias can exist only because mental states are not merely construed as the product of a configuration of uniquely human brain states, but as a property that can be ascribed to just about anything. According to previous theorizing, the tendency to conceptually distinguish minds from bodies is an almost logical by-product of our species' mentalizing skills. While others' behavior is visible and readily accessible, their mental states are not and must therefore be construed differently (Bloom 2004).

This differential construal, paired with the adaptive motivation to see agency in the world, can make people perceive human mental states in nonhuman, and sometimes bodiless, entities (Boyer 2001). According to anecdotal reports, even our closest evolutionary relatives, great apes, engage in social signaling (using dominance displays) with forces of nature, such as thunderstorms or waterfalls, as if they were interacting with agents that have threatening intentions (Montgomery 1991).

For human beings, such a disembodied mind perception allows for beliefs in animism (e.g., a belief in a spirit inhabiting a river that can become angry and cause a flood), theism (e.g., a belief in a bodiless god that judges us), or in souls that can exist after bodily death (Bering 2006; Boyer 2001). Notably, such beliefs were not evolutionarily disadvantageous and still exist today, just as the underlying cognitive mechanisms responsible for them still exist. Only today, people also ascribe mental states to entire nations, groups of people (Waytz & Young 2012), or corporations (Rai & Diermeier 2015).

Likewise, people frequently use language that anthropomorphizes economy-related concepts ("the goal of capitalism is *X*," "*Y* hurts the economy," etc.), and some of the FEBs that B&P discuss, such as emporiophobia (the fear of markets; Rubin 2014), align with this notion. As B&P state, these abstract constructs have mechanisms that are in principle unobservable (Nozick 1994). Yet, in reality, people witness a constantly changing socioeconomic environment, and they are eager to perceive these changes as being caused by a single responsible entity. Just as ascribing anger to a spirit inhabiting a river, this approach simplifies a complex system, allows prediction, and thereby satisfies effectance motivation.

When economic systems or the economy itself are understood in anthropomorphic terms, it is likely to affect how people react to the respective entity's apparent "behavior" (Chartrand et al. 2008). Just like apes facing a thunderstorm, people who anthropomorphize the economy are suddenly confronted with a seemingly all-powerful and potentially malevolent entity that is responsible for the current state of the world around them. They perceive a willful agent that engages in semi-coherent, goal-directed behavior, rather than a set of individual structures and conditions spanning various social and economic domains, each with its own causes and consequences. Normally, each of these structures, when perceived as flawed, could be the individual target for modification or reconstruction (Connor 2016), whereas any attempt at change could be viewed as hopeless when these structures are construed as characteristics of a larger, more powerful, entity – as fingers of the invisible hand, so to say. Therefore, on the one hand, contrary to the assumed purpose of anthropomorphization, perceiving a powerful entity that follows its own agenda may, under some circumstances, paradoxically induce a perceived *lack* of control, and ultimately foster learned helplessness and obedience (see Prilleltensky & Gonick 1996). On the other hand, when anthropomorphizing abstract entities such as corporations, people typically ascribe to them agentic but no experiential mental states, considering them capable of being responsible for their actions, but not of being victims. Viewing the economy or the market as a moral agent allows people to perceive themselves as moral patients (or suffering victims), and to blame and direct moral outrage at this entity (Gray et al. 2012). Moral anger, as opposed to other negative emotions such as sadness, can in turn function as a catalyst for political or social action (Valentino et al. 2011). Future research may thus investigate under which conditions an anthropomorphization of economy-related constructs may have positive or negative motivational consequences for political action.

Social transmission bias and the cultural evolution of folk-economic beliefs

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Abstract: Evolved dispositions influence, but do not determine, how people think about economic problems. The evolutionary cognitive approach offers important insights but underweights the social transmission of ideas as a level of explanation. The need for a *social* explanation for the evolution of economic attitudes is evidenced, for

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example, by immense variations in folk-economic beliefs over time and across individuals.

What explains human attitudes toward economic exchange? One explanation is that economic attitudes directly follow the shape of evolved human intuitions. For example, Boyer & Petersen (B&P) propose that coalitional psychology (a tendency to favor one's own group in competition with other groups) leads to a perception that, in international trade, foreigners disproportionately benefit at the expense of own country citizens.

Previous work has also studied how psychological dispositions shape attitudes toward markets and their regulation (Caplan 2008; Hirshleifer 2008; Hirshleifer & Teoh 2009; 2010; Rubin 2002). For example, the three papers by Hirshleifer and by Hirshleifer and Teoh propose the *psychological attraction approach* to economic and financial regulation. This holds that regulation is a result of the psychological dispositions of political participants and regulators, and the cultural evolution of regulatory ideologies whose spread is influenced by these dispositions. Like B&P's target article, this work emphasizes that evolved psychological mechanisms underlie economic attitudes. B&P go much further, by systematically and insightfully analyzing the evolutionary psychological sources of human economic beliefs. However, in doing so, B&P underweight the causal importance of cultural evolution, as influenced by *social transmission biases*.

As B&P recognize, evolved psychological dispositions tilt, but do not directly determine, how people think about economic issues. The same evolved human psychology that gives us socialists also gives us libertarians, as well as dramatic variations over time in the prevalence of different beliefs. For example, communism for a time dominated a large part of the globe before receding. Just as genes and psychological dispositions do not directly and fully determine whether someone is Christian, Buddhist, or Marxist, human evolved psychology alone does not fully determine economic attitudes.

In the phrasing of Hull (1980), genes (and individual-level psychological dispositions) determine a *reaction norm* – that is, a stochastic relation between environmental input and the likely range of an individual's beliefs. An instinct for reciprocity, for example, can tilt people toward viewing economic exchange as beneficial, but other cultural inputs can easily overturn this tilt.

This is not to deny that evolved psychological dispositions profoundly influence which ideas are appealing, and thereby which will spread. B&P have advanced our understanding of these individual-level propensities. These include, for example, ownership intuitions and coalitional psychology, which play out in intuitive ways. But psychological propensities can also feed into economic attitudes in much less intuitive ways, by influencing cultural transmission. For example, conformist transmission can support ideas which, taken in isolation, are not appealing, if they can somehow become popular in the first place.

So, to understand the evolution of economic attitudes, we need to understand biases in the social transmission of ideas. Economic attitudes are culturally transmitted, and folk economic ideas are often linked together as ideologies, such as socialism or free market ideologies. This means we need to understand how culture evolves, and an explicit focus on the *cultural*, not just the genetic, evolutionary process to understand the evolution of economic issues. (On social transmission biases, see, e.g., Boyd & Richerson 1985).

Consider, for example, simplistic, "catchy" ideas. At the individual level, these are easy to absorb, but their weak logic may make them less attractive. So there is no conclusive general presumption that individuals will adopt simplistic ideas. However, simplicity is often an advantage in *social* transmission. Simple ideas are easy to remember and communicate to others. Furthermore, bandwidth constraints may force subtle ideas to be reduced in communication to un-nuanced versions. Simple ideas become more prevalent. Furthermore, owing to the *truth effect* (e.g., Schwartz 1982), ideas that an individual hears often are more likely to be perceived as correct. So basic psychological properties – the ease of remembering and describing simple ideas, and the truth effect – increase the cultural fitness of simplistic economic ideas.

Simple ideas or catch-phrases are common in the economic realm: for example, "property is theft," or, alternatively, "the only handout I want is the government's hand out of my pocket"; that the system is rigged to favor the 1%, or, alternatively, that the death tax unfairly taxes income a second time. Public economic discourse is not limited to sound-bites, but casual observation suggests that they are disproportionately influential.

To see how social transmission biases can induce surprising cultural evolutionary outcomes, consider a hypothetical example. Suppose that people like to talk more about their investment successes than their failures. Then listeners will hear more stories from their friends about large profits than about losses from active stock trading. If listeners neglect this selection bias in what is reported (there is much general psychological evidence of such neglect), they may conclude that ordinary people can easily profit by actively trading individual stocks. This argument is modelled formally in a working paper by Han et al. (2018).

In this example, there is no psychological disposition *directly* pushing people toward believing that active stock market trading is a good strategy. Instead, psychological dispositions induce a *bias in the social transmission process*, and this social process causes cultural evolution toward active trading – a direction that is non-obvious based on individual level propensities.

B&P do thoughtfully and appropriately discuss cultural transmission processes, and they correctly recognize that the effect of evolved intuition on economic beliefs is probabilistic. However, when it comes to forming actual hypotheses, B&P's method is to move in a straightforward way from evolved psychology to folk beliefs. This is an important and valid approach if followed with appropriate caution. But our contention is that there is much additional value to be gained by considering how social transmission biases cause economic attitudes to evolve.

Another crucial element of a cultural evolutionary approach is that *assemblies* of ideas evolve (Dawkins 1976; Distin 2004). For example, socialism became much more contagious when Engels and Marx combined ideas about shared ownership of the means of production with the claim that the historical inevitability of socialism was a scientifically proven fact. The cultural evolution of more attractive economic ideologies is a key driver of economic attitudes – one that deserves more analytic attention.

People are intuitive economists under the right conditions

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Abstract: Boyer & Petersen (B&P) argue that a "rudimentary exchange psychology" is responsible for many of people's folk-economic beliefs that are at odds with the consensus views of economists. However, they focus primarily on macroeconomic beliefs. I argue that the same rudimentary exchange psychology could be expected to produce fairly accurate microeconomic intuitions. Existing evidence supports this prediction.

Boyer & Petersen (B&P) make a compelling case that people's folk-economic beliefs are primarily shaped by what they call a "rudimentary exchange psychology" that would have been adaptive in the small hunter-gatherer groups of our ancestors. They show that some of the intuitions based on this psychology can

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explain why many people today share certain folk-economic beliefs, many of which do not align with the consensus views of economists (e.g., Caplan 2008). However, B&P focus primarily on folk-economic beliefs about macroeconomic issues – precisely the sorts of issues that our rudimentary exchange psychology is most poorly equipped to handle. On the other hand, many microeconomic judgments – such as making predictions about other people's choices, or making inferences about people's preferences – are much closer to the sorts of judgments that our ancestors would have had to make in simple exchange economies. B&P's account therefore makes an additional prediction that they do not discuss: that people will behave much more like intuitive economists when reasoning about other people's microeconomic choices. As I will show, existing evidence supports this prediction.

First, it should be acknowledged, as B&P do, that people certainly are not intuitive economists when it comes to *making* economic choices. The behavioral economics literature is full of examples of people deviating from the prescriptions of rational choice theory. To give just a few examples, people weigh losses more heavily than gains (Kahneman & Tversky 1979), ignore opportunity costs (Frederick et al. 2009), and allow themselves to be influenced by sunk costs (Arkes & Blumer 1985; Thaler 1999). These tendencies lead people to make poor choices involving their time and money.

However, people often think about other people's choices differently than their own choices. Whereas people's own choices are sometimes driven by emotion, which can bias them toward making impulsive and irrational decisions, they tend to be less emotional and more objective when reasoning about other people's choices. Trope and Liberman (2010) have shown that this is a domain-general phenomenon: As psychological distance increases (e.g., from choices someone is making for oneself to reasoning about someone else's choices), people tend to think more abstractly. The more abstractly people think about economic problems, the more they will tend to rely on intuitions rooted in their rudimentary exchange psychology. For many microeconomic problems, these intuitions will lead people to make judgments that are in close alignment with how economists think. Evidence suggests this is true even if those people's judgments do not align with their own behavior.

For example, people's behavior in the two-player Ultimatum Game is often used as an example of irrational economic behavior. In the game, the first player offers a split of a sum of money between both players. The second player can either accept or reject the offer. If the second player rejects the offer, neither player receives any money. The economically rational thing for the second player to do is to accept any offer, but many people reject unfair offers (Thaler 1988). However, Kim et al. (2013) found that when subjects were asked to imagine they were playing on behalf of a stranger, thus placing some psychological distance between the subjects and their choices in the game, their acceptance rates increased for unfair offers, bringing their choices more in line with economic norms. As another example, Mazar et al. (2008) performed an experiment in which subjects were given an opportunity to cheat on a task and were given different monetary incentives for cheating. They found that the amount subjects cheated did not vary with the incentive for cheating, contrary to the predictions of economists (e.g., Becker 1968). The researchers also asked a separate group of subjects to predict the outcome of the experiment. This second group of subjects shared the intuitions of economists, expecting the first group of subjects to cheat more when the incentives for cheating were greater. Once again, people's intuitions about other people's choices were different than people's actual behavior, and those intuitions were aligned with economists' views.

Both of these examples involve predicting other people's choices. But people are also capable of making inferences about other people's characteristics, like their preferences, by observing the choices they make. To provide one such example from my own work, we (Jern et al. 2017) presented subjects with different hypothetical choices that other people had made between different bags of candy and asked subjects to order them by how strong a preference the person making the choice had for red candy. We compared subjects' mean rankings of the choices with predictions generated by the logit model, a model commonly used by economists for learning consumers' preferences (McFadden 1974; Train 2009). We found a strong correlation between subjects' rankings and the rankings of the logit model, suggesting that people learn others' preferences in much the same way that the logit model does, and by extension, the way that many economists do.

Decades of empirical work and even casual observation point to the conclusion that people are not intuitive economists. B&P offer a theoretical argument for why this is the case. But, I have argued, their account can also explain why people may actually be quite astute intuitive economists under certain conditions. Although it is true that modern markets are dramatically different from the exchange economies of hunter-gatherer societies, causing our rudimentary exchange psychology to produce some faulty macroeconomic intuitions, the act of choosing from a set of options has remained largely the same over time. It therefore stands to reason that people's microeconomic intuitions should be quite reasonable, and perhaps even consistent with prevailing economic norms.

Why do people believe in a zero-sum economy?

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Abstract: Zero-sum thinking and aversion to trade pervade our society, yet fly in the face of everyday experience and the consensus of economists. Boyer & Petersen's (B&P's) evolutionary model invokes coalitional psychology to explain these puzzling intuitions. I raise several empirical challenges to this explanation, proposing two alternative mechanisms – intuitive mercantilism (assigning value to money rather than goods) and errors in perspective-taking.

In *The Wealth of Nations*, Adam Smith (1776/1999) overturned a dogma that had long dominated economic thinking – the mercantilist theory of trade. Mercantilism held that exporting nations "won" because they gained gold (while giving up goods) and importing nations "lost" because they gave up gold (while gaining goods). The notion that a trade can have winners and losers is nonsensical, according to Smith: Two people would not agree to a trade unless they both felt it was in their interest. Why else would a buyer and seller voluntarily execute the transaction? This basic insight is borne out by common sense, everyday experience, volumes of empirical and theoretical research, and the essentially universal consensus of economists.

Yet, zero-sum talk of "winners" and "losers" at trade pervade our society. Zero-sum thinking occupies the thoughts of powerful political leaders, and appears across a multiplicity of countries and political persuasions. What can explain the ubiquity of this idea – across both space and time – that flies in the face of so much evidence?

An evolutionary model of folk-economic beliefs provides an appealing solution to this puzzle and many others. Our inborn intuitions about physics and psychology (e.g., Carey 2009) evolved in an environment with objects and minds similar to their modern counterparts. But any inborn intuitions we have about economics evolved in a world of exchange that could hardly be more different from the modern economy, global in scale and mediated by money (Fiske 1992; Pinker 2002). Given

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the mismatch in environments, it makes sense that folk-economic beliefs built atop evolved intuitions should not, in general, track modern economic realities.

To explain aversion to trade as a specific folk-economic belief, Boyer & Petersen (B&P) invoke coalitional psychology – an aversion to transferring resources to rival groups. Despite my general enthusiasm for B&P's theory, I find other mechanisms more plausible in the case of zero-sum thinking, based on recent results from my own research program.

First, B&P make the specific prediction that aversion to trade, being rooted in coalitional psychology, should "invariably occur in the context of, precisely, debates about trade between *countries*" (sect. 5.1, para. 3; emphasis theirs). As it happens, I have tested the idea that trade imbalances would be viewed as problematic even in the context of trade among U.S. states. Indeed, Arizona is seen as "losing" to Iowa when Arizonans import shoes from Iowa, albeit not to the same extent as when they import shoes from Thailand (Johnson et al. 2018a). At the very least, some other factors must explain some of the aversion to trade.

Second, an explanation based on coalitional psychology predicts that zero-sum thinking should exist at the level of international trade, but not of exchanges among individuals, particularly within the same country. Yet, in my own work, people evaluating simple monetary exchanges (e.g., Sally buying a shirt from Tony's store for $30) frequently believed that sellers were made better off at the expense of buyers (Johnson et al. 2018b), espousing a zero-sum belief. These beliefs are no stronger when the seller comes from a different country than the buyer, and only modestly stronger when describing trade in aggregate across countries (Johnson et al. 2018a). These results are all difficult to square with the idea that coalitional psychology is an important driver of zero-sum thinking.

Third, let us consider the fact that our evolutionary ancestors exchanged goods in a world without currency. The most straightforward prediction would be that we should have difficulty intuitively assigning value to useless bits of paper. This predicts an aversion to trade imbalances – in the opposite direction. Trade imbalances should be seen as favoring the country that is *importing* (intrinsically valuable) goods in exchange for (intrinsically worthless) currency. Yet, our intuitions are the opposite: Because it imports more than it exports, the United States "loses" to China. If coalitional psychology accounted for these intuitions, it would presuppose the intuition that money is worth *more*, not less, than the goods and services it can purchase – that is, mercantilist thinking of the type Smith debunked.

Fourth, if people have special difficulty thinking about money, then one would expect currency-mediated exchanges (e.g., Sally purchasing a shirt from Tony's store) to be seen as zero-sum but barters (e.g., neighbors swapping soy sauce for vinegar) as positive-sum. In fact, people often see both types of exchanges as zero-sum, but for different reasons (Johnson et al. 2018b). For currency-mediated exchanges, buyers are seen as worse-off while sellers are seen as better-off, consistent with the mercantilist intuition that money is worth more than the goods it can purchase. But for like-kind barters, *both parties* are seen as neither gaining nor losing from the exchange. Once again, this is consistent with mercantilist thinking that equates wealth with money, since no money changes hands. But it is precisely the opposite of what an evolutionary account would seem to predict, since goods (but not currency) have intrinsic value and existed in our evolutionary environment.

I am therefore forced to conclude that coalitional psychology has a limited role in explaining our basic aversion to trade. (That said, it may well aggravate this basic anti-trade bias, causing a special aversion to trade with rival countries). Instead, I propose two alternative mechanisms. First, as suggested above, people are intuitive mercantilists, imputing to money value over-and-above the goods it can purchase. Intuitive mercantilism is encouraged by several features of money (e.g., fungibility, permanence, and communicative role for conveying relative prices). If mercantilist thinking emerges late in development, this would undercut claims of its innateness. Second, when contemplating exchanges in the abstract, people often fail to take the perspective of the parties. When encouraged to do so, they recognize that people have self-interested reasons for exchange and that both parties are thus made better off (Johnson et al. 2018b).

Adam Smith wrote: "Give me that which I want, and you shall have this which you want, is the meaning of every [exchange]" (Smith 1776/1999, pp. 118–19). Few truths in modern life appear to be so obvious, yet so elusive.

Does evolutionary cognitive psychology crowd out the better angels of our nature?

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Abstract: Although Boyer & Petersen's (B&P's) target article provides an exciting framework for political communication studies of framing effects, I raise questions concerning the presumed importance of folk-economic beliefs, the relative utility of identifying such proximate (as opposed to more generalized) drivers of public opinion, and the extent to which their model can explain variability among individuals. I conclude with thoughts on the normative implications of the evolutionary cognitive model for democratic governance.

Boyer & Petersen's (B&P's) target article on folk-economic beliefs (FEBs) and their underlying evolutionary cognitive foundation provides an exciting contribution that can guide and inspire further research in political communication. The rich literature on framing in political communication begins with the premise that issues, candidates, elections, and political actions can be framed – and thereupon interpreted – in multiple ways (e.g., Chong & Druckman 2007); for instance, a given election might be understood as an opportunity to celebrate strength in diversity or a moment to insulate the ingroup from outsiders. Some frames fall flat, some frames seize attention, some persuade, and some even go viral. B&P's evolutionary cognitive framework provides scholars with a theoretical foundation for moving political communication studies forward, by specifying, ex ante, which cognitive frames appeal to and resonate with those intuitive, evolutionary cognitive structures in place. In this respect, B&P's argument applies well beyond folk-economic beliefs, as it articulates an evolutionary psychology framework for unpacking framing effects in political communication. This is an exciting opportunity for scholars of political communication, as they can examine which frames are more easily processed, become more accessible, are transmitted among social networks, and are more readily marshalled into public opinion, candidate evaluation, and political behavior.

Outside of this theoretical architecture, B&P's specific focus on FEBs does raise some concerns. The first concern revolves around the presumed importance of these folk-economic beliefs. B&P argue that FEBs are important because they predict political decision-making. But to what extent are FEBs actually causal drivers of political decision-making? FEBs are, by definition, "explicit beliefs" – that is, lay explanations for economic conditions that presumably become worthy of study because they correlate with political decision-making. However, is it possible that these FEBs are merely reasonable-sounding rationalizations of evaluations and attitudes, the drivers of which exist outside of the realm of introspection? A rich line of research in psychology (e.g., Nisbett & Wilson 1977) teaches us that people are often unaware of or incapable of articulating the causal drivers of their attitudes; and, moreover, when people do generate causes, these reasonable explanations may themselves simply reflect folk beliefs of causality rather than actual causes. Moreover, insofar as people develop implicit and automatic reactions to policies (valenced reactions to

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welfare, for example, based upon the race of potential beneficiaries), might FEBs simply constitute an explicit rationalization of an implicitly automatic, valenced reaction? If so, then can we still argue for the causal importance of FEBs?

Another point of concern I raise involves the proximate (and domain-specific) nature of FEBs. Even granting the authors' claim that these beliefs are causal drivers (as opposed to rationalizations), it is probably not surprising to find that people who believe welfare presents perverse incentives are opposed to welfare. Public-opinion scholars often seek to build broader models of public opinion that transcend specific domains. Although some of the exemplar FEBs seem to contradict each other, some common threads do emerge – enough to raise the question of the relative utility of studying these domain-specific beliefs as opposed to the generalized perspectives. For example, suspicion of international trade, beliefs about the nefariousness and laziness of immigrants, and emporiophobia generally stem from distrust of outsiders – be they commodity chains or people from other countries, or anonymous or impersonal traders. I fully grant that distrust of others arises from an intuitive readiness forged by evolutionary adaptation.

Yet, some people are more distrusting than others. An evolutionary psychology argument has a hard time explaining variability across individuals. B&P define folk-economic beliefs as being "widespread" – but how widespread do these beliefs need to be to qualify as FEBs? And how can we understand heterogeneity in ascription to such beliefs? How does an evolutionary psychology story about how small-scale societies have prepared the human mind to process in specific ways account for individual differences in beliefs? B&P seem to fall on cultural transmission to do some work here, but this explanation feels underdeveloped.

Finally, B&P state that their model "is emphatically not a normative proposal" (sect. 1.4, para. 1). That is, they do not intend for their evolutionary cognitive model to prescribe the right (or wrong) ways for ordinary people to understand economic processes. Still, their model does raise normative questions concerning the foundations for democratic governance: public opinion. It is no stretch to characterize many of these FEBs as hard-hearted: encapsulating a zero-sum, conflict-laden, ingroup-oriented state of the world. In many ways, the small-scale evolutionary societies that have left their imprint on the human mind reflect Hobbes' description of human life as "nasty, brutish, and short." B&P's argument provides a framework for understanding why we succumb to the darker side of human nature, guarding against potential intruders and protecting ingroups from contamination, and, at the same time, for understanding why it can be so difficult for politics and political elites to appeal to the better angels of our nature.

B&P's article provides one framework for understanding the challenges confronting political messages that entreat abstract values such as egalitarianism, diversity, and tolerance. These frames, it would seem, do not as easily resonate with our intuitive cognitive systems – it takes cognitive effort and intentionality to process and apply them. Politics, as "a sideshow in the great circus of life" (Dahl 1961, p. 305), is often interpreted by the automatic, unreflexive mind. Moreover, the electoral temptations to appeal to the intuitive cognitive infrastructure of the insular, small-scale societies of our past have, if anything, become even more prominent and pernicious in contemporary political life.

Broadening the role of "self-interest" in folk-economic beliefs[1]

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Abstract: We extend Boyer & Petersen's (B&P's) model of folk-economic beliefs (FEBs) by suggesting FEBs serve self-interest (broadly defined), which includes indirect benefits such as creating alliances, advancing self-beneficial ideologies, and signaling one's traits. By expanding the definition of self-interest, the model can predict who will hold what FEBs, which FEBs will propagate, when they will change, why, and in which direction.

Boyer & Petersen (B&P) present an excellent model arguing that folk-economic beliefs (FEBs) are a product of automatic inference systems, which evolved in ancestral small-scale societies. However, their model is currently unclear: Are FEBs only (mis) applications of social exchange heuristics into the evolutionarily novel domain of macroeconomics, or are they self-interested under a broader concept of self-interest? Here we supplement B&P's model by expanding the definition of self-interest to include indirect benefits, and advance novel specific predictions about who will hold which FEBs, and when.

In the target article, the definition of self-interest is limited to direct material benefits and excludes implicitly self-interested actions, such as signaling (Higham 2014), competitive altruism (Barclay & Willer 2007), conformity (Cialdini & Goldstein 2004), and helping allies (Weeden & Kurzban 2014). This limits the predictive power of the model by making it too general to predict which FEBs each individual will hold. Moreover, the model also misses the opportunity to use self-interest to predict why certain FEBs prevail over others.

We propose that FEBs will not only map onto the existing social exchange mechanisms, but also reflect the interests of the individual. Specifically, we predict that individuals will hold FEBs that are aligned with their perceived interests – broadly defined – and will promote FEBs that (a) create beneficial alliances (see DeScioli & Kurzban 2013) or signal one's group membership (as discussed in the target article); (b) increase one's competitiveness in a biological market, where individuals differ in "partner quality" and compete for access to desirable partners (see Barclay 2013; 2016); and (c) benefit a large or influential group of people.

People hold beliefs and act in ways they perceive will benefit themselves (see DeScioli et al. 2014; Petersen et al. 2013), which can vary according to circumstances (DeScioli et al. 2014; Petersen et al. 2014; self-serving justifications: Shalvi et al. 2015; error management theory: Galperin & Haselton 2013). Longitudinal studies show that redistributive preferences (e.g., "government should reduce income disparity") change when individuals face difficult times, such as unemployment, in the direction aligned with their interest (DeScioli et al. 2014; Owens & Pedulla 2014; Naumann et al. 2015). Moreover, the perceived benefits may not accurately map onto actual benefits, especially when individuals are manipulated by others. We propose that FEBs function in a similar way, and vary according to *perceived* benefits and costs, thus leading to an occasional mismatch between one's interest as predicted by macroeconomics and one's FEB.

Some FEBs can have significant coalitional value, and will be expressed most often to individuals with similar interests in order to make alliances and promote changes (or the status quo) based on shared, mutually favorable goals. Championing an FEB can rally alliances, coordinate condemnation of undesirable behaviors, and convince others to act in a way consistent with one's own interests. As in moral condemnation (DeScioli & Kurzban 2013), publicly signaling support for an FEB can promote bystanders to take sides. For example, individuals who perceive they will be harmed by markets will favor the "markets are bad" FEB, and the "price regulation has the intended effect" belief will be held

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by those unable to compete in unregulated markets and consequently benefit the most from price regulations. Moreover, believing that "immigrants steal jobs" will be more likely when one is unsuccessfully competing for the same type of jobs, and the "labor as the source of value" FEB should be held most often by those for whom labor is the primary source of income (e.g., those in low-paying, highly demanding jobs).

In terms of partner choice and biological markets, individuals should promote their interests by selectively adopting FEBs which enhance their market value or advertise desirable traits, while rejecting FEBs that decrease their market value. By analogy, individuals' Big Five personality traits are correlated with their values – one's values (and beliefs) can be used to justify or extol one's traits (Roccas et al. 2002). With FEBs, the "immigrants steal jobs" FEB should be least common among individuals who want to signal their competitiveness on the job market; the "profit motive is detrimental" FEB should be most common in contexts where it is beneficial for people to be perceived as prosocial or genuinely concerned for others' welfare, as it will increase their value as a partner (e.g., Barclay 2013); and the "social welfare programs are abused by scroungers" FEB should be most prevalent among job-holders who want to signal that they are hard workers. Furthermore, which FEBs are expressed should depend on who the audience is and what their interests are: For example, the "immigrants steal jobs" or the "immigrants abuse welfare" FEBs should be experienced less often when on a date with an attractive immigrant; the "labor as the source of value" FEB should be expressed more often when befriending a laborer; and the "international trade has negative effects" FEB is more likely to be imparted in the company of fellow patriots.

Why do some beliefs become FEBs, while others do not? Those that take hold are likely beneficial for the individual *and* beneficial to a large or influential group who propagate it, because they also perceive that belief to benefit them. For example, if only a small group of low-status laborers thought "labor is the source of value," that wouldn't become a widely held FEB even if it mapped onto social exchange mechanisms. Beliefs will become FEBs only if there are interested parties to champion them *and* interested audiences to propagate them.

In this commentary, we add to B&P's model and make predictions about which FEBs individuals will support based on their perceived interests and their audience. If FEBs were solely a reflection of social exchange heuristics, we wouldn't expect them to systematically vary in these ways. This view is consistent with the characteristics of FEBs listed by the authors, such that they are unstable and can change rapidly, between and within individuals. Furthermore, we predict which FEBs will propagate, when they will change, why, and in which direction: towards self-interest, broadly defined.

NOTE

1. Mia Karabegović and Amanda Rotella contributed equally to the preparation of this commentary.

A grounded cognition perspective on folk-economic beliefs

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Abstract: Thought about abstract concepts is grounded in more concrete physical experiences. Applying this grounded cognition perspective to Boyer & Petersen's (B&P's) folk-economic beliefs, we highlight its implications for the activation, application, cultural acceptance, and context sensitivity of folk-economic beliefs.

Boyer & Petersen (B&P) analyze folk-economic beliefs (FEBs) "by considering the environment in which many, if not most, human cognitive mechanisms evolved" (sect. 1.1, para. 2) and suggest that the cultural acceptance of FEBs is subject to "the influence of specialized, largely automatic inference systems that evolved as adaptations to ancestral human small-scale sociality" (target article Abstract). Complementing this perspective, we note that people interact with the world through their body and experience it through their senses. Higher mental processes are grounded in these basic experiences (Barsalou 2008), and their role in abstract thought is reflected in the metaphorical expressions people use in common parlance (Lakoff & Johnson 1999; Landau 2017; Landau et al. 2014; Lee 2016; Lee & Schwarz 2014). The grounding of FEBs in basic physical experiences that are concrete, easy to process, and common to all further facilitates their communication and acceptance. A grounded perspective is compatible with B&P's analysis and observations and predicts additional psychological properties regarding the online activation and application of FEBs in daily life. (See Table 1).

B&P argue that "[people] make up their attitudes and beliefs 'on the spot,' by retrieving relevant cultural representations, and […] activating the relevant intuitive inference systems" (sect. 6.2, para. 3). Because mental processing is grounded in physical experience, situational changes in physical experience can influence the construction of attitudes and beliefs in a highly context-sensitive manner (Schwarz & Lee, in press). For example, reflecting a close link between physical and social warmth (Bargh & Shalev 2012), people perceive the physical environment as colder when they are socially rejected (Zhong & Leonardelli 2008); conversely, they feel closer to others (IJzerman & Semin 2009) and treat them more favorably (Williams & Bargh 2008) when the physical environment is warm. Similarly, FEBs can be activated by incidental physical experiences. For example, temporary hunger affects welfare attitudes and people are more supportive of providing for the needs of the population before than after lunch, an effect mediated by subjective feelings of hunger (Petersen et al. 2014). Messages framed in ways that match the applicable metaphor are more persuasive (Cian et al. 2015).

B&P assume that "prior psychological assumptions and expectations make certain representations easier to acquire, store, and communicate than others" and that "an 'attraction' process … results in the spread of highly particular mental representations" (sect. 3.4, para. 2). From a grounded perspective, the intuitive, easily processed, and culturally shared nature of FEBs results from shared experience with the same physical world. Because basic physical experiences (e.g., balance, force, temperature) are common to all, the corresponding FEBs are accessible to all. Nevertheless, individuals differ in how frequently they have specific physical experiences and how strongly they react to them (e.g., anxiously attached people react to cues of physical warmth more strongly than securely attached people do; Fay & Maner 2012). Such differences may moderate the likelihood and strength of endorsing a related FEB. For this reason, FEBs that are grounded in the most perceptually intense and functionally important physical experiences shared by everyone (e.g., food, temperature) should be the most compelling at the population level, influential for collective judgments and decisions, and successful within and across cultures (cf. Akpinar & Berger 2015; Lee & Schwarz 2012; Lee et al. 2015).

Because basic physical experiences involve simple relations of cause and effect, the corresponding FEBs exhibit simple, one-step, two- or few-agents causal relations rather than complex, multi-step systems of causality. For example, the grounding of international trade in physical balance renders it a zero-sum game because in physical balance, when one side increases, the other side decreases. Beliefs like FEB 1 reflect that people

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Table 1 (Lee & Schwarz). *Folk-economic beliefs (FEBs)*, physical experiences that are hypothesized to ground them, and inferences drawn from the physical experiences.*

Folk-economic belief (FEB)	Metaphorical grounding	Inference drawn from concrete experience
1. International trade is zero-sum, has negative effects	Trade as balance	When one side increases, the other side decreases.
2. Immigrants "steal" jobs	Nation as container	When immigrants occupy the space, we are displaced.
3. Immigrants abuse the welfare system	Social welfare as nurturance	When immigrants eat our food, our food is gone.
4. Necessary social welfare programs are abused by scroungers	Government as nurturant parent vs. strict father	A nurturant parent offers support and protection; a strict father disciplines and discourages laziness (Lakoff 2002).
5. Markets have a negative social impact	Market as a cold, impersonal entity	A cold, impersonal entity does not offer warm, personal nurturance.
6. The profit motive is detrimental to general welfare	Profit as imbalance	Profit disrupts the balance between cost and price.
7. Labor is the source of value	Labor (cost) and value (price) as two sides of balance	Labor correlates positively with value. Relative to intellectual labor, physical labor is more directly grounded, hence its heavier influence on value.
8. Price-regulation has the intended effects	Regulation as force	Regulation exerts its effects as directly as in Newtonian mechanics.

*See B&P's target article for full details.

understand and apply this simple, one-step, two-agents process of intuitive causality, as opposed to the wide scope and long chain of indirect effects of international trade.

As these comments indicate, we embrace B&P's admonition that folk-economic views should not be seen "as irrational deviations from normative understandings of economic processes," but as "the outcome of principled cognitive systems" (sect. 7, para. 2). These systems evolved in response to recurrent problems that included the physical as well as the social world. Exploring the implications of a grounded cognition perspective for lay reasoning about economic processes presents ample opportunities for future research.

Economic complexities and cognitive hurdles: Accounting for specific economic misconceptions without an ultimate cause

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Abstract: Do folk-economic beliefs have an ultimate cause? We argue that, in many cases, the answer is negative. Cognition is constrained in both scope (via long-term memory [LTM]) and depth (via working memory [WM]). Consequently, laypeople are challenged by concepts essential for understanding complex systems, economics included: aggregation, indirect causation, and equilibrium. We discuss several economic misconceptions arising from this acute mismatch.

In their target article, Boyer & Petersen (B&P) draw a distinction between proximate and ultimate explanations for folk-economic beliefs. They argue that bias-based models explain only *how* such beliefs are forged (proximate cause), not *why* they arise (ultimate cause), nor do they explain the specific contents those beliefs contain. B&P argue that folk-economic beliefs emerge, ultimately, from the operation of specialized cognitive systems, crafted by evolution and "brought online" by the modern economic environment.

We applaud this approach but believe that it fails to seriously consider that many folk-economic misconceptions have no ultimate cause; they result from a "bug," not a feature, of human cognition. In this sense, they are no different from folk-scientific or folk-medical beliefs, or those in any other complex domain (Shtulman 2015).

The human cognitive system is severely constrained in both scope and depth. "Scope" refers to the *range of elements* brought to bear on a given issue, and it is mediated and constrained by long-term memory (LTM). The countless pieces of information in LTM are rarely harmonized (DiSessa 2006; Leiser 2001), and retrieval from LTM is strongly biased by salience cues (Higgins 1996). Cognitive "depth" refers to *the complexity and the number* of reasoning steps of an argument, and it is bounded by the capacity of working memory (WM) (Halford et al. 2007; Oberauer et al. 2003; 2007). The notorious exiguity of WM means that people struggle to follow the causal chains leading to and from the issues in question.

Economic theory relies on three interrelated key ideas not readily grasped without formal training: (1) It concerns itself with aggregated variables and treats them as causal factors; (2) it integrates indirect effects and feedback loops into a coherent system; and (3) it explains outcomes as equilibrium states. All three seriously challenge the limits of both the scope and depth of our reasoning.

To illustrate with an accessible example from an unrelated domain, consider the "fundamental law of traffic congestion" (Duranton & Turner 2011). Lay thinking assumes that increasing the number of lanes in a road will decrease congestion. In reality, congestion always rises back to maximum capacity. The optimistic assumption stems from a failure to consider feedback and to ignore equilibrium and aggregate effects.

The mismatch between our cognitive endowment and the assumptions of economics means that people often fail to grasp the proper economic explanations when presented, let alone identify them on their own. The resulting folk-economic beliefs are simply the best laypeople are able to come up with.

Whereas economists consider the aggregate, laypeople focus on individuals. Pitching explanations at the level of individual

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elements also impedes the understanding of other emergent processes such as heat flow, osmosis, natural selection, or indeed, traffic congestion. These are all processes where the complex interactions of a collection of elements jointly cause the observable outcome. Such processes are cognitively challenging and lead to robust misconceptions (see Chi et al. 2012). There is no need to refer to ancestral conditions to explain the difficulties experienced by laypeople in understanding such emergent processes. These misconceptions are not the output of some intuitive system, but rather arise from the absence thereof.

Elsewhere, we document many consequences of the mismatch between our cognitive makeup and economic theory (Leiser & Shemesh 2018). Here we will focus on two of the folk-economic beliefs discussed by B&P.

FEB 1 holds that international trade has negative consequences. According to B&P, trade activates a coalitional psychology evolved in the ancestral context, which assumes coalitionary interaction to be a zero-sum game. Applied to international trade, this principle leads people to believe that when one nation transfers resources to another, the latter is gaining something, which to them implies the former is losing.

But there is a more parsimonious explanation. The logic of comparative advantage states that nations are better at producing some things compared to others. Therefore, when a given nation buys from another, it is getting something at a lower price than it would cost itself to produce. Why do people see trade as a (zero-sum) transfer rather than a (non-zero-sum) exchange? The relational complexity (Halford et al. 1998) of two-way exchange is overwhelming: Instead of focusing on Country A receiving payment from Country B for Product K, we now have to consider also A obtaining payment from B for Product L, and moreover realize that by obtaining K from B, and by doing so comparatively cheaply, A is able to shift production from K to L. We contend that the demands on working memory for the understanding of comparative advantage are so computationally taxing as to make this account inaccessible without considerable deliberation and effort.

Consider now FEB 8, which posits that regulations achieve their intended effects. B&P argue that this belief is based on the assumption that supply is stable, which itself results from the fact that the ancestral exchange environment included no changes in supply attendant on aggregate demand. As a result, humans never evolved the cognitive wherewithal to handle this specific aggregate dynamic.

We concur but would add that this FEB, and others, can be better understood once we consider the mechanisms underlying retrieval from long-term memory. As we noted, the failure to apprehend aggregate dynamics is widespread, and it does not depend on specific ancestral conditions. Because search in LTM is constrained by salience, when people contemplate economic problems, they tend to think of solutions stated in the same terms as the problem, but pushing in the opposite direction. If rent prices are too high, the popular preference will be to cap prices; if salaries are too low, the most intuitive policy is to raise the minimum wage. Similarly, if many people are unemployed, the "obvious" solution is to create more jobs rather than, say, increase competition. That is to say, people do not trawl their long-term memory for possible causes of the particular phenomenon but simply come up with the most direct solution and are satisfied to leave it at that.

Understanding the development of folk-economic beliefs

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Abstract: Developmental psychology can shed light on (1) the intuitive systems that underlie folk-economic beliefs (FEBs), and (2) how FEBs are created and revised. Boyer & Petersen (B&P) acknowledge the first, but we argue that they do not seriously consider the second. FEBs vary across people (and within a person), and much of this variation may be explained by socialization, social context, and social learning.

Boyer & Petersen (B&P) argue that folk-economic beliefs (FEBs) are formed when people elaborate on and explain intuitions that stem from universally present adaptive and automatic inference systems. This mechanism is in line with how developmental psychologists think about the mind: Cognition results from interactions between nature and nurture. Applying a developmental psychology lens to FEBs can shed light on (1) the initial inference systems that feed into resulting FEBs, and (2) how experiences activate and shape specific FEBs. The target article excellently acknowledges the first area, but we suggest that future research considering the second would be profitable.

B&P lay out five systems that underlie FEBs: detecting free-riders, choosing social partners, engaging in communal sharing, creating and affiliating with coalitions, and reasoning about ownership. Recent developmental psychology research provides evidence that components of each of these abilities are present early in development. As example, children care about partiality when evaluating resource distribution (e.g., Liberman & Shaw 2017; Shaw 2013), which could be an output of the cheater detection system. Additionally, infants are selective in whom they choose as social partners (e.g., Hamlin et al. 2007; Kinzler et al. 2007; Mahajan & Wynn 2012) and form expectations about which people will engage in positive social relationships (e.g., Liberman et al. 2014), indicating active psychologies for partner choice and coalitional affiliation. Indeed, evidence suggests that the relevant inference systems that underlie FEBs evolved early in human phylogeny and ontogeny, and emerged before (and outside of) markets (sect. 4.1).

Although the inference systems that support FEBs are early emerging and likely universally present, FEBs themselves are neither consistent nor coherent. That is, different people can hold different FEBs, and a person can hold seemingly contradictory FEBs. As B&P assert, "The beliefs in question may well vary between social classes, cultures, age-groups, and so on" (sect. 2.1, para. 10).

We argue that understanding how people go from A (inference system) to B (FEB) and how this developmental trajectory unfolds in different contexts – *how* social class, culture, and age-group impact upon thinking – will be important going forward. Although research by developmental psychologists and behavioral economists who study biases in decision-making rarely cross-fertilizes, these fields could be mutually extended to understand how different environments may shape FEBs.

B&P discuss psychological essentialism as an example of how reflexive beliefs can be incoherent. In our view, essentialism also serves as a good case study for understanding how initial inferences and later intuitions that support FEBs may emerge differently in different environments.

For instance, although essentialist beliefs likely arise from elaborating on an adaptive system for categorization, people do not imbue all categories with essences (e.g., Bloom 1996). Indeed, "social essentialism" (essentialist beliefs about groups of people) are more stable for some social categories: Adults' categorization by race (but not gender) can be disrupted when coalitions cross category boundaries (e.g., Kurzban et al. 2001), and children develop gender essentialism before racial essentialism (e.g., Rhodes & Gelman 2009). Indeed, the amount that people essentialize the *same* category can vary based on age and social experience (e.g., Kinzler & Dautel 2012; Pauker et al. 2010). For example, children from rural and non-diverse environments grow to develop higher levels of racial essentialism (Pauker

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et al. 2016; Rhodes & Gelman 2009). We hypothesize that this variation is due to children having an inference system for social categorization, where the specific parameters that activate coalitional cognition may vary based on the child's early cultural experiences (e.g., Liberman et al. 2017).

Similarly, different experiences may lead to different likelihoods activating the inference systems that underlie a particular FEB. As example, living in a diverse community may decrease activation of cheater-detection mechanisms towards immigrants, whereas living in poverty may increase activation of these same mechanisms (e.g., if poor people perceive immigrants as opponents in a zero-sum competition for resources, see Esses et al. 2001). Supporting these ideas, people are more in favor of welfare policies for people who are unemployed persons but actively pursuing a job, likely because they do not view such persons as cheaters (Petersen et al. 2012). Additionally, people who are lower in socioeconomic status, more politically right-wing, and who attend church regularly (van Oorschot 1998), and countries that are poorer and have a strong focus on meritocracy (van Oorschot 2006), are more likely to be conditional in terms of who is viewed as deserving of welfare (e.g., by supporting giving to the elderly but not to the unemployed). Therefore, knowledge about a person's social identity, background, and experiences can provide predictive power of which FEBs that person might hold.

Indeed, changing a person's experiences may change their endorsement of a particular FEB. As example, economic stability versus variability could trigger different psychologies (Cosmides & Tooby 1994), such that experiencing prolonged unrest (e.g., a civil war) or an acute disturbance (e.g., a natural disaster) could cause people to be more likely to activate zero-sum reasoning and cheater-detection mechanisms. Even smaller changes could impact FEBs: positive exposure to diversity, or interventions that highlight how poverty is due to systematic structural inequality could make people more supportive of broader welfare policies.

We think that the examples above are very much in line with B&P's argument – for instance, their acknowledgment that reflective FEBs can change rapidly in different sociocultural contexts (sect. 6.2, para 5). We aim this commentary to serve as a call to arms for research to investigate the developmental trajectory by which FEBs may emerge predictably in different early sociocultural environments. Furthermore, the impact of social contexts at different points in ontogeny may be differentially important.

In sum, although B&P suggest that it is not important to determine whether FEBs are "correct," they acknowledge that these beliefs have profound political consequences. Thus, understanding how FEBs are activated and revised would have impressive real-world impact. Societies can harness the knowledge gained by investigating the emergence of FEBs across varied developmental factors to construct effective social policies.

Mapping the *terra incognita* of economic cognition will require an experimental paradigm that incorporates context

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Abstract: Researchers, including Boyer & Petersen (B&P), commonly use experimental economic studies to draw their conclusions. These studies conventionally strip away context and present participants only with abstract rules. Because context is a strictly necessary component of the decision-making process, it is not clear that inferences about high-level folk psychological concepts (e.g., rationality) can be drawn from decontextualized economic games.

We generally agree with Boyer & Petersen (B&P) regarding folk-economic beliefs (FEBs), including that economic cognition is largely *terra incognita* (sect. 6.3, para. 3), and that a computational, or "design stance," framework is a viable alternative to intuitive person-level descriptions of rationality and utility – that is, the "intentional stance" (Dennett 1987). This might even be carried a step further: Person-level, commonsense "folk psychology" (FP) is robustly predictive in social encounters (Baron-Cohen et al. 2013), but it is an obstacle for less-intuitive concepts in psychology (Bloom 2004; Damasio 2005), especially in light of progress in computational and neurobiological research (Churchland 1981; 2013). In general, if computational models are better for carving psychology at its joints, then they should displace FP models where the two are at odds.

This disconnect between computational and FP perspectives is precisely the current state of affairs for competing theories of economic cognition and behavior. As B&P note, the main challenge is in describing "how [computational] models and findings could be integrated with classical, and often empirically successful, descriptions of economic behavior in terms of rationality […] and utility" (sect. 6.3, para. 5). The empirical success of classical descriptions is based, in part, on results in experimental economic games, which conventionally aim to isolate and test the forces of interest, namely, rationality and various forms of utility (sect. 6.3, para. 4) in the absence of environmental noise (Colman 1982; Camerer & Fehr 2005). They attempt to do this by omitting any environmental context except for the abstract rules of the game. When empirical results deviate systematically from the "standard model" of rationality and self-regarding utility, some researchers have attempted to rescue rationality by rejecting self-regarding utility in favor of other-regarding utility (e.g., Fehr & Schmidt 1999; Gintis 2007).

Environmental context is not noise, however; it is a signal. The decision-making machinery of all living organisms, including humans and human ancestors, evolved to make decisions based, in part, on cues of environmental context. This attempt to eliminate contextual cues from the experimental procedure therefore fails to control for an essential element of the decision-making process – that is, it increases rather than reduces noise. If empirical deviations from the "standard model" are based on a failure to control essential aspects of the decision-making process, then attempts to reconcile them with high-level FP concepts are misguided.

Taking a design stance, others argue that it is probably not computationally tractable for agents to search for optimal solutions in a novel decision-making task such as an economics experiment, and therefore suggest that agents rely on bounded rationality and a "toolkit" of ecologically valid computational heuristics (e.g., Gigerenzer 2010; Gigerenzer & Selten 2001; Kahneman 2003; Simon 1990). If so, the cognitive problem for participants in economic experiments would not be utility maximization in their task environment (Simon 1991), but rather, context identification prior to executing some associated heuristic – also known as the "frame problem."

Solving the frame problem is especially difficult in experimental economics games that provide participants with only the rules and no context, and most "systematic" divergences from "subjective utility maximization predictions" (sect. 6.3, para. 3) occur in exactly these types of experiments. In general, we know very little about the cognitive mechanisms that "match input conditions" to "specific systems" (Figure 2 in B&P) in novel tasks such as experimental economic games. But what we do know is that when input conditions, or frames, are provided to participants, results can vary from the empirically robust classical findings. For instance, they can deviate subtly when subtle framing cues are presented (e.g., Cronk 2007; Cronk & Wasielewski

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2008; Eriksson & Strimling 2014; Gerkey 2013; Keser & van Winden 2000; Liberman 2004; Leliveld et al. 2008), and they can deviate dramatically when even slightly more detailed framing scenarios are presented (Lightner et al. 2017). More important, these cited framing effects all deviate from standard findings in a way that reflects the social norms associated with the provided context in each experiment.

Theoretical models of economic cognition should therefore not take studies finding systematic deviations from standard economic theory at face value to begin with, especially when they are found in decontextualized experimental economic games (Hagen & Hammerstein 2006). Interestingly, a version of this critique is raised by B&P themselves against the idea that the FEBs reveal an implicit theory of the economy (sect. 6.2). As they rightly note, there are likely as many different cognitive models of an economic scenario as there are individuals modeling that scenario. This exact line of reasoning can be applied to novel exchange scenarios such as experimental economic games, and as a consequence, there are likely as many different games being played as there are participants (Hagen & Hammerstein 2006).

It is nonetheless tempting for researchers to continue taking behavioral "signals" from decontextualized game studies for granted – as B&P do in some parts of their target article (e.g., FEB 5 in sect. 5.4). The theoretical conclusions they extrapolate from them, however, are susceptible to the critique we raise here, and raised by B&P in section 6.2. If computational models of economic cognition will accommodate behavioral findings, then their radically different theoretical frameworks, each with radically different assumptions, must be addressed in future research. Productive steps in this direction would include reconsidering questionable results from decontextualized experimental economic games.

Folk-economic beliefs as moral intuitions

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Abstract: Although Boyer & Petersen's (B&P's) cataloguing of and evolutionary explanations for folk-economic beliefs is important and valuable, the authors fail to connect their theories to existing explanations for why people do not think like economists. For instance, people often have moral intuitions akin to principles of fairness and justice that conflict with utilitarian approaches to resource allocation.

Boyer & Petersen's (B&P's) article speaks to several fields of research including behavioral economics, evolutionary psychology, and political science. The authors lay out an important research agenda on folk-economic beliefs that is ripe for empirical testing. This piece is very much in the tradition of Gerd Gigerenzer (1996), who critiqued the heuristics and biases program of Daniel Kahneman and Amos Tversky. Like Gigerenzer, B&P go beyond a simple cataloguing of economic "mind bugs" and put forward evolutionary explanations for why people's economic cognitions do not align with rational choice theory. In this commentary, I make connections between B&P's theoretical framework and existing work on moral intuitions, taboo trade-offs, mental mind games, and others. B&P do not engage with these literatures. Even though their evolutionary approach is unique, it would have been helpful for them to compare and contrast their theory with existing approaches to understanding why people do not typically think like economists.

Consider, for example, Jonathan Haidt's (2012) work on moral intuitions. People may not hold rigorously derived economic principles, but they have intuitions that serve them well. Many of these intuitions also fly in the face of utilitarianism, whose analysis of costs and benefits accords closely with the logic of economics. For instance, people value other ideals such as rights and fairness that often go against traditional economic theory. This is not to say that people are consistent Kantians or Rawlsians, but that folk-economic beliefs can be rationalized in terms of moral principles. These moral positions may or may not have an evolutionary basis or be culturally transmitted.

Price discrimination is a classic example. Humans believe that some goods and services should be allocated via markets whereas others should not (Fiske & Tetlock 1997). For example, people think it is okay to allocate scarce concert tickets to the highest bidder but not scarce kidneys. These distinctions do not abide by strict economic principles for efficient resource allocation, but they do have an intuitive logic and a basis in more rigorous moral arguments. For instance, price discrimination is viewed as taboo when some sort of harm is at play. It may be okay for a hardware store to raise the price of plywood before Labor Day, but not before an oncoming hurricane. Uber can surge its prices on most days, but not when there is an emergency. There is a belief that goods should sometimes be allocated through mechanisms less efficient than markets. Further, people have intuitions that price discrimination that disparately impacts historically underprivileged and protected classes is wrong even if economically efficient. For example, it may make economic sense to charge more for car insurance in black neighborhoods if there is higher risk, but this would likely strike most people as unfair. These moral intuitions relate to the more-sophisticated idea that utility cannot be easily compared across people. People do not believe that the rich man hails a taxicab in the rain because he gains more utility from being dry than the poor man (Binmore 2008). Yet, the ability to make interpersonal comparisons of utility based on revealed preferences is a key assumption of economic theory (Robbins 1997).

There is also a burgeoning literature in the psychology of conflict on mental models (e.g., Halevy et al. 2012). Researchers found that when ordinary people were asked to represent a conflict in matrix form, more than 70% intuitively chose a set of payoffs that mapped to one of four canonical economic games: Maximizing Difference, Assurance, Chicken, and the Prisoner's Dilemma. This is quite remarkable given that there are more than 576 possible payoff permutations. B&P's view of folk-economic beliefs does not really cover game theory and whether people conceive of common conflict situations as economic games.

Further, several of the empirical patterns B&P discuss could be explained by much simpler explanations that do not rely upon evolutionary psychology. For example, people's belief that social welfare programs are abused likely stem from both urban legends and elite discourse on the topic. There exist cultural memes such as the "welfare queen" that are propagated by politicians on the right. Other folk-economic beliefs not discussed by B&P could similarly be rooted in urban legends. For instance, economists generally believe that consumer-driven lawsuits can be socially efficient – even in the absence of company negligence – because they provide incentives for the party with more information to embed safety features into products (Calabresi & Melamed 1972). The strict liability in tort standard is justified using this logic. However, urban legends and elite communication on frivolous lawsuits, such as the famous case of the woman who spilled coffee on herself at McDonald's, generally shape people's economic beliefs when it comes to consumer torts (Malhotra 2015).

Moreover, economists themselves have argued that basic economic decision-making may be genetically determined (Chen et al. 2006). Research on capuchin monkeys has shown that capuchins react to price and wealth shocks as simple microeconomic models would suggest. However, they also exhibit common biases such as reference dependence and loss aversion. Hence, some behavioral biases seem to be present in primates that predate the features of early human societies noted by B&P.

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Lastly, one wonders whether many of the evolutionary explanations offered by B&P could be rationalized using economic principles. Consider, for example, the institution of the "law merchant" in Medieval Europe (Milgrom et al. 1990). Trade was facilitated in fairs among merchants who rarely interacted. How could this occur without repeat play? A system of judges known as law merchants arose to enforce contractual violations and help traders develop reputations. In essence, the law merchant was an early-day Yelp. What appears to be evolutionary exchange was actually a market-sustaining equilibrium that had a rational economic basis.

In summary, B&P present an important contribution to our understanding of lay economic beliefs, which often exhibit logical inconsistency and do not accord with rigorous economic thinking. Nonetheless, I think it would have been helpful to engage more directly with other popular explanations that do not rely on evolutionary explanations. Doing so will help guide empirical scholars in testing many of B&P's theoretical claims.

Coalitional rivalry may hurt in economic exchanges such as trade but help in war

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Abstract: Economic exchange constitutes the basis of many, but not all, aspects of human cooperation. The incentives overlap with, but remain distinct in important ways, from other fundamental aspects of cooperation, including the organization of collective violence for combat. The specific alignment of sometimes-conflicting goals helps inform the construction of political ideology.

Boyer & Petersen (B&P) provide a helpful discussion about the political ramifications of folk-economic beliefs. Given the current state of populism around the world, exhibiting primarily xenophobic and protectionist beliefs, it is impossible not to see the urgency and relevance of these issues to current political crises, although the authors are careful to situate the origins of these beliefs in more ancient evolutionary origins. A great deal of robust experimental evidence in both psychology and behavioral economic (Akerlof & Shiller 2010; Camerer et al. 2011) has demonstrated that extant normative models of classical economic theory are not grounded in any meaningful description of human psychological architecture, so B&P's approach provides a useful paradigm for locating the origins of economic exchange in broader patterns of social cooperation.

B&P's perspective could be elaborated in a productive manner by specifying some of the ways in which in-group social and economic exchange and cooperation overlap with, but remain distinct from, processes of coalitional cooperation that evolved to gain advantage in war and combat (Wrangham 1999; McAuliffe et al. 2015) against predators and out-groups. Although the domains of application to in-group and out-group clearly diverge, the importance of cooperation for competitive success remain similar. In addition, the organization of collective violence the authors specify under their domain-specific inference systems, suggests that a specific input format, such as threat, triggers automatic activation of specific psychological mechanisms which are designed for protection and defense. These inputs not only share specific inference rules, such as who constitutes an ally or enemy, and unconscious computation, but also produce an intuitive output, such as the attempted annihilation and elimination of threats. This cooperation to achieve collective defense through coordinated destruction may be organized around a different goal than economic exchange, but the underlying psychological mechanisms of cooperation likely share some important overlaps that deserve more systematic consideration; the specific input format likely offers the greatest potential for distinguishing the systems.

B&P address some of the out-group implications of their model in their discussion of international trade as coalitionary rivalry. The activation of this coalitional psychology, which they correctly characterize as a zero-sum interaction, is key to the important distinction between social in-group cooperation and antagonistic out-group conflict as I have just described. As they rightly note, "we argue that the zero-sum assumption is part of the *design* of coalitional reasoning. The resulting motivations are part of the architecture of this system. To maintain stable and efficient coalitions, humans in many different contexts must have assumed that other groups' advantage was a potential loss" (sect. 5.1, para. 2; emphasis theirs). Yet this is important not just in trade, as B&P outline, but also in other conflictual situations involving non-economic factors, such as dispute over territory or population control. B&P note that their model allows for some novel testable hypotheses and predictions in this regard; such possibilities can be expanded well beyond the realm of economics into violent coalitional conflicts as well.

Particular alignments of political and social beliefs may join those espousing particular economic and military beliefs. B&P argue that the folk-economic beliefs they identify hold across various dimensions of political ideology. This may indeed be the case within economically restricted views, such as those between laziness, deservingness, and welfare benefits, as Petersen has shown in other work, but the alignment between specific economic and defense attitudes are not as random (Hatemi & McDermott 2012). Further investigation and specification of the ways in which such attitudes and beliefs align may further help illuminate the origins and nature of how human social cooperation emerged and manifests, and help identify the scope conditions of its limitations – economically, socially, and politically. Humans are likely to have folk-defense beliefs that are similar to, but diverge in important ways from, their folk-economic beliefs. For example, attacks activate a desire for revenge and motivate actions designed for deterrence (McDermott et al. 2017); such behaviors can rupture existing alliances or trade agreements. In this way, some folk-economic- and folk-defense-related beliefs may operate in concert with each other, but others likely motivate contrasting behavior. When such beliefs come into conflict, those which privilege defense-related concerns are likely to take precedence.

After all, while economic exchange constitutes the basis of much human cooperation, it certainly does not comprise the entirety of such cooperation. Even critical forms of cooperation, such as human mating, which incorporate an economic element, are not solely financial in promoting shared interests. The veritable ubiquity of human social cooperation in general makes it one of the most important reasons we became different from, and were able to dominate, other species. However, one of the most valuable aspects of cooperation within groups derives from how effectively it can potentiate the annihilation of out-groups. Thus, although the activation of coalitional rivalry may hurt the "imagined" nation (Anderson 2006) in some areas such as trade, it likely benefits the survival of that community in situations of militarized conflict. In this way, while coalitional rivalry may hurt particular countries in trade, such losses are clearly heavily outweighed by how much more benefit derives to countries which can activate strong coalitionary rivalry under conditions of war and combat.

Adding culture and context improves evolutionary theorizing about human cognition

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Abstract: Boyer & Petersen (B&P) lay out an evolutionarily grounded framework to produce concrete, testable predictions about economic phenomena. We commend this step forward, but suggest the framework requires more consideration of cultural contexts that provide necessary input for cognitive systems to operate on. We discuss the role of culture when examining both evolved cognitive systems and social exchange contexts.

Boyer & Petersen (B&P) take great strides to bring the light of evolution into the murky waters of economic phenomena. We wholeheartedly agree with B&P that evolutionary thinking is crucial for understanding folk-economic beliefs and seeming irrationality in making economic decisions. Our concern is that they lean heavily upon Evolutionary Psychology (EP) theory positing a set of domain-specific, cognitive computational modules that evolved early in human ancestry and remain unchanged since then. As a consequence, their framework suffers from the limitations of this form of EP theory: over-reliance on strict computational models of cognition, exaggerated assumptions of universality and uniformity, and questionable assumptions of a singular Environment of Evolutionary Adaptiveness (EEA) with a singular set of social exchange conditions. We argue that ecological and cultural environments, along with cultural evolutionary processes, are relevant. It is therefore implausible to focus on a single evolutionary model. Our commentary focuses on the role of culture when examining both evolved cognitive systems and social exchange contexts, examining the role of domain-specificity of cognition and the role of context for cognition. We then focus on two specific examples to illustrate our points: intentionality reasoning and notions of ownership and fairness.

Classic EP theory of the sort that B&P rely upon focuses on the idea that cognition is best accomplished by a broad array of purpose-built, domain-specific, algorithmic information processing units to solve computational problems in the ancestral environment (L. Barrett et al. 2014). Recent advances in understanding the mind as a predictive, Bayesian processor suggest that (a) consciousness can be studied with domain-general information processing modules in which (b) culturally driven, top-down processing interacts with bottom-up sensory input. Importantly, much of this Bayesian, priors driven, top-down processing is likely encoded into environments through cultural systems like kinship, marriage rules, and parenting strategies that can stabilize the learning beyond individual brains (Mesoudi 2011; Smaldino 2014).

Debates about modularity and processing arguments aside, much of the research supporting domain-specific cognitive systems is situated in evolutionary unusual settings (Henrich et al. 2010). Cognitive experiments are typically conducted with university students in settings that are significantly different from our collective evolutionary history. Even when focusing on modern-day hunter-gatherer societies as an analogue to ancestral groups, issues of representativeness remain. Modern hunter-gatherer groups have been exposed to various other cultural and social systems, and most groups have been systematically displaced over the last few hundred years, leading to divergent cultural and social structures. For example, the endowment effect does not have equal impact even among the Hadza; instead, it appears to be sensitive to exposure to economic market-based exchange (Apicella et al. 2014). Focusing on social exchange, different modes of social exchange across societies (as noted by, e.g., Fiske 1992) call into question the plausibility of a single evolutionary model. Rules and norms in one's social context are internalized and in turn shape specific beliefs about the economy (Kunst et al. 2017). In short, it is possible and informative to consider the contextual nature of economic beliefs while acknowledging the role of evolutionary constraints.

A first example is reasoning about intent. Small-scale societies vary in emphasis on intent (H. C. Barrett et al. 2016), to the extent that some societies have culturally conditioned rules against mental state inference to explain behavior (Duranti 2015; Luhrmann 2011). This provides a significant challenge to a universalistic evolutionary account. Local norms and scripts can greatly reduce the information space needed to execute theory of mind functions such as intent reasoning (Apperly 2011). More communal settings, where norms more strictly dictate behavior than in more individualistic contexts, may therefore make situational factors more efficient and effective sources of behavioral information and prediction than thinking about minds (Ames et al. 2001; Hughes et al. 2017; Shahaeian et al. 2011). Indeed, one might argue that the intent focus in previous cheater-detection research may in large part be due to studying this process among American undergraduates, who are among the most mind-focused populations (Choi & Nisbett 1998; Delton et al. 2012; Lillard 1998).

Similarly, B&P place too much emphasis on universal notions of ownership and fairness. While the idea of labor as ownership dates back to John Locke, ideas about ownership and resource distributions vary in small-scale societies along kinship and hierarchical lines (Pierce et al. 2003; also see Fiske 1992) as well as ecology (Gurven 2004). For example: In rural Fiji, labor and ownership are not perfectly correlated because social life is largely structured by deference to a hereditary chief. Community members may be expected to do manual labor and still not be allowed to freely partake of the resources (such as coconuts or certain kinds of fish) on that land if it is the property of the chief. Similarly, cross-cultural developmental research shows a consistent pattern of rule learning in children in response to local norms instead of universal norms of fairness (Gampe & Daum 2018; House et al. 2013). These learned norms reflect local ecological and social conditions, which may in turn influence folk-economic beliefs.

In summary, we agree that evolutionary analysis of economic phenomena is necessary, but we suggest that B&P miss important cultural and environmental inputs into the cognitive system. We strongly support evolutionary investigations of economic beliefs, but encourage greater attention to cultural evolution models and local ecology and social context as shaping cognition. With humans, it is difficult (if not impossible) to completely ignore culture in such cognitive models, because culturally transmitted factors can constrain the learning space in a way that leads to outputs indistinguishable from domain-specific processing units (L. Barrett et al. 2014). We therefore suggest that B&P's evolutionarily grounded model of economic cognition cannot be complete without further consideration of these contextual factors and how they affect cognitive processing.

Developmental and cultural factors in economic beliefs

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Abstract: Boyer & Petersen (B&P) assume that the intuitive systems underlying folk-economic beliefs (FEBs), and, in particular, emporiophobia, evolved in the environment of evolutionary adaptedness (EEA), before markets. This makes the historical development of markets puzzling. We suggest that what evolved in the EEA are templates that help children develop intuitive systems partly adjusted to their cultural environment. This helps resolve the puzzle.

We are sympathetic to Boyer & Petersen's (B&P's) overall approach to folk-economic beliefs (FEBs) but believe their evolutionary psychology perspective would benefit from taking into

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greater account developmental and cultural-evolutionary factors. We focus by way of example on FEB 5, "emporiophobia" (hostility to markets). According to B&P, information about markets activates a partner-choice system that evolved in the environment of evolutionary adaptedness (EEA) and that "requires that the parties in a transaction be identifiable as specific individuals" (sect. 5.4, para. 3). This requirement has been less and less satisfied in the history of markets. Modern financial markets in particular involve mostly impersonal transactions, and this explains current emporiophobia. B&P's account implies that the historical development of markets had to overcome ever-increasingly hostile FEBs. This renders the success of market economy rather puzzling, not to say paradoxical. The independently motivated modifications of B&P's account of FEBs that we propose resolve the puzzle.

We accept the evolutionary hypothesis that a "partner-choice system" and similar cognitive mechanisms evolved in the EEA. We disagree on the exact function of these mechanisms. One possible view, suggested by B&P, is that what evolved in the EEA are modules that apply specialized inferential procedures to relevant inputs and that have remained part of modern humans' cognitive tool-kit. Because the input information that these modules process may vary across societies and historical periods, so may their intuitive output. This explains why FEBs, which are reflective elaboration of these intuitive outputs, also tend to differ across cultures.

We suggest an alternative approach (see Mercier & Sperber 2017, Ch. 4; Sperber & Hirschfeld 2007). Many cognitive mechanisms that have evolved in the EEA were not inference modules ready to process information but modular templates (or, in other terms, specialized acquisition devices) used in the course of individual cognitive development to acquire, on the basis of experience and cultural inputs, locally adjusted inferential procedures (just as a biologically evolved language acquisition ability combines with culturally evolved linguistic inputs to produce people's knowledge of their local language). In particular, we hypothesize that information locally relevant to partner choice is not fed to an ancestral partner-choice inferential module identical in all cultures. It is fed rather to inferential modules acquired in the course of cognitive development. Because these acquired modules are all based on the same evolved template, only limited cultural variability is to be expected. Still, the resulting modules are adjusted to the local cultural environment, and so are the intuitions they deliver.

This developmental hypothesis has consequences for cultural evolution. It helps explains how, in the course of human history, what may have been undertaken as a risky innovation by one generation can appear an intuitive practice to the next generation. We may speculate, for instance, that the first people in a prehistoric community who took the risk of engaging in economic exchanges beyond their familiar social network had to overcome the strong intuition that you cannot trust strangers. If, however, their risk-taking ended up being beneficial, their descendants would have grown up witnessing such exchanges as normal practice. They presumably developed with somewhat different intuitions about whom to trust. A readiness to choose economic partners on the basis of reputation even in the absence of prior acquaintance had become the "new normal." Less speculatively, Avner Greif (2004) has shown how, in medieval Europe, trading relationships across cities, instead of relying just on acquaintance and reputation, began to rely also on expectations of impersonal justice based on mutual agreements among independent cities. Generations born in a system where these expectations guided ordinary practices took them for granted, developed their intuitions from there, and acquired reflective folk-economic beliefs on the basis of these intuitions.

In the modern world, several types of market coexist; from farmers' markets to bitcoin exchanges, from gun shows to the NASDAQ. Different people have different attitudes towards these various institutions. What Rubin (2014) and B&P describe as *emporiophobia* is typically an attitude towards *financial* markets held by people who are not very knowledgeable about them. A more comprehensive study of contemporary FEBs about different types of market would have to look at this whole range of intuitions and explicit beliefs and at how they relate to one another. What we suggest is that these intuitions themselves result not from feeding information about these markets to intuitive systems which "evolved before and outside markets" (sect. 4.1), as B&P would have it, but from the modularization of different inferential competencies in laypeople and in experts.

Emporiophobia is a common FEB of ordinary people who are not active agents in these markets and who realize that what happens there, though opaque and beyond their control, can have major effects on their lives. Financial market actors and experts, on the other hand, are rarely if ever emporiophobic: They stand to benefit greatly from financial markets, and have a vested interest in convincing laypeople that these markets work for the greater good of all. In these conditions, it is not clear to what extent laypeople's emporiophobia is a reaction to the high impersonality of financial markets, and to what extent it is a reaction to their power and opacity, and to the lack of impartiality of the experts.

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Spoiled for choice: Identifying the building blocks of folk-economic beliefs

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Abstract: Boyer & Petersen suggest that folk-economic beliefs result from evolved domain-specific cognitive systems concerned with social exchange. However, a major challenge for their account is that each folk-economic belief can be explained by different combinations of evolved cognitive systems. We illustrate this by offering alternative explanations for several economic beliefs they discuss.

Boyer & Petersen (B&P) outline how eight folk-economic beliefs result from five evolved domain-specific cognitive systems concerned with social exchange. We are excited by this proposal. A major challenge, though, is that each folk-economic belief can be explained using many different combinations of evolved cognitive systems (or at least systems in place from early childhood), including some the authors do not mention. To illustrate this, we offer alternative (and perhaps more parsimonious) explanations for several of the folk-economic beliefs (FEBs) they discuss.

FEBs 2 and 3 hold that immigrants steal jobs and abuse the welfare system. We suggest these beliefs could stem from the psychology of group ownership, which is already apparent in preschool-aged children (Eisenberg-Berg et al. 1979; 1981; Huh & Friedman 2017; also see Furby 1980). When a resource is owned by a group, the members can typically access and use it, but other people cannot. Hence, if people conceptualize jobs and welfare as group resources, they might view immigrants as non-members who should be restricted from accessing these resources (Verkuyten & Martinovic 2017). The way people express their concerns about immigrants also supports this group ownership account. People often express these concerns by referring to themselves in terms of their collective identity and ownership (i.e., "we" and "ours" rather than "me" and "mine"), and by referring to immigrants as "stealing" these resources (Verkuyten & Martinovic 2017). Young children may have similar concerns about out-group members. For example, they believe that group

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members are more likely to steal from other groups than to steal from their own group (e.g., Baron & Dunham 2015; Rhodes 2012).

The psychology of group ownership may also explain FEB 4, which holds that social welfare programs are abused by scroungers. A key aspect of the psychology of group ownership is that group members have limited access to resources when acting individually. Again, preschoolers show signs of understanding this (Huh & Friedman 2017), and when working to secure resources with others, they distribute resources by considering the relative contributions of all parties (e.g., Hamann et al. 2011; Kanngiesser & Warneken 2012). So again, beliefs that scroungers abuse welfare programs could stem from concerns about individual group members taking more resources than entitled.

FEB 6 holds that the profit motive is detrimental to general welfare. We suggest this folk-economic belief could stem from people being realists about value – at least when not thinking carefully about market demands. Most of the time, people may feel that objects have true or real values, which depend not only on the labor used to create them (FEB 7), but also on many other properties. For example, assessments of value may depend on objects' physical features, usefulness, previous ownership, historical distinctiveness, and social value (e.g., Gelman 2013; Newman et al. 2011; Frazier et al. 2009). Crucially, assessments of value do not just occur in monetary judgments. For instance, in gift economies, people attend to value when reciprocating gifts they have received (e.g., Mauss 1990). People's intuitions that objects have true values may lead them to connect profit motives with dishonesty and greed; sellers who maximize profits may be viewed as mischaracterizing the true value of objects, attempting to gain more than the objects are truly worth. Similar patterns of reasoning may explain historical hostilities against middleman minorities, who profit without appearing to add value to their wares (e.g., Sowell 2005). This account may also explain FEB 8, which holds that price-regulation has its intended effects, and directs the economy to desired results. Namely, people may assume that price regulation gives objects their true and fair value.

Some key questions remain about our alternative account for the folk-economic beliefs discussed by B&P. First, we have suggested that FEBs 2 to 4 might stem from an intuitive understanding of group ownership. However, we are uncertain whether this understanding reflects the outputs of a single, domain-specific ownership system, the outputs of communal sharing reasoning (Fiske 1992), or the combined output of two distinct systems, such as ownership and coalitional psychology. Second, although we have suggested that people use many cues to derive a sense of true object value, whether these assessments of value stem from a single domain-specific cognitive system is unclear. It is also unclear whether people are intuitive realists about value, or if they instead merely have difficulty coordinating multiple factors that determine it. Regardless, we do know that judgments of group ownership and object value are already present in young children. As such, the folk-economic beliefs we have discussed could stem from early emerging intuitions, which may conflict with later acquired understandings of economics.

Our claim, though, is not that our alternative accounts are more likely to be right than those offered by B&P. Instead, we only suggest that even if folk-economic beliefs do rest on the operation of domain-specific cognitive systems, much empirical work is needed, and it will be challenging to test empirically which folk-economic beliefs are explained by which systems.

Folk-economics: Inherited biases or misapplication of everyday experience?

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Abstract: Evidence for an EEA-derived domain-specific inference system must point to an active, latent representational structure. Otherwise we need to hypothesize only passive, virtual belief not over-ridden on the basis of the individual's experience. The folk economic beliefs identified by Boyer & Petersen (B&P), being with one exception about macroeconomics, might be virtual beliefs that people extrapolate across the micro–macro scale shift based on their experiences with markets.

The central idea of evolutionary psychology, that the human mind incorporates a range of relatively encapsulated, domain-specific inference systems that emerged in the Pleistocene environment of evolutionary adaptedness (EEA), is not uncontroversial. But I will here treat it as a maintained hypothesis. Doing this does not shift the burden of argument from its proponents where invocation of any *specific* inference system in an explanation of a modern behavioral or cognitive phenomenon is concerned. This is because the relevant alternative is not necessarily active inference by a domain-neutral central system, as in the scheme of Fodor (1983).

Some folk beliefs that are in tension with scientific competitors may not require *any* active inference if they simply extend most people's everyday experience, in ignorance of facts that emerge only at scientifically organized scales of observation. For example, most people who have not read a relevant article or seen a documentary probably believe that orcas are, like most apex meat eaters, general predators. In fact, each orca population specializes in a culturally specific type of prey. The folk belief is in this instance the product of a "lazy" or passive inference that requires exposure to science, or, much more rarely, special observational experience, to be over-ridden. No one would hypothesize that evolution selected a special inference system about orcas that is responsible for "folk-orca beliefs."

Most of the folk-economic beliefs (FEBs) on which Boyer & Petersen (B&P) focus lie in domains that are scientifically addressed by macroeconomists. The one clear exception, falling under the purview of microeconomics, is FEB7 ("Labor is the source of value"). This is also the sole FEB among those B&P identify that was once endorsed by leading economists (Adam Smith, Ricardo, Marx). The modern alternative view, that value is determined by the vector of upward-sloping marginal supply and downward-sloping marginal demand, came to be fully understood (including recognition that it does *not* require a psychological principle of diminishing marginal utility) only over several decades of technical work (Mandler 1999). All of us who have taught introductory microeconomics know by experience that the marginalist theory of economic value is not something that even motivated, intelligent, relatively numerate people with experience in anonymous markets understand easily. Other beliefs that B&P seem to associate with folk microeconomics – understanding, for example, that having three pizzerias in the neighborhood will lead to better and cheaper pizzas than having one pizzeria in the neighborhood – are broadly accurate, unlike the beliefs that constitute folk-macroeconomics.

Might it be that, instead of adverting to hypothesized intuitions inherited from the EEA, folk-macroeconomics simply results from people lacking the perspective that would be necessary for accurately scaling up their own direct experiences of economic transactions, all of which are confined to the micro scale? For example, if people model countries, in their economic aspect, as analogous to businesses, then it may be a natural transfer of the principle that a sustainable business's revenues must exceed its costs that generates the folk-belief that a sustainable country's returns on exports should exceed its payments for imports, and that a negative trade balance should predict some sort of eventual crisis akin to bankruptcy. Similarly, the view that immigrants are an economic burden might transfer the everyday business

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principle that a company puts itself at risk if it carries an inefficient wage bill. That is, immigrants might be viewed as naturally analogous to employees. Furthermore, people might model the national labor market as analogous to the local ones in which they themselves participate. To the individual applicant for a specific job, the supply of opportunities *is* effectively finite, and the presence in the pool of a qualified immigrant really *does* reduce the native applicant's own chance.

B&P themselves appeal to inaccurate scaling up at several points in their account of folk economics. For example, they point out that people generally don't consider the general equilibrium effects of policies that try to regulate prices, including wages and rents. B&P argue that these scaling-up failures are consequences of missing elements in representational templates brought into the modern world from the EEA. It is unclear why we need to hypothesize such a template to account for the data. Do people not generally base their beliefs about large-scale social phenomena on direct, small-scale personal experiences from which they can extrapolate? Put another way, need we appeal to ancestral experience in the EEA if most people's experience in their *current* environments supports their folk economics just as well?

Most beliefs maintained by most people are arguably "virtual." That is, behavior conforms to them, and their role as "stand-by" regulators of action can be confirmed by causing people to explicitly produce them in response to directed probes (Pettit 2001). The inherited inference systems of evolutionary psychology are novel constructs, it seems, to the extent that they are *active* latent structures that can be detected even in the absence of such explicit probes. It is not obvious that B&P have demonstrated evidence for such active latent structures with respect to the folk-macroeconomic beliefs that they identify. Their answer to this criticism might advert to a general principle according to which most people *never* think about social relations without using EEA-based inference systems. But in that case, their hypothesis could be summarized simply as: The general natural social inference system knows nothing of large markets. Might this help explain why the few people who do – scientifically – understand such markets are such successful rent-seekers, and recently so widely resented?

Zero-sum thinking and economic policy

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Abstract: A main tenet of folk economics is the assumption that the world is zero-sum. Many implications stem from this assumption. These include: beliefs regarding taxation; beliefs regarding economic regulation; beliefs regarding inequality; and the core of Marxist economics. Zero-sum folk economic thinking is short-term and deals with distribution; standard economic thinking deals with the size of the pie and is longer-term.

Boyer & Petersen (B&P) list eight folk-economic beliefs (FEBs). The first (FEB 1) is "International trade is zero-sum, has negative effects." I agree with this analysis. FEB 2, "Immigrants 'steal' jobs," is also directly associated with zero-sum thinking. However, there are numerous additional FEBs (not considered in the target article) that stem from the zero-sum assumption. These include: beliefs regarding taxation; beliefs regarding certain forms of economic regulation (in addition to B&P's FEB 8, "Price-regulation has the desired effects"); beliefs regarding inequality; and the core of Marxist economics. Zero-sum folk economic thinking tends to be short-term and deals with distribution of the pie; standard economic thinking deals with the size of the pie and is longer term. (This comment is based on Rubin 2002; 2003; 2014).

Using B&P's notation, I list 4 more FEBs:

FEB 9: The best way to measure a tax system is in terms of its "fairness."
FEB 10: Labor market regulations, such as minimum wages, have no impact on levels of employment.
FEB 11: A society can reduce or eliminate inequality with no adverse impacts.
FEB 12: A desirable economic policy can be based on "From each according to his ability, to each according to his needs."

Each of these implications may be derived from zero-sum thinking. I show why they are incorrect, and why they can lead to incorrect policy implications.

FEB 9: The best way to measure a tax system is in terms of its "fairness." As I write this, the U.S. Congress has just passed a massive tax bill. In the media, most of the discussion of the bill has been in terms of "winners and losers," and whether too much of the bill goes to the rich. This is zero-sum analysis. The relevant economic issue is the long-term effect of the bill – will it lead to more investment and to more growth of the economy, which will also benefit lower-income citizens? While economists have addressed this issue, most of the debate has ignored it or treated it as secondary. If we are to have a large and efficient economy, long-term effects must be considered, but zero-sum thinking tends to ignore these effects and assume that the immediate effects are the total effects. ***FEB 10: Labor market regulations, such as minimum wages, have no impact on levels of employment.*** The zero-sum thinking behind this assumption is immediately obvious. In a zero-sum world, the number of jobs is fixed, and an increase in the minimum wage has the immediate effect of increasing the incomes of low-wage workers. In reality, a firm may respond in several ways to an increase in the minimum wage. For some examples: The firm can substitute capital for labor (electronic kiosks and burger machines at fast food outlets); reduce worker training and other aspects of job quality; and increase prices of products, which will lead to reduced sales and so reduced employment. Since many products produced by minimum-wage workers are purchased by lower-income consumers, this increase in prices will harm the intended beneficiary of the increase, in addition to the loss of jobs.

FEB 11: A society can reduce or eliminate inequality in the income distribution with no adverse impacts. Dislike of inequality in income distribution is ultimately based on zero-sum thinking. There is an assumption that the total income of society is fixed, and if some get more, then others get less. But incomes are not "distributed"; they are earned. Inequality is caused by differential productivity of workers and ownership of capital. Low-productivity workers earn lower incomes, and more-productive workers, or those who own capital, earn higher incomes. The best way to reduce long-term inequality is to increase productivity, for instance, by increasing and improving education. Any effort to increase short-term equality will have unfortunate incentive effects. A society may still decide to reduce inequality (e.g., by having a social safety net), but we must be clear that there are trade-offs, and increasing equality (division of the pie) will have incentive effects (reducing the size of the pie.) For example, higher-income workers may choose to work fewer hours or to retire earlier or take less-productive but more pleasant jobs in response to increased taxation. Capital owners may decide to invest in lower-expected-value but less-risky endeavors in response to capital taxation.

FEB 12: A desirable economic policy can be based on "From each according to his ability, to each according to his needs." This slogan was used by Karl Marx in Critique of the Gotha Program (Marx 1875–1970), but it had been used by Communists and Socialists since about 1755. Both halves of the proposition are clearly based on zero-sum thinking. The amount that

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someone produces is based not only on his ability, but also on incentives. Indeed, ability itself is based on incentives for creation of human capital. Similarly, needs are not well defined, and they are subject to the law of demand. For example, we commonly err in calculating costs of medical programs by ignoring the elasticity of demand for medical care as prices change.. Other aspects of Marxism are also based on erroneous folk-economic beliefs. These include the labor theory of value, which applied to our nomadic ancestors but is no longer valid; the theory that a complex economy needs central direction to work well; and the notion of conflict between labor and capital (or between race, class, and gender) when in fact factors work cooperatively together to produce output. It is ironic but also tragic that Marx called his theory "scientific socialism" when in fact it is based on primitive folk-economic beliefs. The deep nature of these beliefs may explain the popularity of Marxist or strong socialist beliefs even though Communism has failed whenever it has been tried, with the best current example being Venezuela.

The challenge of accounting for individual differences in folk-economic beliefs

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Abstract: We argue that existing data on folk-economic beliefs (FEBs) present challenges to Boyer & Petersen's model. Specifically, the widespread individual variation in endorsement of FEBs casts doubt on the claim that humans are evolutionarily predisposed towards particular economic beliefs. Additionally, the authors' model cannot account for the systematic covariance between certain FEBs, such as those observed in distinct political ideologies.

We believe that Boyer & Petersen's (B&P's) model may hold promise for parsimoniously explaining large-scale lay beliefs about the global economy (what they call folk-economic beliefs [FEBs]) by appealing to more basic cognitive mechanisms tuned to specific evolutionary challenges. However, we argue that the model B&P have proposed fails to adequately explain at least two major findings regarding FEBs that have been reliably demonstrated in the literature. The first is the observation of widespread individual differences in the degree to which various FEBs are endorsed across the population. The second is the observation that FEBs tend to cohere into distinct ideologies in largely predictable ways.

We turn first to the issue of individual differences. B&P argue that our evolutionary history has made certain economic beliefs "easier to acquire" (sect. 3.4, para. 2), predisposing humans towards adopting these economic beliefs over others. If this is true, these beliefs should be disproportionately represented in the population, with high levels of endorsement across individuals and cultures. Yet the existing data suggest that this is not the case. For many of the proposed FEBs, there is a great deal of variation in endorsement both within and across cultures. While some amount of variation is to be expected for even the most adaptive of cognitive mechanisms (as has been shown, e.g., for preferential attention to threat; Bar-Haim et al. 2007), the observed variability in the proposed FEBs is far more than the modest individual differences that would be expected from the strong evolutionary account B&P offer; in many cases, a large proportion of people actually hold beliefs that are the polar opposite of the FEBs proposed by B&P. For example, the Pew Research Center (2014) recently surveyed nationally representative samples from 44 countries to examine attitudes towards international trade. Although they found that a substantial portion of the population (14%) endorsed the view that international trade is generally bad for their nation [FEB 1], far more (80%) expressed the belief that international trade is generally good. A similar level of disagreement can be seen in the data regarding attitudes towards the free market: The same international Pew survey found that 64% of respondents endorsed the view that the free market is generally good – the opposite of the negative views predicted by B&P [FEB 5], which were expressed by only 28% of respondents.

Attitudes towards immigration also seem inconsistent with the B&P account. Recent data from a Gallup World Poll conducted across 142 countries showed that while 29% of individuals believe that immigrants take desired jobs from citizens (FEB 2: Immigrants "steal jobs"), nearly the same amount (27%) believe the opposite – that immigrants take low-paying jobs that citizens don't want (Esipova et al. 2015). These data, demonstrating a lack of widespread endorsement of these three FEBs, pose a problem for the claim that these FEBs are particularly easy to acquire, as is suggested by B&P. (Most of the other FEBs the authors propose have received less attention in research and polling, and the extent to which they are endorsed is therefore unclear.) At the very least, their model would have to offer a potential mechanism for why, when, and how these (ostensibly) evolutionarily privileged beliefs are so easily displaced.

The authors do address the existence of individual variation in one domain – ideological differences in support for welfare programs. They attempt to account for this variation as the product of ideological differences in other, upstream beliefs about the "deservingness" of welfare recipients. While it is possible that there are analogous upstream ideological beliefs that give rise to the observed variation in the other FEBs discussed above, the burden would be on B&P to provide this evidence, and to convincingly demonstrate that their proposed FEBs are indeed evolutionarily privileged, despite being so easily overridden across so many domains by other ideological beliefs.

Data on variation in FEBs also reveal a second issue that deserves mention: These beliefs do not vary randomly from one individual to the next. Rather, they tend to cohere into distinct networks, forming the reliable constellations of beliefs that are often referred to as political ideologies. Although some of the content of these ideologies is, of course, particular to the unique history and culture of a given nation, multiple distinct ideologies show considerable consistency across nations and eras (Bobbio 1996; Jost et al. 2003; Muller 2001). Any explanation of how and why FEBs vary across individuals must also account for the observation that they tend to vary in largely predictable ways – a fact that at present seems to find no explanation in B&P's model.

In sum, B&P have proposed an intriguing and novel theory that may hold promise of providing an ultimate explanation for lay economic beliefs, but if their model is to be successful, it must be able to account for the data demonstrating that people's economic beliefs vary in substantial and predictable ways.

A theory of how evolved psychology underpins attitudes towards societal economics must go beyond exchanges and averages

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Abstract: We applaud Boyer & Petersen for the advancement of an ultimate explanation of the dynamics of folk-economic beliefs and the political actions linked to them. To our mind, however, key inference systems regulating societal interaction and resource distribution evolved for more core relations than those of proportionate exchange, and situational factors are not the only constraints on how such systems produce economic beliefs

The target article by Boyer & Petersen (B&P) marks the maturing of a subfield applying evolutionary psychology principles to the study of economic and political behavior and attitudes, focusing on how they are underpinned by evolved, core concepts and motives for social relations (see also Sheehy-Skeffington 2016; Sidanius & Kurzban 2013; Sidanius & Pratto 1999; Thomsen & Carey 2013). Identifying the basic vocabulary or evolved set of relational primitives that govern intuitions about resource distribution is crucial for any such mature theory of folk economics.

Problems arising from opportunities for social exchange – where something is given in proportionate exchange for something received (cf. Fiske 1992) – are central drivers of the evolution of inference systems for social relations. Even infants perform basic proportionate utility calculations, understanding that the value of a material or social resource reflects the effort spent to acquire it (Liu et al. 2017), and both young Western and Turkana children take merit into account when sharing resources (for review, see Blake et al. 2014). This supports B&P's proposal that evolved intuitions regarding proportionate exchange also underpin folk-economic beliefs. However, in several cases proportionate exchange likely does not exclusively or primarily drive intuitions about resource distributions.

Acknowledging this, the authors discuss Fiske's (1992) notion of *communal sharing* (sects. 4.1, 4.4), arguing that communal attitudes towards welfare include more exchange-relevant considerations of deservingness than assumed by those who claim that unconditional altruism operates at the group level. However, non-exchange-related representations influence folk-economic beliefs, and not only through their impact on mechanisms evolved to coordinate social exchange. The core of communal sharing, as prototypically implemented among close kin, also involves expectations of altruistic sharing according to need and contributions according to ability, along with perceptions of being *one and the same,* so that common resources are precisely represented as belonging to everybody in the communal unit. Such core communal representations may drive economic beliefs directly in their own right, for instance concerning inheritance tax, where contradictory folk-economic attitudes might reflect tensions between perceiving the nuclear family as a communal unit (in which the wealth of parents legitimately belongs to their children), and exchange-related expectations that each citizen work for his or her own wealth.

Representations and motives for social dominance – a cross-cultural universal that guides behaviour across species, including our nearest primate ancestors (e.g. Brown 1991; Cummins 2005; Sapolsky 2004; 2017) – form another, evolved system that fundamentally regulates the distribution of scarce resources in zero-sum conflicts according to dove–hawk dynamics of relative formidability. Of course, the idea that dynamics of dominance and counter-dominance relate to economics is hardly new (cf. Marx & Engels 1867/1990). However, we now know that even preverbal infants use cues of formidability – body size (Thomsen et al. 2011), coalition size (Pun et al. 2016), and previous win–lose history (Mascaro & Csibra 2012; 2014) to predict who will dominate in conflict, and that they represent dominance hierarchies as transitive (Gazes et al. 2017). Indeed, whereas infants generally expect equal resource distributions between third-parties (cf. Blake et al. 2014), they expect dominant and subordinate agents to receive unequal resources reflecting their rank (Enright et al. 2017). Inferences of formidability-based dominance also drive attitudes towards societal income redistribution among adults (Petersen et al. 2013).

Aside from limiting their account of folk-economic beliefs to a subset of the social relations that regulate resources, B&P focus on articulating the way everyone's attitudes (e.g., concerning welfare support) are affected, on average, by situational changes in evolutionarily relevant information (e.g., potential free-riding). Enduring ideological preferences, which might shape how any one individual responds to a situational cue differently to how another would, are treated as the product of cultural factors, which provide a background "noise" through which the workings of evolutionary dynamics can nevertheless be discerned (sect. 5.3). Yet stable individual differences, in notions of how people should relate to each other and who should get what, are critical to understanding the interaction between evolved cognition, macro-structural economical context, and economic and political beliefs.

The sociopolitical construct of egalitarianism provides a case in point. B&P argue that "although the notion that people generally prefer equal to unequal distributions of resources (…) has been popular, recent research suggests people are much more concerned with a fair distribution" (sect. 5.3, para. 6), in which proportionate contribution and effort matter. But in fact individuals vary systematically in whether resource inequality is seen as fair or unfair (Jost et al. 2009; Kandler et al. 2012; Pratto et al. 1994; Ho et al. 2012; 2015; Sidanius & Pratto 1999). This, in turn, has pervasive consequences for the kinds of actions and policies people support and engage in order to bring about a societal distribution of resources that matches their relational preferences, including social welfare, taxation, affirmative action, discrimination, criminal justice, and immigration (Green et al. 2009; Ho et al. 2012; 2015; Kteily et al. 2014; 2017; Sidanius et al. 2016; Thomsen et al. 2008; 2010). Intriguingly, individual differences linking whether people will personally share resources with others and their attention to unequal resource distributions among third parties manifest together already in infancy (Ziv & Sommerville 2016), supporting our proposal of an evolved, motivational system for equality.

Seen through an evolutionary psychology lens, individual traits such as egalitarianism are likely facultative adaptations (see Tooby & Cosmides 1990), the product of the interaction between considerations of genetics and embodied capital (e.g., physical strength), current social standing (personal or group), and exchange- and dominance-related structural dynamics (e.g., economic inequality) (see Sidanius & Pratto 1999). For example, individual dominance motives mediate the effect of macro-structural economic inequality (i.e., the Gini coefficient) on individual support for phenomena such as social welfare, racism, and the persecution of outgroups (Kunst et al. 2017); and individual dominance motives further moderate the coalitional aggression provoked by perceptions that immigrants take our resources (Thomsen et al. 2008). An ambitious framework that (1) considers a full set of evolved, early-developing relational primitives regulating the distribution of resources, and (2) theoretically embraces systematic variation across both individuals and context, can reveal how evolutionary dynamics play out in economics and politics, across societies and over time.

Evolutionary model of folk economics: That which is seen, and that which is not seen?

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Abstract: Although Boyer & Petersen (B&P) make the case for evolutionary roots of folk economics stronger, their evolutionary model

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ultimately does not deliver folk-economic explanations that are both novel and correct. We argue that (a) most current explanations are evolutionary already; (b) B&P's model is as ad hoc as other theories, and proves too much; and (c) it overrates evolution at the cost of discounting other crucial factors.

We applaud Boyer & Petersen (B&P) on the choice of an immensely important and under-researched topic, and consider their article an important contribution to our understanding of the ways in which evolution might be affecting people's attitudes in the realm of economic issues (although arguments over the precise effects of evolution on the human mind are notoriously hard to settle). We are afraid, however, that their model, despite its overall ingenuity, eventually falls short of providing a novel (more "ultimate") *and* correct explanation of folk-economic beliefs (FEBs), contra B&P's claim. We see three arguments in favor of such a skeptical verdict.

Not too novel. While the evolution-based narrative supporting the FEB's existence may or may not be true (more on that below), it would not be hard to attach a similar or even identical tale to, for example, Caplan's four biases (Caplan 2007). Had Caplan been more specific in discussing the evolutionary roots of folk economics instead of merely asserting it (p. 178), it would be hard to tell his account apart from B&P's. He did not do so, which is why B&P deserve credit, but for going deeper or being complementary rather than going further. This applies to even simpler FEBs' explanations which B&P do not refer to. For example, all of the folk-economic beliefs that B&P discuss (including their lack of influence on individual-level decision-making) can also be explained by people's tendency to consider the more immediate and salient features of a phenomenon and ignore the ones that are more distant and subtle (Arkes 1991; Houdek 2016; Pennycook & Rand 2017). This is the long-established "seen versus unseen" in economics (Bastiat 1850/1995) or more recent WYSIATI (what-you-see-is-all-there-is) in psychology (Kahneman 2011). This tendency may have its evolutionary origins as indeed both Bastiat (1850/1995, para. 1.5) and Kahneman (2011, p. 90) explicitly suggest, but their failure to be as elaborate as B&P in this regard does not render B&P's account more "ultimate."

Proving too much. Although bias-oriented explanations are admittedly ad hoc, as B&P implicitly hint at in section 2.5, their own model is in the end equally malleable to ad hockery. At first, it appears impressive to see any of the FEBs explained away by a meticulously blended cocktail of intuitions (products of inference systems). But on second thought, these ingredients are so powerful in their combination and so flexible in their interpretation that mixing them in a particular way can explain much more than that, including FEBs that are antithetical to the ones actually held by people, or indeed ones that do not exist. For example, by taking the free-rider detection topped up with the ownership intuition while keeping the coalitional psychology sidelined, one could beautifully prove why laypeople (unlike economists) fanatically oppose trade protectionism or the welfare state (which they of course do not).

Incomplete. B&P portray the whole of folk-economics as ultimately an outcome of evolutionarily determined cognitive processes (they do allow for some cultural input to explain subtle variations between different societies). Although the idea that evolution matters (or, at least, may matter) seems absolutely undisputed, we find B&P's account over-rates the role of evolution at the cost of discounting cultural aspects such as education, values (Caplan 2002; Edwards 2006, Houdek et al. 2016), or media (Ribstein 2012). In reality, non-evolutionary factors may mitigate all of the evolutionary influences so eloquently described by B&P, but they may be deliberately produced by particular interest groups within society. If evolution were all there is, it would be hard to square with observed FEBs incidence that varies with:

1. *Time*: Some FEBs are more widely believed now than they used to be. For example, what McCloskey calls "bourgeois era" was marked by a recession of the many anti-market biases (or by even positive endorsement of alertness to business opportunity, entrepreneurship, and "innovationism"), to which McCloskey attributes the triggering of industrial revolution and the great enrichment (McCloskey 2006; 2010).

2. *Geographic space*: Populations in different countries succumb to different FEBs to different degrees (see, e.g., O'Rourke et al. 2001; Neher 2011; Davidov et al. 2008, also see opinion surveys such as International Social Survey Programme [ISSP] 2006 or World Values Survey [WVS] 2014). In fact, this is true about opinions of economists as well, which vary in important ways across countries (for an overview, see Stastny 2010, pp. 6–23);

3. *Socioeconomic space*: People of different education levels show different degrees of susceptibility to FEBs (e.g., Caplan & Miller 2010).

Insights of many sciences – not only economics – might run against some evolutionary intuitions, but in economics they seem to survive and stick around much more. For example, over the course of evolution, people's folk-physics minds have had every reason to think the Earth was flat, or their folk-biology minds have had every reason to think the world (including humans) was created by divine design (see, e.g., Evans 2001). Yet, natural scientists were able to convince (almost) all of mankind that the Earth is round and was not created within 6 days. However, it may well be that people do find international trade objectionable for evolutionary reasons – but how is it that this is still a predominant belief despite some 250-plus years of economists' trying to enlighten populations in that regard? We are afraid that B&P's model is of limited assistance here, and is actually outperformed by long-existing models that include cultural factors as interacting with cognitive biases without necessarily worrying much about their precise roots (evolutionary or not).

Why do people think that others should earn this or that?

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Abstract: Some questions, such as when a statistical distribution of incomes becomes too unequal, seem highly attention-grabbing, inferentially productive, and morally vexing. Yet many other questions that are crucial to the functioning of a modern economy seem uninteresting non-issues. An evolutionary–psychological framework to study folk-economic beliefs has the potential to illuminate this puzzle.

We commend Boyer & Petersen (B&P) for outlining an evolutionarily and cognitively informed program for studying folk-economic beliefs. Here we consider recent work documenting the folk-economic belief that the current level of economic inequality is too high. This work suggests that people underestimate the actual degree of wealth inequality, prefer less wealth inequality (Arsenio & Willems 2017; Norton & Ariely 2011; Norton et al. 2014), underestimate the actual income gap between CEOs and unskilled workers, and think this gap should be smaller (Kiatpongsan & Norton 2014; see also Davidai & Gilovich 2015; Kraus & Tan 2015). We offer some reflections on the last of these

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claims – that people desire a smaller income gap (Kiatpongsan & Norton 2014; henceforth KN) – although similar arguments apply to the rest of this burgeoning literature.

KN's conclusions are based on their analyses of the Social Inequality IV Questionnaire of the International Social Survey Programme (ISSP, 2009). This is a data-set with survey data from 40 countries which includes participants' open-ended responses to, among others, the questions: "How much do you think *X* earns?" (*estimate* question) and "How much do you think *X* should earn?" (*ideal* question), where *X* is "a chairman of a large national corporation" (*CEO*) or "an unskilled worker in a factory" (*worker*). KN found that in all 40 countries the ratio of *ideal* CEO:worker earnings is significantly lower than the ratio of *estimated* CEO:worker earnings.

To see the significance of this finding, consider how an evolved human mind untrained in economics might estimate the salary of a CEO or indicate the ideal salary for a worker. Over human evolutionary history, our ancestors engaged in many cooperative enterprises (e.g., cooperative hunting) that produced surpluses that were then allocated. From an evolutionary perspective, it seems inevitable that we evolved powerful sentiments about how allocations should be made. It seems plausible that the questions in the ISSP questionnaire activate, to some degree, these evolved systems. There is now a large literature on cooperative game behavior, emotions, and their evolutionary logic (e.g., Frank 1988; Hammerstein 2003; Tooby et al. 2008). One plausible evolved system is a set of sentiments that mobilize compassion for the needy (Goetz 2010; Sznycer et al. 2017), and sharing directed at those who have tried to be productive but have suffered bad luck (Kaplan & Hill 1985a; Petersen et al. 2012). In systems of joint production, this compassion is paired with punitive sentiments toward those who free-ride (Delton et al. 2012; Fehr & Gächter 2000). Ancestrally, these games took place among small groups of people, and although there was a range of highly productive people, it is extremely unlikely that anyone was able to be hundreds of times more productive than the average worker, as some can today.

To judge whether an allocation is fair or ideal or objectionable, it seems likely that the human mind evolved to take as input a number of variables (e.g., the need of the least productive, the amount of group benefit contributed by the highly productive). However, in the ISSP data analyzed by KN, workers and CEOs are presented in decontextualized form, so that all of those parameters are unspecified and must be filled in by the subjects. Since we don't know how subjects filled in these parameters, we don't know how to generalize from these results to an enduring construct of people's actual preferences about the real world.

Do people weight relevant information when judging what an ideal earning should be? To find out, we asked people questions about four types of earnings: CEO estimate and ideal, and unskilled worker estimate and ideal. We created two between-subjects conditions. In one condition, the CEO was described as causing a company to increase its yearly profits by $12,000,000. In the other, the CEO caused an increase in profits of $500,000. The worker questions were the same in both conditions, and the same as in (a) the ISSP (2009) dataset and (b) the KN (Kiatpongsan & Norton 2014) report based on the ISSP (2009) data. There were 99 participants per condition, recruited with Amazon Mechanical Turk. As predicted, and unsurprisingly, subjects thought the CEO earned and should earn more in the $12,000,000 condition (medians: estimate: $1,000,000; ideal: $500,000) than in the $500,000 condition (medians: estimate: $300,000; ideal: $200,000). Also the ideal CEO:worker earnings ratio was higher in the $12,000,000 condition (median: 14:1) than in the $500,000 condition (median: 6:1; Mann-Whitney's $Us > 3{,}082$, $ps \leq .019$).

So, yes: Information about productivity calibrates people's judgments of ideal earnings, as would be expected in an ancestral world in which one would have to incentivize the participation of the productive. That estimated and ideal earnings scale with productivity shows that any specific expressed political preference is not fixed, but a function of input parameters. That estimated and ideal earnings don't scale linearly is interesting, where, ancestrally, much higher productivity than normal would have involved not only greater skill but also unreliable luck.

If perceptions of how much others should earn are shaped by these and other relevant factors, then responses about statistical aggregates stripped of specificity (e.g., "a chairman of a large national corporation") may not translate into stable preferences in specific cases in the real world.

The fact that the ISSP survey asks people how much an unskilled worker and a CEO should earn, and that KN found the responses illuminating, raises the question of just what economic questions are interesting to an evolved human mind. Some questions, like how much others earn or should earn, seem highly attention-grabbing, engaging, inferentially productive, and morally vexing. Others, like how a company should handle its accounting or manage its distribution channels, seem uninteresting non-issues, even though in a modern economy they are every bit as critical as CEO or worker compensation. We believe KN's findings are an important if indirect demonstration of how consistent and compelling folk-economic beliefs can be.

We think the framework sketched by B&P can be productively applied to understanding the epidemiology of this folk-economic belief, and of popular discourse on economics in general.

Do the folk actually hold folk-economic beliefs?

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Abstract: Boyer & Petersen (B&P) argue that folk-economic beliefs are widespread – shaped by evolved cognitive systems – and they offer exemplar beliefs to illustrate their thesis. In this commentary, we highlight evidence of substantial variation in one of these exemplars: beliefs about immigration. Contra claims by B&P, we argue that the balance of this evidence suggests the "folk" may actually hold *positive* beliefs about the economic impact of immigration.

A core feature of folk-economic beliefs (FEBs) according to Boyer & Petersen (B&P) is that they are widespread. There is evidence, however, of substantial variation in several of the exemplar FEBs that they draw upon to illustrate their thesis. For instance, beliefs about the economic impact of immigration vary – sometimes dramatically – as a function of educational attainment and political preference in the United States, Europe, and elsewhere. Furthermore, this evidence suggests that *positive* beliefs about the economic impact of immigration may actually be more prevalent than their negative counterparts, contrary to the exemplar beliefs B&P cite (sect. 2.1) as evidence for their thesis: that immigrants "steal jobs" (FEB 2) and abuse the welfare system (FEB 3).

Figure 1 displays the results of a recent representative survey of the attitudes of British adults (British Social Attitudes; BSA 33, NatCen Social Research 2015). The data reveal substantial variation; the proportion of Britons who believe immigration is "bad" or "very bad" for the economy is almost equal to those who believe that it is "good" or "very good." Similarly, the results of the 2014 European Social Survey reports that 40% of Britons believe immigration is good for the economy, whereas 36% believe it is bad (Ford & Lymperopoulou 2017). Inferential

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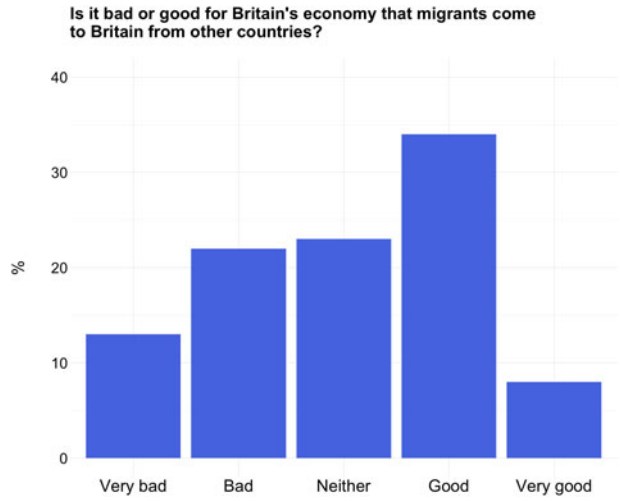


Figure 1 (Tappin et al). Distribution of reported beliefs about whether immigration is bad or good for the British economy. Data are from the 2015 British Social Attitudes Survey. In the survey, responses were provided on a 0–10 scale (0 = extremely bad; 10 = extremely good). The categories displayed on the *x*-axis are collapsed across values: 0–1 (very bad), 2–4 (bad), 5 (neither), 6–8 (good), and 9–10 (very good). N = 2,167, representative sample of British adults. Source: BSA 33, NatCen Social Research (2015).

analyses indicate that educational attainment is a reliable predictor of such variation; more positive beliefs about the economic impact of immigration are consistently observed among individuals with greater education (Hainmueller & Hiscox 2007; Héricourt & Spielvogel 2014; Ueffing et al. 2015).

Survey data from the United States reveals comparable variation in beliefs. According to a 2017 Pew survey, for example, 65% of North American adults believe that immigrants "strengthen the U.S. with their hard work and talents," while 26% believe the opposite – that immigrants are a "burden." This variation is strongly predicted by political identity; 84% of individuals who identify with the Democratic Party report the former belief, compared to only 42% of those who identify with the Republican Party (Pew Research Center 2017).

B&P do not specify how widespread an economic belief must be to be considered a *folk*-economic belief. Must the belief be universal, or merely held by a majority? The preceding evidence indicates that, at least in the context of immigration, the content of such beliefs is strongly variable, and, more notably, the average person (i.e., the "folk") is perhaps more inclined to hold a *positive* belief about the economic impact of immigration. This stands in contrast to the exemplar (negative) FEBs about immigration proffered by B&P, which is significant because the inference mechanisms B&P propose to account for negative content – coalitional affiliation and cheater detection – seem less well-equipped to explain positive content. One could argue that more educated and more liberal individuals simply possess more *accurate* beliefs about the (positive) economic impact of immigration, leaving only the negative beliefs to be explained. But according to B&P's own view (sect. 1.4, para 5), accurate FEBs are unlikely to be due solely (if at all) to superior economic training, and, therefore, still require explanation.

Below, we briefly discuss recent work that offers one explanation for the cited variation in beliefs, and is able to account for both positive and negative content. Broadly speaking, this work suggests variation in beliefs on certain political issues is driven by intergroup processes. Because B&P specify a role for "coalitional" (intergroup) psychology within their model, this work might be integrated with their thesis to account for the variation discussed above.

A prominent line of work suggests that belief formation is affected by cultural conflict, such that, on particularly contested issues, individuals are motivated to form beliefs that signal whose "side" they are on (for a review, see Kahan 2016; for a critique, see van der Linden 2016). In other words, intergroup conflict induces an information-processing bias that drives systematic variation in beliefs: in this case, guiding individuals' beliefs about the economic impact of immigration further towards the belief (positive or negative) that typifies their group identity. B&P allude to such a process in the context of government control over the economy (sect. 6.2, para 4); here we explicitly note this mechanism as one explanation for the variation in beliefs about the economic impact of immigration.

Another possibility is that the variation is somewhat illusory – a product of "expressive responding" (Bullock et al. 2015; Prior et al. 2015; for a critique, Berinsky 2018). That is, individuals are prone to *express* group loyalties, but they harbor a more consonant representation of reality in private. Financially incentivizing accurate responses, as a case in point, diminishes disagreement between individuals of opposing political parties (Bullock et al. 2015). Additional evidence for this proposition is observed in "list experiments," where beliefs are elicited under a thicker cloak of anonymity than classic self-report methods afford. The results of several such experiments indicate that more-educated individuals report views about immigration closer to those of their lesser-educated counterparts when afforded this extra anonymity (e.g., An 2015; Janus 2010). One interpretation of these results is that more-educated individuals possess greater motivation to signal they are tolerant people. Interestingly, whether the cited variation in beliefs reflects expressive responding or sincere difference matters little for the role of intergroup psychology considered here. Variation in beliefs about immigration among the political left and right, and among the more- and less-educated, may indeed be more illusory than real; as suggested by the preceding evidence, however, such an illusion may itself be the product of intergroup processes.

B&P suggest that *negative* beliefs about the economic impact of immigration are *folk* beliefs, shaped by a combination of evolved cognitive systems. We have highlighted evidence of substantial variation in beliefs in this domain and evidence that the "folk" may be more inclined to hold *positive* beliefs about the economic impact of immigration. Consequently, we invite B&P to (i) more clearly specify how widespread an economic belief must be to be considered a *folk*-economic belief (and thus fall within the purview of their model), and (ii) consider how their model might account for widespread *positive* beliefs about the economic impact of immigration.

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Authors' Response

What is seen and what is not seen in the economy: An effect of our evolved psychology

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Abstract: Specific features of our evolved cognitive architecture explain why some aspects of the economy are "seen" and others are "not seen." Drawing from the commentaries of economists, psychologists, and other social scientists on our original proposal, we propose a more precise model of the acquisition and spread of folk-beliefs about the economy. In particular, we try to provide a clearer delimitation of the field of folk-economic beliefs (sect. R2) and to dispel possible misunderstandings of the role of variation in evolutionary psychology (sect. R3). We also comment on the difficulty of explaining folk-economic beliefs in terms of domain-general processes or biases (sect. R4), as developmental studies show how encounters with specific environments calibrate domain-specific systems (sect. R5). We offer a more detailed description of the connections between economic beliefs and political psychology (sect. R6) and of the probable causes of individual variation in that domain (sect. R7). Taken together, these arguments point to a better integration or consilience between economics and human evolution (sect. R8).

R1. Introduction

The classical liberal economist Frédéric Bastiat famously argued that we often misunderstand economic processes because we fail to consider both their "seen" and "unseen" aspects (Bastiat 1850/2007, pp. 1–48). Debates about policy rarely if ever consider the unseen – that much is well-known. But we should go further and explain why some economic facts or processes are more likely than others to be "seen," and to be seen from a particular angle. In vision, what is seen or not seen depends, not just on what is around, but also on the way our eyes and brains work. In the domain at hand, it depends on the way our mental systems make us attend to particular aspects of the economy rather than others – that was the gist of our proposal. We are delighted that the question proved of sufficient interest to elicit such a variety of insightful commentaries that can help us reformulate the model and explore new implications.

R2. What is the domain of folk-economic beliefs?

Explaining folk-economic beliefs (FEBs) is a matter of explaining cultural transmission. What makes these beliefs of interest, what explains their importance for understanding political processes in many large-scale societies, is their recurrence, the fact that they are entertained in roughly similar forms by many different minds. For instance, if a large number of people think that auctions are a terrible way to allocate resources, that belief will influence all sorts of policy proposals (Brennan & Jaworski 2015). By contrast, representations with a much smaller spread – for example, the notion that only markets can allocate goods efficiently – are also folk-economic beliefs. But they are of limited interest for a pragmatic reason: because they carry no political influence, unless of course the small number of believers happens to include agents of extraordinary influence.

Perhaps our explanation of this point was not altogether clear in the target article, which would explain why **Buturovic** suspects us of cherry-picking the beliefs we discussed (although she does not offer any examples of beliefs we neglected) and why **Tappin, Ross, & McKay** (**Tappin et al.**) ask whether the beliefs must be universal, or just very common, to count as part of folk-economics. Our answer is: They have to be common enough to be of interest to political psychology. What we choose to count as folk-economics depends on a purely pragmatic delineation of the field.

Naturally, as **Buturovic** argues, it may make sense in some cases to study finer-grained versions of folk-economic representations, for example, to understand views about Mexican immigrants rather than views about immigrants in general. **Rubin** provides several examples of such additional FEBs that can be identified in political discourse (see discussion below, sect. R4.3). As in any other empirical science, models may be optimal, in terms of descriptive and explanatory value, at a particular level of abstraction – one cannot decide in advance. One finds out by measuring the value of models at different levels (McCauley 1996; McCauley & Bechtel 2001).

Contra **Bhattacharjee & Dana,** we also argued that divergence from economic theory is not the sole criterion for inclusion in the domain of important folk-economic beliefs**.** If a community of people convince each other of a version of price-theory that happens to match current academic wisdom, and if that new idea has some political clout, we should study the cognitive processes that explain the acquisition and spread of that belief. It would be bizarre to limit ourselves to beliefs that violate (current) economic theory, especially given that people had beliefs about the economy long before there was any economy theory.

Another misunderstanding may also stem from our usage of the term "folk" in "folk-economic beliefs," as noted by **Tappin et al.** As we argued, psychologists and philosophers have created much confusion by talking about "folk-psychology" or "folk-biology" to denote two very different kinds of representations. For example, some of what is described as "folk-psychology" consists of intuitive systems and their output, which, for instance, deliver the intuition that Sally will look for a marble where she believes the marble to be, in classical Sally-Ann tasks (German & Leslie 2000; Onishi & Baillargeon 2005; Perner et al. 1987). That is quite distinct from "folk-psychology" in the sense of an explicit, reflective description of mental states and processes (Lillard 1997; Malle & Knobe 1997). When discussing folk-economics, we use the "folk"-term in the latter sense.

R3. Learning systems and principled variation

The main point of an evolutionary psychology approach is that the mind is composed of distinct systems that address specific recurrent problems encountered in our ancestors' lives. These systems include distinct learning capacities, designed to attend to specific kinds of information in environments (e.g., a system that attends to sounds organized in words, a system that attends to how genealogical relations predict assistance and cooperation, and so on).

A great obstacle to understanding human behavior lies in the old and odd assumption that genes predict uniform traits, so that an evolutionary model could only explain inflexible behaviors. A century of evolutionary biology shows the opposite. For example, even humble organisms such as water fleas reorganize their anatomical development to better respond to the prevalence of predators in their

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environments (Dzialowski et al. 2003). A fortiori, we expect evolved cognitive systems to produce very different representations and motivations, as well as different inferential rules, in different developmental contexts and in different circumstances, the opposite of what **McNamara & Fisher** describe as "assumption of uniformity."

This all too frequent misunderstanding may be a residue of misleading commonsense oppositions (nature/nurture, innate/acquired, biology/culture, etc.) that hampered the study of human behavior for decades, and are obviously very difficult to extirpate. Because humans extract more information from environments than any other organisms do, it may seem that they need fewer prior cognitive structures – but the simplest comparative biology shows the opposite to that naive zero-sum assumption (Sperber 1996; Tooby & Cosmides 1992). Neurocognitive systems are more complex in species that learn more, which allows apes to learn more from their environments than do birds, which learn more than most insects. As **Hirshleifer & Teoh** point out, evolution provides organisms not with inflexible responses, but with reaction norms – that is, principled reactions to environmental information – to which we should add that cognitive systems of course instantiate vastly more complex reaction patterns than standard examples of reaction norms. Having learning systems means that the organisms derive appropriate inferences from information in environments.

As **Lightner & Hagen** remark, what environments provide is not noise but signal. However, that signal is not just out there, waiting to be picked up, so to speak. There is a signal only for organisms equipped with the learning systems designed to pick up specific cues and infer from them (Gallistel & King 2011, pp. 218–41). That is why studies of cognitive development can richly inform our explanations of cultural beliefs, by investigating the encounter between domain-specific expectations and a particular environment.

The cognitive systems we described in our proposal are what **Miton & Sperber** describe as "specialized acquisition devices … used in the course of individual cognitive development to acquire, on the basis of experience and cultural inputs, locally adjusted inferential procedures," which is why it seems unfortunate to us that this description is provided as an alternative to, rather than a more precise re-statement of, our proposal. Perhaps the misunderstanding stems from the fact that, for the sake of brevity, we used a shortened description ("evolved cognitive systems") for what we could more precisely describe as "evolved cognitive systems whose adult forms result from selectively favored information-acquisition strategies having focused on environment-specific relevant invariances."

That is also why we did not suggest that FEBs are "shaped by a combination of evolved cognitive systems," as **Tappin et al.** do, if that means that the operation of such cognitive systems automatically delivers the FEBs in question. Rather, we argued that the operation of specialized cognitive systems explains why, through communication, some representations (that were not generated by those systems) become stabilized in roughly similar forms in many different minds. Simply said, evolved cognitive systems provide the background set of intuitions against which certain explicit beliefs about the economy appear sensible or compelling.

R4. Why domain-general explanations are insufficient

We emphasized the role of distinct, relatively independent cognitive systems (e.g., ownership, coalition-building, fairness-detection, etc.). The systems described in our target article were not stipulated ad hoc, as a way to explain folk-economic beliefs. We included them because there is independent evidence for their existence, as **Liberman & Kinzler** emphasize, a point that may be less obvious to economists than to psychologists, as the latter are used to references to these systems in the empirical literature.

Given that there are such domain-specific systems, it remains to justify the view that they are what makes particular folk-economics salient and compelling. The proposal should be judged against available alternatives, in particular the hypotheses that no complex cognitive system is required, that domain-*general* properties of human cognition are more relevant here, or that broad biases are sufficient to account for folk-economic beliefs.

R4.1. Beliefs grounded in experience

Because cognitive systems work smoothly in the background of our conscious mental life, their operation is in many cases entirely hidden from conscious inspection. This favors the emergence of what could be called "cognition-blindness" or spontaneous realism, the view that there is no need to assume a complex architecture of neurocognitive systems, to figure out what is simply "out there" in our experience. But cognition blindness is of course highly misleading. Even parsing a simple sentence, or seeing a scene in three dimensions, requires a vast amount of computation.

That is why there may be limits to explaining FEBs in terms of direct physical experience, as **Lee & Schwarz** propose. True, many abstract views about the economy have physical counterparts – for example, zero-sum thinking is analogous to balancing weights, or physical labor seems more "real" than intellectual work because it is grounded in proprioception. And abstract thoughts gain salience by being couched in terms of physical metaphors, many of which become conventional metaphors (Lakoff & Johnson 1980). But there are many distinct types of physical experience, and FEBs are associated with only some of them. Seeing the economy as zero-sum does bring up imaginative associations with intuitive physics, but the workings of the economy could also be construed in terms of other forms of experience, for example, hunger or walking or sexual desire. That we see the economy in terms of balancing weights, suggests prior intuitions about exchange that subsequently make the analogy intuitively compelling, more so than other possible metaphors.

R4.2. Domain-general properties of cognition

We emphasized the contribution of domain-specific learning systems in the acquisition of explicit, reflective beliefs. One alternative to our proposal would be that specific FEBs in fact result from domain-general properties of human cognition, as several of our commentators (**Bhattacharjee & Dana, Lee & Schwarz, Leiser & Shemesh,** and **Ross**) argue. In that view, human cognition is characterized by general operating constraints, for example,

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processing capacity and speed, size of working memory, and so forth, and by highly general operating principles, such as association and reinforcement, or high-level processes, such as approximations of Bayesian belief-revision (**McNamara & Fischer**). Naturally, we agree that such properties of human cognition exist and matter. The point of domain-specific models is not to deny the operations of general constraints, but to examine how the constraints differ from domain to domain (Hirschfeld & Gelman 1994a).

For example, one may consider that the complexity of economic processes, what **Leiser & Shemesh** describe as "relational complexity," poses some general challenges to human cognition, and that simplified pictures of processes will be favored in the process of social transmission (**Hirshleifer & Teoh**). As Leiser & Shemesh point out, processes of osmosis or even simple selectionist arguments are difficult to entertain without sustained effort or special training. It is quite clear that (in the absence of systematic training), people seldom if ever think in terms of populations, preferring to think of social matters in terms of typical individuals (Leiser & Shemesh) or of generic agents, which leads to many misunderstandings of social phenomena (Boyer 2018, pp. 222–26). For example, we know that very small differences in the distribution of individual racial preferences in housing can lead to dramatic differences in the resulting pattern of housing segregation (Schelling 1971), but that kind of population thinking is unintuitive and effortful. In the same way, describing policies in terms of how they impact "the employers" versus "the employees" or "the rich" versus "the poor" ignores variance in preferences within these categories, when such variance is crucial to understanding the effects of policies – and is crucial to formal models of political choice (Munger 2015, pp. 58–78). And, as **Jern** argues, other domain-general properties of imagination might influence the content of FEBs, among which is a tendency to construe close and distant reality in a qualitatively different manner (Liberman & Trope 2008).

While agreeing that memory and storage constraints impact the activation of representations and their inferential role, we would also contend that such constraints are insufficient to explain the particular contents of beliefs about the economy. Contrary to what an account in terms of cognitive load or constraints would predict, we do not observe a random set of uninformed or disorganized beliefs about the economy. The beliefs go in specific directions – which is why they are sometimes described as the outcome of specific "biases" (Caplan 2006). In our model, the most relevant biases observed in the transmission of FEBs consist of what **Acerbi & Sacco** describe as "content-based biases," to adopt the terminology of Boyd and Richerson (Boyd & Richerson 1985; Mesoudi 2007). That is, the diffusion of particular mental representations is a function of their content, rather than features like their frequency per se or the prestige of their sources (although such biases might also be relevant).

We agree with **Bhattacharjee & Dana** that some descriptions of such content-biases are very close to our own model. That is, for instance, the case for Caplan's description of an "anti-foreign bias" (Caplan 2008) on the one hand, and what we identified as an effect of coalitional psychology on the other. We prefer the latter explanation, because (a) there is already independent evidence for the workings of a coalitional psychology (Delton & Cimino 2010; Pietraszewski 2016; Pietraszewski et al. 2015; Tooby & Cosmides 2010), and (b) coalitional psychology explains why we would expect an anti-foreign bias, why it would focus on people and firms from other ethnic-national groups rather than other possible social categories. So, it is parsimonious to interpret the anti-foreign trade bias as one among the consequences of an already observed psychological mechanism.

We also doubt that folk-economic beliefs could be adequately explained by a tendency to project personal experience onto macro-social processes, as **Ross** suggests, mostly because of the problem of under-determination described above. Ross is certainly right that some macro-economic beliefs may extend aspects of private domestic economy (e.g., do not spend more than you earn) to a country's balance of trade, an analogy that many economists find deeply misleading. But this scaling up of ordinary experience would not explain other aspects of folk-economics, for example, the well-documented tendency to believe that it is better to export things and get money, rather than export money and get things (see our comments on **Johnson** below), or the idea that it is somehow bad for a country to export services and import manufactured goods (Wood 2002, p. 22). Such beliefs are much more specific than a mere extension of domestic economics would warrant.

In a similar way, it may not be optimal to explain people's views of the economy in terms of a general bias towards anthropomorphism. It is probably the case, as **Forstmann & Burgmer** suggest, that representations of the economy as an agent are activated in the course of reflecting on economic processes. Journalists will, for instance, say that "the economy is recovering from the trauma" (i.e., production is increasing after a recession), or "the markets are still shy" (there are more bears than bulls). But anthropomorphism is a feature of the beliefs we observe; it cannot be by itself an explanation for the recurrence of these beliefs. It seems that agent-like descriptions of the economy are more attention-grabbing and potentially transmitted than agent-free representations for two reasons – because we have a rich intuitive psychology to start with, and because some aspects of economic processes may be similar to the input format for that intuitive psychology. Indeed, our rich intuitive psychology is often activated in the description of systems characterized by (a) high complexity, (b) recursive processes, and (c) consequences in people's actions (Boyer 2018, pp. 217–28). That construal of complex social processes in terms of "big agents" lends itself to a narrative format, as **Acerbi & Sacco** rightly emphasize. This may impose a particular set of filters on what become popular views of the economy. For example, narratives require that events have reasons rather than just causes, and that there should be a unity of plot in our description of an overall system.

R4.3. Is there a general "zero-sum" perspective?

Another potential candidate for a general bias that would influence folk-economics is a general view of society as a zero-sum process. Our model described this in the context of international trade, but the assumption is not in fact limited to nations (**Johnson** remarks that it also occurs between regions – our description was unduly

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narrow). In fact, the zero-sum assumption appears in many familiar views of the economy, for example, that the wealth produced in a country is a "fixed pie," or that the prosperity of some countries depends on the impoverishment of others. It also feeds more detailed views about the economy (**Bhattacharjee & Dana**; **Rubin**).

How do we explain the recurrence of this assumption? It is quite clear that in many domains of social interaction, outside economic exchange, our ancestors, like most other organisms, evolved in a zero-sum world. Our evolved psychology certainly includes the intuition that mates, territories, foraging locales, or hunting grounds are rival goods. It is also possible that the mind entertains a general zero-sum template, perhaps grounded in physical experience (**Lee & Schwarz**), or in the simple experience of everyday bookkeeping (**Ross**), that is then projected onto unusually complex systems like the economy as a whole, so that, for example, the high incomes of the rich seem to *cause* lower incomes among the poor.

These latter explanations are not altogether satisfactory, however, for reasons already mentioned. Folk-economic beliefs do not just produce a (distorted) view of the economy by emphasizing some features of exchange – they also ignore equally real features. Consider, for instance, **Bhattacharjee & Dana**'s proposal, that people see the economy as a whole as zero-sum, because they extrapolate from an actual feature of a single trade: the division of profit between seller and buyer. As a result, the positive incentives of profit are invisible. They are certainly "unseen," to use Bastiat's term. For example, people see surge-pricing as "gouging"; they resent the price increase, but do not spontaneously see price hikes as a signal that will motivate agents to increase the quantity supplied. Bhattacharjee & Dana's hypothesis is plausible and should be investigated experimentally. But we would point out that other, equally real aspects of trade are *not* picked up in the construction or adoption of FEBs. For example, profit is certainly zero-sum in a single transaction, but it is also positive on *both* sides – that is, both parties benefit from a trade. The former aspect may form the basis of FEBs, as our commentators point out, but the latter does not. It is indeed possible that people do not actually represent trade as mutually beneficial, as **Johnson** suggests (see discussion in sect. R8.2). In our view, these intuitions about trade would then combine with the intuition that a large market of mostly impersonal agents is a potential threat. Whether this is a valid interpretation is of course an empirical matter that may require more studies of the kind that Bhattacharjee & Dana and Johnson themselves pioneered.

A similar psychological enrichment may be necessary if we want to explain the salience of the additional FEBs described by **Rubin**. For example, although his proposed FEB 10 ("Labor market regulations … have no impact on levels of employment") seems to be directly entailed by many policy proposals and their translation in popular opinion, it seems to us that, in psychological terms, the impact of regulation on quantities supplied and demanded is simply not computed at all. A similar point could be made about Rubin's FEB 11 ("A society can reduce or eliminate inequality with no adverse impact"). Again, this may seem logically entailed by many policy proposals. But that implication is, in our view, not represented at all. What is represented, in this case, are generic descriptions of the poor and the rich, together with a quasi-hydraulic transfer of resources from one to the other, accompanied by an emotional, ethical appraisal of the putative effect. The computation stops there.

This aspect of folk-economics is crucial. When domain-specific intuitive systems are activated (e.g., in parsing sentences, in the construction of 3D visual scenes from 2D retinal images, or in computing someone's attractiveness on the basis of their looks), they respond to a specific input format and perform principled inferences, *and stop there*. For instance, the parsing system does not produce a representation of the speaker's meaning – that task is handled by other, distinct systems further downstream in information processing. In a similar way, in our proposed explanation of folk-economics, when we represent the rich and the poor, this representation meets the input format of a fairness-estimation system that automatically searches for information about these generic agents' contributions to the economy seen as a collective action. But that fairness-estimation system is not in the business, so to speak, of seeking information about what caused previous supply, or about the incentives for future supply.

In our view, it is only by understanding that folk-economic beliefs are meta-representational, and that they activate domain-specific intuitive systems, that we can make sense of the apparent lapses in logic documented by **Rubin**. What is not handled by intuitive systems is bound to remain, barring sustained intellectual effort, in Bastiat's domain of "what is not seen."

R5. The contribution of domain-specific systems

R5.1. Development and the acquisition of FEBs

Interaction between domain-specific expectations and relevant information from a social environment is necessary both (a) to develop an adult inference system and (b) to account for the way that inference system tends to modulate people's explicit beliefs about the economy (**Liberman & Kinzler**). Social essentialism, involved in some aspects of our coalitional psychology, provides an excellent illustration of these two processes. Essentialism is the general label for a variety of inferences that associate membership in a category (e.g., tigers, Germans, conservatives) with (a) an internal (and generally undefined) quality present in all exemplars, (b) the notion that this internal essence is inherited rather than externally caused, and (c) the assumption that the internal quality explains external features common to the category (Gelman 2004). Such essentialism is most common in representations of biological kinds (Hirschfeld & Gelman 1999), but also of some social categories (Gil-White 2001). However, there is an important difference here. Essentialist notions about cats and dogs develop early, do not require explicit reflection, and indeed are resistant enough to hinder the learning of scientific biology (Atran 1998). By contrast, essentialist notions about social groups seem to consist mostly of explicit reflections on one's prior intuitions of group membership (Hirschfeld 1994). That is, one develops a strong intuition that other-group members must somehow be different from "us," before hitting on their supposed essence as the explanation, or acquiring that explanation from others (Boyer 2015, pp. 38–45, 256–61). In other words, what is mostly intuitive in the biological domain seems a matter

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of reflective meta-representations in the social domain. That may be why, as **Liberman & Kinzler** emphasize, essentialist representations of social categories vary as a function of exposure and of the coalitional context – children even vary in their understanding of "race" as a fixed trait (Roberts & Gelman 2016).

Developmental evidence may help us specify and perhaps modify the very broad outline proposed in our target article, in terms of the cognitive systems involved. For instance, some economic beliefs seem rooted in strong intuitions about sharing and ownership. There is an obvious connection between intuitions about communal sharing, on the one hand, and widespread beliefs about the economy as a commonwealth, as something that is "ours" only, on the other (**Sheehy-Skeffington & Thomsen**). This latter representation activates intuitions about group-membership, about the proper extension of the category of individuals that should count as "the same." As **Nancekivell & Friedman** point out, even young children seem to deploy a sophisticated understanding of group ownership. Indeed, it seems that from an early age children understand that ownership is not just *in rem*, connecting a person and a thing, but also *in personam*, modifying interaction between agents – specifically, making it possible for one agent to interfere in another one's access to resources (Boyer 2015). And the *persona* in question can indeed be a group, which makes evolutionary sense as nomadic foraging, characteristic of most of our evolutionary past, involves territorial claims and competition for group access to resources such as hunting grounds (Kelly 1995). Nancekivell & Friedman's description of early notions of group ownership would also account for the spontaneous development of commons-management institutions in many different human groups (Ostrom 1990). As we and Sheehy-Skeffington & Thomsen have emphasized, group ownership representations are often informed by coalitional representations. That is precisely why ownership of common resources in modern economies can be particularly contentious. Unless there are clear ecological boundaries to groups, it may be difficult to decide, for instance, whether a particular natural resource, such as oil or a natural park, belongs to the nation, the region, the ethnic group, or some other community.

Developmental dynamics are crucial to understanding the acquisition of some "emporiophobic" beliefs. As noted by **Echelbarger, Gelman, & Kalish** (**Echelbarger et al.**), there is considerable evidence for the early development of motivations both to maximize utility and to extend unconditional cooperation. While one system allows developing minds to make sense of mutually profitable trade, the other one imposes boundaries on desirable social outcomes. Even in children, the assumption that distribution will be proportional to contributions is limited by the requirement of a minimum level of resources for all, an assumption that modulates the acquisition of beliefs about social welfare systems (see discussion of ideologies in sect. R6.1).

R5.2. The influence of moral psychology

Folk-economic beliefs are very often moralized, as discussed by **Baumard, Chevallier, & André** (**Baumard et al.**), **Bhattacharjee & Dana**, **Chowdhury & Yu**, **Malhotra**, and **Sznycer, Ermer, & Tooby** (**Sznycer et al.**). Given that human moral psychology is best described as the product of highly specific selective pressure (Baumard et al. 2013a; 2013b; DeScioli & Kurzban 2013; Haidt & Joseph 2004), it makes sense to consider how moral intuitions and economic reflections interact in the acquisition and transmission of FEBs.

First, the activation of moral psychology systems explains why some economic questions are more likely than others to be attention-grabbing (**Sznycer et al.**). The question of relative pay levels between CEOs and employees meets the input conditions for cognitive systems geared to fairness in exchange, as well as cheater-detection. These systems seem to bear the traces of their environment of evolutionary adaptedness. For instance, they assume that people who are in exchange will meet again (Krasnow et al. 2013), which makes it potentially costly to ignore the needs of the least-favored. Also, those systems evolved in ecologies with a low ceiling on productivity and therefore on differences in productivity, compared to modern market economies. Although we tend to accept differences in allocations motivated by differences in contributions, we are generally reluctant to extend this beyond relatively small differences in outcomes. As a result, considerations of fairness often dominate policy debates and obscure questions of efficiency and final outcomes, for example in the evaluation of tax systems (**Rubin**).

Also, moral psychology may help us clarify the set of beliefs associated with emporiophobia, which are probably more specific than we suggested in our target article. For example, as **Malhotra** points out, considerations of harm may modulate folk-economic beliefs about the social benefits of markets – people consider that auctions are fine for concert tickets but not for organ transplants, because they consider the harm against a single patient in a deontic manner. That is indeed why aversion to market solutions is not limited to opinion about financial markets, as **Miton & Sperber** suggest (see Fiske & Tetlock [1997] and Brennan & Jaworski [2015] for many other examples). As **Chowdhury & Yu** propose, the impersonality of market transactions is especially salient when it concerns items for which we assume that personal information about the partners involved will be crucial, which is why the idea of an auction of orphaned infants seems repugnant. These suggestions, if we can follow them up with appropriate empirical studies, could lead to a more refined description of what we described in broad strokes as generalized emporiophobia.

Moral psychology triggers motivation through emotional arousal. We do not think that this constitutes an alternative to a description in terms of specialized cognitive systems, as claimed by **Chowdhury & Yu**, who add that such an explanation is of "greater efficacy." Our point is that emotions are part and parcel of the operation of evolved cognitive systems. For instance, the identification of free-riders depends on fine-grained representations of who contributed what and when, whether those who contributed less could have given more, and other such criteria (Delton et al. 2012). It is part of the design of our anti-free-riding system that it leads us not just to categorize free-riders but also to entertain emotions that lead us to avoid them, to denounce them, and to diminish their welfare (Price 2005). In more general terms, emotions are involved because access to emotional arousal is one of the ways in which an evolved computational system can direct behavior.

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A radical alternative to this model is to explain most beliefs about the economy, as well as most explicit beliefs and norms about collective life, as the output of a single fairness system, as proposed by **Baumard et al.** In that view, the only cognitive system engaged in many folk-economic beliefs would be one that is geared to optimizing fair allocations (Barclay & Willer 2007; Baumard et al. 2013a; Noë & Hammerstein 1994). Folk-economic beliefs are often compatible with intuitive fairness criteria. Indeed, this fit with intuitive fairness is an important factor in their acquisition and transmission.

But there are computational problems with the proposal that FEBs, and in fact most components of people's representations of politics, are influenced by a single intuitive system. It is of course an empirical matter, whether one or two or more distant systems are involved in a particular domain of representations or behavior. In general, it makes sense to consider a system as relatively modular, if (a) it handles only specific aspects of the available information, just like an enzyme binds only to particular kinds of molecules (Barrett 2005); (b) it operates on specific inferential principles; and (c) we can detect a specific developmental path. (Other criteria, such as anatomical localization or neuropsychological dissociation, are sometimes relevant; Hirschfeld & Gelman 1994b). Seen in those terms, it seems unlikely that a single fairness system would handle all of the computations that lead to the intuition that something is unfair. For example, it seems intuitively unfair (a) to appropriate the cake someone else just made, and (b) to beat people up because they disagree with you. The "unfair" label results from representations of a gross imbalance between the welfare of two agents, violating principles of mutualism. But those representations of welfare are delivered by different systems, one of which links labor invested to entitlement (as described in our target article; see also commentary by **Nancekivell & Friedman**), whereas the other one compares the levels of harm caused by disagreements and physical violence. So it seems more sensible to accept that fairness-judgments are delivered by a system whose inputs are generated by other dedicated systems (including a representation of differential welfare and respective contributions of different agents). On the basis of these descriptions, the system for fairness-judgments then produces deontic judgments and associated emotions.

R6. Economic beliefs and political psychology

Andrews & Delton propose to extend some of our evolutionary-cognitive perspective to the domain of politics. While we focused on views about the economy, they point out that modern societies include other key institutions that affect resource distribution, and that the state is one particularly important such institution. They also argue that a number of cues are shared by market- and state-mediated interactions (e.g., anonymity) and, hence, that a number of the cognitive causes of emporiophobia might also underlie distrust of the state and politicians. In addition, the citizens' relationship to the state is characterized by a vast power differential that might activate evolved systems for monitoring exploitation from dominant individuals, creating further cascades of political distrust. We agree with this analysis and believe that an evolutionary-cognitive framework might provide a better foundation not just for the understanding of economic beliefs but also for our understanding of political beliefs (Petersen 2015). For example, the evolved psychology for monitoring potentially exploitive leaders seems to be particularly sensitive to whether leaders' decisions follow impartial procedures (Bøggild & Petersen 2016). This suggests that some of the intuitively generated distrust can be alleviated when political leaders carefully adhere to standards of procedural fairness. This could explain between-country and over-time variation in political trust.

In more general terms, folk-economic beliefs are intertwined with political visions and ideologies. Particular views of the economy may be taken to legitimize particular policies. Conversely, parties, media, and political entrepreneurs may be involved in broadcasting particular economic beliefs. So, it makes sense to investigate how such political dynamics affect the diffusion of folk-economics. In particular, we should consider the interaction of cognitive processes with the sources of information usually considered in political science, such as parties, media, and other organizations. A consideration of this interaction should also help us better understand variation in folk-economic beliefs (see also sect. R7).

R6.1. The role of elites and the limits of propaganda

It may seem straightforward that people acquire folk-economic beliefs from elite agents, such as political entrepreneurs and political parties, and we certainly concur with **Bisgaard & Slothuus** that political parties in modern societies are key providers of information. But we should add that political parties share the role of information providers with many other sources such as the media, experts, social media platforms, and interpersonal discussion partners. Indeed, it seems increasingly plausible that social media in particular provide information that media organizations and political parties try to follow and accompany, rather than the other way around. More importantly, although all of these information sources are relevant for understanding FEBs, variation in elite behavior is not sufficient to empirically explain variation in FEBs. We should use a broader set of theoretical tools than the notion of top-down influence, when we try to understand the salience of particular beliefs.

With modern information technology, political parties and other elite actors emit information all of the time. However, only a fraction of that information is likely to "stick" in the minds of citizens. Indeed, we should think of and analyze the mind as part of the selection environment for information. In this perspective, it seems that information will have a higher "survival rate" – that is, it will be acquired more easily, and stored and communicated more frequently – if it meets input conditions of some of our intuitive systems. Investigating the degree of fit between elite rhetoric and evolved cognitive systems should, in other words, help explain why particular pieces of rhetoric are more effective than others. **Malhotra** provides an excellent illustration of this point when he refers to the widespread notion of "welfare queens." In our view, the reason why this particular motif became so successful is a consequence of its fit with evolved cognitive systems for exchange and, in particular, systems for cheater-detection.

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As we develop below in section R6.2, within our evolutionary-cognitive framework, political elites provide information in the sense of (a) coalitional signals that elicit cognitive systems for coalitional coordination among partisans; (b) cues that, depending on their specific content, can elicit the entire suit of intuition-producing human cognitive systems, including systems for sharing or cheater-detection; and (c) factual information that people can build particular FEBs with on the basis of their intuitions. To sum up, it is crucial to describe the cognitive systems and intuitions that these informational pieces tap into, in order to understand the power and limits of elite information.

R6.2. Why partisan politics? The role of coalitional psychology

Describing the way individuals filter and modify top-down information naturally leads to the question: Why do people follow a particular political party? That is, why do they not just receive information from parties, but also favor information from one particular source, and consider their interests as closely bound to those of a particular political organization? As rightly emphasized by **Bisgaard & Slothuus**, people pay enormous attention to the rhetoric of their favored political party, creating – as observed by **Ruisch, Anderson, & Pizarro** (**Ruisch et al.**) and **Buturovic** – systematic partisan and ideological variation in FEBs.

As discussed by **McDermott**, humans are by nature a coalitional species and have massively benefited in terms of fitness from being part of coalitions that amplify their bargaining strength. As a consequence, a core ability for humans is to coordinate agendas within coalitions – that is, to agree implicitly (or, sometimes, explicitly) on a prioritized list of problems to tackle by means of collective action. When people come to identify with a particular coalition, the stance of the other members will, in other words, matter for the beliefs that people adopt, including their FEBs.

In our view, the underlying set of psychological mechanisms – that is, evolutionary coalitional psychology – provides the best available ultimate explanation for partisan variation in FEBs, and for the proximate mechanisms often described as "partisan" or "motivated directional" reasoning within political science (see Leeper & Slothuus 2014). As we noted in the target article (sect. 6.4), empirical evidence from carefully tailored experimental designs shows that modern political parties tap into the slots of human coalitional psychology and that political parties are psychologically represented as an instance of the mental category of "coalitional alliance," along with other instances such as nation or ethnicity. That is why we agree with **Karabegović, Rotella, & Barclay** (**Karabegović et al.**) as well as **McDermott** that cognitive systems for coalitional coordination are crucial for understanding FEBs, and that the effects of such cognitive systems reach beyond the domains mentioned in our article, immigration and trade in particular.

Coalitional psychology explains how the rhetoric of political parties can significantly shape political attitudes and perceptions (including FEBs), and how partisan and ideological considerations often overpower other types of considerations, as demonstrated by a great deal of empirical research in political psychology, mentioned by **Bisgaard & Slothuus**, **Buturovic**, **Ruisch et al.**, and **Tappin et al.** In our view, coalitional intuitions and inferences play a crucial role in generating these effects, including their affective nature (Petersen et al. 2013; 2015) and the fact that that conflict increases their strength (Druckman et al. 2013).

It should be noted, however, that there are limits to the power of coalitional psychology and, hence, to the role of partisan and ideological considerations. One obvious limitation is that coalitional psychology has specific input conditions, for example, cues of group-based conflict. When available information does not meet these input conditions, we should not expect coalitional psychology to have strong effects. Also, other cognitive systems may compete with coalitional considerations to determine attitudes and behaviors. For example, as discussed in the target article (sect. 5.2), when people are confronted with clear cues that a welfare recipient is a cheater or a reciprocator, these cues completely override partisan considerations (Petersen et al. 2012).

A less-obvious way in which other cognitive systems constrain the power of coalitional psychology relates to persuasion. In the target article, we focused on how FEBs affect political attitudes. A coalitional psychological perspective, however, implies that the causal arrow between belief and attitude sometimes will be reversed. At times, processes of coalitional coordination will imply that we agree to a position of a fellow coalitional member and then, in a post hoc manner, construct a set of FEBs around this position. As **Karabegović et al.** note, we can think of coalitional considerations as (broadly defined) self-interested considerations. Past research shows that self-interested considerations operate within the limits of persuasion; that is, self-interest only shapes moral positions to the extent that the position can be justified with reference to principles other than self-interest (DeScioli et al. 2014; Kunda 1990). When people adopt certain positions on economic policies for coalitional reasons, they will, in other words, feel a need to justify this positions on the basis of particular beliefs about the operations of the economy.

R7. Why variation in folk-economic beliefs?

Folk-economic beliefs differ a lot – between times and places, and between individuals in a single community. This is sometimes raised as an objection to understanding these beliefs in an evolutionary cognitive framework (**Buturovic**, **Kam**, **Stastny & Houdek**, and **Ruisch et al.**). Although we did not address the issue of individual variation at length in the target article, such variation is an integral part of the underlying framework, and we agree that it is of key importance.

As mentioned above, an evolved psychology predicts, not uniform behaviors and representations, but principled reactions to differences in environments. In other words, these variations in economic views, like those between the beaks of finches in different ecologies, reveal important features of the cognitive processes involved in acquisition and transmission. It is precisely the pattern of change that informs us about the system – the fact, for instance, that people react to changed circumstances (e.g., development of market transactions) with changed beliefs (commerce as possibly dangerous) that tells us what

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underlying psychological mechanisms are involved. How do we then account for the specific individual and cultural variation observed in endorsements of FEBs?

The commentary by **Karabegović et al.** provides the building blocks for an answer. Following this commentary, we believe it is fruitful to distinguish between two principal (but not mutually exclusive) causes of variation in FEBs: (1) coordination of beliefs within groups on the basis of coalitional dynamics (as discussed above); and (2) the differential activation of domain-specific cognitive systems due to variation in available cues (see also Petersen 2015).

Our focus in the target article was on explaining the general process of how FEBs are constructed on the basis of the activation of domain-specific cognitive systems. It follows that if different systems are activated in the minds of different people, this will favor the adoption of different FEBs. For example, past research suggests that when evolved motivations for communal sharing are activated, people are more prone to endorse the belief that needy individuals are "unlucky" rather than "lazy" (Petersen et al. 2014), and they are more likely to broadcast such beliefs to others (Aarøe & Petersen 2013). That research focused on contextual cues that activate and deactivate sharing motivations. But there is also evidence from work on life history strategies. Differences in early experience calibrate long-lasting differences in the perceptions of environmental stability, which in turn result in different estimates of the advantages of sharing (Petersen & Aarøe 2015). Another example of individual differences, as discussed by **Sheehy-Skeffington & Thomsen**, relates to differences in the activation of systems for regulating antagonistic group relationships, which has downstream consequences for FEBs about both trade relationships and redistribution between social groups.

As noted by several commentators (**Buturovic**, **Kam**, **Ruisch et al.**, and **Stastny & Houdek**), individual differences in FEBs are often related to ideological differences. As already discussed in section R6.2 (see also **Karabegović et al.**), signaling – making one's allegiance manifest – is one crucial factor for the understanding of such differences in FEBs. Yet, differences in FEB-endorsement are not just the product of inter-individual processes related to systems for partner-choice and coalitional signaling but also the product of intra-individual psychological responses to cues. As previous research has documented, ideological differences, at least in part, result from the differential activation of a very large number of cognitive mechanisms, which include, for example, mechanisms for threat-detection (Hibbing et al. 2013), for mating preferences (Petersen 2018), and for conflict-resolution (Price et al. 2011). In this way, differences in FEBs between ideological groups could, in principle, reflect that these groups construct their FEBs on different backgrounds of activated mechanisms.

One example of this is highlighted in **Tappin et al.**'s commentary. Some people, particularly those with a university education, hold positive views about the economic impact of immigration in general. From the perspective of an evolutionary-cognitive framework, this variation could reflect individual differences in the activation of mechanisms for managing intergroup relationships (a set of individual differences also highlighted by **Sheehy-Skeffington & Thomsen**). Ancestrally, as today, individuals with significant amounts of human capital are more likely to gain from exchange relationships with other groups (as they have generic resources to offer these groups), whereas individuals with less human capital are more reliant on deep engagement relationships within close-knit kin and friendship groups (Tooby & Cosmides 1996). In this way, variables related to human capital such as education may create differences in political views through the activations of mechanisms for avoiding or investing in intergroup exchange – see Weeden and Kurzban (2014) for an elaboration of this view.

One important consequence of these considerations is that understanding FEBs requires not just the mapping of the relationship between domain-specific cognitive systems and FEBs (as was our focus in the target article). Rather, it also requires that (a) we identify evolutionarily recurrent cues that activate and de-activate the relevant cognitive systems (including systems for coalitional coordination), and that (b) we explain how the availability of these cues differs between individuals under modern circumstances, so that (c) we may explain stable individual and transient situational differences in folk-economic beliefs.

R8. Implications and outstanding questions

R8.1. Is it possible to counter misleading FEBs?

Although the research program outlined in the target article does not include an inherent normative agenda, we agree with an important point made by **Kam**: FEBs might have normatively undesirable consequences. Some FEBs hinder the pursuit of egalitarian economic policies, others the pursuit of free-market-oriented policies. Depending on one's political values, either set of FEBs might appear undesirable. So it is relevant to ask whether there are ways to counter the intuitive emergence of particular FEBs. **Arceneaux** emphasizes the role of reflection to counter intuitively produced inferences, while **Acerbi & Sacco** emphasize the role of counter-narratives. Both perspectives have merit and, in fact, they can be fruitfully integrated.

In our model, this would imply prompting individuals to direct their attention to relevant experiences that resonate with normatively desirable goals and encourage them (through increased motivation or capacity) to process the relationship between these experiences and the problematic FEBs. For example, as we stress in the target article, people might have repeated experiences of smooth market transactions, yet maintain the FEB that markets in general are exploitive. This is made possible because the FEB is cognitively situated in relative isolation from the experiences – that is, the FEB is produced not from personal experience but from a range of general cues about marks, for example, impersonal transactions. In essence, by activating memories of personal experiences, one set of intuitions (related to plus-sum exchange) operates as counterweights to another set of intuitions (related to the risk of exploitation in anonymous situations).

As we noted elsewhere (Boyer & Petersen 2012), our evolved intuitions do not construct an iron cage, but a rubber one. When sustained effort is exerted, our intuitions can be bent out of their natural shape. Therefore, an important research agenda not just for the next generation of studies on FEBs but for the next generation of evolutionary cognitive psychologists more generally, is to understand the

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ultimate causes and proximate outline of the mechanisms that in this way allow the human organism to prioritize one set of evolved intuitions at the expense of another. This should pave the way for concrete studies on how normatively undesirable FEBs (as defined by one's particular normative agenda) can be countered.

R8.2. The connection to economic psychology

In our original article, we chose not to elaborate on the connections between folk-economic beliefs, on the one hand, and our actual economic psychology, the set of cognitive mechanisms activated when people actually engage in transactions, on the other. This seemed a prudent move, mostly to avoid the temptation to see the "economic mind' as a unitary part of our cognitive makeup, a set of coherent assumptions that would inform all of our representations about economic matters. We also suggested that the connections between FEBs and economic psychology may be tenuous at best, both because reflective beliefs are only weakly constrained by intuitions, and also because most FEBs are about macro-economics. Several commentators, however, suggest that it may make sense to consider the interaction between the two domains of representations because the intuitive systems involved in supporting economic behavior may influence the contents of FEBs directly enough that it would be strange to ignore that effect.

Our economic psychology is a barely explored set of cognitive systems. A persistent problem is that it is mostly studied in terms of its divergence from normative economic theory. But that is not always adequate. For one thing, as **Jern** remarks, people's intuitions about other agents' behavior are often in broad agreement with normative economic theory, although people's own behavior is not. More generally, a number of economists have argued that considering human evolution, and particularly our evolved psychology, is indispensable if we want to understand apparently prosocial behaviors, and other deviations from normative economic theory (Capra & Rubin 2011; Koppl 2005; Robson 2001).

There is unfortunately very little experimental research on the actual cognitive processes involved in valuation and exchange, as **Johnson** points out. For instance, every microeconomic textbook points out that both parties in a voluntary exchange benefit from a trade. The very fact that this notion is unintuitive, and needs to be spelled out, is revealing. Indeed, empirical studies by Johnson et al. show that people's intuitions are at variance with the theory, as they consider that many transactions are "win or lose," that in general sellers are better off after a transaction but buyers are not (Johnson et al. 2018b). If people are indeed intuitive mercantilists, this suggests that cheater-detection systems may be set off in contexts in which we act as buyers, because the amount of the benefit (the good purchased) will always appear slightly less than the amount of the cost (the money paid).

Such non-normative responses suggest that people activate notions of value that diverge from microeconomic models of utility. **Nancekivell & Friedman** suggest that there may be a form of intuitive realism about value, an assumption that goods or services have an inherent numerical property, that prices reflect only imperfectly. If that is indeed an intuitive assumption in our economic psychology, it might explain why political economists for centuries tried to figure out the mysterious process that "creates" value, or why they found mercantilism so compelling. Indeed, some form of mercantilism would explain **Johnson**'s finding of a difference between money transactions (people see the seller as better off) and barter (people see *neither* party as better off) (Johnson et al. 2018b).

R8.3. The prospect of a naturalized economics

Finally, some commentaries lead us to a much broader and more difficult question, to do with the prospect of making economics itself more realistic, by considering that the agents of microeconomic processes are evolved organisms, from a particular species with highly specific motivations and capacities. That is the change of perspective recommended by **DeScioli**, who laments the psychological poverty of classical *Homo economicus*, characterized by exceedingly general, and biologically implausible, motivations and capacities for information processing, preference-ordering, time-discounting, and so forth, which is why both economists and psychologists have argued for more realistic models (see, e.g., Gigerenzer & Selten 2001; Simon 1982).

Like all empirical sciences, economics only predicts phenomena under some degree of idealization. But there is a fine demarcation between sensibly idealizing away some aspect of reality (e.g., friction when dealing with dynamics) on the one hand, and just ignoring those aspects of reality that the model does not explain, on the other. Critics of standard models would argue that the latter is often characteristic of economic modeling (see, e.g. Alexandrova & Northcott 2013; Reiss 2012). Indeed, evidence from behavioral economics, and to some extent from neuro-economics, suggests in many domains behavior predictably goes against standard predictions.

A common way of accommodating these results has been to consider that people's minds are a composite of (a) some utility maximizing neural approximation of rational choice theory, and (b) various "hot" passions, animal instincts, emotional urges, and so forth, that would explain deviations from normative predictions (Loewenstein & O'Donoghue 2004). But such accommodations create further difficulties. First, in cognitive terms, they raise the question of how rational choice is actually implemented in cognitive systems, whether rational choice is a characteristic of the person, the entire assembly of cognitive systems, or of some of those systems, or of neural function inside systems (Ross 2005, pp. 76–100, 114-119). Second, from an evolutionary standpoint, simply adding a measure of emotionality or error to rational choice cannot be a satisfactory account. As **Lightner & Hagen** remark, the results of current behavioral economics studies are often difficult to interpret, because of the wrong idealization problem mentioned above. That is, experimental protocols are generally supposed to eliminate "environmental noise" – for example, reputation, norms of fairness, and so on, from economic behavior. But Lightner & Hagen sensibly point out that such factors are not noise – they are the cues our evolved cognitive systems expect from environments, in order to deliver motivations for behavior. On this basis, we agree with **DeScioli** as regards the limitations of *Homo economicus* – and his cousins *Homo sociologicus*, *Homo politicus*, and so forth. Rather than using the

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wrong kind of idealization, one should pursue social sciences on the basis of *Homo sapiens*.

This leads to another question raised by commentaries from **Lightner & Hagen** as well as **DeScioli**. Once we see human behavior from an evolutionary perspective, is there an actual domain for economic models? Economics is usually defined as the study of all problems that involve alternative choices given scarce resources. But, in the course of evolution, humans, just like other organisms, were never confronted with a unified class of such problems. Rather, they had to solve scarcity and opportunity cost problems in a variety of domains, for example, in foraging, mating, acquisition of social status, recruitment of social support, territorial competition, and more. In actual ecologies, each of these different domains comes with highly specific invariances, therefore with a unique space of potential adaptive solutions, resulting in selective pressure for domain-specific optimization systems. So, it may be that, in terms of cognitive processes, it makes sense to study each of these specialized systems – for example, our intuitive economics of mating, intuitive economics of foraging, and so on – because that is the level of abstraction at which we can maximize explanatory power. By contrast, the "intuitive economics of everything that is economic" just never evolved as a cognitive system. That is why most of our beliefs about the economy are neither intuitive nor scientific; they are folk-economic beliefs.

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[The letters "a" and "r" before author's initials stand for target article and response references, respectively]

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