A defence of quasi-reductionism in the epistemology of testimony

Citation for published version:

Link:
Link to publication record in Edinburgh Research Explorer

Document Version:
Peer reviewed version

Published In:
Philosophica

Publisher Rights Statement:

General rights
Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy
The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.
A DEFENCE OF QUASI-REDUCTIONISM
IN THE EPISTEMOLOGY OF TESTIMONY

DUNCAN PRITCHARD
University of Edinburgh

ABSTRACT. Two key intuitions regarding knowledge are explored: that knowledge is a kind of cognitive achievement and that knowledge excludes luck. It is claimed that a proper understanding of how these intuitions should inform our conception of knowledge leads to some surprising results, not just as regards the theory of knowledge more generally but also as regards the epistemology of testimonial belief. In particular, it is argued that this conception of knowledge motivates a new kind of proposal—quasi-reductionism—that can accommodate the motivations behind both reductionist and anti-reductionist accounts of the epistemology of testimony.

0. Here are two intuitions that many have regarding knowledge, and which inform much of our theorising about knowledge. The first—what I will call the achievement intuition—is that knowledge is a cognitive achievement of some sort. The second—what I will call the anti-luck intuition—is that knowledge is incompatible with luck. It is tempting to think that these intuitions are just two sides of the same coin, or at least that once the intuitions are suitably fleshed out then we will come to see that the one intuition is simply an entailment of the other. For example, one might hold that achievements by their nature exclude luck in the relevant way and thus that the anti-luck intuition is simply a consequence of the achievement intuition. As I will show, however, this natural way of thinking about these two intuitions is mistaken, and this has important ramifications not only for our understanding of knowledge but also for our understanding of specifically testimonial knowledge. Indeed, I will claim that the intuition that knowledge is a type of cognitive achievement, while containing (like all intuitions) an important truth, is in fact wrong. As we will see, gaining an understanding of how these intuitions should inform our conception of knowledge will lead us to adopt a very
specific sort of account of testimonial knowledge, one that captures the motivation behind both reductionist and anti-reductionist theories in the epistemology of testimony. The view that results is novel, in its motivation if not in its detail. I call this view quasi-reductionism.

1. Let us begin by examining the motivation for the achievement intuition. The best way to evaluate this intuition is by considering what achievements more generally involve and assessing whether knowledge has the same relevant properties. Consider an archer, Archie, who selects a target from a range, fires his arrow, and hits the target as intended. Is this an achievement? Well, it is certainly a success, but this by itself will not suffice for an achievement. For suppose that Archie has no archery abilities and simply hits the target by luck. In such a case this would be a success that would not constitute an achievement.

Let us suppose, then, that Archie has the relevant archery abilities and is in addition successful at hitting the target. Is this enough to ensure an achievement? Perhaps surprisingly, the answer to this is ‘no’ since it is essential to achievements that the success in question be appropriately related to the ability. Suppose, for example, that this arrow had been blown off course by a freak gust of wind and then blown back on course again by a second freak gust of wind. In such a case we would have both the ability and success elements of an achievement, but not have an achievement because the two elements are not properly related. In particular, the success would not have been because of the ability in the appropriate way.¹

Achievements, then, are successes that are because of ability. How does this relate to knowledge? Well, one might think that it is a moral of the post-Gettier literature that knowledge is a cognitive achievement in the sense of being a cognitive success (i.e., true belief) that is because of cognitive ability. If you form your belief that there is a sheep in the field by looking at a big hairy dog, then even if it your belief is true (e.g., there is a sheep in the field obscured from view behind the big hairy dog), and even if your belief is formed as a result of the relevant abilities (e.g., one is exercising a generally reliable ability to spot sheep in these conditions), one still does not count as knowing. The natural explanation of why is that one’s cognitive success is not appropriately related to one’s cognitive ability in the sense that it is not because of one’s cognitive ability. In the case just described, for example, the cognitive success is, if anything, because of the fortuitous detail that there happens to be a sheep in the field hidden from view behind the big hairy dog. But if that is the right diagnosis
to give of these cases, then the conception of knowledge as cognitive achievement becomes irresistible—knowledge just is cognitive success that is because of cognitive ability.

Moreover, one might also argue that such a conception of knowledge is able to accommodate the anti-luck intuition as well, since one could reasonably claim that it is distinctive of achievements that they exclude luck of the relevant sort. Just as Gettier-style luck is excluded by the addition of the ‘because of’ relation in the ‘archer’ case, so Gettier-style epistemic luck is excluded by the addition of this relation in the ‘sheep’ case. There is no need, then, for two distinct conditions within one’s theory of knowledge in order to accommodate these two intuitions, since a proper rendering of the achievement intuition will meet both desiderata.

2. This way of thinking of knowledge is now quite widespread, particularly amongst those who defend a virtue-theoretic account of knowledge. I grant that it is superficially appealing and that, if it were true, it would provide an elegant account of knowledge. Unfortunately, however, this view is false. In order to see this, consider the following variation on the ‘archer’ example. Suppose that amongst the targets that Archie selects at random there is only one target that does not contain within it a forcefield that would repel any arrow that came near it, and suppose that Archie just happens to select this target. Now imagine that everything proceeds as before, in that Archie uses his archery abilities to hit the target, is successful, and nothing intervenes during the process (there are no freak gusts of wind, for example). Archie’s success is thus a product of ability in a non-Gettierized fashion. But is it an achievement; that is, is it a success that is because of ability? I think the answer to this is ‘yes’, even despite the luck involved. After all, Archie’s success was indeed the direct result of his ability.

This might initially sound odd, and I think the reason for this is that the previous discussion of Archie’s achievement made it sound as if the very notion of an achievement was luck-excluding, in the sense that it ought not to be possible for Archie’s lucky success in this case to count as an achievement. Notice, however, that the luck involved earlier and the luck involved now are very different. The first kind of luck is of the ‘intervening’ sort that you find in Gettier-style cases, in that it is a luck that intervenes between ability and success, albeit in such a way that the success is preserved. In contrast, the luck involved in this case is
of an ‘environmental’ form, in that rather than intervening between ability and success it instead concerns the environment in which ability generates that success. What we have discovered is that while achievements are incompatible with intervening luck, they are compatible with environmental luck.

This discovery is disastrous for the thesis that knowledge should be understood as a specific kind of achievement because knowledge is incompatible with both kinds of luck. In order to see this, consider the case of Barney who, using his highly reliable cognitive abilities, forms a true belief that there is a barn in front of him. Suppose further that there is no Gettier-style luck in this case, in that nothing intervenes between his cognitive abilities and his cognitive success (Barney really does see a barn). Barney’s cognitive success is thus because of his cognitive ability, and hence he has exhibited a cognitive achievement. Nevertheless, Barney lacks knowledge and the reason for this is that there is environmental luck in play. In particular, although Barney is indeed looking at a real barn just now, he is in barn façade county in which most of the barn-shaped objects are in fact fakes, undetectable to the naked eye. Because he is in such an epistemically unfriendly environment, his belief is only luckily true even despite the presence of his cognitive abilities, and hence he lacks knowledge.

The immediate upshot of this case is that sometimes there is more to knowledge than a mere cognitive achievement. A further implication is that the anti-luck intuition comes apart from the achievement intuition, since Barney lacks knowledge in this case precisely because his belief is only luckily true. More generally, we can conclude that achievements only exclude one sort of malignant epistemic luck—that of the intervening variety—but leave a second type of malignant epistemic luck—that of the environmental variety—untouched. I have argued elsewhere that the best way of understanding the anti-luck constraint on knowledge is in terms of a ‘safety’ condition, a condition which demands, in essence, that one’s belief could not have easily be wrong. As we have just seen, however, there are (at least) two ways in which a belief can be unsafe and so not count as a case of knowledge, and the thesis that knowledge is to be understood as cognitive achievement only excludes one of them.

3. So there are cases of cognitive achievement that are not cases of knowledge, and hence the
thesis that knowledge is to be understood as a cognitive achievement is false. Interestingly, this is not the only problem facing this thesis, since there are also cases in which agents have knowledge and yet do not exhibit cognitive achievements.

Consider the case of Jennifer. Jennifer steps off the train in an unfamiliar city and goes up to the first person that she meets and asks for directions to a local landmark. Let us stipulate that the person that she speaks to has first-hand knowledge of the area and communicates what she knows to Jennifer, who subsequently heads off to her intended destination.

Many will have the intuition that Jennifer can gain knowledge in this case. Indeed, if she is unable to gain knowledge in this case then a great deal of what we presently take ourselves to know is under threat since it is gained in a similar trusting fashion. Interestingly, however, whatever else we might want to say about this case we surely do not want to say that Jennifer’s cognitive success represents a cognitive achievement on her part, since her cognitive abilities only played a minimal role in this knowledge acquisition. Her informant exhibits a cognitive achievement in knowing what she does about her town, and we might say that Jennifer’s cognitive success is therefore down to her and thus her achievement. But we certainly wouldn’t say that it was Jennifer’s achievement.

It is worth being clear about the nature of this claim. The thesis is not, for example, that Jennifer’s abilities played no role in the acquisition of this knowledge, which is the conclusion that some draw from this sort of case. After all, although it is true that Jennifer asked the first person that she met, I think we are implicitly assuming here that she is at least counterfactually sensitive to the issue of who would count as a good informant. For example, if the person she met were clearly a tourist, or a small child, or someone who was manifestly insane, then we would expect her to move on to another potential informant. Moreover, I take it that we are also assuming that Jennifer is at least counterfactually sensitive to relevant defeaters. If, for example, the informant were to give her directions which were clearly false—e.g., directions which sent her out of town, even though she knew that the landmark she is looking for is in town—then we would expect her to spot this and therefore treat the testimony with caution. The claim, then, is not that Jennifer’s cognitive success is not due to her cognitive abilities at all—indeed, I think it is essential that we need to read the example in such a way that Jennifer’s abilities are relevantly in play in order to maintain the intuition that she gains knowledge in this case—but simply that this cognitive success is not because of her
cognitive abilities, and so not a cognitive achievement.

We can illustrate this point by considering again the case of Archie. Suppose that this time Archie gets some help from an expert archer. Archie himself, while having some archery-relevant abilities—good eyesight, good hand-to-eye co-ordination etc.,—has never fired an arrow before, and so needs help from the expert archer if he is to hit the target. Let us suppose, then, that the expert archer stands behind Archie and assists him in pulling back the arrow, taking aim, holding his arm steady as he fires, and so on. Now suppose that Archie is successful in that he hits the target. Clearly, his abilities have played a role in this success, but the crucial question is whether they have played a sufficient role that this success would count as a success that was because of his abilities, and so a cognitive achievement on his part. I think it is clear that this is not the case. If anything, the cognitive achievement is down to the expert helper, or at least the collaborative efforts of Archie and the expert helper, but it is certainly not an achievement of Archie’s.

So sometimes there is less to knowledge than a cognitive achievement. Interestingly, notice that in the case of Jennifer, while the thesis that knowledge is a cognitive achievement is not satisfied, the thesis that knowledge entails safe belief is satisfied. For notice that if Jennifer were in an environment which was epistemically unfriendly—if, for example, nearly all of the potential informants were out to deceive her—then she would not be able to gain knowledge from her informant in this way, even if the informant she happened to chance to upon was indeed trustworthy. So while we have seen that the thesis that knowledge is a cognitive achievement is unsustainable, the thesis that knowledge entails safe true belief is not under threat.

4. I think that a key moral we should draw from the Barney and Jennifer cases is that we need to understand the achievement intuition in a much weaker fashion to how it is usually presented. In particular, I think the underlying thought here is not that knowledge is always a cognitive achievement, but rather that it is in the nature of knowledge that it be due in significant part to the relevant cognitive abilities of the agent, albeit not necessarily to an extent that the knowledge that results always constitutes cognitive achievement.

Moreover, a further moral we should draw is that it is essential to knowledge that it involves a safe true belief. We have already seen that it is mistaken to try to ‘beef-up’ the
ability requirement on knowledge, such that knowledge is identified with cognitive achievement, in order to capture this anti-luck constraint on knowledge since even the more robust ability requirement is unable to eliminate all types of malignant epistemic luck and, in any case, there are instances of knowledge in which the more robust ability requirement is not met. Moreover, it should also be clear that it would be mistaken to try to treat the anti-luck requirement as capturing any need for an ability condition, since a belief with all the necessary modal properties to satisfy the anti-luck condition but which is not formed through ability would not count as knowledge.

For example, suppose I form my beliefs simply by guesswork, but imagine that there is an evil demon of some variety whose job it is to ensure that every time I form a belief the world is adjusted so that my belief is true. In such a case, my true belief could not easily have been wrong, and thus it would be safe. Nevertheless, this clearly would not suffice for knowledge. The reason for this is that my cognitive success in no way relates to my cognitive ability. Indeed, I am not being responsive to the facts at all, but rather the facts are being responsive to me.

This suggests that the right account of knowledge is one in which we have both a safety requirement and an ability requirement, albeit where the latter can impose a relatively modest epistemic demand, consistent with the knowledge possessed by Jennifer in the case described above.

5. I want to suggest that this picture of how we should think about knowledge has some important implications for testimonial knowledge. As is familiar, the debate regarding the epistemology of testimonial belief has tended to cluster around two opposing positions, reductionism and credulism. The motivation for the former view is that testimony cannot be a source of knowledge all by itself, and thus that the epistemic standing of testimonial belief must be traceable back to non-testimonial sources, like observation. The motivation for credulism, in contrast, is the thought that reductionism places an unduly austere demand on testimonial belief and thus that it is essential that we allow that in at least some cases one can gain testimonial knowledge even though the reductionist requirement on testimonial knowledge is not met.

The debate regarding how we should best draw this distinction is messy at best, but
we do not need to pass judgement on this debate here. Instead, for our purposes we can be at least partly stipulative regarding how the distinction should be drawn. With this in mind, I will characterise reductionism as follows:

Reductionism
S has testimonial knowledge that \( p \) only if the epistemic standing of S’s true belief that \( p \) is entirely recoverable in non-testimonial terms.

Furthermore, we will define credulism as follows:

Credulism
There exist cases in which S has testimonial knowledge that \( p \) and yet no part of the epistemic standing of S’s true belief that \( p \) is due to non-testimonial factors.

While these formulations are stipulative, and will certainly fail to capture many of the positions in play in the debate regarding the epistemology of testimony, they do capture what I claim is the fundamental motivation for each view. In particular, the formulation of reductionism captures the fundamental motivation for reductionism that testimony is not itself a source of epistemic support. In contrast, the formulation of credulism captures the fundamental motivation for credulism that there exist cases in which an agent has testimonial knowledge and yet lacks any independent (i.e., non-testimonial) epistemic support for the target belief.

It should be clear that the account of knowledge under discussion here, which incorporates both an anti-luck and an ability requirement, does not naturally fall into either of these categories. Take the case of Jennifer described above. At first pass, one might characterise this example as offering support for the credulist thesis, in that Jennifer has testimonial knowledge and yet she has no independent epistemic support for her belief. Appearances are deceptive, however, in that we have already noted that Jennifer’s abilities are being brought to bear here. Moreover, the epistemic support provided to the belief by those abilities is clearly at least in part non-testimonial. For example, we credit her with knowledge in this case because, as noted above, she has a rough-and-ready ability to tell who would be a poor informant in this regard (e.g., a child, a tourist, etc.), and it is hard to see how an ability of this sort could be exclusively grounded in testimony that Jennifer has received.

That is, insofar as this is indeed a case in which would instinctively ascribe knowledge to Jennifer, then I take it that we would treat Jennifer as having all sort of
background information which is guiding these abilities, background information which cannot plausibly be completely gained via further testimony. For instance, Jennifer surely knows that small children are a poor source of geographical testimony, and the epistemic basis for this belief is almost certainly personal experience. Of course, for each element of the background information we can imagine a way in which this element was gained via further testimony without this threatening the epistemic standing of Jennifer’s testimonial belief. The point, however, is that to imagine that the entire background was gained in this way is to imagine a very different agent to the one that we suppose is active in this example. Moreover, we would not intuitively treat this agent as having knowledge.

Indeed, in order to bring this point into sharper relief, let us imagine that what Jennifer is trying to find out is not directions in an unfamiliar town, but rather the answer to the question of what ‘Il pleut’ means. Her situation is one of complete ignorance. She does not have any idea of what this phrase might mean, nor even what language it is in. Moreover, she is dropped in an unfamiliar place and given no information about the people who occupy this region. Furthermore, just for good measure, all the people in that region are disguised such that there is no way for Jennifer to know what sort of person she is talking to, young or old, male or female, etc. Suppose now that Jennifer asks the first person she meets for an answer to her question and this person, knowledgeable about the French language, informs her that the phrase means ‘It’s raining’. While looking for further support for this, she asks others, but they simply tell her that what the original informant told her was right.

I take it that no-one believes that Jennifer can gain knowledge in this case, and what is significant about the scenario for our purposes is that we have a case in which Jennifer is unable to bring her relevant cognitive abilities to bear but must instead rest content with her belief’s epistemic support being entirely testimonial. Clearly, however, support of this sort is inadequate to the task by itself, and this demonstrates that the operation of Jennifer’s ability in the usual formulation of the case implicitly brings into the picture non-testimonial support for Jennifer’s belief in the target proposition.

More generally, the point is this: knowledge on my view entails the operation of the relevant cognitive abilities, but the operation of the relevant cognitive abilities in the case of testimony entails that one’s belief enjoys at least some non-testimonial epistemic support. The account of knowledge on offer is thus straightforwardly incompatible with credulism as defined above.
Notice, however, that the account of knowledge on offer here, while incompatible with credulism, does not lend support to reductionism either. Indeed, it is incompatible with this thesis too. After all, there is no reason why this account of knowledge should insist that the epistemic support enjoyed by a belief that counts as testimonial knowledge should be entirely recoverable in non-testimonial terms. Perhaps, for example, the agent’s cognitive ability to detect bad informants in this environment is in part acquired via testimony (e.g., by people telling her who to trust on this score). So long as the true belief in question is appropriately related to the agent’s relevant cognitive abilities, and so long as it is in addition safe, then it qualifies as knowledge, even if a full reduction of the epistemic support of that belief to non-testimonial sources is unavailable.

6. The conception of testimonial knowledge that results is, I think, entirely in accordance with intuition. Moreover, it can accommodate the guiding motivations behind both reductionist and credulist views in the epistemology of testimony. On the one hand, the view can allow cases in which the agent’s cognitive abilities play a fairly minimal role in the acquisition of the knowledge, as in the case of Jennifer. Moreover, it can also capture the reductionist thought that testimony by itself is not a suitable source of knowledge.

Indeed, I think this account of knowledge can offer a neat diagnosis of why different conceptions of testimonial knowledge seem to place such different demands on what such knowledge involves. For notice that the reason why we are so sanguine about allowing Jennifer knowledge in the original case described above is precisely because the environment is so friendly. As a result, it is very easy for her to meet the anti-luck constraint on knowledge and, therefore, she need not exhibit very much in terms of cognitive ability in order to be counted as having knowledge. If the environment had been more unfriendly, however—if, for example, there had been a number of potential informants in the area who would have given false information—then I take it that we would not be nearly so quick to ascribe knowledge to Jennifer. The explanation for this, I suggest, is that meeting the anti-luck condition in this case would involve far more input from Jennifer, and thus it would be much harder for her to have knowledge (i.e., she would need to draw more on the successful operation of her relevant cognitive abilities).

Moreover, the reason why we do not ascribe knowledge in cases where the epistemic
support for the agent’s belief is entirely testimonial is that we have a strong intuition that knowledge is in part at least the product of cognitive ability, and yet we implicitly recognise that there is no sense to be made of cases in which an agent uses her cognitive abilities in order to gain testimonial knowledge and yet the belief that results enjoys only testimonial epistemic support.

It is an interesting question, however, how we should describe the view that results given that it does not fall into either the reductionist or the credulist camp as we have defined these positions above. For my part, I favour quasi-reductionism as the best description of the view, since I take it that what is core to the proposal is that some form of reduction is required for testimonial knowledge (that said, it would not, I think, be misleading to call the view quasi-credulism). Since the original characterisation of the reductionism/credulism dispute was partly stipulative, however, it is worth closing by saying a little more about where quasi-reductionism stands within the general geography of the contemporary debate regarding the epistemology of testimony.

7. One issue that is important here is that often in the debate between reductionism and credulism the respective points made by either side are essentially expressed in terms of non-testimonial grounds that the agent is able to cite in favour of her belief, with reductionism demanding such non-testimonial grounds and credulism allowing testimonial knowledge in the absence of non-testimonial grounds. If one thinks that the possession of citable non-testimonial grounds is the decisive factor in whether one’s view counts as credulist, then the view I am proposing here is a kind of credulism. After all, Jennifer could well be unable to actually offer non-testimonial grounds in favour of her belief, and yet I still want to count that belief as being an instance of knowledge.

I think, however, that characterising the distinction between reductionism and credulism in terms of citable—and thus, presumably, reflectively accessible—grounds is not particularly helpful since it is too closely ties the distinction to a specifically epistemic internalist demand for reflectively accessible grounds, rather than being agnostic (as it should be) on the epistemic externalism/internalism distinction.

Another issue that is important here is how the reductionist/credulist distinction plays out as regards epistemic standings that fall short of knowledge. After all, the characterisation
of this distinction offered above is specifically cast in terms of testimonial knowledge. Clearly, however, one can imagine parallel views as regards weaker epistemic standings. For example, one might claim that one’s testimonial belief can enjoy a positive epistemic standing, possibly even a justification, even in the absence of any non-testimonial epistemic support, while nonetheless denying that such a positive epistemic standing would suffice for testimonial knowledge. This would thus be a kind of credulism, albeit a weaker thesis to the view described above.

I think this is an important distinction to make, one that is actually quite useful for my purposes since it enhances the irenic credentials of my view. For notice that, in effect, quasi-reductionism about testimonial knowledge allows that some form of positive epistemic standing may be traceable to entirely testimonial support, and thus accords with the weak form of credulism. What it denies is simply the more robust—and therefore less intuitive—formulation of credulism which allows that testimonial knowledge can be possessed even in the absence of any non-testimonial epistemic support. Again, then, we find that quasi-reductionism can accommodate credulist intuitions.

8. It is my contention that reflecting on the nature of knowledge reveals that it imposes two distinct demands, one that is to be understood in terms of cognitive ability, and one that is to be understood in terms of safety. Bringing this conclusion to bear on the topic of the epistemology of testimonial belief highlights a new way of thinking about testimonial knowledge. This view—which I have here christened quasi-reductionism—can accommodate the motivations behind both reductionist and credulist proposals and therefore help us to see a way through the current impasse.9

REFERENCES

—— (Forthcoming). ‘What’s Wrong With Contextualism?’, The Philosophical Quarterly.
Lackey, J. (2007). ‘Why We Don’t Deserve Credit for Everything We Know’, Synthese 156.
—— (Forthcomingc). ‘Sosa On Epistemic Value’, Philosophical Studies.

NOTES

1 ‘Because of’ is here to be read in causal-explanatory terms. This raises a number of technical issues about how best to understand this relation that I have not the space to explore further here. For discussion of this topic, see Greco (2007; forthcomingb) and Pritchard (forthcominga).

2 This position is most explicit in recent work by Greco (e.g., 2002; 2007; forthcominga; forthcomingb), though the impetus for such a view is clearly earlier work by Sosa. For more on Sosa’s view in this regard, see especially Sosa (2007). See also Zagzebski (1996; 1999).

3 I explore the problem posed by barn façade-style cases for the thesis that knowledge should be identified with cognitive achievement further elsewhere. See Pritchard (2007b; forthcominga; forthcomingb). Kvanvig (forthcoming) makes a similar point. For a discussion of some possible lines of response to this type of objection, see Greco (2007; forthcominga; forthcomingb).

4 For more on safety, see Sosa (2000) and Pritchard (2002; 2005, ch. 6; 2006; 2007a).

5 What follows is a variation of a case offered by Lackey (2007).

6 This is the conclusion drawn by Lackey (2007), for example.

7 I develop this account of knowledge in more detail elsewhere. See, for example, Pritchard (2007b; forthcomingb).
I discuss the debate regarding how the distinction should be drawn in more detail in Pritchard (2004). The literature on the reductionism/credulism distinction in the epistemology of testimony is now so vast that it would take us too far afield to present a survey of the various positions. For an excellent overview of the contemporary debate, see Lackey & Sosa (2006).

Thanks to Daniel O’Brien for feedback on an earlier version of this paper.