I. Situation

Amy and Bob are stuck on an island. They will jointly agree on some kind of arrangement through a contract. It seems clear that whatever they agree to, there should be no alternative contract which will land at least one of them better off [1].

II. Perfect information

If there is perfect information, that is agents know their own and each others preferences and capabilities, the full set of resources on the island, how all of these resources can be mixed and transformed, and know the future outcomes that will occur to either the agents or the different resources. This implies that everything can be contractually settled at this original position.

Perfect information does not imply that no production occurs. Indeed if an asset can be used to create another asset, this can be incorporated in into it's value.

What does this mean? If the agents value having an asset for their whole lifetime and having monopoly over their asset, then this can occur in the contract. Amy and Bob can split all the assets as they like in the begining. If they Amy likes apples and Bob likes berry bushes, they can agree on a pareto point of assets.

In other words perfect knowledge implies a lack of need for an agreement about a property rights regime. Property rights are ex-post, there is no sense in discussing a property right acquisition regime if the agents can agree on something before. So for appropriation to be part of the initial contract, it is REQUIRED that either there is imperfect information, or the agents enjoy the process of appropriating in itself.

To reach a Pareto point in negotiation, it is necessary to have an initial endowment. The source of the initial endowment is not very important for our purposes, but perhaps the most intuitive way Bob and Amy would agree to endow the island would be that they both have half of every type of divisible asset on the island. From this initial endowment they can trade in the standard general equilibrium way. So for example if there are two bushes on the island, they each own one berry bush before trading. If there is an odd number of berry bushes they can assume half a berry bush each and presumably two half a berry bushes are worth a whole bush.

What if there are non divisible assets? Say there is some asset that loses its value if it's ownership is divided. In this case it seems like the two agents would have to make a mechanism to allocate them. Here we describe a simple such mechanism: both agents choose all possible combinations from the other agents initial set of divisible goods endowments. Amy and Bob look at each others super-sets and see if there is a set in there that they prefer to the asset. If there is at least one set that either of the two agents prefer, then the mechanism is done and that transfer occurs.

If they both cannot find a set which they agree for the transfer, the non-divisible asset can either be randomly allocated, but a more egalitarian outcome would be to flip a coin, Amy's side shows up. All of Amy's assets are transferred to Bob and Amy gets the non-divisible asset.

[1] Pareto equilibrium

The Rawlsian method of initial acquisition becomes a little more problematic when time is a variable. Time often has the effect of creating new agents. One could imagine that the agents agree that they will only use the resources once they exist or are born. There is an issue of what the initial endowment would be. For instance suppose that there is one asset and 4 periods. Agent A is born in period 0 and can consume in period 1,2,3,4. Agent B is born on period 2 can consume in periods 2-4. So the question is, A fully endowed with that asset in period 1 and 2? If both agent are fully endowed then clearly agent A won't consume in the last two periods. If the agents are endowed equally ONLY in the periods in which are they are alive then agent A won't.

III. Imperfect information and symmetric players

Amy and Bob run having imperfect information does not have to a imply a change in setup. Perhaps they can simply meet again and have another contractual agreement at every new discovery. This can introduce asymmetric information problems, 1) if all new resources are equally split there is no incentive to disclose new discoveries, 2) The cost of contracting at every new information may be high 3) The cost of discovery may be higher than the gain AFTER re-negotiation. All of these reasons make Amy and Bob more interested in using an appropriation rule.

If their cost of discovery is identical it seems intuitive that numerous appropriation rules could be acceptable some distinctions are in order. Upon discovery of an asset, the appropriation rule could either occur conditionally on some action or behavior or the appropriation could be automatic. An example of a costly rule is the Lockean rule, mixing labor with the land is time intensive. Here, game theoretic considerations are in order, a first best outcome is the outcome that would occur without game theoretic considerations. More detail below:

Let us take a situation where Amy and Bob are both running around in the island, exploring it more thoroughly as time progresses. They have the option at any point in time to keep exploring the island or to stop and do some other activity which will entail that they stop exploring. To illustrate, assume that they are simply searching for fertile land, and the alternative option would be to use the land, to say plant crops which could be consumed.

Why might the agents want to create a costly appropriation rule? A costly appropriation rule may be optimal because without a costly one they could OVER-discover. Suppose that upon discovery of an asset, Amy could simply appropriate it costlessly, perhaps by sticking a market on it, here she could simply move on further explore or plants crops. If Amy was ALONE, she would prefer to cultivate the land rather than discover more. Numerous reasons could be given for this, but the simplest is simply that she likes to a certain ratio of searching/cropping per day. However due to the game theoretic considerations, that is, if Amy does not appropriate the rest of the island, Bob will, so she is forced forced to over-appropriate. Ideally we would like to come up with an appropriation rule that gets us closer to the first best.

We need to favor the activity that would take place in the first best scenario so that it occurs with our rule. In other words, if the first best is to cultivate the land, one could think of a plethora of rules to make appropriation. For instance digging a hole that is 10 meter deep could be the appropriation rule. This does not seem to be a good candidate because, while it imposes an appropriation cost it does not seem to make the agents better off. It is best if the appropriation is NOT some arbitrary cost, but is instead a byproduct of something which adds value in itself. The obvious solution is simply to say that farming the land, is what causes the appropriation.