The Economics of Strategic Relationships

Part One

2022 — 2023

A key question

Which industries are more profitable, and which are less?

And why?

While there is no obvious measure of industry profitability, it is pretty clear that firms in some lines of business “do better” on average than do firms in other industries.

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Porter’s fives

Michael Porter, in the classic business strategy textbook *Competitive Strategy*,[4] provides a framework for trying to answer this question, called the Five Forces.

Let’s meet them one by one.

First force: barriers to entry

If firms within an industry are relatively profitable, the industry will attract new entrants, to the extent that there are no barriers in the way of those entrants.

And those new entrants will tend to compete away the relatively good profits that drew their attention. So, high barriers to entry tend to go along with supernormal profitability.

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Second force: substitutes and complementary products

Firms inside an industry are more profitable the higher the prices they can charge their customers.

Insofar as there are substitutes for what the firms are selling, they are limited in how high they can raise their prices.

Hence, an industry whose products have a lot of good substitutes is likely to be less profitable on average than one whose products have few, bad, or no substitutes.

On the other side, demand for an industry's products or services is higher the more available and cheaper are goods that are complementary to what they sell. (Automobile manufacturers are more profitable, for instance, when the price of fuel is lower.)

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Third force: supplier power

Suppose firms in an industry are making supernormal profits.

Suppliers to the industry, *if they can,* will suck those profits upstream, lowering those profits.

The key here is the *if they can*: It is a matter of the relative bargaining strength of the suppliers to the industry vis-a`-vis firms in the industry.

If there are lots of potential suppliers who compete among themselves, firms in the industry needn't worry much about having their profits sucked upstream. If a critical input to the industry is supplied by a single and powerful supplier, firms in the industry must worry, and perhaps even resign themselves to not being hugely profitable.

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Fourth force: customer power

Even if there are no good substitutes, customers may be able to bargain for low prices.

Suppose, for instance, that a large share of the retail market in a particular good is held by Walmart.

Firms that manufacture this good probably don’t get very high margins on what they sell to Walmart for resale.

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Fifth force: rivalry

The fifth and final of Porter’s forces is rivalry.

How hard do firms within the industry compete with one another?

If competition among firms in the industry is fierce, with price cutting and price wars the norm, profits will be relatively low. If firms in the industry compete in restrained fashion, profits are more likely to be relatively high.

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The economics of relationships

In the world of Strategic Management, Porter's Five Forces is one of the pillars of analysis.

But while it is one thing to say, "Think about rivalry in the industry," or "Gauge the relative bargaining positions of firms in the industry and their suppliers/ customers," it is another thing to know ***how*** to do this.

And while Porter provides some tendencies in how these factors affect profitability, these are only tendencies.

When we have a better, more nuanced understanding of how suppliers are connected to the industry in question, we might learn more: way more than that!!

The “way more”

A lot of that “way more” comes down to the ***relationships*** the firms within the industry have with one another and with their suppliers, customers, employees..

This is most obvious when it comes to the relationships

- between firms and their customers;
- between firms and their suppliers;
- between suppliers of labor inputs or, in other words, the employees of the firm.

It is all about relationships!!!

The road ahead

To carry out an intelligent analysis of the Five Forces, you need to understand the nature of economic relationships.

So, let’s get started by learning a language for modeling and analyzing relationships.

Non Cooperative Game Theory

Summary

1) We discuss two ways to model multiparty interactions, strategic-form and extensive- form games.

2) We show how to analyze these models using dominance analysis and Nash-equilibrium analysis.

Our work horse story

Two friends, Sam (she) and Jan (he), must decide independently where to spend a Tuesday evening after work.

The three possible choices are a bar named Old Pros, an art museum, and a coffee house named Cafeen.

Sam and Jan have preferences over these three spots, but they also have a general desire to be together, rather than apart. More specifically:

> Sam’s first choice is to be with Jan at Old Pros, second is to be with Jan at the art museum, third is to be alone at Old Pros, fourth is to be with Jan at Cafeen, fifth is to be at the art museum alone, and last is alone at Cafeen.

> Jan’s ranking is, from best to worst, be with Sam at Cafeen, be with Sam at the art museum, be with Sam at Old Pros, be alone at the art museum, be alone at Cafeen, and be alone at Old Pros.

		Jan's choice		
		Old Pros	Art Museum	Cafeen
Sam's choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

What can we say?

If we have the payoffs of Sam right, we can be fairly sure that Sam is not going to Cafeen. No matter what Jan does, Sam is better off going to Old Pros than to Cafeen.

		Jan's choice		
		Old Pros	Art Museum	Cafeen
Sam's choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

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What can we say?

Suppose Jan is familiar enough with Sam to know Sam's payoffs for the nine outcomes.

Then Jan should conclude that Sam is not going to Cafeen.

Once there is no chance of this, Jan's payoffs are such that he prefers the art museum with or without Sam to being at Cafeen without Sam.

		Jan's choice		
		Old Pros	Art Museum	Cafeen
Sam's choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

So, we conclude — on the basis of our assumptions — that Jan will not choose Cafeen

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Two objections

Being at Cafeen with Sam is Jan’s first choice. If Sam and Jan are friends, is there no chance that Sam will sacrifice her own interests to please Jan?

If the two friends get together frequently, might not Sam sacrifice her own interests on this one occasion, ex- pecting that Jan would reciprocate in the future?

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Two objections

In real life, the answer to both questions is, Yes, this is possible.

But if these are possibilities, then:

> (1) We are unsure about Sam's payoffs. If she prefers to please Jan and sacrifice her own selfish interests, then the ranking we assumed for her is incorrect.
>
> (2) If the two friends face this sort of situation repeatedly, the "game" they play is a lot more complex than a one-shot choice of a place to go.

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Let’s try and go further

i.e. rule those objections out

1. We are left with the conclusions that Sam will not choose Cafeen
2. If Jan realizes this, neither will he.
3. But this still leaves Sam and Jan each with a choice of either the art museum or Old Pros.
4. Now we reach an impasse.

5.

		Jan’s choice		
		Old Pros	Art Museum	Cafeen
Sam’s choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

Try and go further

If Jan could anticipate that Sam would go to the art museum, the art museum is his best response.

If he anticipates that she would go to Old Pros, Old Pros is his best response.

The same is true of Sam; her best choice is to match whatever she anticipates he would do.

Logic alone does not seem to answer the question, Where will they wind up?

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		Jan's choice		
		Old Pros	Art Museum	Cafeen
Sam's choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

Try and go further

If we cannot say how Sam and Jan will coordinate their actions, can we at least predict that they will?

That depends.

If they could converse on the phone beforehand, it seems likely they will do so.

If they have to guess at what each other will do, they might not.

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Suppose Jan moves first

Suppose for a moment that Jan chooses a location, goes there, and phones Sam, saying reliably and credibly, “I’m at location X, and I’m not moving.” (which is in sharp contrast with our assumptions)

What do we predict?

Jan would reason as follows: “If I go to Old Pros, Sam will follow me there. If I go to the art museum, Sam will follow me there. If I go to Cafeen, Sam will go to Old Pros. So predicting Sam’s responses, I’m best off going to the art museum.”

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		Jan’s choice		
		Old Pros	Art Museum	Cafeen
Sam’s choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

Watch this out!

This example is all the flesh our class is made of!

1) When Sam and Jan move simultaneously, they engage in a game in which their strate- gies are simple actions and, therefore, our figure represents their situation as a **strategic-form game.**

2) When we rule out Sam going to Cafeen, we are applying a dominance argument. Jan's decision in consequence not to go to Cafeen is an application of **iterated dominance.**

3) If Jan gets to move first, though, and Sam, having learned Jan's choice, responds, then the game is converted to a simple **extensive-form game of complete and perfect information**, which is simple enough that we can apply **backward induction**, to conclude that Jan goes to the art museum and Sam follows.

Modelling real world situations as games

A game-theoretic model has the following pieces:

- A list of individuals or parties involved, called the ***players***.

- The ***rules*** of the game, which specify the options the players have, when they must make their various choices, and what information they will possess when they must choose.

- For every possible play of the game, a **pay-off** for each player.

Players

- This is easy: those who play, act, choose, you name it.

Rules

- These can be specified in either of two ways, as a ***strategic-form*** or an ***extensive-form*** game.

Strategic form games

- In a strategic-form game, we specify for each player a list of his/her/its *strategies*.
- A **strategy** is a complete plan for playing the game, for any one of the players. Depending on how complex the game is, strategies can be ferociously complex.

But, in simple games, strategies are usually fairly simple. For instance:

- In the Sam and Jan game, Sam and Jan must make a single choice where to go, and they must choose independently.
- Hence, each has three strategies, namely (1) go to Old Pros, (2) go to the art museum, or (3) go to Cafeen.

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Strategic form games

But suppose we change the way the game is played. Specifically, suppose Jan chooses where to go first, goes there, and then Sam, knowing Jan’s choice, responds.

Strategic games

Jan has a simple choice of Old Pros, the art museum, and Cafeen; Jan has three strategies.

But Sam's strategies are more complex, because Sam has to plan what she will do contingent on what she learns about Jan's choice.

One strategy for Sam is to go to Old Pros no matter what Jan does.

A second is to go to Old Pros if Jan goes to Old Pros and to go to the art museum if Jan goes to either the art museum or to Cafeen.

Since Sam has to choose one of three places to go and she must plan her choice in each of three "**information states**," Sam has 3 x 3 x 3 = 27 strategies under these rules.

Strategic games

Given a list of strategies for each player, the term *strategy profile* is used for a vector of strategy choices, one for each player.

In the Sam and Jan game where the two must choose simultaneously, and so each has three strategies, there are 3 ⇥ 3 = 9 strategy profiles.

In the formulation where Jan chooses first where to go, Sam learns Jan's choice, and then Sam decides how to respond, Jan has three strategies and Sam has 27, so there are 3 x 27 = 81 strategy profiles!!

As to payoffs…

So, in the original formulation with nine strategy profiles, if Jan chooses to go to Old Pros and Sam chooses the Art Museum, the payoff to Jan is 1 and the payoff for Sam is 2.

		Jan's choice		
		Old Pros	Art Museum	Cafeen
Sam's choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

As to payoffs…

Or, in the formulation where Jan chooses first and Sam responds:

suppose Jan's choice of strategy "go to the art museum"

and Sam chooses the strategy "go to the Old Pros if Jan goes to Old Pros, go to the art museum if Jan goes to the art museum, go to Old Pros if Jan goes to Cafeen."

Then the *outcome* under this particular strategy profile is that they both end up at the art museum, and so we assign payoffs of 5 to both Sam and Jan

		Jan's choice		
		Old Pros	Art Museum	Cafeen
Sam's choice	Old Pros	6,4	4,3	4,2
	Art Museum	2,1	5,5	2,2
	Cafeen	1,1	1,3	3,6

…can be very cumbersome…

Sam's strategy:
Where to go, given Jan's choice

If Jan chooses Old Pros, go to:	If Jan chooses Museum, go to:	If Jan chooses Cafeen, go to:
Old Pros	Old Pros	Old Pros
Old Pros	Old Pros	Art Museum
Old Pros	Old Pros	Cafeen
Old Pros	Art Museum	Old Pros
Old Pros	Art Museum	Art Museum
Old Pros	Art Museum	Cafeen
Old Pros	Cafeen	Old Pros
Old Pros	Cafeen	Art Museum
Old Pros	Cafeen	Cafeen
Art Museum	Old Pros	Old Pros
Art Museum	Old Pros	Art Museum
Art Museum	Old Pros	Cafeen
Art Museum	Art Museum	Old Pros
Art Museum	Art Museum	Art Museum
Art Museum	Art Museum	Cafeen
Art Museum	Cafeen	Old Pros
Art Museum	Cafeen	Art Museum
Art Museum	Cafeen	Cafeen
Cafeen	Old Pros	Old Pros
Cafeen	Old Pros	Art Museum
Cafeen	Old Pros	Cafeen
Cafeen	Art Museum	Old Pros
Cafeen	Art Museum	Art Museum
Cafeen	Art Museum	Cafeen
Cafeen	Cafeen	Old Pros
Cafeen	Cafeen	Art Museum
Cafeen	Cafeen	Cafeen

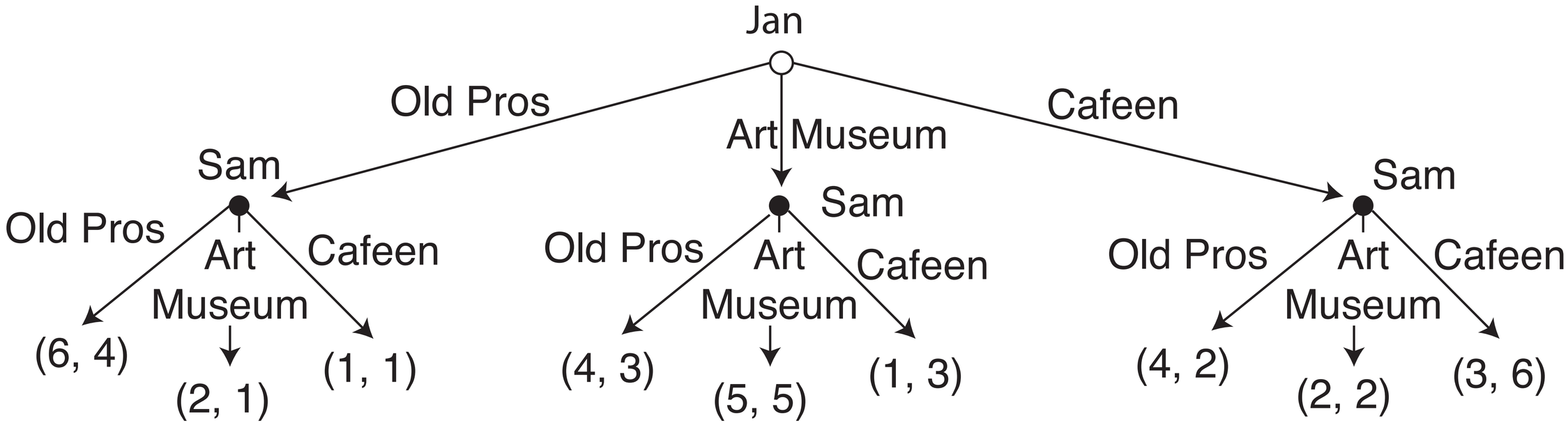
Jan's strategy:
Where to go

Old Pros	Art Museum	Cafeen
6,4	4,3	4,2
6,4	4,3	2,2
6,4	4,3	3,6
6,4	5,5	4,2
6,4	5,5	2,2
6,4	5,5	3,6
6,4	1,3	4,2
6,4	1,3	2,2
6,4	1,3	3,6
2,1	4,3	4,2
2,1	4,3	2,2
2,1	4,3	3,6
2,1	4,3	4,2
2,1	4,3	2,2
2,1	4,3	3,6
2,1	5,5	4,2
2,1	5,5	2,2
2,1	5,5	3,6
1,1	1,3	4,2
1,1	1,3	2,2
1,1	1,3	3,6
1,1	5,5	4,2
1,1	5,5	2,2
1,1	5,5	3,6
1,1	1,3	4,2
1,1	1,3	2,2
1,1	1,3	3,6

Extensive form games

In extensive-form games, an alternative way to depict (model) a competitive situation, the emphasis is on the dynamic back-and-forth tactics of the players.

The second version of the Sam and Jan game provides an ideal example.


Jan
Old Pros
Art Museum
Cafeen
Sam
Old Pros
Art
Museum
Cafeen
(6, 4)
(2, 1)
(1, 1)
Sam
Old Pros
Art
Museum
Cafeen
(4, 3)
(5, 5)
(1, 3)
Sam
Old Pros
Art
Museum
Cafeen
(4, 2)
(2, 2)
(3, 6)

Extensive form games

1. There are ***nodes*** (one open circle and some filled-in circles);

2. ***labels*** on each node, where each node is labelled with the name of one of the players;

3. ***moves***, which are depicted by arrows leading from one node to another node, with labels on the arrows that give the name of the particular move; and, at the end of each sequence of moves (or each path from the open circle, which is where the game begins, to the “end” of the game);

4. ***payoffs*** for the players.

Information sets

A (seemingly) weird question: Can we model the original formulation of the Sam and Jan game, where the two must choose simultaneously, with an extensive-form game?

Suppose that Sam does choose before Jan.

If we put Sam's choice first and Jan's second, Jan does not know, when it is his turn to choose, what Sam has chosen.

Of course, this makes a difference. How do we record this difference?

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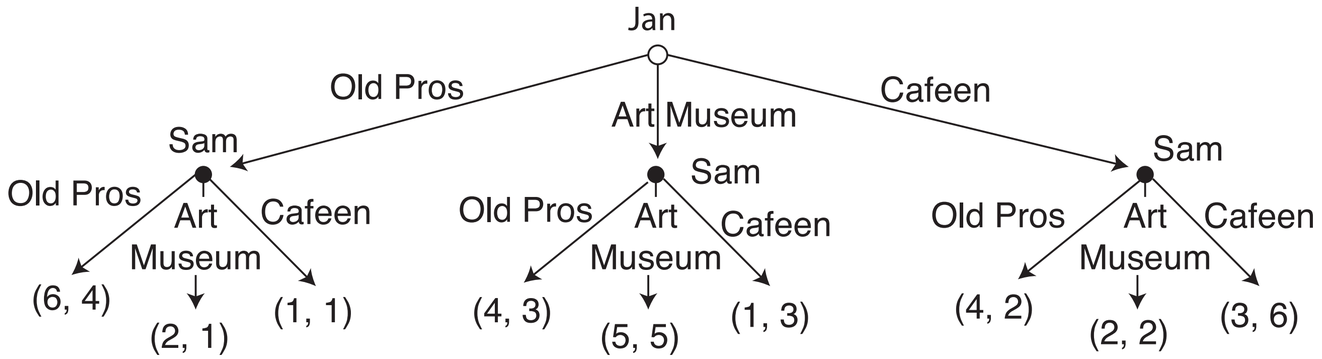
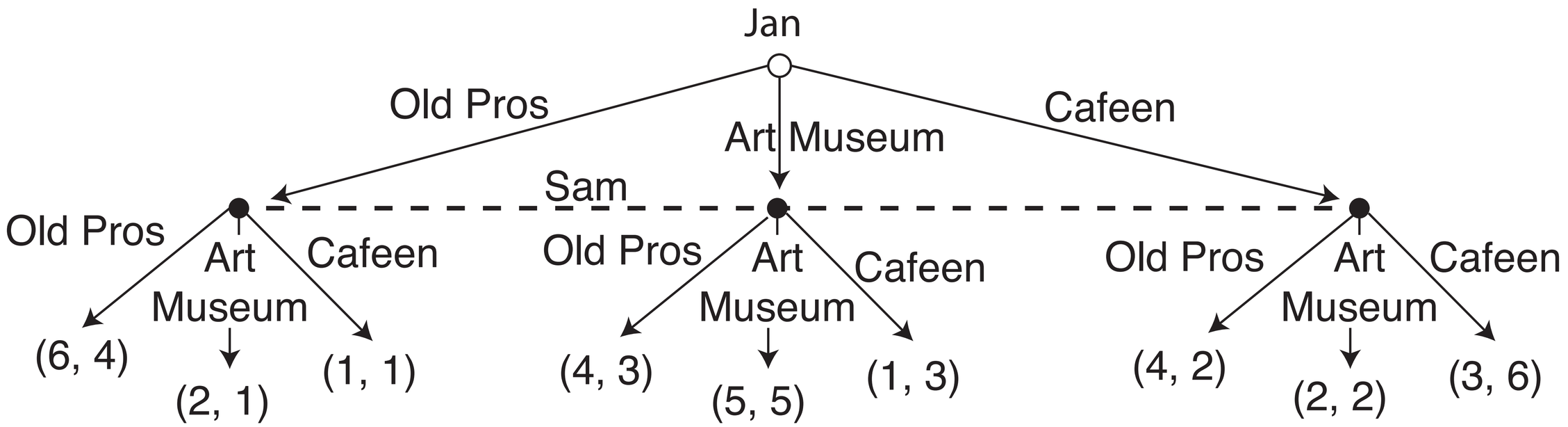


Information sets



Information sets

The device used is called an *information set*.

We have joined the three nodes that belong to Sam (where she must choose) with a dashed line.

This indicates that, when Sam must choose, she isn’t provided with information about which of these three situations prevails.

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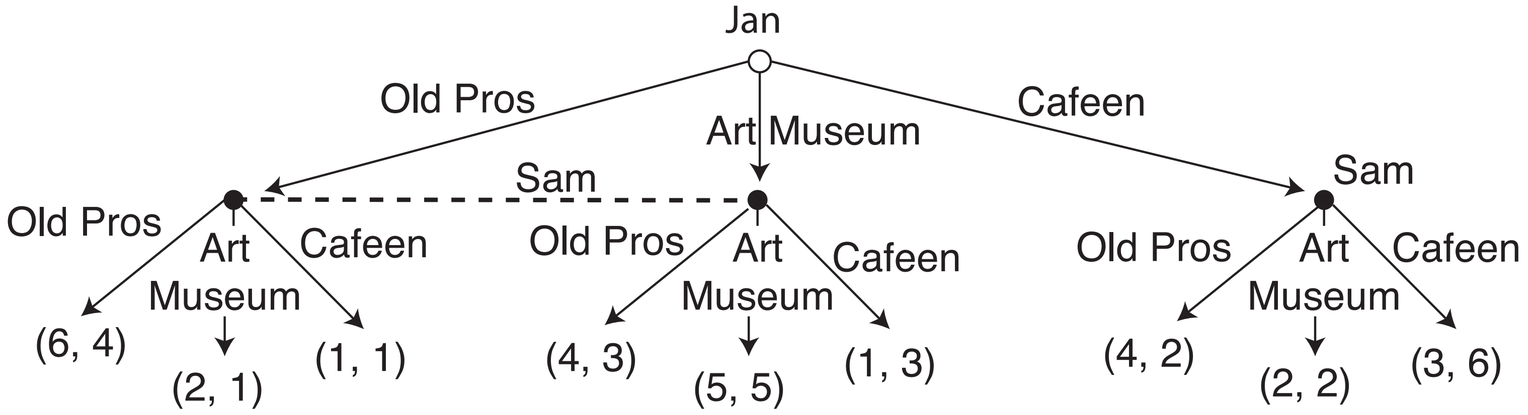
Information sets

Suppose the situation is that Jan chooses first and then, if Jan chooses Cafeen, Sam **is informed of this**.

If Sam doesn’t receive this information, she knows that Jan didn’t choose Cafeen, but she doesn’t know whether Jan chose Old Pros or the art museum.

How would we depict this?

…answer in the following figure…



Sam has two information sets.

One, depicted by the dashed line, consists of the two nodes following choices of Old Pros or the art museum by Jan.

The second, which doesn’t need a dashed line because it consists of a single node, is where Jan has chosen Cafeen