# Relation 3: Product-Producer

## Preamble

(Girju et al., 2005) name this relation "MAKE/PRODUCE" and define it as "an animated entity creates or manufactures another entity". They have two versions of it, depending on the directionality. For example in "honey bee" the modifier (honey) is the product and the head (bee) is the producer. In "GM car" the direction is reversed – the modifier (GM) is the producer and the head (car) is the product.

Levi (1979) also has two versions of her "MAKE" relation, which differ by their directionality: MAKE1 is "product-producer", while MAKE2 is "producer-product". Some examples of hers MAKE1 are: "honeybee", "silkworm", "musical clock", and "sebaceous glands". Examples of MAKE2: "daisy chains", "snowball", "consonantal patterns", and "molecular chains".

## Definition

Product-Producer (X, Y) is true for a sentence S that mentions entities X and Y if and only if:

(1) X and Y appear close in the syntactic structure of S (so for example we do not assign the relation to entities from separate clauses in a composite clause);

(2) according to common sense, the situation described in S entails the fact that X is a product of Y, or Y produces X. Here X is the product and Y is the producer.

## Definition – restrictions

(a) The producer should be actively involved in the process of bringing the product into existence and not just serve as a raw material.

(b) The product can be any concrete or abstract object.

## Definition – notes

(i) The relation applies to both physical and abstract products and producers.

(ii) Product-Producer can overlap with Purpose-Tool, e.g. "supercomputer business".

(iii) If the producer is serving as a raw material for the product (e.g., in "olive oil", suppose "olive" is the producer and "oil" is the product), then the producer must be actively involved in the process of bringing the product into existence (thus "olive" is not suitable as the producer of the product olive oil). Passive things do not count as producers when a second agent (the real producer) is required to act on the raw material to convert it to the final product (e.g., a person must squeeze the olives in a press to make olive oil). Passive things may count as producers when the raw material they produce is also the final product (i.e., there is no further processing required; no second agent is needed).

(iv) The product should not be an occurrence (e.g., a state, action, or activity). Occurrences are too brief and transitory to count as products.

(v) The producer can be a process (e.g., in "wine produced by fermentation", we allow wine as the product and fermentation as the producer).

## Positive examples

"The <e1>honey</e1> <e2>bee</e2> is the third insect genome published by scientists, after a lab workhorse, the fruit fly, and a health menace, the mosquito."
WordNet(e1) = "n2", WordNet(e2) = "n2", Product-Producer(e1, e2) = "true"

**Comment:** This is a typical example of Product-Producer. Condition (2) is fulfilled: the bees do produce honey.

"This 8 day <e1>music</e1> <e2>clock</e2> needs winding only once a week."
WordNet(e1) = "n2", WordNet(e2) = "n1", Product-Producer(e1, e2) = "true"

**Comment:** This is a typical example of Product-Producer. Restriction (a) is fulfilled: the clock is actively involved in playing the music.

"The reactor will aim to turn sea water into fuel by mimicking the way the <e2>sun</e2> produces <e1>energy</e1>."
WordNet(e1) = "n3", WordNet(e2) = "n2", Product-Producer(e1, e2) = "true"

**Comment:** Another typical example of Product-Producer. Condition (2) is fulfilled.

"The goat, sheep, water buffalo, camel, and <e2>cow</e2> all give nourishing <e1>milk</e1>."
WordNet(e1) = "n3", WordNet(e2) = "n3", Product-Producer(e1, e2) = "true"

**Comment:** This is a typical example of Product-Producer. Condition (2) is fulfilled: cows do produce milk.

"That year, summer students at the VLA made the first discovery of <e1>radio emission</e1> from a <e2>brown dwarf star</e2>."
WordNet(e1) = "n1", WordNet(e2) = "n3", Product-Producer(e1, e2) = "true"

**Comment:** This is an example of Product-Producer. Condition (2) is fulfilled.

"An <e2>arbitrageur</e2> makes <e1>money</e1> by taking advantage of a small price disparity, selling in one market while buying in the other."
WordNet(e1) = "n3", WordNet(e2) = "n1", Product-Producer(e1, e2) = "true"

**Comment:** This is a positive example. Here the product money is used in the abstract sense of "wealth reckoned in terms of money". Restriction (b) allows for abstract products and is thus fulfilled.

"The essence of the new <e1>philosophers</e1>' <e2>theory</e2> was to challenge the (French) stereotype that an intellectual was necessarily a left-wing intellectual, such as illustrated by Jean-Paul Sartre or, in a completely different stance, Michel Foucault."
WordNet(e1) = "n2", WordNet(e2) = "n1", Product-Producer(e1, e2) = "true"

**Comment:** This is an example of a Product-Producer relation in a metaphorical sense. The sentence fulfills condition (2): the philosophers do "produce" the theory.

"The survival of spinoff Cray Computer Corp. as a fledgling in the <e1>supercomputer</e1> <e2>business</e2> appears to depend heavily on its chairman Seymour Cray."
WordNet(e1) = "n1" WordNet(e2) = "n2" Product-Producer(e1, e2) = "true"

**Comment:** This is an example of a Product-Producer relation in a metaphorical sense. This could also be seen as a Purpose-Tool(e1, e2) relation.

## Near-miss negative examples

"All <e2>olive</e2> <e1>oil</e1> —which is, after all, fat—has 120 calories per tablespoon (33 kJ/mL)."
WordNet(e1) = "n3", WordNet(e2) = "n1", Product-Producer(e1, e2) = "false"

**Comment:** The sentence violates restriction (a) since the olive is only passively involved in the production of the oil. This should be Origin-Entity(olive,oil),.

"She's working on a collar and lead made of <e2>alligator</e2> <e1>leather</e1> with diamond and gold charms."
WordNet(e1) = "n1", WordNet(e2) = "n2", Product-Producer(e1, e2) = "false"

**Comment:** The sentence violates restriction (a), since the alligator is not actively participating in the production of the leather. This should be Origin-Entity(alligator,leather).

"Bishop is out to settle his score with Claude Malloche, an international <e2>assassin</e2> responsible for the <e1>death</e1> of Bishop's brother."
WordNet(e1) = "n8", WordNet(e2) = "n2", Product-Producer(e1, e2) = "false"

**Comment:** The sentence violates restriction (b), because the product cannot be an occurrence. This should be Cause-Effect(assassin, death).

"At an individual level, mental <e2>illness</e2> is one of the biggest causes of personal <e1>unhappiness</e1> in our society."
WordNet(e1) = "n2", WordNet(e2) = "n1", Product-Producer(e1, e2) = "false"

**Comment:** The sentence violates restriction (b), because the product cannot be an occurrence. This should be Cause-Effect(illness, unhappiness).

"<e2>War</e2> only causes destructions and <e1>death</e1>."
WordNet(e1) = "n8", WordNet(e2) = "n1", Product-Producer(e1, e2) = "false"

**Comment:** The sentence violates restriction (b), because the product cannot be an occurrence. This should be Cause-Effect(war,death).

"Playing a <e1>music<e1> <e2>instrument</e2> opens up a lot of possibilities to enrich your life."
WordNet(e1) = "n5", WordNet(e2) = "n4", Product-Producer(e1, e2) = "false"

**Comment:** The sentence violates restriction (a), because the instrument is only passively involved in the process of music production. This should be Purpose-Tool(music, instrument).

"A <e2>windstorm</e2> which roared through North Idaho and eastern Washington late Thursday made a <e1>mess</e1> of area utility systems."
WordNet(e1) = "n1", WordNet(e2) = "n1", Product-Producer(e1, e2) = "false"

**Comment:** Restriction (b) is violated: the product here (mess) is not a concrete or an abstract object. This should be a Cause-Effect(windstorm, mess).