管理学统计分析快速上手指南

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目录

简介

本书涵盖管理学 (特别是微观管理) 研究中常用的方法，诸如问卷调查分析方法、实验法、元分析等。适用于研究生、科研人员以及对管理学研究方法感兴趣的读者。

Chapter 1

调节与中介分析

1.1 线性关系

1.1.1 调节与中介效果的检验步骤

自 (**Baron1986:RNG**) 关于调节与中介效果的检验经典文章以来，调节与中介效果的检验已经非常成熟，甚至现在有所谓的调节的中介与中介的调节。

社会科学尤其是管理学，未来以后肯定会有大的方法上的突破，现有的管理学研究范式已经进入了相对瓶颈期。鉴于目前国内期刊上很多关于中介与调节的检验不是很正确，下文给出相对正确的检验步骤。

调节效果的检验步骤：

- 第一步，如果有控制变量，先放入控制变量与结果变量进行回归；
- 第二步，将自变量与控制变量一起与结果变量进行回归；
- 第三步，将控制变量、自变量、调节变量一起与结果变量进行回归；
- 第四步，将控制变量、自变量、调节变量、自变量与调节变量的乘积项一起与结果变量进行回归，自变量与调节变量的乘积项显著，则调节作用存在。

需要注意的是：在验证调节作用时，通常需要将自变量与调节变量中心化以降低共线性的可能性。

中介效果的检验步骤：

最有效最直接也最简单的方法是使用 Bootstrapping，诸如 SPSS、Mplus 等软件都可以轻易实现，便捷高效。

以下列出我所认为相对不错的中文论文供大家参考：

[1] 方杰, 张敏强, 李晓鹏. 中介效应的三类区间估计方法 [J]. 心理科学进展, 2011, 19(5):765-774.

[2] 刘冰, 齐蕾, 徐璐. 棍棒之下出 “孝子” 吗——员工职场偏差行为研究 [J]. 南开管理评论, 2017, 20(3):182-192.

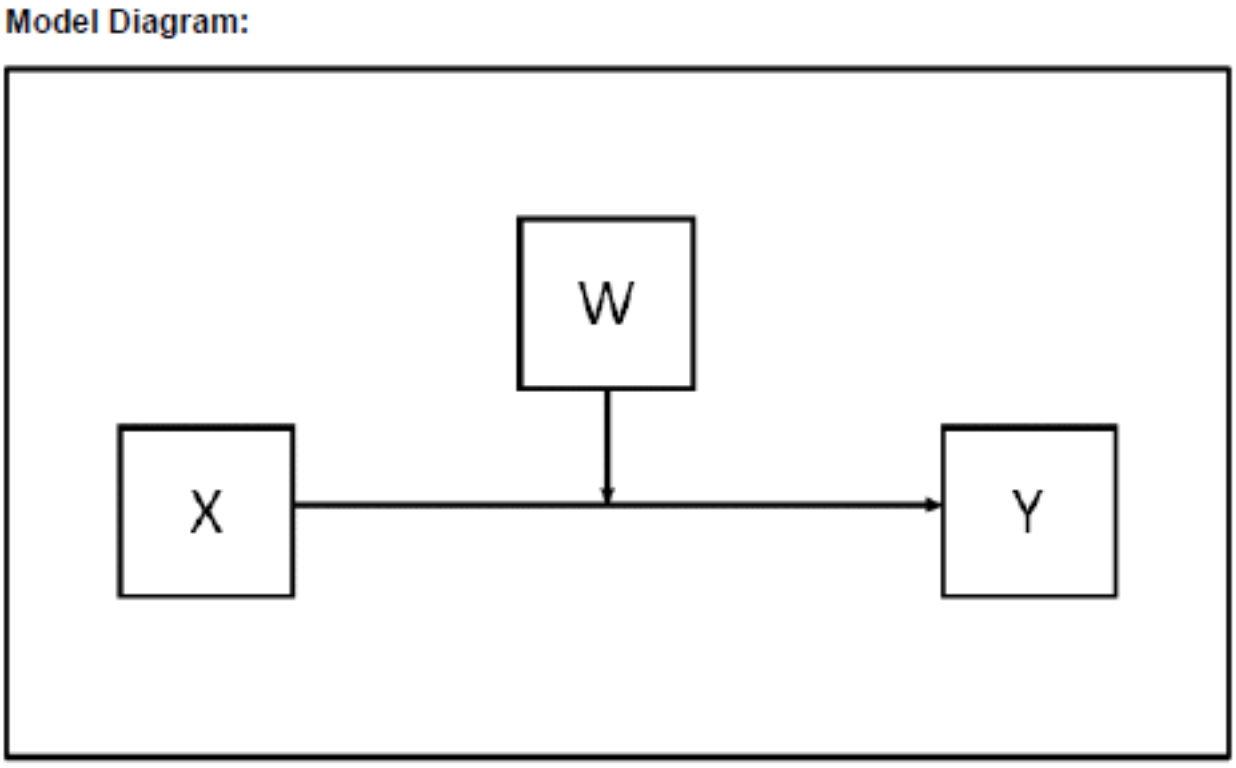
[3] 芦谢峰, 韩立敏. 中介变量、调节变量与协变量——概念、统计检验及其比较 [J]. 心理科学, 2007, 30(4):934-936.

[4] 温忠麟, 张雷, 侯杰泰. 有中介的调节变量和有调节的中介变量 [J]. 心理学报, 2006, 38(3):448-452.

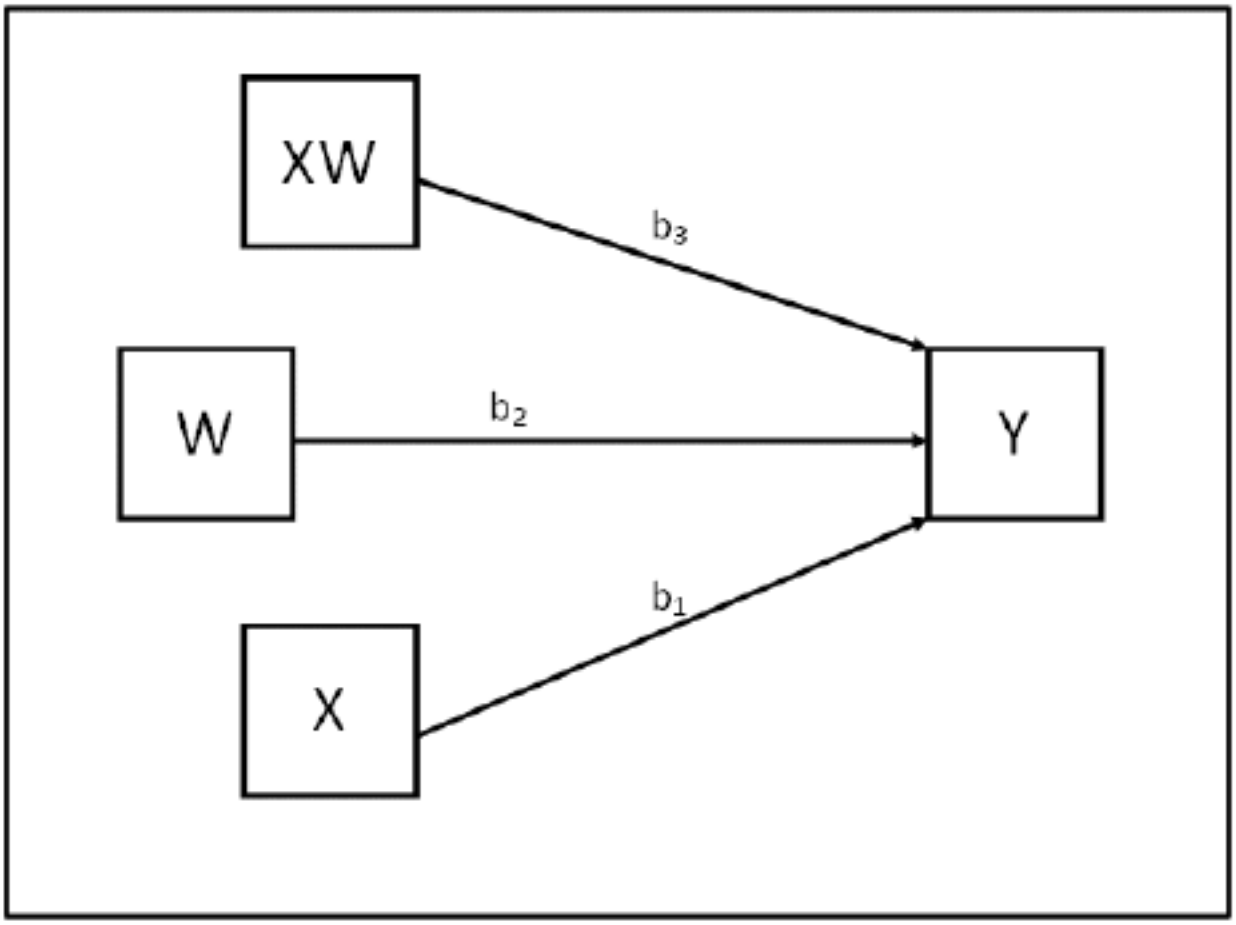
其中，刘冰等 (2017) 这篇文章关于调节与中介的检验较为标准，所以我列出供大家参照借鉴。

1.1.2 管理学研究常用调节效应检验 Mplus Code

1. 只有一个调节变量



Statistical Diagram:

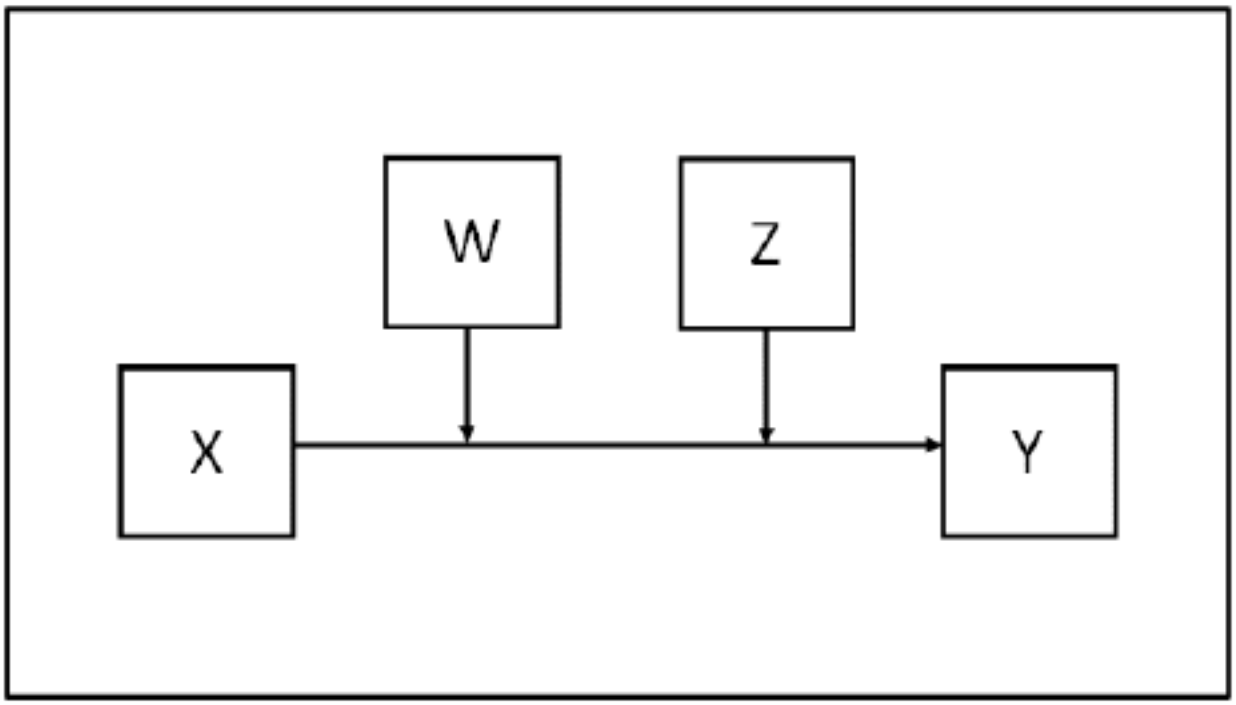


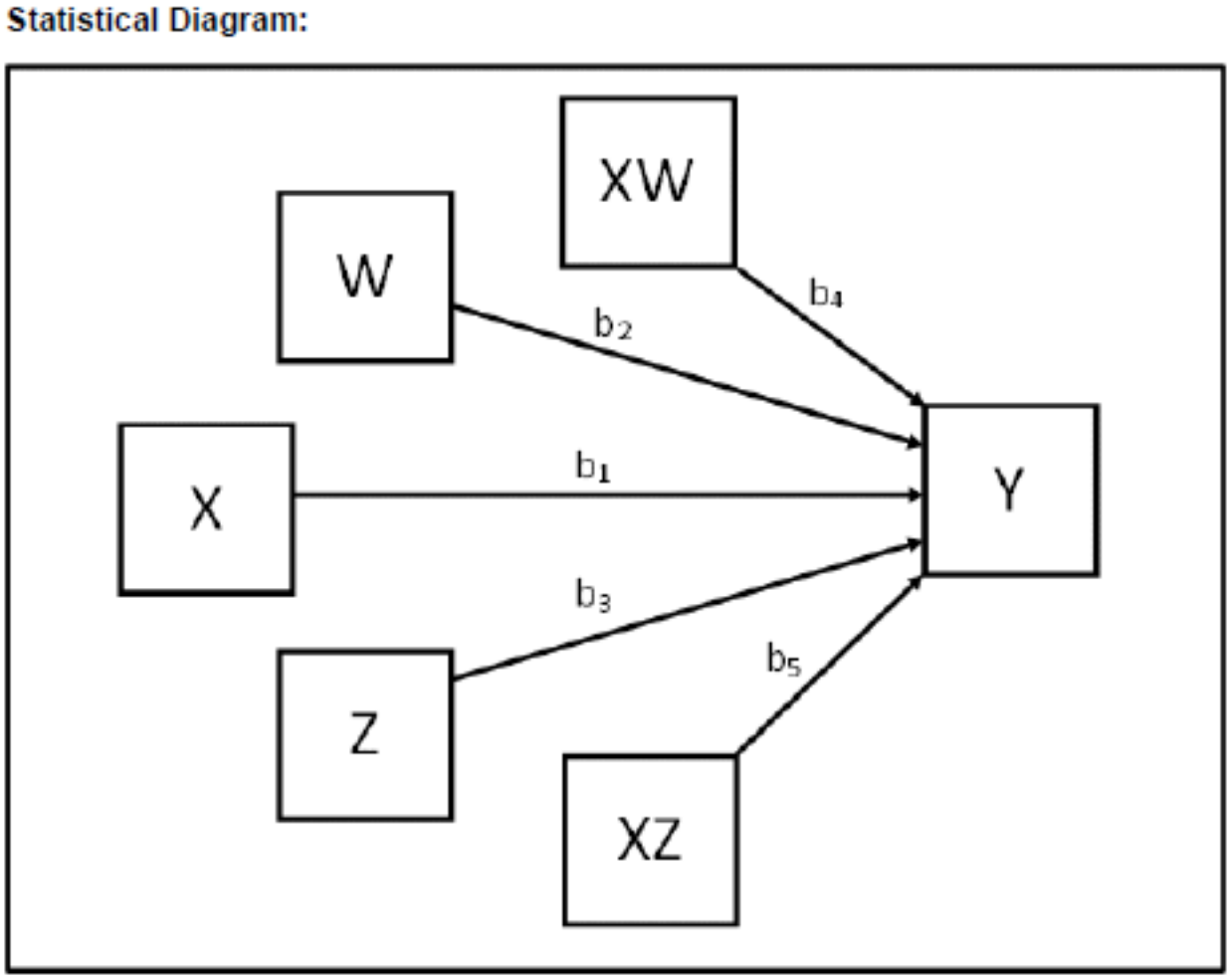

```
USEVARIABLE = X W Y XW;
DEFINE:
  XW = X*W;
ANALYSIS:
  TYPE = GENERAL;
  ESTIMATOR =  ML;
  BOOTSTRAP = 5000;
MODEL:
  [Y](b0);
  Y ON X(b1);
  Y ON W(b2);
  Y ON XW(b3);
MODEL CONSTRAINT:
  NEW(LOW_W HIGH_W SIMP_LO SIMIP_HI DIFF);
```

```
  LOW_W = #LOWW; ! replace #LOWW in the code with your chosen low value of W
  HIGH_W = #HIGHW; ! replace #HIGHW in the code with your chosen high value of W
! Now calculate simple slopes for each value of W
  SIMP_LO = b1 + b3*LOW_W;
  SIMP_HI = b1 + b3*HIGH_W;
  DIFF = SIMP_HI - SIMP_LO;
OUTPUTE:
  STAND CINT(bcbootstrap);
```

2. 存在两个并列的调节变量

Model Diagram:



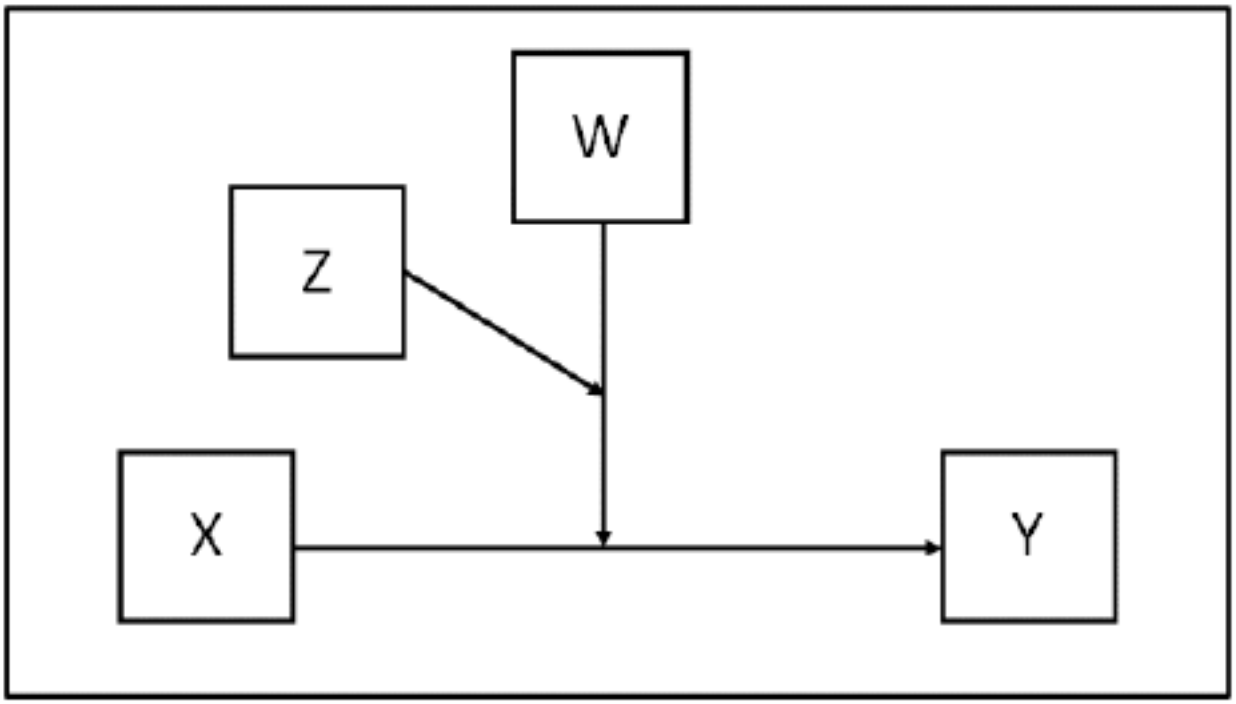



```
USEVARIABLES = X W Y XW XZ;
DEFINE:
  XW = X*W;
  XZ = X*Z;
ANALYSIS:
  TYPE = GENERAL;
  ESTIMATOR = ML;
  BOOTSTRAP = 5000;
MODEL:
  [Y](b0);
  Y ON X(b1);
  Y ON W(b2);
  Y ON Z(b3);
  Y ON XW(b4);
```

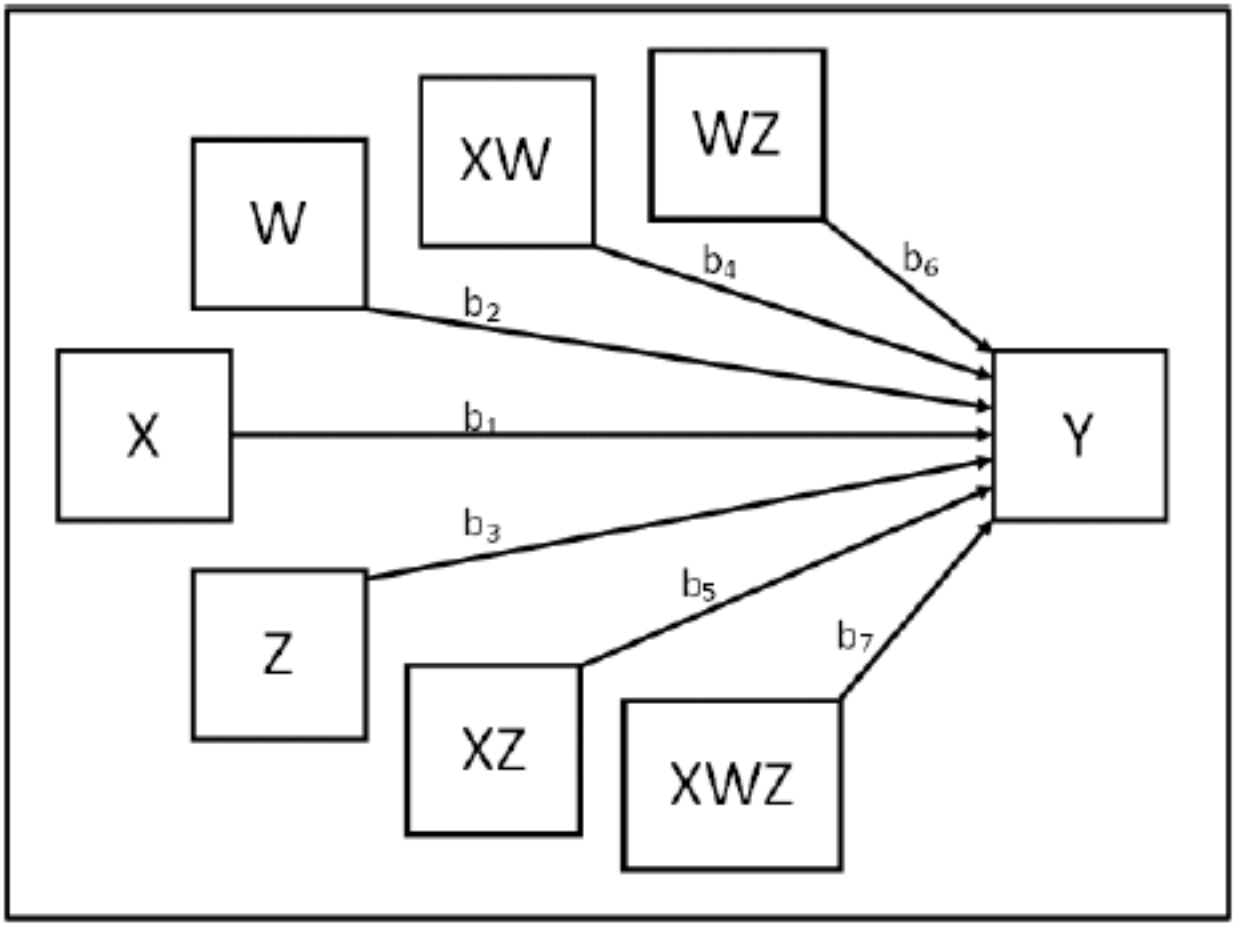
```
  Y ON XZ(b5);
 MODEL CONSTRAINT:
   NEW(LOW_W HIGH_W LOW_Z HIGH_Z LOW_LOZ HIW_LOZ LOW_HIZ HIW_HIZ DIFF1 DIFF2 DIFF3 DIFF4 DIFF5 DIFF6)
   LOW_W = #LOWW; ! replace #LOWW in the code with your chosen low value of W
   HIGH_W = #HIGHW; ! replace #HIGHW in the code with your chosen high value of W
   LOW_Z = #LOWZ; ! replace #LOWZ in the code with your chosen low value of Z
   HIGH_Z = #HIGHZ; ! replace #HIGHZ in the code with your chosen high value of Z
 ! Now calc simple slopes for each value of W and Z
   LOW_LOZ = b1 + b4*LOW_W + b5*LOW_Z;
   HIW_LOZ = b1 + b4*HIGH_W + b5*LOW_Z;
   LOW_HIZ = b1 + b4*LOW_W + b5*HIGH_Z;
   HIW_HIZ = b1 + b4*HIGH_W + b5*HIGH_Z;
   DIFF1 = LOW_LOZ - HIW_LOZ;
   DIFF2 = LOW_LOZ - LOW_HIZ;
   DIFF3 = LOW_LOZ - HIW_HIZ;
   DIFF4 = HIW_LOZ - LOW_HIZ;
   DIFF5 = HIW_LOZ - HIW_HIZ;
   DIFF6 = LOW_HIZ - HIW_HIZ;
OUTPUT:
  STAND CINT(bcbootstrap);
```

3. 调节的调节效应

Model Diagram:



Statistical Diagram:




```
USEVARIABLES = X W Y XW XZ WZ XWZ;
DEFINE:
  XW = X*W;
  XZ = X*Z;
  WZ = W*Z;
  XWZ = X*W*Z;
ANALYSIS:
  TYPE = GENERAL;
  ESTIMATOR = ML;
  BOOTSTRAP = 5000;
MODEL:
  [Y] (b0);
  Y ON X(b1);
  Y ON W(b2);
```

```
  Y ON Z(b3);
  Y ON XW(b4);
  Y ON XZ(b5);
  Y ON WZ(b6);
  Y ON XWZ(b7);
  MODEL CONSTRAINT:
  NEW(LOW_W HIGH_W LOW_Z HIGH_Z LOW_LOZ HIW_LOZ LOW_HIZ HIW_HIZ DIFF1 DIFF2 DIFF3 DIFF4 DIFF5 DIFF6);
  LOW_W = #LOWW; ! replace #LOWW in the code with your chosen low value of W
  HIGH_W = #HIGHW; ! replace #HIGHW in the code with your chosen high value of W
  LOW_Z = #LOWZ; ! replace #LOWZ in the code with your chosen low value of Z
  HIGH_Z = #HIGHZ; ! replace #HIGHZ in the code with your chosen high value of Z
! Now calc simple slopes for each value of W and Z
  LOW_LOZ = b1 + b4*LOW_W + b5*LOW_Z + b7*LOW_W*LOW_Z;
  HIW_LOZ = b1 + b4*HIGH_W + b5*LOW_Z + b7*HIGH_W*LOW_Z;
  LOW_HIZ = b1 + b4*LOW_W + b5*HIGH_Z + b7*LOW_W*HIGH_Z;
  HIW_HIZ = b1 + b4*HIGH_W + b5*HIGH_Z + b7*HIGH_W*HIGH_Z;
   DIFF1 = LOW_LOZ - HIW_LOZ;
   DIFF2 = LOW_LOZ - LOW_HIZ;
   DIFF3 = LOW_LOZ - HIW_HIZ;
   DIFF4 = HIW_LOZ - LOW_HIZ;
   DIFF5 = HIW_LOZ - HIW_HIZ;
   DIFF6 = LOW_HIZ - HIW_HIZ;
OUTPUTE:
  STAND CINT(bcbootstrap);
```

1.1.3 常见中介效应

重点：

首先介绍只有一个中介变量的单中介模型；然后介绍具有多个中介变量的并列中介模型；最后介绍具有多个中介变量的中介链模型。

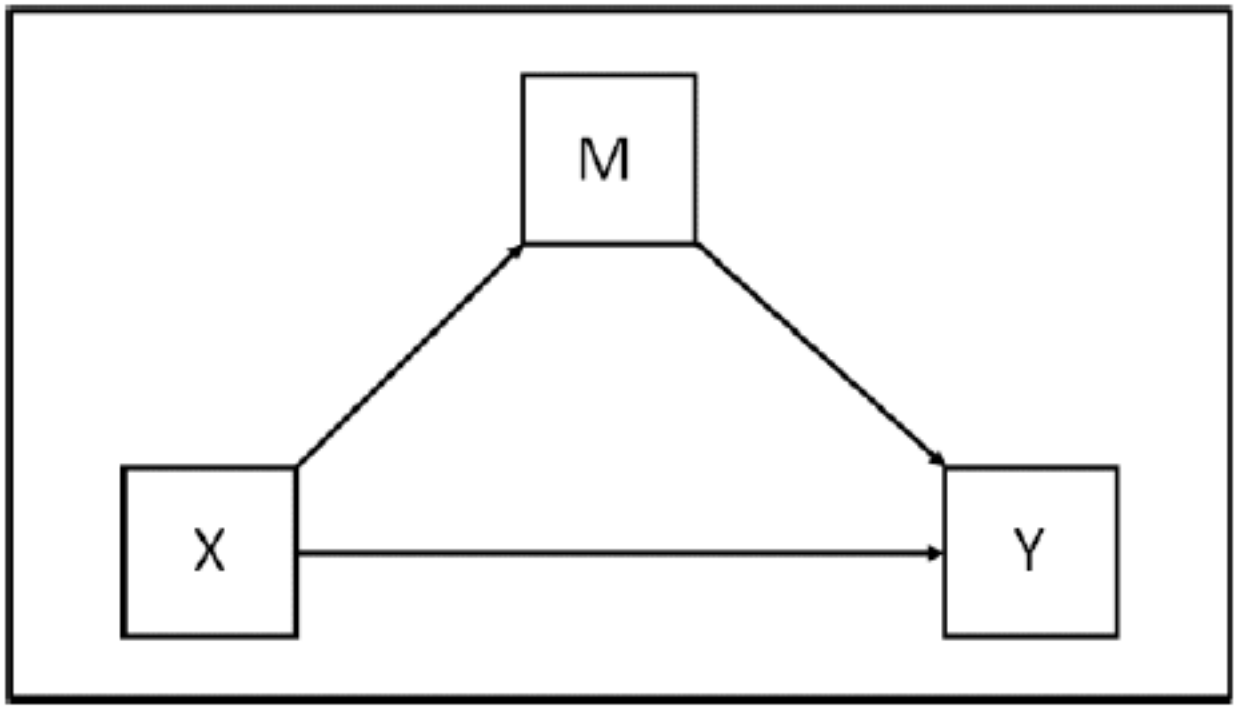
需要说明的是，以上中介效应模型的分类名称是我结合自身的理解命名，大家可能不太熟悉，明白就好。比如链式中介、连续中介等，其实就是我所阐述的中介链。

开始之前，还想结合阅读的文献以及自己的理解，想跟大家阐述一下间接效应与中介效应的区别。

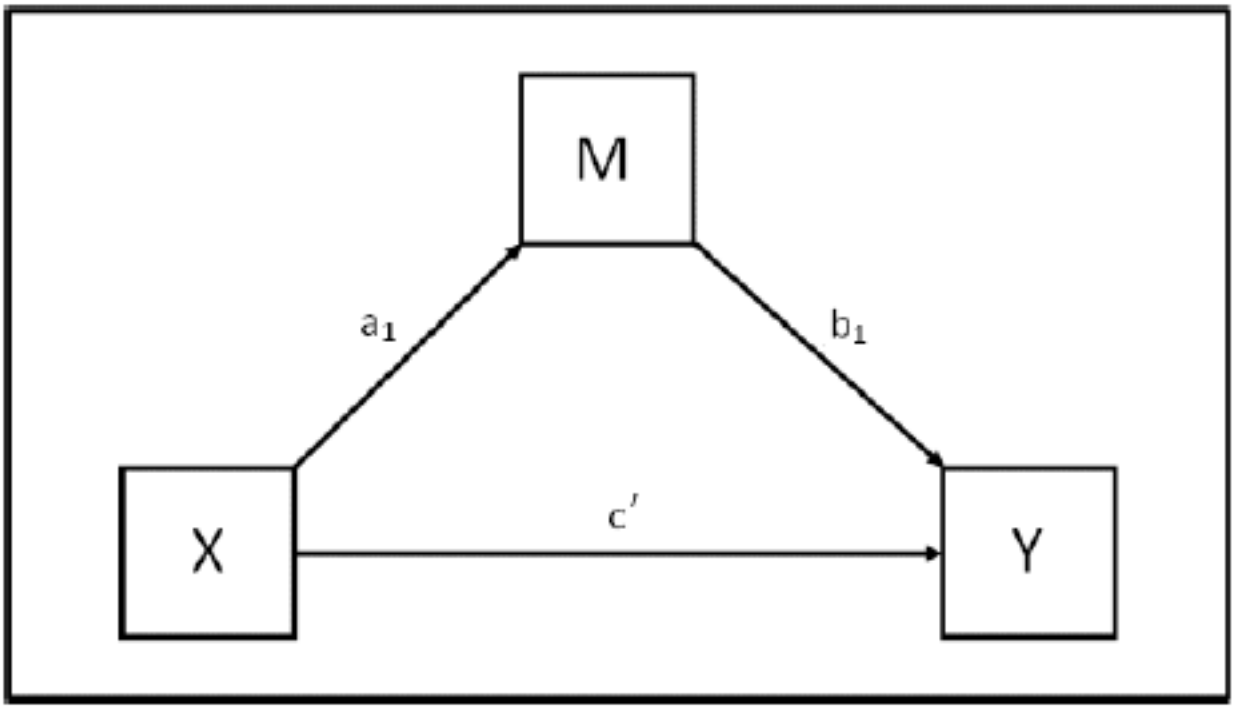
简言之，间接效应 (Indirect Effect) 实质上等同于中介效应 (Mediation Effect)。只不过提及间接效应的假设时，通常不会提主效应 (X→Y)，只会提 X→M→Y 的关系假设。此外，心理统计类论文通常只会出现 indirect effect，而不会出现 mediation effect。~~我的推测是，当有 direct effect 的说法后，说 indirect effect 可能更直觉。~~

1. 单中介模型的 Mplus code

Model Diagram:



Statistical Diagram:

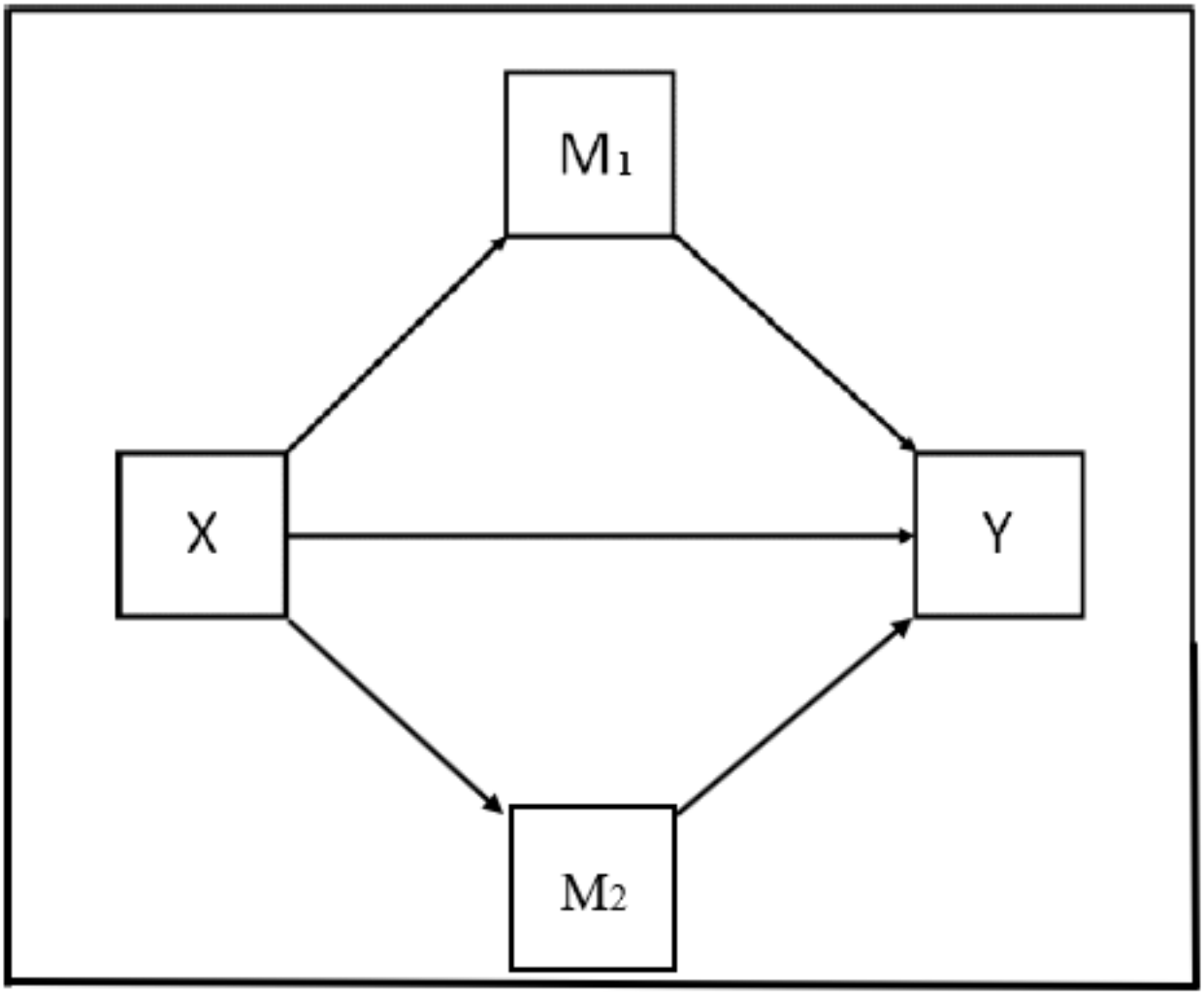


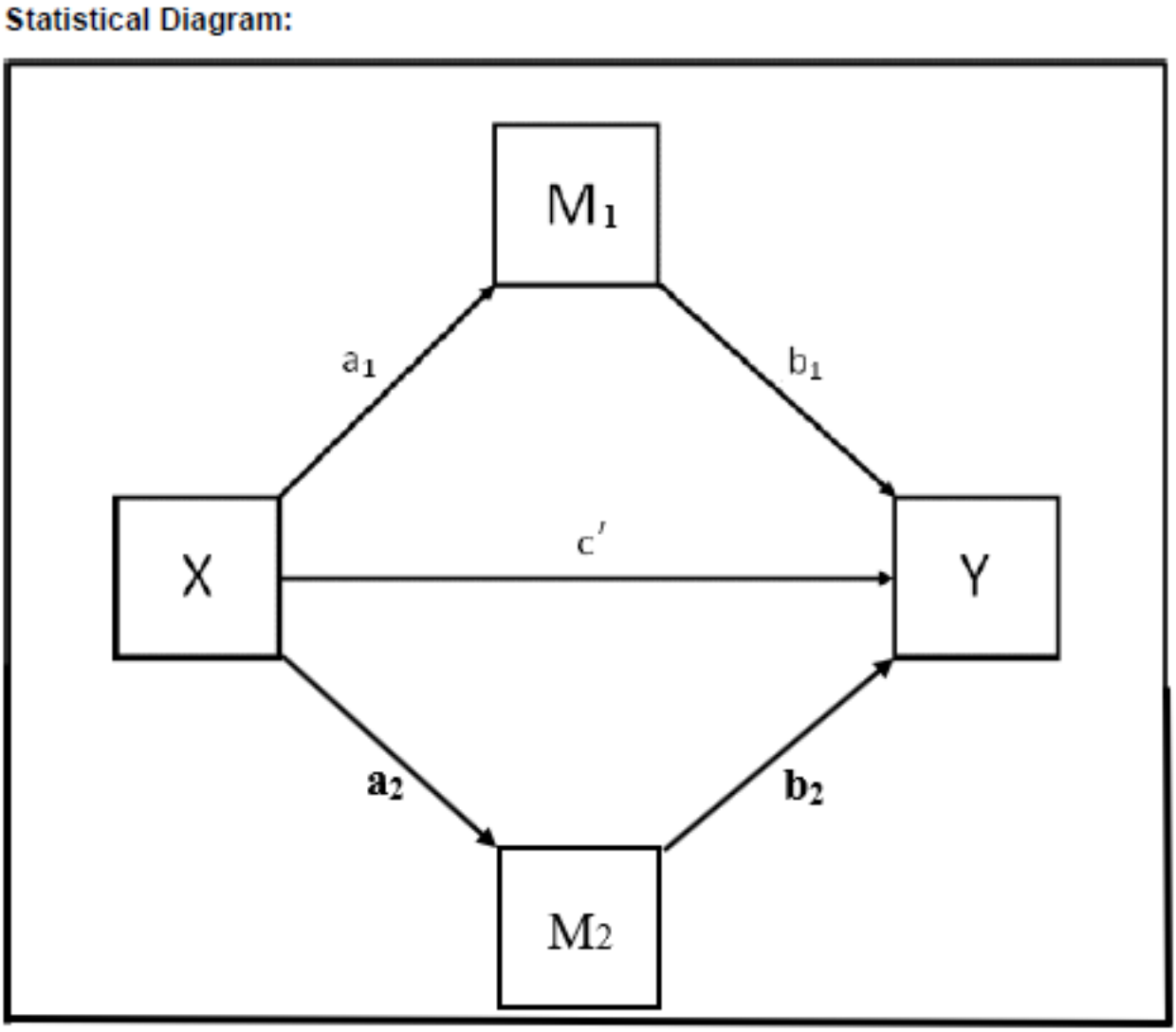
```
USEVARIABLES = X M Y;

ANALYSIS:
  TYPE = GENERAL;
  ESTIMATOR = ML;
  BOOTSTRAP = 10000;

! In model statement name each path using parentheses
MODEL:
  Y ON M (b1);
  Y ON X (cdash); ! direct effect of X on Y
  M ON X (a1);
! Use model constraint to calculate indirect and total effect
  MODEL CONSTRAINT:
  NEW(a1b1 TOTAL);
    a1b1 = a1*b1; ! Indirect effect of X on Y via M
    TOTAL = a1*b1 + cdash; ! Total effect of X on Y

OUTPUT:
  STAND CINT(bcbootstrap);
```

2. 并列中介模型的 Mplus code

以常见的双重并列中介为例：

Model diagram



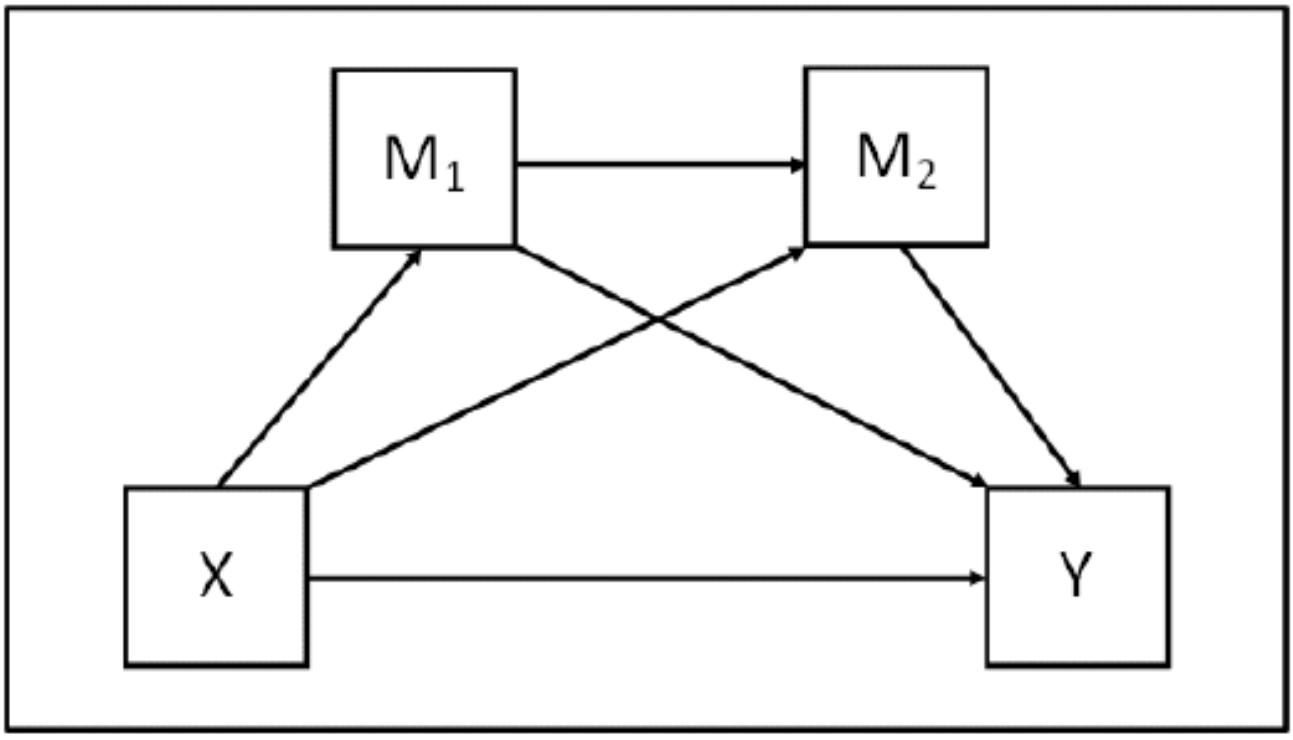



```
USEVARIABLES = X M1 M2 Y;

ANALYSIS:
  TYPE = GENERAL;
  ESTIMATOR = ML;
  BOOTSTRAP = 10000;

! In model statement name each path using parentheses
MODEL:
  Y ON M1 (b1);
  Y ON M2 (b2);
```

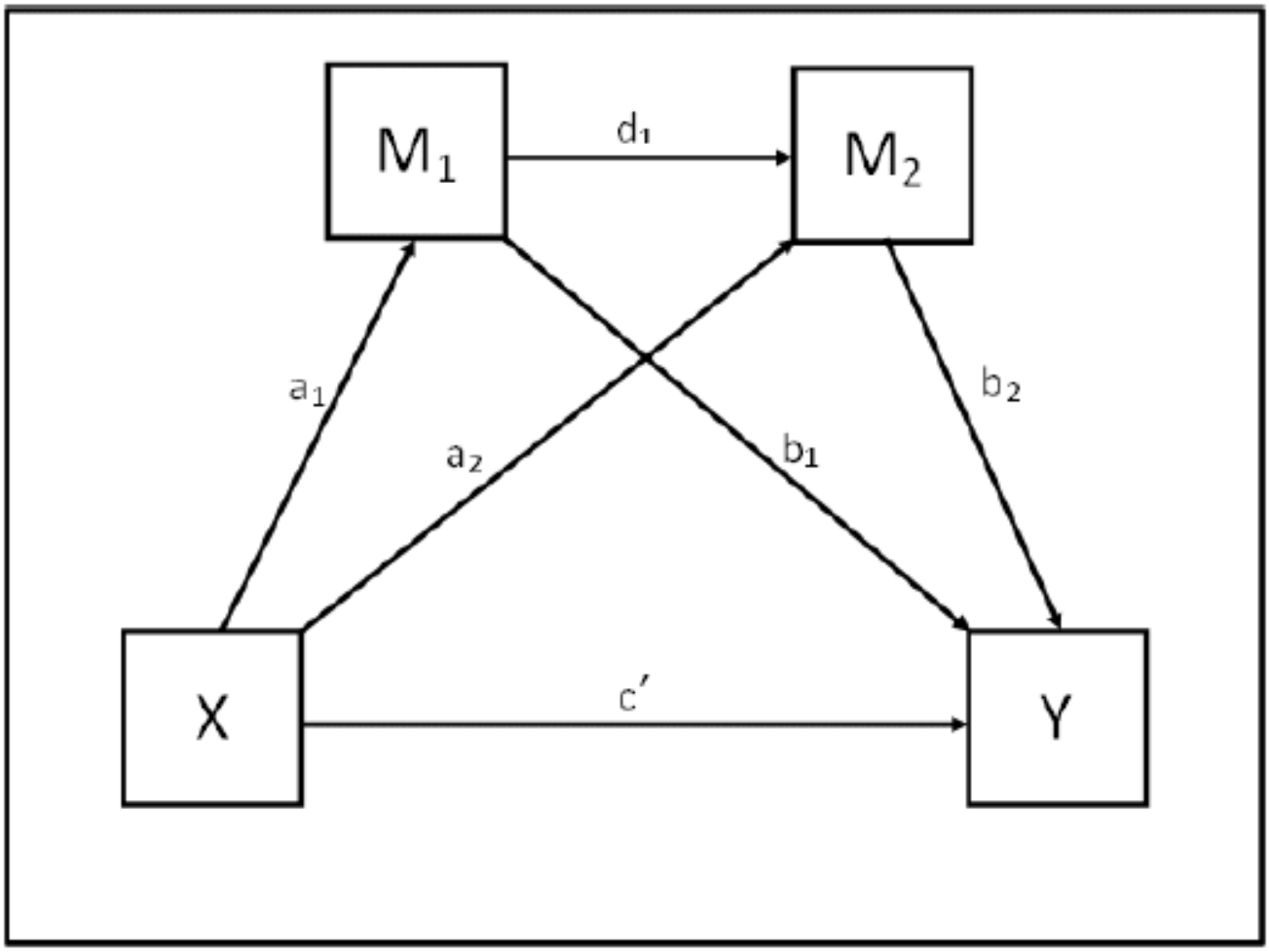
```
  Y ON X (cdash); ! direct effect of X on Y
  M1 ON X (a1);
  M2 ON X (a2);
! Use model constraint to calculate indirect and total effect
  MODEL CONSTRAINT:
  NEW(a1b1 a2b2 TOTAL);
    a1b1 = a1*b1; ! Indirect effect of X on Y via M1
    a2b2 = a2*b2; ! Indirect effect of X on Y via M2
    TOTAL = a1*b1 + a2*b2 + cdash; ! Total effect of X on Y

OUTPUT:
  STAND CINT(bcbootstrap);
```

3. 中介链模型的 Mplus code

Model Diagram:



Statistical Diagram:




```
USEVARIABLES = X M1 M2 Y;

ANALYSIS:
  TYPE = GENERAL;
  ESTIMATOR = ML;
  BOOTSTRAP = 10000;

! In model statement name each path usingparentheses
MODEL:
  Y ON X (cdash); ! direct effect of X on Y
  Y ON M1 (b1);
  Y ON M2 (b2);
```