Why Do Borrowers Default on Mortgages? A New Method for Causal Attribution

Peter Ganong and Pascal Noel

UChicago and NBER

November 20, 2020

Sources of mortgage default

Ben Bernanke (2008): "To determine the appropriate public- and private-sector responses to the rise in mortgage delinquencies and foreclosures, we need to better understand the sources of this phenomenon.

*In good times and bad, a mortgage default can be triggered by a **life event**, such as the loss of a job, serious illness or injury, or divorce.*

*However, another factor is now playing an increasing role in many markets: declines in **home values**."*

Sources of mortgage default

Ben Bernanke (2008): "To determine the appropriate public- and private-sector responses to the rise in mortgage delinquencies and foreclosures, we need to better understand the sources of this phenomenon.

*In good times and bad, a mortgage default can be triggered by a **life event**, such as the loss of a job, serious illness or injury, or divorce.*

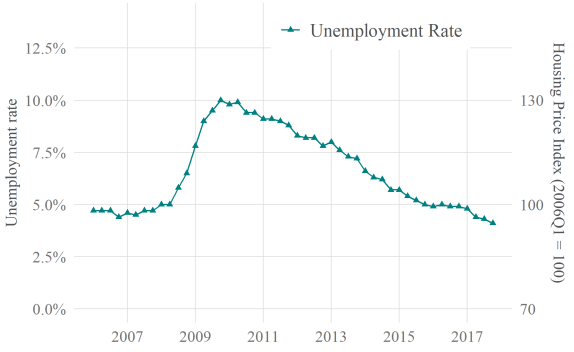
*However, another factor is now playing an increasing role in many markets: declines in **home values**."*

Sources of mortgage default

Ben Bernanke (2008): "To determine the appropriate public- and private-sector responses to the rise in mortgage delinquencies and foreclosures, we need to better understand the sources of this phenomenon.

In good times and bad, a mortgage default can be triggered by a ***life event****, such as the loss of a job, serious illness or injury, or divorce.*

However, another factor is now playing an increasing role in many markets: declines in ***home values****."*

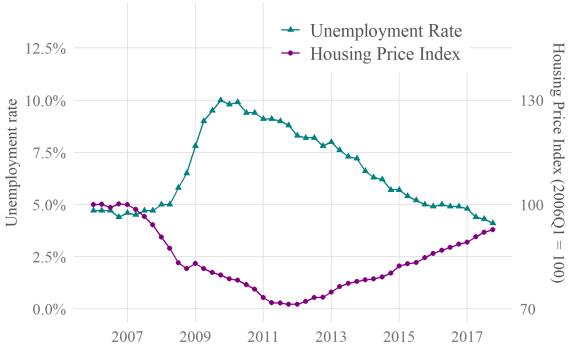


Sources of mortgage default

Ben Bernanke (2008): "To determine the appropriate public- and private-sector responses to the rise in mortgage delinquencies and foreclosures, we need to better understand the sources of this phenomenon.

In good times and bad, a mortgage default can be triggered by a ***life event****, such as the loss of a job, serious illness or injury, or divorce.*

However, another factor is now playing an increasing role in many markets: declines in ***home values****."*



"Why Do Borrowers Default?" Debate since 1980's

1. **Negative equity**: option-value (Foster and Van Order 1984)
2. **Cash flow**: life event (Riddiough 1991)
3. Double-trigger: both negative equity and cash flow (Foote, Gerardi, and Willen 2008)

Related literature

Foster and van Order (1984), Epperson, Kau, Keenan and Muller (1985), Riddiough (1991), Vandell (1995), Deng, Quigley, and Van Order (2000), Elul, Souleles, Chomsisengphet, Gennon, and Hunt (2010), Ashworth, Goodman, Landy, and Yin (2010), Keys, Piskorski, Seru, and Vig (2012), Guiso, Sapeinza and Zingales (2013), Mayer, Morrison, Piskorski, and Gupta (2014), Gyourko and Tracy (2014), Ehrlich and Perry (2015), Fuster and Willen (2015), Palmer (2015), Bradley, Cutts and Liu (2015), Adelino, Schoar, and Severino (2016), Scharlemann and Shore (2016, 2018), Bhutta Dokko and Shan (2017), Gerardi, Herkenhoff, Ohanian, and Willen (2018), Haughwout, Okah and Tracy (2016), Agarwal et al. (2017a, b), Di Maggio et al. (2017), Hsu, Matsa, and Melzer (2018), Gupta, Morrison, Fedorenko, and Ramsey (2018), Abel and Fuster (2018), Campbell and Cocco (2018), Schelkle (2018), Bajari, Chu, and Park (2018), Hembre (2018), Ganong and Noel (2019), Gupta and Hansman (2019)

Disentangling the role of "adverse life events" from that of "negative equity" remains one of the "central questions in this literature"
–Foote and Willen, *Annual Review of Financial Economics (2018)*

"Why Do Borrowers Default?" Debate since 1980's

1. **Negative equity**: option-value (Foster and Van Order 1984)
2. **Cash flow**: life event (Riddiough 1991)
3. Double-trigger: both negative equity and cash flow (Foote, Gerardi, and Willen 2008)

Related literature

Foster and van Order (1984), Epperson, Kau, Keenan and Muller (1985), Riddiough (1991), Vandell (1995), Deng, Quigley, and Van Order (2000), Elul, Souleles, Chomsisengphet, Gennon, and Hunt (2010), Ashworth, Goodman, Landy, and Yin (2010), Keys, Piskorski, Seru, and Vig (2012), Guiso, Sapeinza and Zingales (2013), Mayer, Morrison, Piskorski, and Gupta (2014), Gyourko and Tracy (2014), Ehrlich and Perry (2015), Fuster and Willen (2015), Palmer (2015), Bradley, Cutts and Liu (2015), Adelino, Schoar, and Severino (2016), Scharlemann and Shore (2016, 2018), Bhutta Dokko and Shan (2017), Gerardi, Herkenhoff, Ohanian, and Willen (2018), Haughwout, Okah and Tracy (2016), Agarwal et al. (2017a, b), Di Maggio et al. (2017), Hsu, Matsa, and Melzer (2018), Gupta, Morrison, Fedorenko, and Ramsey (2018), Abel and Fuster (2018), Campbell and Cocco (2018), Schelkle (2018), Bajari, Chu, and Park (2018), Hembre (2018), Ganong and Noel (2019), Gupta and Hansman (2019)

Disentangling the role of "adverse life events" from that of "negative equity" remains one of the "central questions in this literature"
–Foote and Willen, *Annual Review of Financial Economics (2018)*

"Why Do Borrowers Default?" Debate since 1980's

1. **Negative equity**: option-value (Foster and Van Order 1984)
2. **Cash flow**: life event (Riddiough 1991)
3. Double-trigger: both negative equity and cash flow (Foote, Gerardi, and Willen 2008)

Related literature

Foster and van Order (1984), Epperson, Kau, Keenan and Muller (1985), Riddiough (1991), Vandell (1995), Deng, Quigley, and Van Order (2000), Elul, Souleles, Chomsisengphet, Gennon, and Hunt (2010), Ashworth, Goodman, Landy, and Yin (2010), Keys, Piskorski, Seru, and Vig (2012), Guiso, Sapeinza and Zingales (2013), Mayer, Morrison, Piskorski, and Gupta (2014), Gyourko and Tracy (2014), Ehrlich and Perry (2015), Fuster and Willen (2015), Palmer (2015), Bradley, Cutts and Liu (2015), Adelino, Schoar, and Severino (2016), Scharlemann and Shore (2016, 2018), Bhutta Dokko and Shan (2017), Gerardi, Herkenhoff, Ohanian, and Willen (2018), Haughwout, Okah and Tracy (2016), Agarwal et al. (2017a, b), Di Maggio et al. (2017), Hsu, Matsa, and Melzer (2018), Gupta, Morrison, Fedorenko, and Ramsey (2018), Abel and Fuster (2018), Campbell and Cocco (2018), Schelkle (2018), Bajari, Chu, and Park (2018), Hembre (2018), Ganong and Noel (2019), Gupta and Hansman (2019)

Disentangling the role of "adverse life events" from that of "negative equity" remains one of the "central questions in this literature"
–Foote and Willen, *Annual Review of Financial Economics (2018)*

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

This paper

Goal

- Separate "strategic" defaults from "cash-flow" and "double-trigger" defaults

Label	Potential outcomes type for default	Results
Strategic	Negative equity is necessary and sufficient	3%
Cash-flow	Life event is necessary and sufficient	97%
Double-trigger	Both life event and negative equity are necessary	

Two challenges

1. Mortgage servicing data do not record adverse life events
   - Prior work: coarse measures such as regional unemployment
   - Ingredient #1: link default to contemporaneous bank account income for 3 million borrowers
2. What does a default look like when a life event is a necessary condition?
   - Ingredient #2: use comparison group of defaulters with positive equity

Outline

1. Data
2. Empirics: main estimate
3. Empirics: internal and external validity
4. Comparison to model of mortgage default

Outline

Previously-available data

- Review of first wave: Vandell (1995)
  - *"Track a panel of several thousand mortgages from origination and gather detailed information whenever termination occurs"*
- Review of second wave: Foote and Willen (2018)
  - *"Develop data sets that match labor market experiences and default behavior at the individual level"*

Previously-available data

- Review of first wave: Vandell (1995)
  - *"Track a panel of several thousand mortgages from origination and gather detailed information whenever termination occurs"*
- Review of second wave: Foote and Willen (2018)
  - *"Develop data sets that match labor market experiences and default behavior at the individual level"*

Previously-available data

- Review of first wave: Vandell (1995)
  - *"Track a panel of several thousand mortgages from origination and gather detailed information whenever termination occurs"*
- Review of second wave: Foote and Willen (2018)
  - *"Develop data sets that match labor market experiences and default behavior at the individual level"*

Previously-available data

- Review of first wave: Vandell (1995)
  - *"Track a panel of several thousand mortgages from origination and gather detailed information whenever termination occurs"*
- Review of second wave: Foote and Willen (2018)
  - *"Develop data sets that match labor market experiences and default behavior at the individual level"*

Data

Mortgage servicing (standard)

- Default: three missed payments
- Loan-to-value ratio: $\frac{\text{total mortgage debt on home}}{\text{purchase price} \times \text{CoreLogic price index}}$
  - Robustness 1: Define abovewater as LTV$<$60 (truly abovewater unless house price error of 3 standard deviations)
  - Robustness 2: Measurement error correction using two-sample IV with validation data

Linked bank account (novel)

- Balance: January 2007 to October 2015 (n = 5 million)
- Income: October 2012 to October 2015 (n = 2.9 million)
  - Newly available: income data back to 2007, similar conclusions

Summary Statistics Program Participation

Data

Mortgage servicing (standard)

- Default: three missed payments
- Loan-to-value ratio: $\frac{\text{total mortgage debt on home}}{\text{purchase price} \times \text{CoreLogic price index}}$
  - Robustness 1: Define abovewater as LTV$<$60 (truly abovewater unless house price error of 3 standard deviations)
  - Robustness 2: Measurement error correction using two-sample IV with validation data

Linked bank account (novel)

- Balance: January 2007 to October 2015 (n = 5 million)
- Income: October 2012 to October 2015 (n = 2.9 million)
  - Newly available: income data back to 2007, similar conclusions

Summary Statistics Propensity Analysis

Data

Mortgage servicing (standard)

- Default: three missed payments
- Loan-to-value ratio: $\frac{\text{total mortgage debt on home}}{\text{purchase price} \times \text{CoreLogic price index}}$
  - Robustness 1: Define abovewater as LTV$<$60 (truly abovewater unless house price error of 3 standard deviations)
  - Robustness 2: Measurement error correction using two-sample IV with validation data

Linked bank account (novel)

- Balance: January 2007 to October 2015 (n = 5 million)
- Income: October 2012 to October 2015 (n = 2.9 million)
  - Newly available: income data back to 2007, similar conclusions

Data

Mortgage servicing (standard)

- Default: three missed payments
- Loan-to-value ratio: $\frac{\text{total mortgage debt on home}}{\text{purchase price} \times \text{CoreLogic price index}}$
  - Robustness 1: Define abovewater as LTV$<$60 (truly abovewater unless house price error of 3 standard deviations)
  - Robustness 2: Measurement error correction using two-sample IV with validation data

Linked bank account (novel)

- Balance: January 2007 to October 2015 (n = 5 million)
- Income: October 2012 to October 2015 (n = 2.9 million)
  - Newly available: income data back to 2007, similar conclusions

▸ Summary statistics ▸ Representativeness

Outline

Figure: What explains the behavior of underwater defaulters?

Figure: What explains the behavior of underwater defaulters?

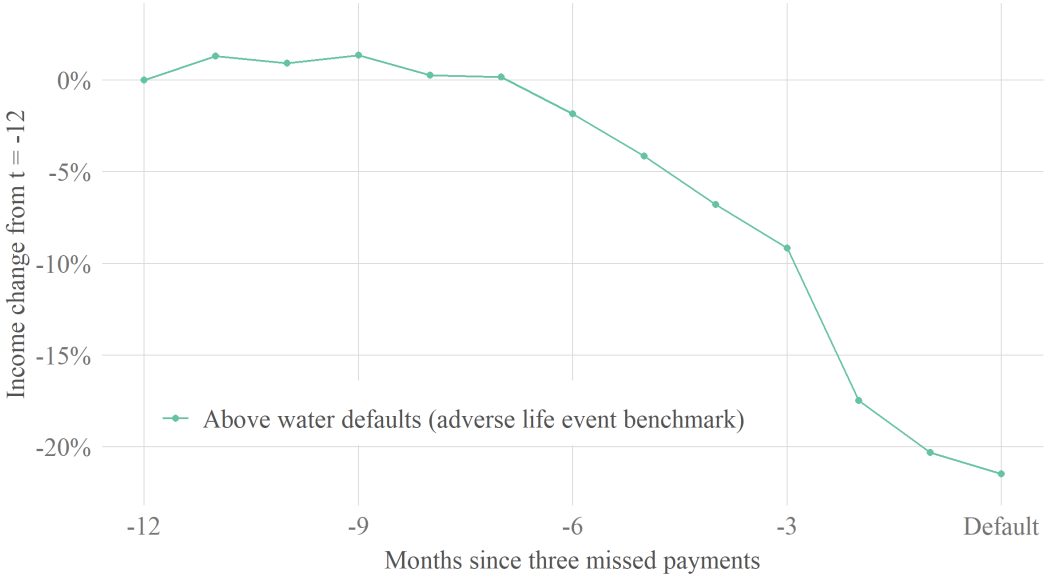


Figure: What explains the behavior of underwater defaulters?

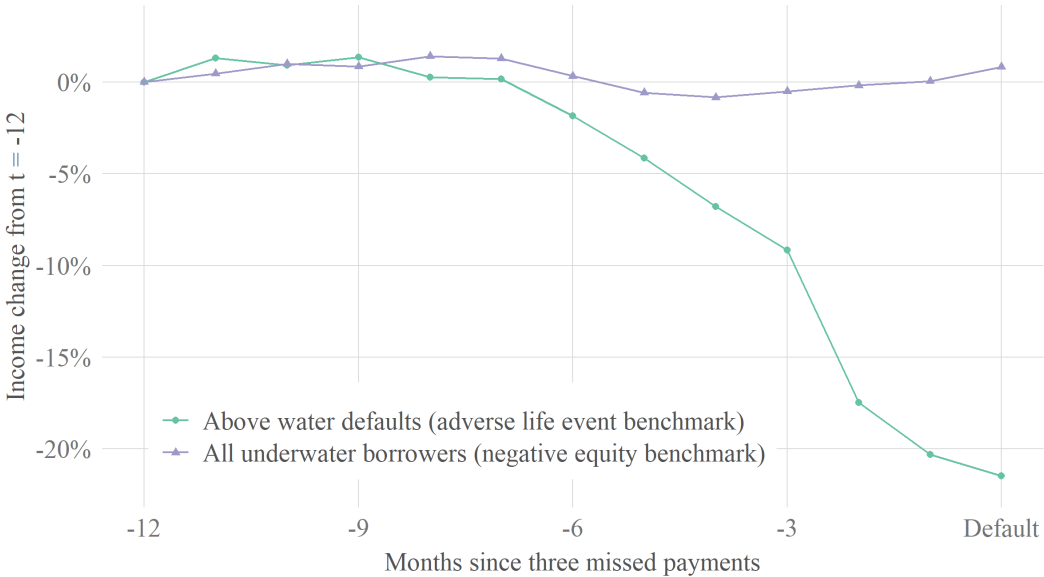
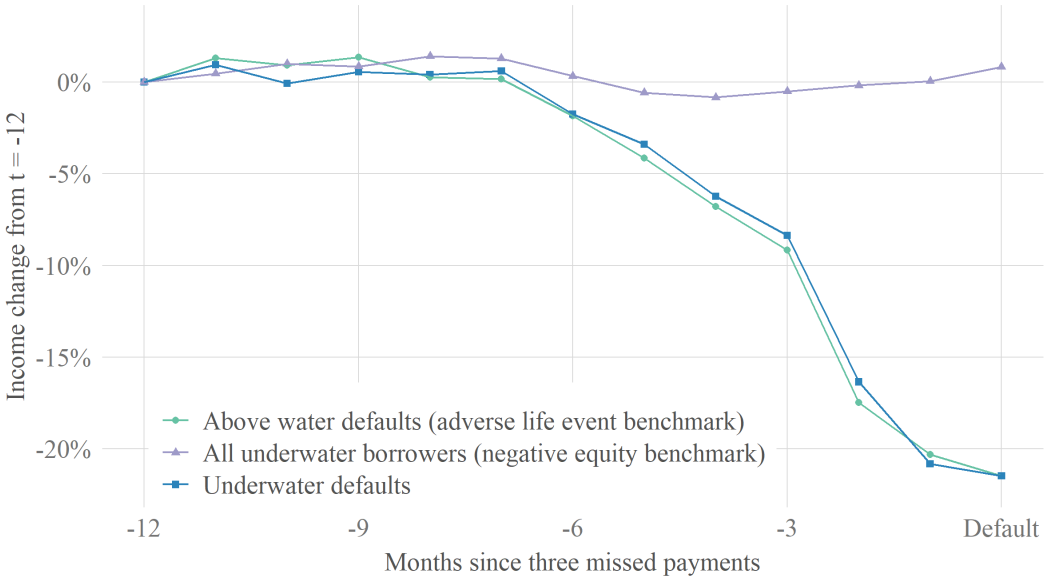


Figure: What explains the behavior of underwater defaulters?



Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$\alpha \equiv \frac{E(Y) - E(Y(0,1))}{E(Y)}$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$\alpha \equiv \frac{E(Y) - E(Y(0,1))}{E(Y)}$$
$$= \frac{E(\Delta Income^{UnderwaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}{E(\Delta Income^{AbovewaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

Label	Potential outcomes type for default	$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$ $Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$\alpha \equiv \frac{E(Y) - E(Y(0,1))}{E(Y)}$$
$$= \frac{E(\Delta Income^{UnderwaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}{E(\Delta Income^{AbovewaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$\alpha \equiv \frac{E(Y) - E(Y(0,1))}{E(Y)}$$

$$= \frac{E(\Delta Income^{UnderwaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}{E(\Delta Income^{AbovewaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$\alpha \equiv \frac{E(Y) - E(Y(0,1))}{E(Y)}$$
$$= \frac{E(\Delta Income^{UnderwaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}{E(\Delta Income^{AbovewaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$\alpha \equiv \frac{E(Y) - E(Y(0,1))}{E(Y)}$$
$$= \frac{E(\Delta Income^{UnderwaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}{E(\Delta Income^{AbovewaterDefaulter}) - E(\Delta Income^{UnderwaterAll})} = \frac{-19.6\% - 2.8\%}{-20.2\% - 2.8\%}$$
$$= 97\%$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$
\begin{aligned}
\alpha &\equiv \frac{E(Y) - E(Y(0,1))}{E(Y)} \\
&= \frac{E(\Delta Income^{UnderwaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}{E(\Delta Income^{AbovewaterDefaulter}) - E(\Delta Income^{UnderwaterAll})} = \frac{-19.6\% - 2.8\%}{-20.2\% - 2.8\%} \\
&= 97\% \Rightarrow \\
1 - \alpha &= 3\%
\end{aligned}
$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Causal attribution formula (Details in paper)

		$Y(\underbrace{T^*}_{\text{life event}}, \underbrace{G}_{\text{negative equity}})$		
Label	Potential outcomes type for default	$Y(0,1)$	$Y(1,0)$	$Y(1,1)$
Strategic	Negative equity is necessary and sufficient	1	0	1
Cash-flow	Life event is necessary and sufficient	0	1	1
Double-trigger	Both life event and negative equity are necessary	0	0	1

$$
\begin{aligned}
\alpha &\equiv \frac{E(Y) - E(Y(0,1))}{E(Y)} \\
&= \frac{E(\Delta Income^{UnderwaterDefaulter}) - E(\Delta Income^{UnderwaterAll})}{E(\Delta Income^{AbovewaterDefaulter}) - E(\Delta Income^{UnderwaterAll})} = \frac{-19.6\% - 2.8\%}{-20.2\% - 2.8\%} \\
&= 97\% \Rightarrow \\
1 - \alpha &= 3\%
\end{aligned}
$$

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Interpretation relative to prior evidence

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Label	Potential outcomes type for default	Prior estimates	New results
Strategic	Negative equity is necessary and sufficient	30-70%	3%
Cash-flow	Life event is necessary and sufficient	0%	97%
Double-trigger	Both life event and negative equity are necessary	30-70%	

- Strategic: only 3% of defaults [Bhutta et al. 2017, Gerardi et al. 2018; Guiso et al. 2013]
  - Why lower? Attenuation bias in estimated role of life events
- Double-trigger: *conditional* on life event, negative equity may raise likelihood of default [Gerardi et al. 2018, Mian and Sufi 2011, Palmer 2015, Chan et al 2016, Gupta and Hansman 2019]
- ...but negative equity not a necessary condition for *all* defaults (i.e. cash-flow) [Low 2018]

Interpretation relative to prior evidence

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Label	Potential outcomes type for default	Prior estimates	New results
Strategic	Negative equity is necessary and sufficient	30-70%	3%
Cash-flow	Life event is necessary and sufficient	0%	97%
Double-trigger	Both life event and negative equity are necessary	30-70%	

- Strategic: only 3% of defaults [Bhutta et al. 2017, Gerardi et al. 2018; Guiso et al. 2013]
  - Why lower? Attenuation bias in estimated role of life events
- Double-trigger: *conditional* on life event, negative equity may raise likelihood of default [Gerardi et al. 2018, Mian and Sufi 2011, Palmer 2015, Chan et al 2016, Gupta and Hansman 2019]
- ...but negative equity not a necessary condition for *all* defaults (i.e. cash-flow) [Low 2018]

Interpretation relative to prior evidence

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Label	Potential outcomes type for default	Prior estimates	New results
Strategic	Negative equity is necessary and sufficient	30-70%	3%
Cash-flow	Life event is necessary and sufficient	0%	97%
Double-trigger	Both life event and negative equity are necessary	30-70%	

- Strategic: only 3% of defaults [Bhutta et al. 2017, Gerardi et al. 2018; Guiso et al. 2013]
  - Why lower? Attenuation bias in estimated role of life events
- Double-trigger: *conditional* on life event, negative equity may raise likelihood of default [Gerardi et al. 2018, Mian and Sufi 2011, Palmer 2015, Chan et al 2016, Gupta and Hansman 2019]
- ...but negative equity not a necessary condition for *all* defaults (i.e. cash-flow) [Low 2018]

Interpretation relative to prior evidence

"Only 3% of defaults are strategic; 97% are cash-flow or double-trigger"

Label	Potential outcomes type for default	Prior estimates	New results
Strategic	Negative equity is necessary and sufficient	30-70%	3%
Cash-flow	Life event is necessary and sufficient	0%	97%
Double-trigger	Both life event and negative equity are necessary	30-70%	

- Strategic: only 3% of defaults [Bhutta et al. 2017, Gerardi et al. 2018; Guiso et al. 2013]
  - Why lower? Attenuation bias in estimated role of life events
- Double-trigger: *conditional* on life event, negative equity may raise likelihood of default [Gerardi et al. 2018, Mian and Sufi 2011, Palmer 2015, Chan et al 2016, Gupta and Hansman 2019]
- ...but negative equity not a necessary condition for *all* defaults (i.e. cash-flow) [Low 2018]

▸ Double Trigger Binscatter

Further decomposing mechanisms driving mortgage default

New estimates + prior evidence on causal impact of negative equity (Gupta and Hansman (GH) 2019, Palmer 2015):

Label	Prior estimates	New Results	Decomposition	
			New + GH	New + Palmer
Strategic	30-70%	3%	3%	3%
Cash-flow	0%	97%	50%	75%
Double-trigger	30-70%		47%	22%

Lesson 1: 50-75% of underwater defaults driven *exclusively* by cash-flow

Lesson 2: How important is each channel?

- No life events → eliminate 97% of defaults (cash-flow + double-trigger)
- No negative equity → eliminate 25-50% of defaults (strategic + double-trigger)

Further decomposing mechanisms driving mortgage default

New estimates + prior evidence on causal impact of negative equity (Gupta and Hansman (GH) 2019, Palmer 2015):

Label	Prior estimates	New Results	Decomposition	
			New + GH	New + Palmer
Strategic	30-70%	3%	3%	3%
Cash-flow	0%	97%	50%	75%
Double-trigger	30-70%		47%	22%

Lesson 1: 50-75% of underwater defaults driven *exclusively* by cash-flow

Lesson 2: How important is each channel?

- No life events → eliminate 97% of defaults (cash-flow + double-trigger)
- No negative equity → eliminate 25-50% of defaults (strategic + double-trigger)

Further decomposing mechanisms driving mortgage default

New estimates + prior evidence on causal impact of negative equity (Gupta and Hansman (GH) 2019, Palmer 2015):

Label	Prior estimates	New Results	Decomposition	
			New + GH	New + Palmer
Strategic	30-70%	3%	3%	3%
Cash-flow	0%	97%	50%	75%
Double-trigger	30-70%		47%	22%

Lesson 1: 50-75% of underwater defaults driven *exclusively* by cash-flow

Lesson 2: How important is each channel?

- No life events → eliminate 97% of defaults (cash-flow + double-trigger)
- No negative equity → eliminate 25-50% of defaults (strategic + double-trigger)

Further decomposing mechanisms driving mortgage default

New estimates + prior evidence on causal impact of negative equity (Gupta and Hansman (GH) 2019, Palmer 2015):

Label	Prior estimates	New Results	Decomposition	
			New + GH	New + Palmer
Strategic	30-70%	3%	3%	3%
Cash-flow	0%	97%	50%	75%
Double-trigger	30-70%		47%	22%

Lesson 1: 50-75% of underwater defaults driven *exclusively* by cash-flow

Lesson 2: How important is each channel?

- No life events → eliminate 97% of defaults (cash-flow + double-trigger)
- No negative equity → eliminate 25-50% of defaults (strategic + double-trigger)

Further decomposing mechanisms driving mortgage default

New estimates + prior evidence on causal impact of negative equity (Gupta and Hansman (GH) 2019, Palmer 2015):

Label	Prior estimates	New Results	Decomposition	
			New + GH	New + Palmer
Strategic	30-70%	3%	3%	3%
Cash-flow	0%	97%	50%	75%
Double-trigger	30-70%		47%	22%

Lesson 1: 50-75% of underwater defaults driven *exclusively* by cash-flow

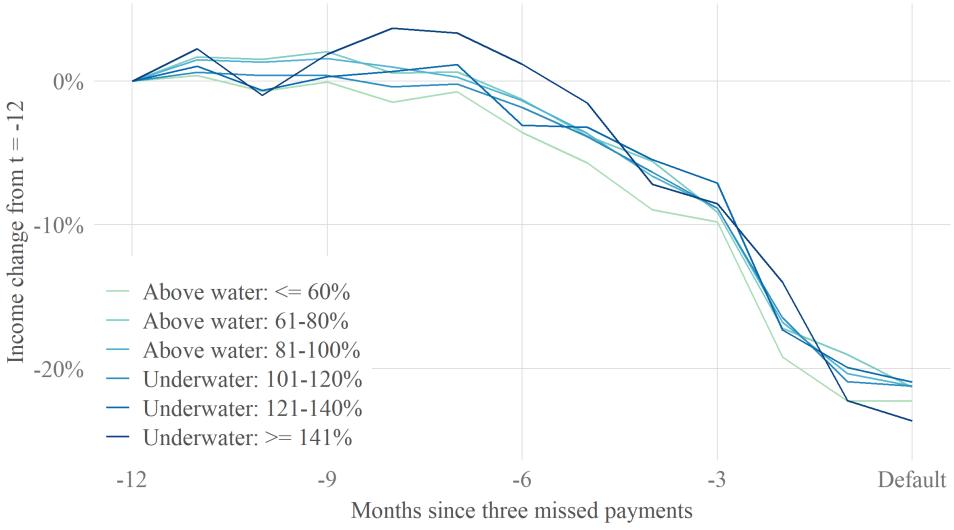
Lesson 2: How important is each channel?

- No life events → eliminate 97% of defaults (cash-flow + double-trigger)
- No negative equity → eliminate 25-50% of defaults (strategic + double-trigger)

Outline

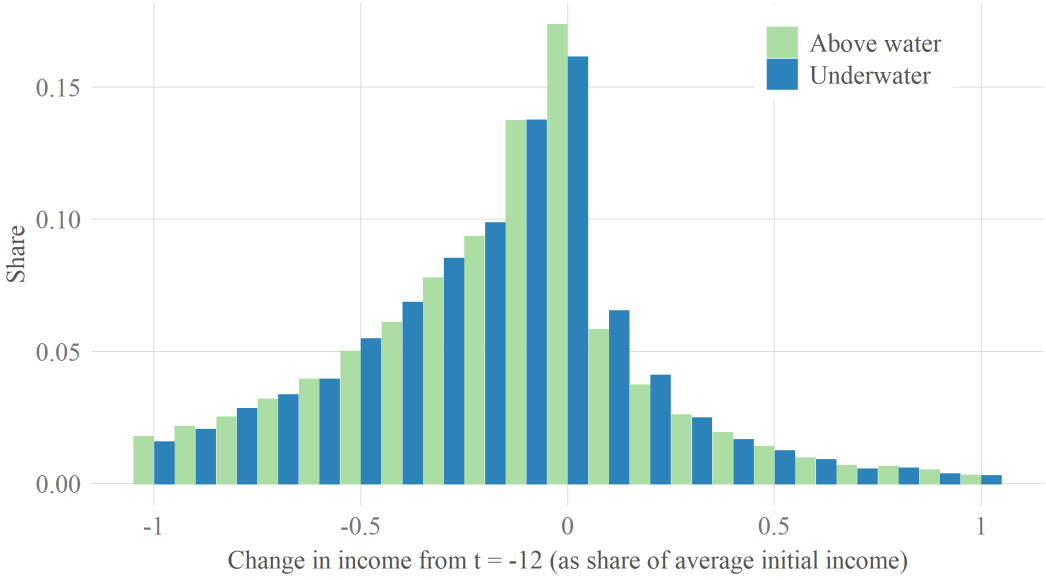
Relax expositional assumption: LTV cutoff of 100

Relax expositional assumption: LTV cutoff of 100



Relax expositional assumption: mean as summary statistic

Relax expositional assumption: mean as summary statistic



3% of defaults finding: relaxing assumptions

- Already shown
  - Alternative LTV cutoffs ▸ LTV income ▸ LTV balances
  - Entire distribution of change in income

- Further robustness
  - Account for LTV mismeasurement ▸ LTV Mismeasurement
  - Alternative numbers of missed payments ▸ Days past due
  - Bank account balance ▸ Balance
  - Separate estimates by year from 2008 to 2014 ▸ Years
  - Non-recourse states ▸ Non-recourse
  - Test for income manipulation ▸ Manipulation
  - Investors ▸ Investors

Common questions

Can the method ever detect *any* strategic default?

- Yes!
- Specification motivated by Mayer, Morrison, Piskorski, and Gupta (AER 2014)
- 14% strategic default in subsample with three consecutive missed payments

Are our results driven by peculiarities of data set, or definition of "strategic"?

- No!
- Similar results using prior definitions in Panel Study of Income Dynamics (PSID) data
- Why lower? Comparison group approach for addressing measurement error in life events

Common questions

Can the method ever detect *any* strategic default?

- Yes!
- Specification motivated by Mayer, Morrison, Piskorski, and Gupta (AER 2014)
- 14% strategic default in subsample with three consecutive missed payments

Are our results driven by peculiarities of data set, or definition of "strategic"?

- No!
- Similar results using prior definitions in Panel Study of Income Dynamics (PSID) data
- Why lower? Comparison group approach for addressing measurement error in life events

Common questions

Can the method ever detect *any* strategic default?

- Yes!
- Specification motivated by Mayer, Morrison, Piskorski, and Gupta (AER 2014)
- 14% strategic default in subsample with three consecutive missed payments

Are our results driven by peculiarities of data set, or definition of "strategic"?

- No!
- Similar results using prior definitions in Panel Study of Income Dynamics (PSID) data
- Why lower? Comparison group approach for addressing measurement error in life events

Common questions

Can the method ever detect *any* strategic default?

- Yes!
- Specification motivated by Mayer, Morrison, Piskorski, and Gupta (AER 2014)
- 14% strategic default in subsample with three consecutive missed payments

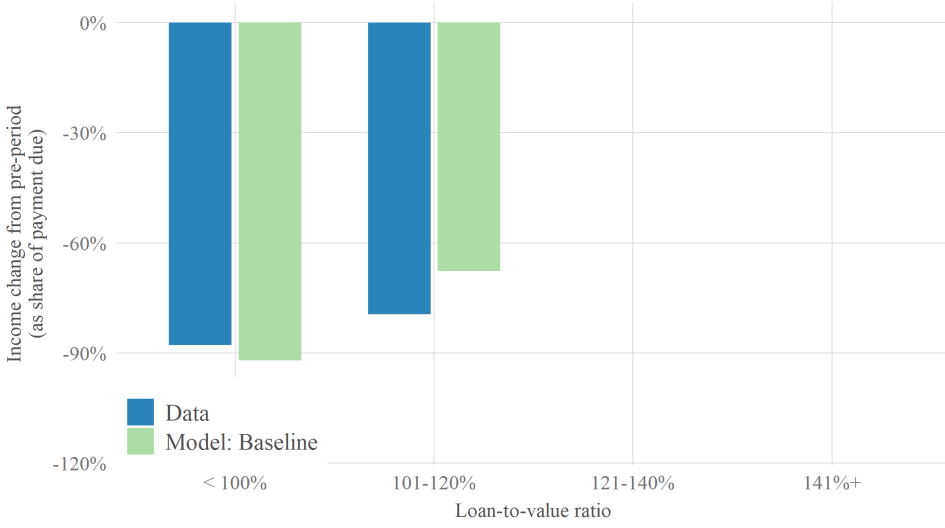
Are our results driven by peculiarities of data set, or definition of "strategic"?

- No!
- Similar results using prior definitions in Panel Study of Income Dynamics (PSID) data
- Why lower? Comparison group approach for addressing measurement error in life events

▸ Straight default ▸ PSID

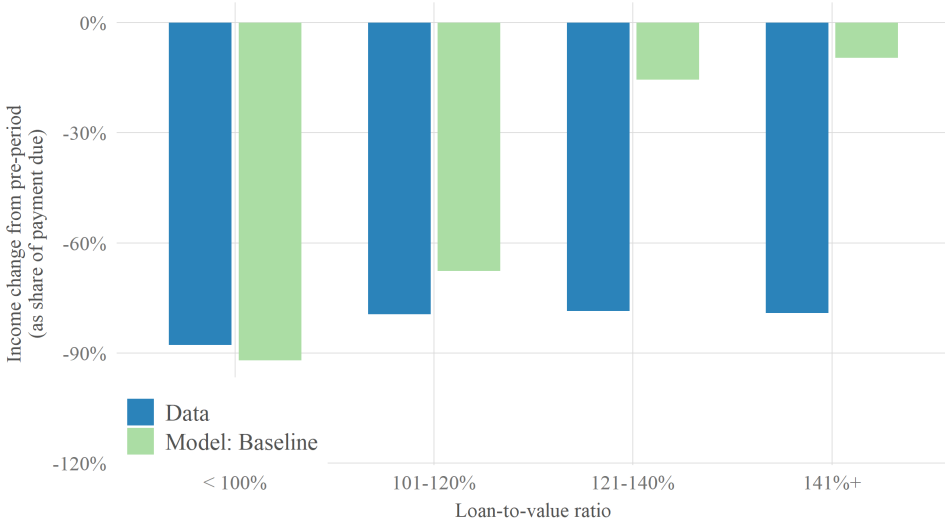
Outline

Figure: Income drop compared to predictions from structural model (Campbell and Cocco 2015)



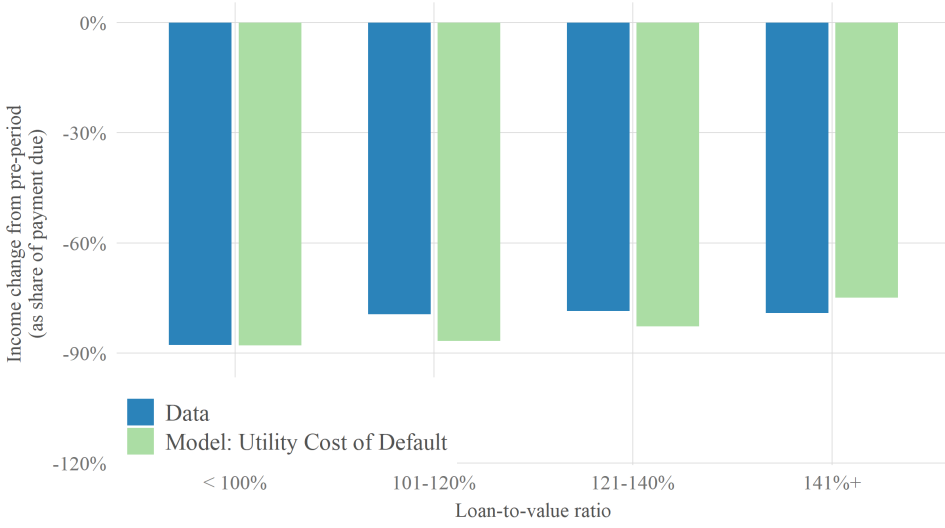
- Close match ⇒ high default cost provides plausible microfoundation for empirical behavior

Figure: Income drop compared to predictions from structural model (Campbell and Cocco 2015)



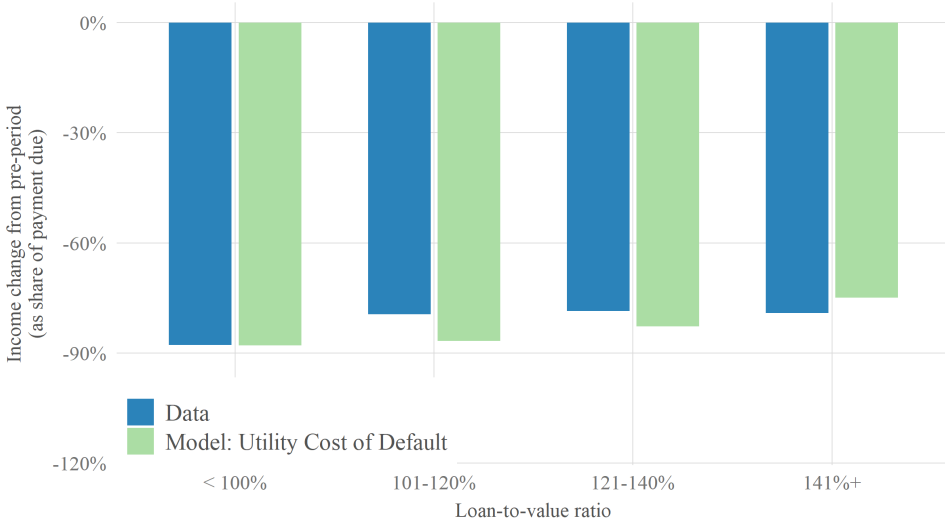
- Close match ⇒ high default cost provides plausible microfoundation for empirical behavior

Figure: Income drop compared to predictions from structural model (Campbell and Cocco 2015)



- Close match ⇒ high default cost provides plausible microfoundation for empirical behavior

Figure: Income drop compared to predictions from structural model (Campbell and Cocco 2015)



- Close match $\Rightarrow$ high default cost provides plausible microfoundation for empirical behavior

Conclusion: "Why Do Borrowers Default on Mortgages?"

- Longstanding debate over extent of strategic default
  - Ingredient #1: micro data with income for 2.9 million borrowers
  - Ingredient #2: above water defaulters with no strategic default motive
- Contributions
  - Econometrics: method for causal attribution with measurement error
  - Empirics: only 3% of defaults are strategic; life events necessary condition for 97% of defaults
  - Micro foundations: model with high utility cost of default can match data

Conclusion: "Why Do Borrowers Default on Mortgages?"

- Longstanding debate over extent of strategic default
  - Ingredient #1: micro data with income for 2.9 million borrowers
  - Ingredient #2: above water defaulters with no strategic default motive
- Contributions
  - Econometrics: method for causal attribution with measurement error
  - Empirics: only 3% of defaults are strategic; life events necessary condition for 97% of defaults
  - Micro foundations: model with high utility cost of default can match data

Conclusion: "Why Do Borrowers Default on Mortgages?"

- Longstanding debate over extent of strategic default
  - Ingredient #1: micro data with income for 2.9 million borrowers
  - Ingredient #2: above water defaulters with no strategic default motive
- Contributions
  - Econometrics: method for causal attribution with measurement error
  - Empirics: only 3% of defaults are strategic; life events necessary condition for 97% of defaults
  - Micro foundations: model with high utility cost of default can match data

Conclusion: "Why Do Borrowers Default on Mortgages?"

- Longstanding debate over extent of strategic default
  - Ingredient #1: micro data with income for 2.9 million borrowers
  - Ingredient #2: above water defaulters with no strategic default motive
- Contributions
  - Econometrics: method for causal attribution with measurement error
  - Empirics: only 3% of defaults are strategic; life events necessary condition for 97% of defaults
  - Micro foundations: model with high utility cost of default can match data

Conclusion: "Why Do Borrowers Default on Mortgages?"

- Longstanding debate over extent of strategic default
  - Ingredient #1: micro data with income for 2.9 million borrowers
  - Ingredient #2: above water defaulters with no strategic default motive
- Contributions
  - Econometrics: method for causal attribution with measurement error
  - Empirics: only 3% of defaults are strategic; life events necessary condition for 97% of defaults
  - Micro foundations: model with high utility cost of default can match data

Conclusion: "Why Do Borrowers Default on Mortgages?"

- Longstanding debate over extent of strategic default
  - Ingredient #1: micro data with income for 2.9 million borrowers
  - Ingredient #2: above water defaulters with no strategic default motive
- Contributions
  - Econometrics: method for causal attribution with measurement error
  - Empirics: only 3% of defaults are strategic; life events necessary condition for 97% of defaults
  - Micro foundations: model with high utility cost of default can match data