

**Household Debt and Business Cycles Worldwide**  
**Out-of-sample results based on IMF's new "Global Debt**  
**Database"**

Atif Mian  
Princeton University and NBER

Amir Sufi  
University of Chicago Booth School of Business and NBER

Emil Verner  
MIT Sloan School of Management

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This note provides new out-of-sample results for the key results in our published paper Mian et al. (2017) (MSV henceforth) based on IMF's recently introduced Global Debt Database (GDD henceforth) (Mbaye et al. (2018)). GDD provides the most comprehensive data base on total private debt, with private debt broken down into its two components, household debt and non-financial firm debt. We refer the reader to Mbaye et al. (2018) for details concerning data construction.

Table 1 shows the coverage of GDD for the sample of 30 countries covered by MSV. Both data sets essentially have similar coverage for these countries, with the notable exception that MSV have additional data for Thailand before 2003. Table 2 shows data coverage in GDD for the 105 new countries that were not in MSV. The coverage for these additional countries is largely based on post-2000 period. Table 3 shows summary statistics for the main variables used in MSV, the three year change in debt to GDP ratio for various debt categories, as well as the three year change in log real GDP. We show summary statistics for the GDD sample separately for the 30 countries covered by MSV and the remaining 105 countries.

Table 4 replicates Table II of MSV using GDD in the full sample, sample restricted to 30 countries covered in MSV, and new countries added in GDD. Table 5 does the same for columns (1) through (6) of MSV. Collectively these two tables represent the core findings in Mian et al. (2017). Figure 1 replicates figure 3 panel (a) of MSV. As the results indicate, all of the key results in MSV are robust to the out-of-sample tests conducted.

## References

- Mbaye, S., M. Moreno Badia, and K. Chae (2018). Global debt database: Methodology and sources. IMF Working Paper 18/111, International Monetary Fund.
- Mian, A. R., A. Sufi, and E. Verner (2017). Household debt and business cycles worldwide. *Quarterly Journal of Economics* 132(4), 1755–1817.

Figure 1: Household Debt Predicts Growth Slowdown: Out of Sample

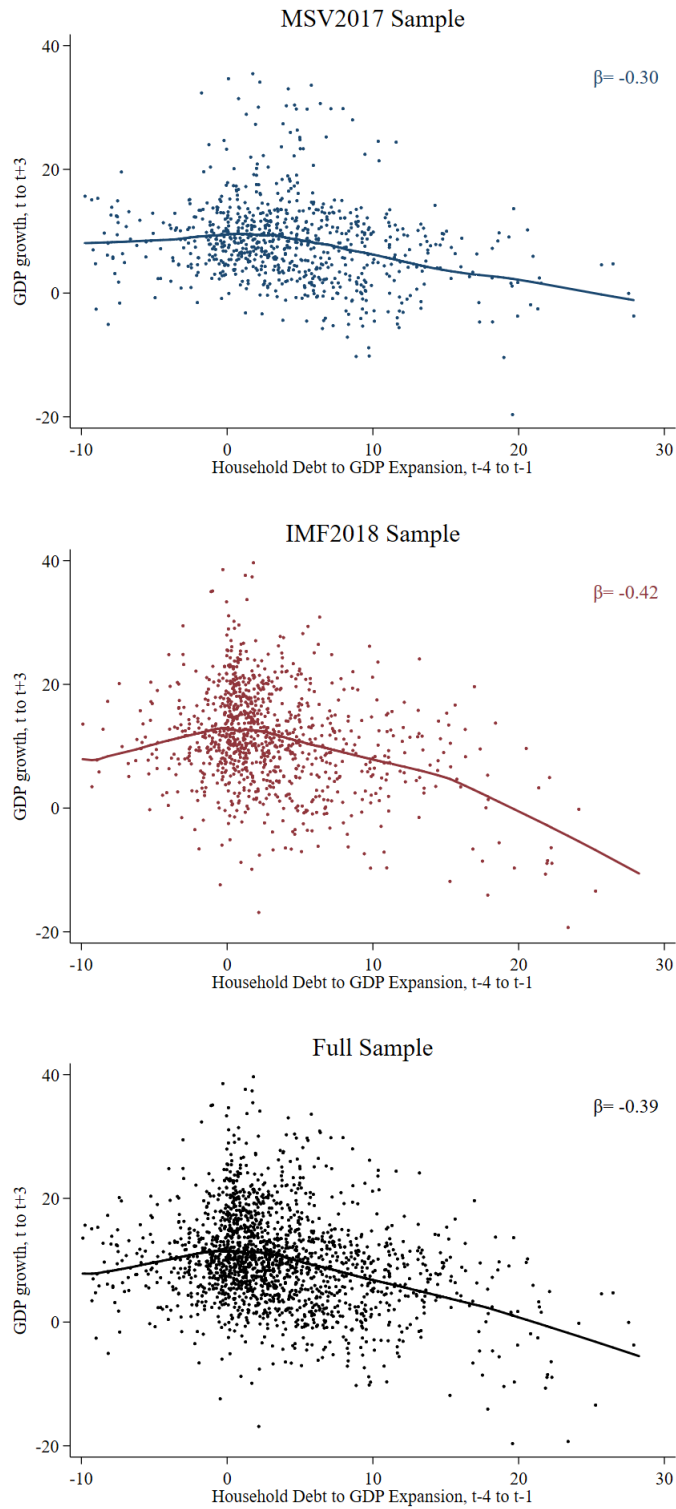


Table 1: Sample Coverage of IMF Global Debt Database and Mian et al. (2017)

Country	GDD 2018	MSV 2017
Australia	1977-2016	1977-2012
Austria	1995-2016	1995-2012
Belgium	1980-2016	1980-2012
Canada	1969-2016	1969-2012
Czech Republic	1995-2015	1995-2012
Denmark	1994-2016	1994-2012
Finland	1970-2016	1970-2012
France	1977-2016	1977-2012
Germany	1970-2016	1970-2012
Greece	1994-2016	1994-2012
Hong Kong SAR	1990-2016	1990-2012
Hungary	1991-2016	1989-2012
Indonesia	2001-2016	2001-2012
Ireland	2002-2016	2002-2012
Italy	1960-2016	1962-2012
Japan	1964-2016	1964-2012
Korea, Republic of	1962-2016	1962-2012
Mexico	1994-2016	1994-2012
Netherlands	1990-2016	1990-2012
Norway	1975-2016	1975-2012
Poland	1995-2016	1995-2012
Portugal	1979-2016	1979-2012
Singapore	1991-2016	1991-2012
Spain	1980-2016	1980-2012
Sweden	1961-2016	1980-2012
Switzerland	1999-2016	1999-2012
Thailand	2003-2016	1991-2012
Turkey	1986-2016	1986-2012
United Kingdom	1966-2016	1966-2012
United States	1960-2016	1962-2012

Table 2: Sample Coverage of IMF's Global Debt Database: 105 New Countries

Country	Coverage	Country	Coverage	Country	Coverage
Afghanistan	2006-2016	Ghana	2003-2016	Papua New Guinea	2001-2016
Albania	2003-2016	Grenada	2001-2016	Peru	2001-2016
Algeria	2001-2016	Guatemala	2005-2016	Philippines	2006-2016
Argentina	1994-2016	Guinea-Bissau	2001-2016	Qatar	2001-2016
Azerbaijan	2001-2016	Guyana	2001-2016	Romania	2001-2016
Bangladesh	2004-2016	Haiti	2006-2016	Russian Federation	1998-2016
Benin	2001-2016	Honduras	2001-2016	Rwanda	2004-2016
Bhutan	2001-2016	Iceland	1970-2015	Samoa	1995-2016
Botswana	2001-2016	India	1998-2016	Saudi Arabia	1998-2016
Brazil	1994-2016	Iraq	2004-2015	Senegal	2001-2016
Bulgaria	1995-2016	Israel	1992-2016	Serbia	2003-2016
Burkina Faso	2001-2016	Jamaica	2001-2016	Sierra Leone	2001-2016
Burundi	2000-2016	Kazakhstan	2003-2016	Slovak Republic	1995-2016
C.A.R.	2001-2016	Kenya	2001-2016	Slovenia	2001-2016
Cambodia	2004-2016	Kyrgyz Republic	2001-2016	Solomon Islands	2001-2016
Cameroon	2001-2016	Latvia	1995-2016	South Africa	2008-2016
Cape Verde	2001-2016	Lesotho	2001-2016	South Sudan	2011-2015
Chad	2001-2016	Lithuania	1995-2016	Sri Lanka	2001-2016
Chile	2002-2016	Luxembourg	2002-2016	St. Lucia	2001-2016
China, Mainland	2006-2016	Macedonia, FYR	2005-2016	St. Vincent	2001-2016
Colombia	1996-2016	Malaysia	2001-2016	Sudan	2001-2016
Comoros	2001-2016	Maldives	2001-2016	Sao Tome and Principe	2006-2016
Congo, Dem. Rep. of	2000-2016	Mali	2001-2016	Tajikistan	2001-2016
Congo, Republic of	2001-2016	Malta	1995-2016	Tanzania	2008-2016
Costa Rica	2001-2016	Mauritius	2007-2016	Timor Leste	2003-2016
Cote D'Ivoire	2001-2016	Moldova	2001-2016	Togo	2001-2016
Croatia	2001-2016	Mongolia	2001-2016	Tonga	2001-2016
Cyprus	1995-2016	Morocco	2001-2016	Trinidad and Tobago	2001-2016
Dominica	2001-2016	Mozambique	2001-2016	U.A.E.	2008-2016
Dominican Republic	2001-2016	Myanmar	2001-2016	Uganda	2003-2016
Ecuador	2002-2016	Nepal	2002-2016	Ukraine	1995-2016
Egypt	2004-2016	New Zealand	1990-2016	Uruguay	2001-2016
El Salvador	2001-2016	Nicaragua	2001-2016	Vanuatu	2001-2016
Eritrea	2001-2006	Niger	2001-2016	Venezuela	2001-2014
Estonia	1995-2016	Oman	2007-2015	Zambia	2001-2016
Georgia	2001-2016	Pakistan	2006-2016		

Table 3: Summary Statistics

<i>Panel A: Full Sample</i>						
	N	Mean	Median	SD	$\frac{SD}{SD(\Delta_{3y})}$	Ser. Cor.
$\Delta_{3y}$	2333	10.93	10.36	8.85	1.00	0.79
$\Delta_3 d^{Private}$	2358	6.13	4.40	18.67	2.11	0.78
$\Delta_3 d^{HH}$	2358	2.79	1.90	5.70	0.64	0.78
$\Delta_3 d^F$	2358	3.34	2.19	16.19	1.83	0.70
$\Delta_3 d^{Gov}$	2144	-0.79	0.69	19.18	2.17	0.72
<i>Panel B: Mian et al. (2017) Sample</i>						
	N	Mean	Median	SD	$\frac{SD}{SD(\Delta_{3y})}$	Ser. Cor.
$\Delta_{3y}$	683	9.69	9.28	6.66	1.00	0.71
$\Delta_3 d^{Private}$	684	8.27	6.74	14.48	2.18	0.74
$\Delta_3 d^{HH}$	684	4.41	3.57	5.99	0.90	0.79
$\Delta_3 d^F$	684	3.85	3.18	11.19	1.68	0.69
$\Delta_3 d^{Gov}$	631	1.63	1.11	9.14	1.37	0.71
<i>Panel C: Not-Mian et al. (2017) Sample</i>						
	N	Mean	Median	SD	$\frac{SD}{SD(\Delta_{3y})}$	Ser. Cor.
$\Delta_{3y}$	1384	12.53	12.34	9.57	1.00	0.79
$\Delta_3 d^{Private}$	1387	5.33	3.37	21.10	2.21	0.78
$\Delta_3 d^{HH}$	1387	2.30	1.39	4.99	0.52	0.78
$\Delta_3 d^F$	1387	3.03	1.72	18.94	1.98	0.70
$\Delta_3 d^{Gov}$	1245	-3.36	-0.29	23.11	2.41	0.72

Table 4: Credit Expansion and Contemporaneous and Future Three-Year GDP Growth

<i>Panel A: Full Sample</i>							
Dependent variable: $\Delta_3 y_{it+k}, k = -1, 0, \dots, 5$							
	$\Delta_3 y_{it-1}$	$\Delta_3 y_{it}$	$\Delta_3 y_{it+1}$	$\Delta_3 y_{it+2}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+4}$	$\Delta_3 y_{it+5}$
$\Delta_3 d_{it-1}^{HH}$	0.133 <sup>+</sup> (0.0747)	0.0536 (0.0740)	-0.0959 (0.0772)	-0.259** (0.0834)	-0.392** (0.0933)	-0.408** (0.0886)	-0.356** (0.0800)
$\Delta_3 d_{it-1}^F$	0.00499 (0.0190)	-0.0368 (0.0272)	-0.0538* (0.0250)	-0.0531** (0.0162)	-0.0335** (0.0118)	-0.00791 (0.0137)	0.0160 (0.0209)
$R^2$	0.0112	0.00697	0.0257	0.0602	0.0927	0.0875	0.0631
Observations	2195	2060	1927	1795	1660	1530	1398
<i>Panel B: Mian et al. (2017) Sample</i>							
Dependent variable: $\Delta_3 y_{it+k}, k = -1, 0, \dots, 5$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta_3 y_{it-1}$	$\Delta_3 y_{it}$	$\Delta_3 y_{it+1}$	$\Delta_3 y_{it+2}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+4}$	$\Delta_3 y_{it+5}$
$\Delta_3 d_{it-1}^{HH}$	0.145 <sup>+</sup> (0.0767)	0.110 (0.0766)	-0.0232 (0.0722)	-0.184* (0.0744)	-0.334** (0.0837)	-0.390** (0.0912)	-0.384** (0.103)
$\Delta_3 d_{it-1}^F$	-0.0702 (0.0535)	-0.137* (0.0556)	-0.141** (0.0482)	-0.0884* (0.0403)	-0.0287 (0.0385)	0.0326 (0.0427)	0.0776* (0.0393)
$R^2$	0.0237	0.0530	0.0674	0.0715	0.102	0.111	0.107
Observations	864	867	865	837	809	781	753
<i>Panel C: Not-Mian et al. (2017) Sample</i>							
Dependent variable: $\Delta_3 y_{it+k}, k = -1, 0, \dots, 5$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta_3 y_{it-1}$	$\Delta_3 y_{it}$	$\Delta_3 y_{it+1}$	$\Delta_3 y_{it+2}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+4}$	$\Delta_3 y_{it+5}$
$\Delta_3 d_{it-1}^{HH}$	0.219 <sup>+</sup> (0.119)	0.0692 (0.116)	-0.148 (0.117)	-0.349* (0.146)	-0.487* (0.193)	-0.468* (0.184)	-0.343* (0.159)
$\Delta_3 d_{it-1}^F$	0.0131 (0.0153)	-0.0157 (0.0175)	-0.0324* (0.0162)	-0.0406** (0.0111)	-0.0325** (0.00941)	-0.0188* (0.00915)	-0.00838 (0.0116)
$R^2$	0.0210	0.00233	0.0188	0.0604	0.0919	0.0773	0.0398
Observations	1276	1168	1062	958	851	749	645

Table 5: Household Debt Expansion Predicts Lower Subsequent Growth

<i>Panel A: Full Sample</i>						
	Dependent variable: $\Delta_3 y_{it+3}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 d_{it-1}^{Private}$	-0.0674** (0.0233)					
$\Delta_3 d_{it-1}^{HH}$		-0.371** (0.0894)		-0.353** (0.0897)	-0.345** (0.0797)	-0.342** (0.0827)
$\Delta_3 d_{it-1}^F$			-0.0502** (0.0153)	-0.0213* (0.0107)	-0.0205* (0.00805)	-0.0158* (0.00800)
$\Delta_3 d_{it-1}^{Gov}$						-0.0119 (0.0168)
$R^2$	0.0331	0.0742	0.0146	0.0766	0.0815	0.0803
Observations	1809	1801	1809	1801	1769	1610
<i>Panel B: Mian et al. (2017) Sample</i>						
	Dependent variable: $\Delta_3 y_{it+3}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 d_{it-1}^{Private}$	-0.111** (0.0311)					
$\Delta_3 d_{it-1}^{HH}$		-0.344** (0.0784)		-0.326** (0.0834)	-0.352** (0.0859)	-0.361** (0.0903)
$\Delta_3 d_{it-1}^F$			-0.0814+ (0.0419)	-0.0332 (0.0392)	-0.0514 (0.0408)	-0.0272 (0.0460)
$\Delta_3 d_{it-1}^{Gov}$						0.0739 (0.0566)
$R^2$	0.0592	0.0975	0.0205	0.101	0.131	0.146
Observations	791	791	791	791	777	710
<i>Panel C: Not-Mian et al. (2017) Sample</i>						
	Dependent variable: $\Delta_3 y_{it+3}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 d_{it-1}^{Private}$	-0.0517* (0.0227)					
$\Delta_3 d_{it-1}^{HH}$		-0.396* (0.167)		-0.371* (0.167)	-0.299* (0.143)	-0.254+ (0.138)
$\Delta_3 d_{it-1}^F$			-0.0417** (0.0146)	-0.0183* (0.00719)	-0.0124** (0.00378)	-0.00900** (0.00208)
$\Delta_3 d_{it-1}^{Gov}$						-0.0222 (0.0161)
$R^2$	0.0229	0.0544	0.0127	0.0567	0.0793	0.0770
Observations	969	961	969	961	948	857