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The Impacts and Determinants of Savings Risk-Sharing Channels on International Consumption
Smoothing

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Abstract

In this study, we found that both institutional quality and average exposure to higher education are determinants in OECD savings channel risk-sharing in 1996-2018. However, when assessing their relationships with the emerging economies, the results are either insignificant or in the wrong direction. Institutional quality only gains statistical significance following the Global Financial Crisis for both country groups, indicating that they are potentially only determinant factors in times of financial turbulence. Greater years in secondary and tertiary education enhances the OECD government savings subchannel's risk-sharing capacity in the 1990-2010 timeframe but is once again statistically insignificant for their emerging country counterparts.

Preface

I chose to conduct this thesis in the risk-sharing discipline as I have always been interested in how countries formulate and implement their macroeconomic policies in turbulent times. Especially now in our unprecedented covid-era, this economics discipline is more important than ever before. In this study, we seek the determinants explaining why some countries can weather financial storms, while others fail. We accomplish this through decomposition analyses, explained in our paper below.

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Tables and Figures

The tables in this thesis are split into four sections, 1-10, 11-21, 22-33, and 34-40.

Each section consists of descriptive statics, followed by regression analyses.

Table 1

Descriptive Statistics of 72 Countries

	<u>GNI/GDP</u>	<u>Depreciation/GDP</u>	<u>Transfers/GDP</u>	<u>Consumption/GDP</u>
Mean	0.98	0.14	0.02	0.78
Median	0.99	0.14	0.00	0.78
Maximum	1.44	0.39	0.28	1.16
Minimum	0.64	0.01	-0.14	0.38

Notes. Sample countries (72): Armenia, Aruba, Australia, Austria, Azerbaijan, Bahrain, Belgium, Botswana, Bulgaria, Burkina Faso, Canada, Chile, Costa Rica, Croatia, Cyprus, Denmark, Dominican Republic, Ecuador, Estonia, Finland, France, Georgia, Germany, Greece, Guinea, Honduras, Hungary, India, Ireland, Israel, Italy, Japan, Kazakhstan, Kenya, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Mexico, Mongolia, Namibia, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Panama, Papua New Guinea, Philippines, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Senegal, Serbia, Sierra Leone, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Tajikistan, Thailand, Tunisia, Turkey, Ukraine, United Kingdom, and United States. Descriptive statistics are presented as proportions of GDP.

Table 2

Descriptive Statistics of 51 Countries

	<u>GNI/GDP</u>	<u>Depreciation/GDP</u>	<u>Transfers/GDP</u>	<u>Consumption/GDP</u>	<u>Savings</u>
Mean	0.98	0.14	0.01	0.76	0.00
Median	0.99	0.15	0.00	0.77	0.29
Maximum	1.13	0.39	0.23	1.10	40.00
Minimum	0.64	0.02	-0.13	0.38	-50.00

Notes. Sample countries (51): Armenia, Aruba, Austria, Azerbaijan, Belgium, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Denmark, Dominican Republic, Ecuador, Estonia, Finland, France, Germany, Greece, Guinea, Honduras, Hungary, India, Ireland, Italy, Japan, Kazakhstan, Kuwait, Latvia, Lithuania, Luxembourg, Mexico, Mongolia, Netherlands, Nicaragua, Niger, Norway, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Serbia, Slovenia, South Africa, Spain, Sweden, Tunisia, Ukraine, United Kingdom, and United States. Descriptive statistics for the first four variables are presented as proportions of GDP; Savings is calculated as (total savings - (private savings + government savings + financial corporate savings + non-financial corporate savings)) / total savings * 100.

Table 3

International Risk-Sharing Decompositions for 51 Countries (Oil-Rich Inclusive), 1996-2018

	Overall (51)	Emerging (32)	OECD (24)
Net Factor Income (β_K)	5 (1)	3 (2)	14 (3)
Depreciation (β_D)	-3 (1)	-3 (1)	2 (1)
International Transfers (β_T)	-1 (1)	-1 (1)	-1 (1)
Savings (β_S)	38 (3)	41 (4)	34 (4)
Not Smoothed (β_U)	61 (2)	60 (3)	51 (2)
Obs.	900	406	494

Notes. Emerging economies: Armenia, Aruba, Azerbaijan, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Kuwait, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Saudi Arabia, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Results are presented as percentages of exogenous shocks absorbed at each stage. Results may not summate to 100 due to rounding. Standard errors in parenthesis. β_K represents the OLS estimate of the regression $\Delta \log \widehat{GDP}_t^l - \Delta \log \widehat{GNI}_t^l$ against $\Delta \log \widehat{GDP}_t^l$. β_D is the estimate for $\Delta \log \widehat{GNI}_t^l - \Delta \log \widehat{NNI}_t^l$ against $\Delta \log \widehat{GDP}_t^l$. β_T and β_S follow similar processes (as per Identity 2). β_U is also determined by OLS regression and is from $\Delta \log (\widehat{C} + \widehat{G})_t^l$ against $\Delta \log \widehat{GDP}_t^l$. The first four β coefficients represent the degree of consumption-smoothing present in each respective channel, while β_U represents the unsmoothed consumption.

Table 4

International Savings Decompositions for 51 Countries (Oil-Rich Inclusive), 1996-2018

	Overall (51)	Emerging (32)	OECD (24)
Household Savings (β_h)	4	6	-2
	(2)	(4)	(2)
Government Savings (β_g)	24	27	18
	(2)	(4)	(2)
Financial Corporate Savings (β_f)	2	3	-1
	(1)	(2)	(3)
Non-Financial Corporate Savings (β_{nf})	-1	-7	25
	(3)	(4)	(5)
Obs.	900	406	494

Notes. Emerging economies: Armenia, Aruba, Azerbaijan, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Kuwait, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Saudi Arabia, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Results are presented as percentages of exogenous shocks absorbed at each stage. Standard errors in parenthesis. β_h represents the OLS estimate of the regression $\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{private\ savings})$ against $\Delta \log \widehat{GDP}_t^i$. β_g is the estimate for $\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{government\ savings})$ against $\Delta \log \widehat{GDP}_t^i$. β_f and β_{nf} follow similar processes (as per Identity 3). These β coefficients represent the degree of consumption-smoothing present in each respective channel.

Table 5

International Risk-Sharing Decompositions for 47 Countries (Excluded Oil-Rich Countries), 1996-2018

	Overall (47)	Emerging (29)	OECD (23)
Net Factor Income (β_K)	5 (1)	3 (2)	15 (3)
Depreciation (β_D)	-2 (1)	-3 (1)	5 (1)
International Transfers (β_T)	2 (1)	2 (1)	0 (1)
Savings (β_S)	19 (3)	20 (4)	24 (4)
Not Smoothed (β_U)	75 (2)	77 (3)	57 (3)
Obs.	841	370	471

Notes. Emerging economies: Armenia, Aruba, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Results are presented as percentages of exogenous shocks absorbed at each stage. Results may not summate to 100 due to rounding. Standard errors in parenthesis. β_K represents the OLS estimate of the regression $\Delta \log \widehat{GDP}_t^i - \Delta \log \widehat{GNI}_t^i$ against $\Delta \log \widehat{GDP}_t^i$. β_D is the estimate for $\Delta \log \widehat{GNI}_t^i - \Delta \log \widehat{NNI}_t^i$ against $\Delta \log \widehat{GDP}_t^i$. β_T and β_S follow similar processes (as per Identity 2). β_U is also determined by OLS regression and is from $\Delta \log (\widehat{C} + \widehat{G})_t^i$ against $\Delta \log \widehat{GDP}_t^i$. The first four β coefficients represent the degree of consumption-smoothing present in each respective channel, while β_U represents the unsmoothed consumption.

Table 6

International Savings Decompositions for 47 Countries (Excluded Oil-Rich Countries), 1996-2018

	Overall (47)	Emerging (29)	OECD (23)
Household Savings (β_h)	8 (2)	12 (4)	-2 (2)
Government Savings (β_g)	10 (2)	9 (3)	9 (2)
Financial Corporate Savings (β_f)	2 (2)	4 (2)	-1 (4)
Non-Financial Corporate Savings (β_{nf})	-3 (3)	-10 (4)	29 (5)
Obs.	841	370	471

Notes. Emerging economies: Armenia, Aruba, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Results are presented as percentages of exogenous shocks absorbed at each stage. Standard errors in parenthesis. β_h represents the OLS estimate of the regression $\Delta \log \widehat{DNNI}_t^l - \Delta \log(\widehat{DNNI}_t^l - \widehat{private\ savings})$ against $\Delta \log \widehat{GDP}_t^l$. β_g is the estimate for $\Delta \log \widehat{DNNI}_t^l - \Delta \log(\widehat{DNNI}_t^l - \widehat{government\ savings})$ against $\Delta \log \widehat{GDP}_t^l$. β_f and β_{nf} follow similar processes (as per Identity 3). These β coefficients represent the degree of consumption-smoothing present in each respective channel.

Table 7

International Period Risk-Sharing Decompositions for 47 Countries, 1996-2007, and 2008-2018

	1996-2007		2008-2018	
	Emerging	OECD	Emerging	OECD
Net Factor Income (β_K)	2 (2)	21 (6)	6 (4)	12 (3)
Depreciation (β_D)	-3 (2)	-6 (1)	-3 (3)	10 (2)
International Transfers (β_T)	2 (2)	0 (1)	3 (2)	0 (1)
Savings (β_S)	18 (5)	22 (7)	23 (6)	25 (5)
Not Smoothed (β_U)	81 (4)	64 (4)	71 (4)	54 (4)
Obs.	197	232	173	239

Notes. Emerging economies: Armenia, Aruba, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Results are presented as percentages of exogenous shocks absorbed at each stage. Results may not summate to 100 due to rounding. Standard errors in parenthesis. β_K represents the OLS estimate of the regression $\Delta \log \widehat{GDP}_t^i - \Delta \log \widehat{GNI}_t^i$ against $\Delta \log \widehat{GDP}_t^i$. β_D is the estimate for $\Delta \log \widehat{GNI}_t^i - \Delta \log \widehat{NNI}_t^i$ against $\Delta \log \widehat{GDP}_t^i$. β_T and β_S follow similar processes (as per Identity 2). β_U is also determined by OLS regression and is from $\Delta \log (\widehat{C} + \widehat{G})_t^i$ against $\Delta \log \widehat{GDP}_t^i$. The first four β coefficients represent the degree of consumption-smoothing present in each respective channel, while β_U represents the unsmoothed consumption.

Table 8

International Period Savings Decompositions for 47 Countries, 1996-2007, and 2008-2018

	1996-2007		2008-2018	
	Emerging	OECD	Emerging	OECD
Household Savings (β_h)	20 (5)	-8 (4)	-1 (5)	1 (3)
Government Savings (β_g)	0 (3)	9 (4)	25 (5)	9 (3)
Financial Corporate Savings (β_f)	8 (3)	0 (3)	-4 (4)	-2 (6)
Non-Financial Corporate Savings (β_{nf})	-13 (5)	2 (7)	-7 (6)	41 (8)
Obs.	197	232	173	239

Notes. Emerging economies: Armenia, Aruba, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Results are presented as percentages of exogenous shocks absorbed at each stage. Standard errors in parenthesis. β_h represents the OLS estimate of the regression $\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{private\ savings})$ against $\Delta \log \widehat{GDP}_t^i$. β_g is the estimate for $\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{government\ savings})$ against $\Delta \log \widehat{GDP}_t^i$. β_f and β_{nf} follow similar processes (as per Identity 3). These β coefficients represent the degree of consumption-smoothing present in each respective channel.

Table 9

International Regional Risk-Sharing Decompositions for 47 Countries, 1996-2018

	OECD and Emerging EU comparison		Emerging countries regional decomposition			
	OECD EU	Emerging EU	Europe Non-EU	Central and South America	Africa	Asia and the Middle East
Net Factor Income (β_K)	17 (3)	2 (9)	1 (3)	2 (4)	2 (2)	9 (10)
Depreciation (β_D)	7 (2)	-6 (6)	-2 (3)	-5 (2)	0 (2)	1 (3)
International Transfers (β_T)	0 (1)	6 (2)	-1 (3)	10 (3)	4 (5)	4 (4)
Savings (β_S)	23 (4)	16 (13)	16 (9)	38 (7)	9 (11)	21 (13)
Not Smoothed (β_U)	53 (3)	81 (5)	86 (5)	55 (7)	85 (8)	64 (11)
Obs.	396	71	107	66	79	47

Notes. OECD EU: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, and United Kingdom. Emerging EU: Bulgaria, Croatia, Cyprus, Estonia, Latvia, Lithuania, and Romania. Emerging non-EU Europe: Bulgaria, Croatia, Cyprus, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Serbia, Slovenia, and Ukraine. Emerging Central and South America: Aruba, Chile, Costa Rica, Dominican Republic, Ecuador, Honduras, and Nicaragua. Emerging Africa: Burkina Faso, Guinea, Niger, South Africa, and Tunisia. Emerging Asia and the Middle East: Armenia, India, Kazakhstan, and Mongolia. Results are presented as percentages of exogenous shocks absorbed at each stage. Results may not summate to 100 due to rounding. Standard errors in parenthesis. β_K represents the OLS estimate of the regression $\Delta \log \widehat{GDP}_t^i - \Delta \log \widehat{GNI}_t^i$ against $\Delta \log \widehat{GDP}_t^i$. β_D is the estimate for $\Delta \log \widehat{GNI}_t^i - \Delta \log \widehat{NNI}_t^i$ against $\Delta \log \widehat{GDP}_t^i$. β_T and β_S follow similar processes (as per Identity 2). β_U is also determined by OLS regression and is from $\Delta \log(\widehat{C} + \widehat{G})_t^i$ against $\Delta \log \widehat{GDP}_t^i$. The first four β coefficients represent the degree of consumption-smoothing present in each respective channel, while β_U represents the unsmoothed consumption.

Table 10

International Regional Savings Decompositions for 47 Countries, 1996-2018

	OECD and Emerging EU comparison		Emerging countries regional decomposition			
	OECD EU	Emerging EU	Europe Non-EU	Central and South America	Africa	Asia and the Middle East
Household Savings (β_h)	0	0	30	-4	2	2
	(2)	(7)	(8)	(9)	(6)	(20)
Government Savings (β_g)	10	0	-1	23	4	37
	(2)	(5)	(4)	(9)	(6)	(21)
Financial Corporate Savings (β_f)	-1	7	11	0	-2	4
	(4)	(10)	(4)	(2)	(1)	(10)
Non-Financial Corporate Savings (β_{nf})	30	6	-27	10	11	-29
	(6)	(8)	(7)	(9)	(5)	(34)
Obs.	396	71	107	66	79	47

Notes. OECD EU: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, and United Kingdom. Emerging EU: Bulgaria, Croatia, Cyprus, Estonia, Latvia, Lithuania, and Romania. Emerging non-EU Europe: Bulgaria, Croatia, Cyprus, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Serbia, Slovenia, and Ukraine. Emerging Central and South America: Aruba, Chile, Costa Rica, Dominican Republic, Ecuador, Honduras, and Nicaragua. Emerging Africa: Burkina Faso, Guinea, Niger, South Africa, and Tunisia. Emerging Asia and the Middle East: Armenia, India, Kazakhstan, and Mongolia. Results are presented as percentages of exogenous shocks absorbed at each stage. Standard errors in parenthesis. β_h represents the OLS estimate of the regression $\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \text{private savings})$ against $\Delta \log \widehat{GDP}_t^i$. β_g is the estimate for $\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \text{government savings})$ against $\Delta \log \widehat{GDP}_t^i$. β_f and β_{nf} follow similar processes (as per Identity 3). These β coefficients represent the degree of consumption-smoothing present in each respective channel.

Table 11

Worldwide Governance Indicators Descriptive Statistics

	OECD Countries		Emerging Economies	
	Mean	Stdev	Mean	Stdev
Control of Corruption	1.36	0.74	-0.15	0.73
Government Effectiveness	1.38	0.55	0.04	0.70
Political Stability and Absence of Violence/Terrorism	0.83	0.51	0.07	0.63
Regulatory Quality	1.31	0.44	0.19	0.71
Rule of Law	1.34	0.58	-0.10	0.72
Voice and Accountability	1.23	0.32	0.16	0.73

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. World Governance Indicators range from -2.5 to +2.5.

Following, Tables 12-16 assess the OECD's savings channels, while Tables 17-21 assesses the Emerging countries; in the respective order of general savings, private, government, financial, and non-financial. The specific channel for each Table is also presented in italics in the title, and in the equation below.

Table 12

Worldwide Governance Indicators Effects on OECD Savings 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.21 (0.08)	0.21 (0.08)	0.16 (0.07)	0.17 (0.07)	0.19 (0.08)	0.20 (0.08)
Trend (<i>t</i>)	0.07 (0.09)	0.07 (0.09)	0.10 (0.09)	0.08 (0.09)	0.07 (0.09)	0.08 (0.09)
Control of Corruption	0.10 (0.04)					
Government Effectiveness		0.15 (0.05)				
Political Stability and Absence of Violence/Terrorism			0.16 (0.05)			
Regulatory Quality				0.09 (0.06)		
Rule of Law					0.12 (0.05)	
Voice and Accountability						0.21 (0.09)
R-squared	0.35	0.35	0.35	0.34	0.35	0.35

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 449 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 13

Worldwide Governance Indicators Effects on OECD *Private Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.03	0.03	0.03	0.02	0.03	0.03
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Trend (<i>t</i>)	-0.05	-0.05	-0.05	-0.05	-0.06	-0.05
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Control of Corruption	0.01					
	(0.02)					
Government Effectiveness		0.02				
		(0.03)				
Political Stability and Absence of Violence/Terrorism			-0.02			
			(0.03)			
Regulatory Quality				0.02		
				(0.03)		
Rule of Law					0.04	
					(0.03)	
Voice and Accountability						0.04
						(0.05)
R-squared	0.24	0.24	0.24	0.24	0.24	0.24

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 449 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{DNNI}_t^i - \widetilde{private\ savings}_t^i)$$

$$= v_t + \beta_0 \widetilde{GDP}_{it} + \beta_1 \Delta \widetilde{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widetilde{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 14

Worldwide Governance Indicators Effects on OECD *Government Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.07 (0.04)	0.07 (0.04)	0.03 (0.04)	0.04 (0.04)	0.06 (0.04)	0.06 (0.04)
Trend (<i>t</i>)	0.06 (0.05)	0.07 (0.05)	0.09 (0.05)	0.07 (0.05)	0.06 (0.05)	0.07 (0.05)
Control of Corruption	0.12 (0.02)					
Government Effectiveness		0.16 (0.03)				
Political Stability and Absence of Violence/Terrorism			0.13 (0.03)			
Regulatory Quality				0.15 (0.03)		
Rule of Law					0.14 (0.03)	
Voice and Accountability						0.24 (0.05)
R-squared	0.58	0.58	0.57	0.57	0.58	0.58

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 449 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{DNNI}_t^i - \widetilde{\text{government savings}}_t^i) \\ = v_t + \beta_0 \widetilde{GDP}_{it} + \beta_1 \Delta \widetilde{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widetilde{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 15

Worldwide Governance Indicators Effects on OECD *Financial Corporate Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Trend (<i>t</i>)	0.01	0.01	0.01	0.01	0.01	0.01
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Control of Corruption	0.02					
	(0.03)					
Government Effectiveness		0.03				
		(0.05)				
Political Stability and Absence of Violence/Terrorism			0.04			
			(0.05)			
Regulatory Quality				0.04		
				(0.05)		
Rule of Law					0.02	
					(0.04)	
Voice and Accountability						0.03
						(0.08)
R-squared	0.04	0.04	0.04	0.04	0.04	0.04

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 449

Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{financial\ corporate\ savings}_t^i)$$

$$= v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 16

Worldwide Governance Indicators Effects on OECD *Non-Financial Corporate Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.20	0.19	0.16	0.17	0.19	0.19
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Trend (<i>t</i>)	0.16	0.16	0.18	0.16	0.16	0.16
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Control of Corruption	0.11					
	(0.05)					
Government Effectiveness		0.11				
		(0.07)				
Political Stability and Absence of Violence/Terrorism			0.07			
			(0.07)			
Regulatory Quality				0.21		
				(0.08)		
Rule of Law					0.14	
					(0.06)	
Voice and Accountability						0.18
						(0.12)
R-squared	0.13	0.12	0.12	0.13	0.13	0.12

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 449 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{DNNI}_t^i - \text{nonfinancial corporate savings}_t^i) \\ = v_t + \beta_0 \widetilde{GDP}_{it} + \beta_1 \Delta \widetilde{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widetilde{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 17

Worldwide Governance Indicators Effects on Emerging Economies Savings 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.19	0.20	0.21	0.21	0.20	0.17
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Trend (<i>t</i>)	-0.08	-0.09	-0.10	-0.09	-0.08	-0.05
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Control of Corruption	-0.04					
	(0.05)					
Government Effectiveness		-0.03				
		(0.05)				
Political Stability and Absence of Violence/Terrorism			-0.03			
			(0.05)			
Regulatory Quality				-0.01		
				(0.04)		
Rule of Law					-0.03	
					(0.04)	
Voice and Accountability						-0.08
						(0.04)
R-squared	0.13	0.13	0.13	0.13	0.13	0.14

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 355 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 18

Worldwide Governance Indicators Effects on Emerging Economies *Private Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.11 (0.06)	0.11 (0.06)	0.14 (0.06)	0.13 (0.06)	0.12 (0.06)	0.10 (0.06)
Trend (<i>t</i>)	-0.12 (0.07)	-0.12 (0.07)	-0.14 (0.07)	-0.13 (0.07)	-0.12 (0.07)	-0.11 (0.07)
Control of Corruption	-0.06 (0.04)					
Government Effectiveness		-0.07 (0.04)				
Political Stability and Absence of Violence/Terrorism			-0.03 (0.04)			
Regulatory Quality				-0.04 (0.03)		
Rule of Law					-0.05 (0.03)	
Voice and Accountability						-0.07 (0.03)
R-squared	0.11	0.11	0.10	0.10	0.11	0.11

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 355 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{private\ savings}_t^i) \\ = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 19

Worldwide Governance Indicators Effects on Emerging Economies *Government Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	-0.06	-0.05	-0.05	-0.05	-0.05	-0.08
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Trend (<i>t</i>)	0.22	0.21	0.21	0.21	0.21	0.24
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Control of Corruption	-0.03					
	(0.03)					
Government Effectiveness		0.00				
		(0.03)				
Political Stability and Absence of Violence/Terrorism			0.03			
			(0.04)			
Regulatory Quality				0.00		
				(0.03)		
Rule of Law					0.00	
					(0.03)	
Voice and Accountability						-0.06
						(0.03)
R-squared	0.28	0.28	0.28	0.28	0.28	0.29

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 355 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{government\ savings}_t^i) \\ = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 20

Worldwide Governance Indicators Effects on Emerging Economies *Financial Corporate Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.03	0.03	0.04	0.04	0.03	0.03
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Trend (<i>t</i>)	-0.05	-0.05	-0.06	-0.05	-0.05	-0.05
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Control of Corruption	-0.02					
	(0.02)					
Government Effectiveness		-0.03				
		(0.03)				
Political Stability and Absence of Violence/Terrorism			-0.01			
			(0.03)			
Regulatory Quality				-0.02		
				(0.02)		
Rule of Law					-0.02	
					(0.02)	
Voice and Accountability						-0.02
						(0.02)
R-squared	0.07	0.08	0.07	0.07	0.08	0.08

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 355 Observations for each metric.

Results presented represent the β_2 value in the equation below.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{DNNI}_t^i - \widetilde{financial\ corporate\ savings}_t^i)$$

$$= v_t + \beta_0 \overline{GDP}_{it} + \beta_1 \Delta \overline{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \overline{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 21

Worldwide Governance Indicators Effects on Emerging Economies *Non-Financial Corporate Savings* 1996-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.00	-0.02	-0.03	-0.03	-0.02	-0.01
	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
Trend (<i>t</i>)	-0.05	-0.04	-0.03	-0.03	-0.03	-0.05
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Control of Corruption	0.05					
	(0.04)					
Government Effectiveness		0.04				
		(0.05)				
Political Stability and Absence of Violence/Terrorism			-0.07			
			(0.05)			
Regulatory Quality				0.02		
				(0.04)		
Rule of Law					0.01	
					(0.04)	
Voice and Accountability						0.04
						(0.04)
R-squared	0.07	0.07	0.07	0.07	0.07	0.07

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 355 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{nonfinancial\ corporate\ savings}_t^i)$$

$$= v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 22

Worldwide Governance Indicators Period Decomposition Descriptive Statistics OECD

	1996-2007		2008-2018	
	Mean	Stdev	Mean	Stdev
Control of Corruption	1.47	0.66	1.25	0.79
Government Effectiveness	1.49	0.54	1.28	0.55
Political Stability and Absence of Violence/Terrorism	0.97	0.48	0.69	0.50
Regulatory Quality	1.35	0.41	1.27	0.47
Rule of Law	1.40	0.49	1.29	0.65
Voice and Accountability	1.29	0.26	1.16	0.36

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. World Governance Indicators range from -2.5 to +2.5.

Table 23

Worldwide Governance Indicators Period Decomposition Descriptive Statistics Emerging

	1996-2007		2008-2018	
	Mean	Stdev	Mean	Stdev
Control of Corruption	-0.03	0.80	-0.28	0.62
Government Effectiveness	0.11	0.73	-0.04	0.65
Political Stability and Absence of Violence/Terrorism	0.15	0.62	-0.04	0.63
Regulatory Quality	0.29	0.74	0.08	0.65
Rule of Law	-0.04	0.77	-0.17	0.66
Voice and Accountability	0.21	0.76	0.09	0.68

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. World Governance Indicators range from -2.5 to +2.5.

Following, Tables 24-33 explore the period breakdown of the savings channels. 24 and 25 displays OECD savings, 26 and 27 OECD non-financial corporate savings, 28 and 29 emerging savings, 30 and 31 emerging private savings, while 32 and 33 displays emerging government savings. The channel/subchannels each Table displays is presented in italics in the titles, and in the equations below.

Table 24

Worldwide Governance Indicators Effects on OECD Savings 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.11	0.11	0.11	0.11	0.11	0.11
	(0.12)	(0.12)	(0.13)	(0.12)	(0.12)	(0.12)
Trend (<i>t</i>)	0.19	0.19	0.18	0.18	0.18	0.18
	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Control of Corruption	0.06					
	(0.06)					
Government Effectiveness		0.06				
		(0.08)				
Political Stability and Absence of Violence/Terrorism			-0.01			
			(0.09)			
Regulatory Quality				0.01		
				(0.10)		
Rule of Law					0.05	
					(0.08)	
Voice and Accountability						-0.03
						(0.15)
R-squared	0.15	0.15	0.15	0.15	0.15	0.15

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 213 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 25

Worldwide Governance Indicators Effects on OECD Savings 2008-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.25 (0.10)	0.28 (0.10)	0.22 (0.09)	0.21 (0.10)	0.24 (0.10)	0.26 (0.10)
Trend (<i>t</i>)	0.01 (0.11)	0.00 (0.11)	0.04 (0.10)	0.03 (0.11)	0.01 (0.11)	0.01 (0.11)
Control of Corruption	0.14 (0.05)					
Government Effectiveness		0.25 (0.08)				
Political Stability and Absence of Violence/Terrorism			0.34 (0.08)			
Regulatory Quality				0.13 (0.07)		
Rule of Law					0.16 (0.06)	
Voice and Accountability						0.35 (0.11)
R-squared	0.45	0.46	0.48	0.44	0.45	0.46

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 236 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 26

Worldwide Governance Indicators Effects on OECD *Non-Financial Corporate Savings* 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	-0.02	-0.01	0.00	0.00	-0.01	-0.01
	(0.13)	(0.13)	(0.14)	(0.13)	(0.13)	(0.13)
Trend (<i>t</i>)	0.05	-0.05	0.05	0.05	0.05	0.05
	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)
Control of Corruption	-0.07					
	(0.06)					
Government Effectiveness		-0.10				
		(0.08)				
Political Stability and Absence of Violence/Terrorism			-0.03			
			(0.09)			
Regulatory Quality				-0.08		
				(0.11)		
Rule of Law					-0.07	
					(0.08)	
Voice and Accountability						-0.17
						(0.16)
R-squared	0.06	0.06	0.06	0.06	0.06	0.06

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 213 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{DNNI}_t^i - \widetilde{nonfinancial\ corporate\ savings}_t^i)$$

$$= v_t + \beta_0 \widetilde{GDP}_{it} + \beta_1 \Delta \widetilde{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widetilde{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 27

Worldwide Governance Indicators Effects on OECD *Non-Financial Corporate Savings* 2008-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.37 (0.14)	0.41 (0.15)	0.30 (0.14)	0.31 (0.14)	0.35 (0.14)	0.35 (0.14)
Trend (<i>t</i>)	0.10 (0.16)	0.09 (0.16)	0.16 (0.16)	0.11 (0.16)	0.11 (0.16)	0.11 (0.16)
Control of Corruption	0.25 (0.08)					
Government Effectiveness		0.39 (0.11)				
Political Stability and Absence of Violence/Terrorism			0.32 (0.12)			
Regulatory Quality				0.38 (0.11)		
Rule of Law					0.28 (0.09)	
Voice and Accountability						0.47 (0.17)
R-squared	0.21	0.21	0.19	0.21	0.20	0.19

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 236 Observations for each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{DNNI}_t^i - \widetilde{\text{nonfinancial corporate savings}}_t^i) \\ = v_t + \beta_0 \widetilde{GDP}_{it} + \beta_1 \Delta \widetilde{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widetilde{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 28

Worldwide Governance Indicators Effects on Emerging Savings 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.31	0.32	0.32	0.33	0.33	0.30
	(0.10)	(0.10)	(0.09)	(0.09)	(0.10)	(0.10)
Trend (<i>t</i>)	-0.39	-0.39	-0.39	-0.40	-0.40	-0.38
	(0.13)	(0.13)	(0.12)	(0.12)	(0.13)	(0.13)
Control of Corruption	-0.01					
	(0.05)					
Government Effectiveness		0.00				
		(0.06)				
Political Stability and Absence of Violence/Terrorism			0.01			
			(0.06)			
Regulatory Quality				0.03		
				(0.05)		
Rule of Law					0.01	
					(0.05)	
Voice and Accountability						-0.03
						(0.05)
R-squared	0.15	0.15	0.15	0.15	0.15	0.15

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 182 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 29

Worldwide Governance Indicators Effects on Emerging Savings 2008-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.06 (0.14)	0.06 (0.14)	0.10 (0.14)	0.07 (0.14)	0.06 (0.14)	0.05 (0.14)
Trend (<i>t</i>)	0.20 (0.15)	0.20 (0.15)	0.16 (0.15)	0.21 (0.15)	0.22 (0.15)	0.22 (0.15)
Control of Corruption	-0.10 (0.08)					
Government Effectiveness		-0.11 (0.08)				
Political Stability and Absence of Violence/Terrorism			-0.11 (0.09)			
Regulatory Quality				-0.12 (0.08)		
Rule of Law					-0.15 (0.07)	
Voice and Accountability						-0.18 (0.07)
R-squared	0.18	0.18	0.18	0.18	0.19	0.20

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 173 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 30

Worldwide Governance Indicators Effects on Emerging *Private Savings* 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.16 (0.08)	0.17 (0.08)	0.19 (0.08)	0.18 (0.08)	0.18 (0.08)	0.17 (0.08)
Trend (<i>t</i>)	-0.19 (0.11)	-0.20 (0.11)	-0.21 (0.11)	-0.21 (0.11)	-0.20 (0.11)	-0.19 (0.11)
Control of Corruption	-0.05 (0.05)					
Government Effectiveness		-0.06 (0.05)				
Political Stability and Absence of Violence/Terrorism			-0.04 (0.05)			
Regulatory Quality				-0.03 (0.05)		
Rule of Law					-0.03 (0.04)	
Voice and Accountability						-0.04 (0.04)
R-squared	0.14	0.14	0.14	0.14	0.13	0.14

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 182 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{private\ savings}_t^i)$$

$$= v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 31

Worldwide Governance Indicators Effects on Emerging *Private Savings* 2008-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	-0.03 (0.11)	-0.02 (0.11)	-0.01 (0.11)	-0.01 (0.11)	-0.02 (0.11)	-0.03 (0.10)
Trend (<i>t</i>)	0.02 (0.11)	0.02 (0.11)	-0.01 (0.11)	0.01 (0.11)	0.02 (0.11)	0.03 (0.11)
Control of Corruption	-0.07 (0.06)					
Government Effectiveness		-0.08 (0.06)				
Political Stability and Absence of Violence/Terrorism			0.00 (0.07)			
Regulatory Quality				-0.04 (0.06)		
Rule of Law					-0.08 (0.05)	
Voice and Accountability						-0.13 (0.05)
R-squared	0.08	0.08	0.07	0.07	0.08	0.10

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 173 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{private\ savings}_t^i)$$

$$= v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 32

Worldwide Governance Indicators Effects on Emerging *Government Savings* 1996-2007

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	-0.03 (0.06)	-0.03 (0.06)	-0.05 (0.06)	-0.03 (0.06)	-0.03 (0.06)	-0.05 (0.06)
Trend (<i>t</i>)	0.06 (0.08)	0.07 (0.08)	0.08 (0.08)	0.07 (0.08)	0.07 (0.08)	0.08 (0.08)
Control of Corruption	0.03 (0.03)					
Government Effectiveness		0.03 (0.04)				
Political Stability and Absence of Violence/Terrorism			0.06 (0.04)			
Regulatory Quality				0.04 (0.03)		
Rule of Law					0.03 (0.03)	
Voice and Accountability						-0.01 (0.03)
R-squared	0.10	0.10	0.11	0.11	0.10	0.10

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 182 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{government\ savings}_t^i) \\ = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 33

Worldwide Governance Indicators Effects on Emerging *Government Savings* 2008-2018

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GDP</i>	0.01	0.03	0.05	0.04	0.03	0.02
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Trend (<i>t</i>)	0.27	0.25	0.23	0.26	0.27	0.27
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)
Control of Corruption	-0.15					
	(0.06)					
Government Effectiveness		-0.08				
		(0.06)				
Political Stability and Absence of Violence/Terrorism			-0.02			
			(0.06)			
Regulatory Quality				-0.11		
				(0.05)		
Rule of Law					-0.11	
					(0.05)	
Voice and Accountability						-0.17
						(0.05)
R-squared	0.42	0.40	0.39	0.41	0.41	0.44

Notes. Emerging economies: Armenia, Bulgaria, Burkina Faso, Chile, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Guinea, Honduras, Hungary, India, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 173 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{government\ savings}_t^i) \\ = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 34

Years of Education Descriptive Statistics

	OECD Countries		Emerging Economies	
	Mean	Stdev	Mean	Stdev
Primary	5.55	0.89	5.17	1.27
Secondary	4.06	0.91	3.57	1.39
Tertiary	0.66	0.27	0.50	0.30
Total	10.27	1.32	9.24	2.35

Notes. Emerging economies: Armenia, Bulgaria, Chile, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Honduras, Hungary, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Results presented as average years of education for adults aged 15+ in the country groups.

Following, Tables 35-39 describe the effects of years-in-education on OECD savings accounts in order of general savings, private, government, financial corporate, and non-financial corporate savings. Table 40 displays that of the emerging countries general savings.

Table 35

Years of Education Effects on OECD Savings 1995-2010

	(1)	(2)	(3)	(4)
<i>GDP</i>	0.26 (0.10)	0.32 (0.10)	0.17 (0.09)	0.18 (0.09)
Trend (<i>t</i>)	0.18 (0.13)	0.13 (0.13)	0.20 (0.13)	0.22 (0.13)
Primary	-0.07 (0.05)			
Secondary		0.17 (0.06)		
Tertiary			0.47 (0.19)	
Total				0.05 (0.04)
R-squared	0.36	0.37	0.37	0.36

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 290 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 36

Years of Education Effects on OECD *Private Savings* 1995-2010

	(1)	(2)	(3)	(4)
<i>GDP</i>	-0.11 (0.05)	-0.08 (0.05)	-0.14 (0.05)	-0.14 (0.05)
Trend (<i>t</i>)	0.12 (0.07)	0.10 (0.07)	0.13 (0.07)	0.14 (0.07)
Primary	-0.03 (0.02)			
Secondary		0.07 (0.03)		
Tertiary			0.15 (0.10)	
Total				0.02 (0.02)
R-squared	0.35	0.36	0.35	0.35

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 290 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{private\ savings}_t^i) \\ = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 37

Years of Education Effects on OECD *Government Savings* 1995-2010

	(1)	(2)	(3)	(4)
<i>GDP</i>	0.22 (0.06)	0.24 (0.05)	0.15 (0.05)	0.17 (0.05)
Trend (<i>t</i>)	-0.12 (0.07)	-0.14 (0.07)	-0.11 (0.07)	-0.10 (0.07)
Primary	-0.04 (0.03)			
Secondary		0.09 (0.03)		
Tertiary			0.43 (0.10)	
Total				0.03 (0.02)
R-squared	0.63	0.64	0.65	0.63

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 290 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{government\ savings}_t^i) \\ = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 38

Years of Education Effects on OECD *Financial Corporate Savings* 1995-2010

	(1)	(2)	(3)	(4)
<i>GDP</i>	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.04)	-0.03 (0.04)
Trend (<i>t</i>)	-0.02 (0.06)	-0.02 (0.06)	-0.03 (0.06)	-0.02 (0.06)
Primary	0.01 (0.02)			
Secondary		0.00 (0.03)		
Tertiary			0.02 (0.01)	
Total				0.00 (0.02)
R-squared	0.06	0.06	0.06	0.06

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 290 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{DNNI}_t^i - \widetilde{financial\ corporate\ savings}_t^i)$$

$$= v_t + \beta_0 \widetilde{GDP}_{it} + \beta_1 \Delta \widetilde{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widetilde{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 39

Years of Education Effects on OECD *Non-Financial Corporate Savings* 1995-2010

	(1)	(2)	(3)	(4)
<i>GDP</i>	-0.05 (0.10)	-0.03 (0.10)	-0.03 (0.09)	-0.03 (0.09)
Trend (<i>t</i>)	0.34 (0.13)	0.33 (0.13)	0.32 (0.13)	0.32 (0.13)
Primary	0.03 (0.05)			
Secondary		-0.01 (0.06)		
Tertiary			0.08 (0.19)	
Total				0.02 (0.04)
R-squared	0.13	0.13	0.13	0.13

Notes. OECD: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom, and United States. Standard errors in parenthesis. 290 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{nonfinancial\ corporate\ savings}_t^i)$$

$$= v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Table 40

Years of Education Effects on Emerging Savings 1995-2010

	(1)	(2)	(3)	(4)
<i>GDP</i>	0.39 (0.08)	0.43 (0.09)	0.39 (0.09)	0.46 (0.09)
Trend (<i>t</i>)	-0.30 (0.10)	-0.33 (0.10)	-0.31 (0.10)	-0.34 (0.10)
Primary	-0.05 (0.04)			
Secondary		-0.02 (0.03)		
Tertiary			0.05 (0.12)	
Total				-0.04 (0.03)
R-squared	0.21	0.21	0.21	0.22

Notes. Emerging economies: Armenia, Bulgaria, Chile, Croatia, Cyprus, Dominican Republic, Ecuador, Estonia, Honduras, Hungary, Kazakhstan, Latvia, Lithuania, Mongolia, Nicaragua, Niger, Poland, Romania, Russian Federation, Serbia, Slovenia, South Africa, Tunisia, and Ukraine. Standard errors in parenthesis. 238 Observations in each metric. Results presented represent the β_2 value in the equation below.

$$\Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{C + G})_t^i = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}$$

Figure 1
 Government Savings as a Proportion of GDP (Country by Country)
 Emerging Economies

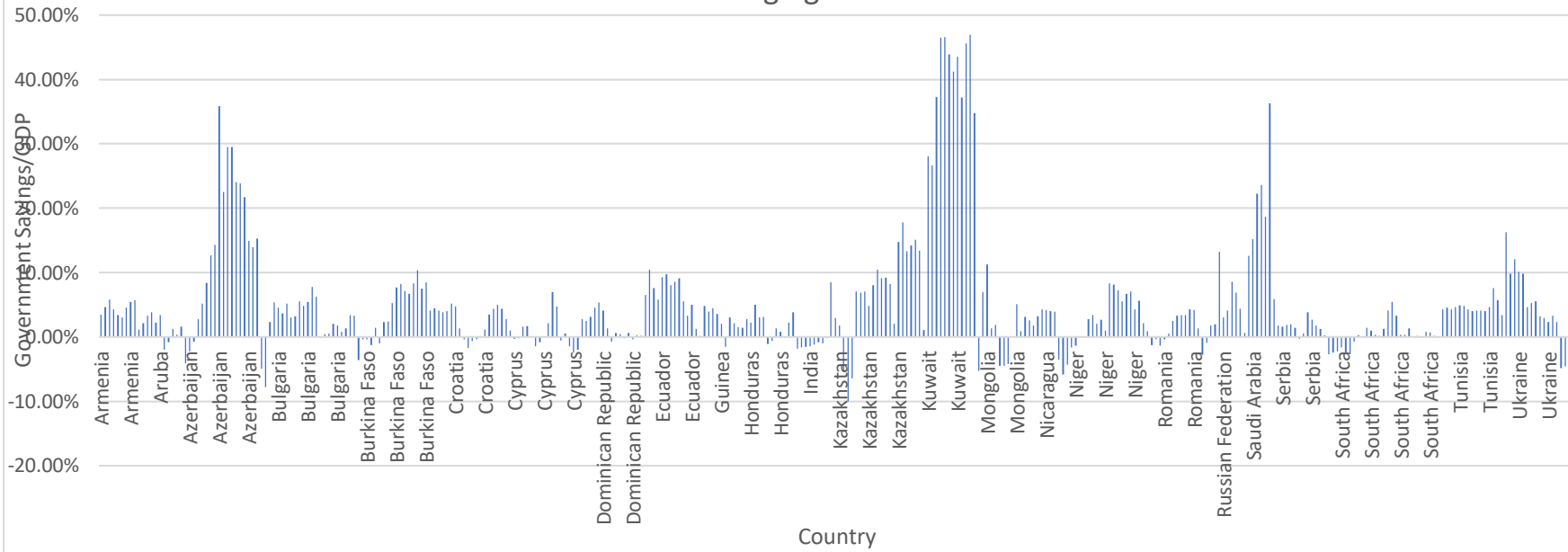
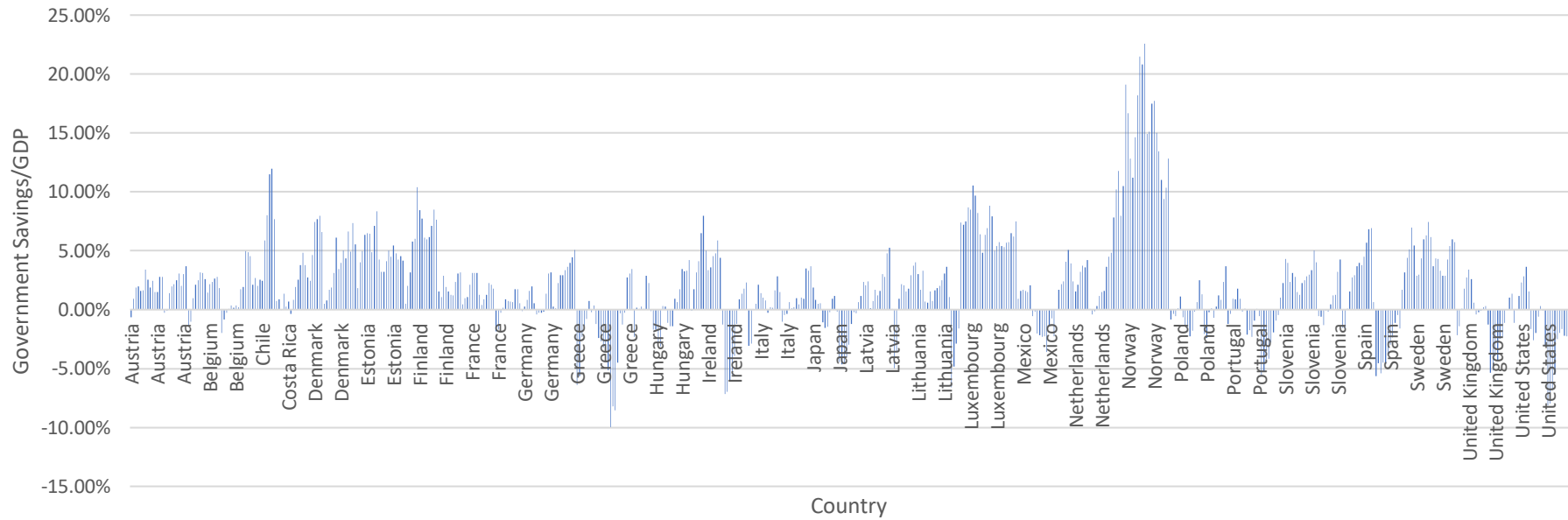


Figure 2
 Government Savings as a Proportion of GDP (Country by Country)
 OECD



1. Introduction

Recent destabilizing events such as the COVID-19 pandemic, climate change, the US-China trade war, the Taliban takeover of Afghanistan, and Russian posturing over Ukraine are inflicting shocks unprecedented in modern history to the incomes and consumption levels of consumers worldwide. As a result, globally, we are experiencing among other things, heightened levels of unemployment, famine, and slowing economic growth. This highlights the importance of reducing the exposure that these uncontrollable shocks have on consumer livelihoods around the world. There are many approaches one can take when exploring how to minimize the effects that these unfavourable events have on consumer's incomes and consumption. We will be focusing on achieving stabilization through consumption smoothing, or risk-sharing. In effect, we are assessing how well consumers are able to decouple their consumption from their income. Specifically, we will be looking into the mechanisms that help both consumers and countries alike maintain a steady level of consumption in the face of fluctuating incomes. The benefit that this decoupling of income and consumption provides draws from the theory of diminishing marginal utility, and overall longevity. The theory states that maintaining a constant level of consumption (including growth trends) produces greater utility than if consumption fluctuates. Longevity is self-explanatory following the ideology of saving for a rainy day. One could look at the mechanisms that provide consumption smoothing as the finance equivalent of diversification or insurance; overall risk mitigation through broader holdings of income streams. In this study, we will be using the terms consumption smoothing, risk-sharing, and stabilization interchangeably as they refer to the same concept.

The purpose of this study is twofold. First, we seek to ascertain the magnitudes and statistical significances of the relevant mechanisms, or channels of income and consumption smoothing in countries and regions across the world to determine patterns and guidelines (or traits of best practice) that countries can follow to improve the economic welfare of their citizens. Second, we look to decompose the savings risk-sharing channel into four subchannels, as well as explore their potential determinants. The savings, specifically government savings channels are quintessential in the welfare of nations as they provide more equitable allocations of smoothing relative to their capital markets, net factor income counterpart. As Hepp and von Hagen (2013) puts it, increasing dependence on the capital markets channel (especially in the absence of the government sector's public risk-sharing) could overexpose households without significant holdings in productive cross-border assets. As we explore the literature in Section 2, we find that internationally, the savings channel is the only risk-sharing channel that remains consistently significant across all country groups. Not only is this channel significant, it also accounts for the majority of all risk-sharing

experienced on the global stage. However, despite the savings channel's prominence, it is sparsely covered in the literature. We aim to fill this gap in knowledge by providing international savings channel decompositions along with some determinant testing.

In this study, we seek to accomplish three objectives. First, we will determine the risk-sharing compositions of both geographic and membership-based country groups across the world. Not only does this provide the context for the rest of our study, it also acts as a robustness test in determining if our findings are consistent with the existing literature. Next, we will decompose the savings channel into four subchannels, namely private, government, financial corporate, and non-financial corporate. This helps clarify how savings, the largest risk-sharing channel in most country groups in the literature is comprised, allowing for potentially greater understanding of the savings risk-sharing mechanism as a whole. Finally, we seek to ascertain the determinants of the savings channel and its multiple subchannels. This allows us to determine the underlying reasons as to why countries experience different levels of savings induced consumption smoothing, as well as how other countries can follow suit. Following, Section 2 will review the related literature, Section 3 presents the proposed methodology, Section 4 the data selection, filtering, and manipulation process, Section 5 displays the results and commentary, and Section 6 concludes.

2. Literature review

2.1. Full insurance microeconomics

Mace (1991) was one of the first papers to test for household-level risk-sharing. She regressed changes in household consumption against changes in aggregate consumption and numerous other variables such as household income and employment. She hypothesized that the only determinant of personal consumption is aggregate consumption and that all other variables would be statistically insignificant, indicating full insurance or full risk-sharing. Her tests produced mixed results depending on the framework utilized. This suggested that there is likely a lack of full risk-sharing. Cochrane (1991) ran similar tests and found that low-persistence shocks to income, lasting less than 100 days, such as periodic unemployment, do not affect consumption growth levels. However, high-persistence shocks to income, lasting more than 100 days, such as long-term illnesses, negatively influence household consumption, which also supports the lack of full risk-sharing. Townsend (1994) stated that Mace (1991) and Cochrane (1991) provided results that were not sufficiently robust as they were too dependent on the choice of right-hand-side variables. With his own study, Townsend (1994) concluded that although household consumption does see notable co-movement with aggregate consumption and is unaffected by involuntary unemployment, it is affected by household

income. Although Townsend (1994) states that this impact of income on consumption is not overly notable, he is comfortable in rejecting the hypothesis of full insurance.

Although Mace (1991), Cochrane (1991), and Townsend (1994) all lean towards rejecting full insurance (risk-sharing), they do agree that risk-sharing still exists to a high degree at the micro-level. This aligns with the popular economic theory that in open economies, consumption correlations across countries should exceed output correlations. This is theoretically due to the rational consumer behaviour of income diversification where individuals hold claims on each other's income streams to smooth out idiosyncratic shocks to their own. However, Backus et al. (1992) has found that in reality, this is not the case. Backus et al. (1992) calls this the consumption-output anomaly. Contrary to previous studies, these authors suggest that international consumption risk-sharing is in fact limited. This anomaly shares similarities with Obstfeld's (1993) findings. Obstfeld (1993) concluded that even in simulations assuming unrestricted levels of international asset trade, the best-case scenario of an open economy, risk-sharing among even the most developed countries is limited. However, he notes that developed countries are experiencing converging consumption growth rates irrespective of their idiosyncratic output shocks, moving towards greater integration and international risk-sharing.

2.2. The ASY model and interstate risk-sharing

From the newfound understanding that risk-sharing is not perfect even among the world's most developed and integrated economies, Asdrubali et al. (1996) developed a model, now central in this discipline, that assesses the degree to which risk-sharing actually occurs. This model was henceforth referred to as the ASY model, named after the authors Asdrubali, Sorensen and Yosha. This model works to decompose the cross-sectional variance of regional outputs across individual states within the United States of America in the period 1963-1990. This model is unique as it allows for the simultaneous assessment of multiple risk-sharing channels alongside the total unsmoothed shock to consumption. The ASY model is further explained and illustrated in Section 3.

Asdrubali et al.'s (1996) findings of imperfect cross-border national risk-sharing across states in the United States in all of their tests are consistent with the prior literature (see Mace, 1991; Cochrane, 1991; Townsend, 1994; and others on page 1083, and on footnote 1 of Asdrubali et al., 1996). Their findings suggest that the capital markets channel captures 39% of the exogenous, idiosyncratic shocks to state output, the credit markets channel 23% (61% cumulative consumption smoothing through market channels), the federal government channel 13%, and 25% is left unsmoothed, affecting consumption levels. This result indicates that state consumption will still co-move with idiosyncratic output shocks with a magnitude of 25% after all the available risk-sharing has been

exhausted. Asdrubali et al. (1996) define the capital markets channel as the interregional cross-ownership of productive assets, the credit markets channel, otherwise known as the savings channel, as lending and borrowing, and the federal government channel as the central tax-transfer system. The authors found that the capital markets channel's prominence has been rising every decade (1964-1970 smoothing 27%; 1971-1980 smoothing 34%; and 1981-1990 smoothing 48%) indicating growing levels of interregional financial integration. At the same time, the credit markets and federal government channels were more volatile (smoothing 37%, 45%, and 19%; 5%, 16%, and 14% respectively in aforementioned timeframes).

When shock persistence is taken into consideration, the landscape changes drastically. If shocks are expected to persist for longer than one year as initially parameterized, capital markets tend to provide the bulk of the stabilization relative to their credit markets counterpart. In this situation, smoothing from the capital markets channel increases to 47% over the course of the study. In contrast, the credit markets channel appears to do very little. When shock persistency is adjusted to 10 years, the credit markets channel even appears to provide a dis-smoothing effect of 17%. Asdrubali et al. (1996) states that the drastic change in the two market channel's stabilization abilities in the face of higher-persistence shocks is due to the relative natures of the channels themselves. Generally, capital markets risk-sharing requires ex-ante setup, while credit markets transactions mainly occur ex-post. Asdrubali et al. (1996) illustrates this via splitting the United States' individual states into groups concerning their primary output. These groups are agriculture, manufacturing, and mineral extraction focused states. The authors found that the agricultural-centric states, states that are expected to experience relatively lower shock persistence, experience between 12-33% risk sharing through the capital markets channel, while a much greater 12-51% through credit markets. While on the other end of the spectrum, mineral extraction focused states, states that expect to experience relatively higher shock persistence, stabilize 33-53% through capital markets, while only 14-27% through credit. All in all, states that expect to experience high persistence income shocks tend to invest relatively more in the capital markets in anticipation of potentially adverse future events to stabilize and ensure their foreseeable continuity. This early ex-ante investment is nothing short of a necessity in these industries as, once the high persistence shocks begin, it becomes significantly harder to obtain sufficient funds in the credit markets to offset potential damages without prior insurance due to both excess demand and rising credit default risk.

Following Asdrubali et al. (1996), many interstate/interprovincial risk-sharing studies, adopting the ASY model, joined the body of literature. Two of the most notable studies concern the interprovincial risk-sharing in Canada (Balli et al., 2012) and the interstate risk-sharing in Germany (Hepp & von Hagen, 2013). Balli et al. (2012) noted that in a similar timeframe (1961-2006),

Canadian provinces had access to greater risk-sharing than the United States; 80% total risk-sharing as opposed to 75%. In Canada, the capital markets channel appears to only provide 29% risk-sharing in this timeframe. Although this was their largest source of risk-sharing, it is notably inferior to the United States' 39%. However, Canada makes up for this with 27% risk-sharing from their government channel, as opposed to the United States' 13%. Like in Asdrubali et al. (1996), the capital markets channel's smoothing effects in Balli et al. (2012) also grew every decade, while the credit and government channels showed more volatility. In Hepp and von Hagen's (2013) assessment of Germany's interstate risk-sharing, the complication of the 1990 German reunification exists as the study spans from 1970-2006. Pre-reunification, Germany only experienced 9% unsmoothed consumption. This degree of risk-sharing was due to the tremendous impact of the government channel smoothing 54% of shocks. Post-reunification, the government channel dropped to smoothing only 10% of shocks. However, to compensate, the private factor (capital) markets channel grew to provide 51% risk-sharing. This offsetting adjustment meant that instead of seeing drastically less consumption smoothing, the total level of risk-sharing only decreased from 91% pre-unification to 80% post. These studies show that regardless of the risk-sharing make-ups in large, developed countries, the amount of interstate/interprovincial risk-sharing is approximately the same at around 80%. However, in most cases, especially those in more recent periods or where shock persistence is high, this risk-sharing is dominated by the capital markets channel.

2.3.1. The expanded ASY model and international risk-sharing

Two years later, Sorensen and Yosha (1998), two of the initial authors of Asdrubali et al. (1996), expanded the ASY model to assess international as opposed to interregional risk-sharing. In their publication, Sorensen and Yosha (1998) evaluated risk-sharing in the European Community (EC) and the Organization for Economic Co-operation and Development (OECD) in 1966-1990. Unlike the findings from Asdrubali et al.'s (1996) interregional risk-sharing, the net factor income channel in Sorensen and Yosha (1998), the capital markets channel equivalent, was not statistically significant in providing risk-sharing for either country group. At the same time, the international transfers channel, the government channel equivalent, only became significant in the 1981-1990 period. Even then, it only accounted for approximately three to seven percent of overall risk-sharing instead of the United States' 13%, Canada's 27%, and Germany's 51%. Although these differences are noteworthy, their rationales are intuitive; integration, both financial and social, is unsurprisingly more advanced within a country, than between countries. For financial integration, it is easier to buy cross-border assets between states or regions that use the same currency and abide by the same legal framework. When it comes to social integration, a country is definitely more inclined to make transfer payments to struggling internal states, as opposed to other country entities.

Sala-i-Martin and Sachs (1991) expand on this position, stating that the lack of international transfer risk-sharing stems from the absent or inept global fiscal federalist systems. The authors use the United States as comparison. They argue that the fiscal strength of the United States' federal government, with pre-existing automated income tax adjustment systems, allows its states to experience great transfer-based risk-sharing. In other words, the authors emphasize the importance of a central federal system that can absorb and redistribute taxation depending on each country or state's idiosyncratic output shocks in achieving transfer-based risk-sharing. On the empirics, Sala-i-Martin and Sachs (1991) observes that for the United States, every dollar decrease in regional per capita income consequently results in a regional federal tax reduction of 34 cents and a 6-cent increase in federal transfers. This results in an effective 60 cent decrease in income per dollar, or 40% smoothing. In the European Economic Community (EEC) however, the authors found that for every dollar decrease in idiosyncratic national output, the smoothing incurred is only half a cent through the same procedure.

Intuitively, it is understandable that the world has been unable to accomplish the monumental task of establishing a central tax-transfer federalist system. As all countries are vying for their own self-interests, it is unlikely that they can even reach a consensus as to what 'fair' practice is in this theoretical construction; let alone work towards even initiating the project. Individual states or provinces operating under the same flag such as that of the United States, Canada, and Germany are able to accomplish sufficient unification to support such a system due to their close proximities and shared culture. However, as seen in Sorensen and Yosha (1998) and Sala-i-Martin and Sachs (1991), the precursors of the EU, the EC and EEC are both unable to achieve this level of interconnectedness despite being in the same geographical area, having similar cultures, and even adopting the same currency. The difficulty in establishing such a federalist system in the EU, the closest international relative of national confederations of states or provinces, illustrates the lost cause that is trying to achieve substantial risk-sharing through the global international transfer channel with today's mentality. Sala-i-Martin and Sachs (1991) adds to this by stating that even if a central federalist system is established on the international stage, sufficient consensus must be achieved among nations to allow for the tax-transfer system to be automated. The alternative of reviewing transfer appeals case-by-case in a conglomerate full to the brim with self-interest is unlikely to provide the necessary risk-sharing levels in times of scarcity.

Due to this lack of international risk-sharing from both net factor income and international transfers, the majority of risk-sharing on the international stage is derived from the savings (credit markets) channel (Sorensen & Yosha, 1998). Sorensen and Yosha (1998) present that when shocks are assumed to be transitory, lasting one year, approximately 40% risk-sharing is experienced in the EC

and OECD regions. Roughly half of this is from corporate savings while the other half is from budget deficits run by national governing bodies. When shocks are assumed to be more permanent, lasting three years, the amount of overall risk-sharing decreases dramatically to 25%. In this scenario, corporate savings risk-sharing becomes very low and statistically insignificant, the government channel on the other hand remains strong and provides almost the entirety of this 25% risk-sharing. Private savings provide small and statistically insignificant smoothing effects in both scenarios. This lack of international risk-sharing with increasing shock persistence is also consistent with the findings of Canova and Ravn (1996), who also determined that higher shock persistence results in lesser insurance in industrialized nations.

2.3.2. The road to greater international risk-sharing

For the OECD and EC to achieve similar levels of risk-sharing comparative to the federation of states in the United States or Germany, or the provinces of Canada, they need to notably improve the risk-sharing capacity of at least one of their three main channels. As previously discussed, achieving this through enhanced international transfers is implausible in today's world. This leaves two potential points of improvement, the net factor income, and savings channels. To promote the net factor income channel, the OECD could aim to mitigate their strong home biases in asset, debt, and FDI holdings to allow for further international financial integration. As for the savings channel, member nations could voice the potential of loosening international, union, or bloc monetary regulations and restrictions regarding debt levels such as those present in the Maastricht treaty of the EU. Sorensen et al. (2007) tackled the home bias problem and noticed that although international risk-sharing through the cross-border ownership of productive assets in the EU and OECD member countries was relatively low in 1993, they did see significant improvement in the following decade. This improvement coincided with relative decreases in both debt and equity home bias. Through regression analysis, Sorensen et al. (2007) concluded that this co-movement was statistically significant.

In studying international federations, von Hagen and Eichengreen (1996) found that the debt requirements for member nations of the EU following the Maastricht Treaty are atypical of monetary unions. The authors note that of the 16 federations present internationally in 1996, only half imposed any degree of fiscal restrictions on its member states. von Hagen and Eichengreen (1996) argue that fiscal regulations are beneficial primarily in scenarios where subcentral governing bodies do not receive their own taxation revenue. As EU member countries control their own national taxation revenues, debt control policies could potentially do more harm than good. Kalemli-Ozcan et al. (2013) demonstrated this potential restriction-induced harm. The authors assessed the economic performance of the governing bodies of Portugal, Italy, Ireland, Greece, and Spain (PIIGS),

comparative to that of the other EU nations (non-PIIGS) in response to the Global Financial Crisis (GFC). The authors found that the governing bodies of both groups of countries committed to significant government dis-saving to smooth national consumption directly following the GFC in 2008 and 2009. However, in the years after, the PIIGS, facing debt levels exceeding the Maastricht Treaty's limits after prior accumulation, were forced to undertake stricter fiscal policy, resulting in notable savings channel dis-smoothing. This in turn forced the nation's households to commit to significant private dissaving to smooth their own consumption levels. From these analyses, we believe that significant improvements could be attained in the risk-sharing capacities of the net factor income and savings channels given the right circumstances. However, the suggested reduction in home bias and loosening of debt requirements, among other potential solutions, all have difficult-to-cross hurdles in their paths and take time to come to fruition.

Not only is there no easy way forward in attaining greater consumption risk sharing, the literature is also full of conflicted opinions. One such conflict resides in the EU expansion of 2004. Demyanyk and Volosovych (2008) forecasted that following this expansion, EU members, both new and old, should benefit from their enhanced risk-sharing prospects driven by the new pathway to greater financial integration. Demyanyk and Volosovych (2008) note that although this expansion is a win-win, the newer entrants experience greater potential benefits as they tend to experience more volatile output patterns. However, it should be noted that their forecasts are based off potential, as opposed to realized gains. Donadelli and Gufler (2021) on the other hand are doubtful of this outlook. They believe that, contrary to popular international macroeconomic theory, there is insufficient evidence to suggest that a statistically significant relationship exists between financial integration and risk-sharing capacity across most country groups. Donadelli and Gufler (2021) state that although international financial integration enhances potential net factor income risk-sharing, it also brings about some mitigating factors. These factors are price convergence and business cycle synchronization, both of which work much in the opposite direction, providing greater potential consumption volatility. Donadelli and Gufler (2021) state that to distinguish the direct relationship financial integration poses on consumption smoothing, the relative magnitudes of price convergence and business cycle synchronization must first be determined. Until these metaphorical creases are ironed out in the literature and understanding of risk-sharing, it is unlikely that countries will actively shift from the current status quo.

2.3.3. International region-focused risk-sharing

Much like the single-country interregional risk-sharing studies that followed Asdrubali et al. (1996), a string of studies examining the international risk-sharing positions of various nation groups was published following Sorensen and Yosha (1998) using their expanded ASY model. Notable

publications include van Wincoop (1999) studying the potential welfare gains from enhancing international risk-sharing, Kim et al. (2006) studying East Asian countries, Balli and Ozer-Balli (2011) studying the Pacific Island Countries (PICs), Zouri (2021) studying the Economic Community of Western African States (ECOWAS), Yehoue (2005) studying the African Financial Community (CFA) zones, and Balli et al. (2013) and Balli and Ozer-Balli (2013) studying Middle Eastern and North African (MENA) countries. van Wincoop's (1999) study provides some initial context by stating that with sensible parameterization, the conservative potential gains in the permanent consumption of tradable goods in OECD countries would be between the range of 1.1% to 3.5% with a 50-year horizon; This number increases to 2.5% to 7.4% when the period increases to 100 years.

Kim et al. (2006) finds that the net factor income and international transfer channels of East Asian countries were statistically insignificant, much like Sorensen and Yosha's (1998) OECD. Furthermore, as the savings channels of East Asia provides less smoothing than that of the OECD, smoothing only around 20% of shocks, East Asia's total unsmoothed consumption lies at approximately 80%. It is worth noting that when isolating the group of more developed East Asian countries (Korea, Japan, Hong Kong, Singapore, and Taiwan), the risk-sharing levels are more resemblant of the OECD, with only 65% of total shocks unsmoothed. Balli and Ozer-Balli (2011) noticed that the PICs exhibit a uniquely different risk-sharing profile relative to the OECD and East Asia. In this country group, excluding Australia and New Zealand, the net factor income and international transfers channels appear to play more significant roles in the provision of consumption smoothing. The PICs consist of mostly smaller countries with smaller economies. Their net factor income predominantly comes from the compensation that their employees receive from working abroad, as opposed to the generic cross-border ownership of productive assets. As the total per capita outputs in the PICs are low, their net factor income channel, fuelled by these international earnings, provided 6% risk-sharing. These PICs also enjoy ample countercyclical foreign aid, resulting in 9% smoothing through the international transfer channel. However, despite having additional risk-sharing channels to depend on relative to the OECD, the PICs still experienced less consumption smoothing at 60% total unsmoothed relative to the OECD's 43% in the study's timeframe of 1981-2007. This was due to their weaker savings channel which only provided 26% risk-sharing comparative to the OECD's 58% (Balli and Ozer-Balli, 2011).

The only primary risk-sharing channel with statistical significance in the ECOWAS nations is savings, which smoothed 22% of shocks (Zouri, 2021). This resulted in 77% of the shocks remaining unsmoothed, similar to that of the East Asian bloc. When Zouri (2021) expanded the model to better represent the region, a newly added variable, the official development assistance (ODA) channel became statistically significant and was revealed to be providing 11% risk-sharing, while the

effectiveness of savings decreased to 17% (an example of the omitted variable bias). However, it appears that with this expansion, another channel, other net secondary incomes, consisting of social benefits and contributions was also introduced. This channel seemingly provided an 11% dis-smoothing effect. These changes resulted in a cumulative improvement in overall risk-sharing from 23% to 28%. When the study's timeline was split into its 20th and 21st-century components, 1980-1999 and 2000-2016, it is made obvious that risk-sharing has improved dramatically in the ECOWAS nations over time. In the first sample period, 85% of shocks remained unsmoothed. This number decreased to 63% in the second. In 1980-1999, none of the risk-sharing channels in Zouri's (2021) extended ASY model proved statistically significant. In 2000-2016 however, many channels became significant, most notably the three aforementioned ones; savings smoothing 25% of shocks, official development assistance smoothing 15%, and other net secondary incomes dis-smoothing 13%. This 37% cumulative consumption smoothing in the ECOWAS countries in 2000-2016 is similar to the OECD's in 1966-1990 (Sorensen & Yosha, 1998). Although this improvement is commendable, we must stress the time difference. Yehoue (2005) also commented on the small proportions of risk-sharing African nations in the African Financial Community (CFA) obtain from the standard market channels in the late 20th century. However, he states that both the West African Economic and Monetary Union (WAEMU) and the Economic and Monetary Community of Central Africa (CEMAC) performed well in overall risk-sharing in this period, due to foreign aid from France. In Yehoue's (2005) study, he found that in the last twenty years of the 20th century, the WAEMU nations received 63% smoothing, and the CEMAC 44%, solely from this foreign aid. These results prove different to those found in Zouri (2021). This is due to differing country selection methodologies, with Yehoue focusing predominantly on the historical French West Africa.

During the turn of the millennium, circa 1992-2009, the MENA countries experienced 63% unsmoothed consumption as a collective (Balli et al., 2013); an amount notably lower than the emerging world, but above that of the OECD. Of their 37% smoothing experienced, 40% was due to their savings channel and 8% from net factor income; the difference is due to international transfers, which provided approximately 10% dis-smoothing. When shock persistence was increased from one to three years, the savings channel of the MENA countries gained prominence as opposed to Asdrubali et al.'s (1996) theory. This is due to the inclusion of the oil-rich Gulf Cooperation Council (GCC) countries in the sample. Specifically, with this increased shock persistence, the savings channel increased smoothing capacity from 40% to 44% in the MENA collective, while it rose from 44% to 63% in the GCC exclusively. This is also illustrated through the GCC's removal from MENA country sample. In this situation, risk-sharing actually decreases (as per Asdrubali et al., 1996) from 33% to 31% with increasing shock persistence. The anomaly of the oil-rich GCC's savings channel is one of

the reasons we find the savings channel so fascinating, and acts as one of the inspirations in our study.

2.4. Parallel perspectives

Asdrubali and Kim's (2008) OECD study provides an interesting parallel viewpoint on international risk-sharing. They find, contrary to much of the literature including Obstfeld (1993), that even in developed countries, the relationship between domestic consumption growth with the aggregate is very weak, verging non-existent. Their study takes a slightly different approach to our current understanding. We assess risk-sharing capacity based on how much co-movement exists between income and consumption in the aggregate. While Asdrubali and Kim's (2008) approach works by assuming if risk-sharing is significant between countries, their consumption growth rates should also grow in matching order. These findings although seemingly extreme, still suggest that as previously discussed, there is a great lack of international financial and social integration. Asdrubali and Kim (2008) also goes as far as stating that no matter the conditions, risk-sharing within a country will always exceed risk-sharing between countries. Although this is likely true, we still believe countries can significantly improve their overall international risk-sharing profiles. Lewis (1996) provides the theory as to how this may occur. She demonstrates that, theoretically, even perfect international risk-sharing could be achieved if two pre-existing problems are resolved. These are the inseparable nature of tradeable and non-tradable (i.e., leisure) goods, and the presence of capital market restrictions. In other words, a better quantified, laissez-faire system of governance. However, as it is impossible to perfectly satisfy either condition, perfect international risk-sharing is out of reach. Nevertheless, moving in the direction of these suggestions, alongside our prior discussions of reducing home bias and loosening debt restrictions could provide worthwhile benefits.

Reverting back to microeconomic analysis, Balli et al. (2016) provides a modern review of the risk-sharing capacities of UK households. They found that much like the financially and socially segregated international economic system; individual households also primarily depend on their savings channels to smooth their consumption. Aside from the 77% risk-sharing from the savings channel, the authors also note that households experience 8% risk-sharing from investment (net factor) income, 1% from transfers from outside the household, and 7% from the national fiscal tax-transfer system. This lack of investment income diversification risk-sharing coincides with van Wincoop's (1995) findings that only 15 to 20% of households in both the US and Japan hold any form of stocks. Balli et al. (2016) also adds that a large determining factor in how effective household savings channels are at providing risk-sharing lies in their intertemporal saving flexibility. Depending on how willing and able households are in adjusting their savings rates, the degree of potential smoothing from the channel varies from between 55% and 87%. The authors found that the groups

that experience the least amount of savings-based risk-sharing lie on opposite ends of the spectrums. They include both high-savings and low-income households, as well as those who are risk averse and less educated. As the risk-sharing compositions of these microeconomic studies draws parallels to the international stage, it could be interesting to test these variables on international datasets. Balli et al.'s (2016) findings outlining the importance of autonomy and flexibility on savings-based risk-sharing also supports von Hagen and Eichengreen's (1996) view of the potential risks embedded in the Maastricht Treaty's debt requirements for member states.

2.5. Overview and motivation

The literature surrounding both intra- and inter-country risk-sharing cited above together illustrates the extreme contrast in the levels of global interconnectivity. When assessing risk-sharing between states within a nation, the three primary risk-sharing channels all appear relatively healthy due to greater financial integration and the presence of a central tax-transfer system. In expanding the model to cover international risk-sharing between countries, total risk-sharing experienced plummets. In our financially and socially segregated international environment, the tax-transfer channel of consumption smoothing all but disintegrates, while the net factor income channel loses most of its strength. This results in the majority of countries experiencing a less-than-optimal level of consumption smoothing as they are forced to primarily depend on their savings channel alone. Unfortunately, there is also no easy way forward in establishing stronger risk-sharing channels with our current available knowledge. Although the literature has provided potential direction in achieving this cause, in the form of reducing home bias, loosening debt restrictions, and moving towards international free markets without capital restrictions among other things, all of these options require substantial time commitments and international cooperation that we just don't have. Therefore, we believe further research must be undertaken in this discipline, in order to find concrete yet manageable pathways countries can adopt in accomplishing greater international risk-sharing.

In our current coronavirus era, improving the global understanding of how to best improve risk-sharing through greater research is more important than ever. The long-term solutions to acquiring greater risk-sharing as suggested above are currently unintuitive, as countries and households around the world tirelessly combat waves upon waves of economic shocks and uncertainties. Unlike the prior proposals which focus on the net factor income and international transfers channels, we propose that in the context of today, the best potential solutions to our immediate problems lie in enhancing our savings channels. Although the government component of the savings channel could potentially be restricted by bloc or other international restrictions, the savings channel as a whole is ultimately autonomous. This indicates that, unlike the net factor income and international transfers

channels, alterations in the savings channel does not require international cooperation, which is hard to achieve in this dog-eat-dog world. It is also worth noting that the savings channel is unique in the sense that its subchannels often operate countercyclically to each other. This is demonstrated in Balli and Sorensen (2006) and Kalemli-Ozcan et al. (2013). These studies demonstrated that falls in government savings risk-sharing are often met with opposite effects in private or corporate savings, smoothening the overall risk-sharing reduction.

Although there have been many studies in the literature focusing on the effects and determinants of specific risk-sharing channels, such as Volosovych (2013) who assesses the international net factor income channel; Balli et al. (2011) who looks at the capital gains channel; Balli and Rana (2015) who studies the remittances channel; and Balli et al. (2019) who studies foreign aid; none, to the best of our knowledge thus far, assesses the savings channel in depth. As savings is the largest risk-sharing channel in all our cited international risk-sharing studies, sometimes being the only channel of statistical significance, we believe it undisputedly deserves further analysis. Although studies such as Sorensen and Yosha (1998), Balli and Sorensen (2006), and Balli and Sorensen (2007) have performed decompositions of the channel into subchannels, we do not believe the literature has yet to touch on potential determinants. With this study, we are looking to do just that.

3. Method

Overview

This study seeks to accomplish three objectives as detailed in Section 1. First, we aim to assess the prominence of the primary international risk-sharing channels of various country groups. Not only does this assessment provide context for how much risk-sharing occurs in the countries within our dataset, but it also acts as a primary robustness test to check for consistency (or inconsistency) with the existing literature. In pursuing this first objective, we observe the risk-sharing levels of all countries in the dataset as a collective, as well as separately, in OECD countries and non-OECD emerging countries groupings. We also split our dataset into smaller geographical subclusters for further analysis. Within our OECD country group, we isolate the EU members, while the emerging countries are split into EU Europe, non-EU Europe, Central and South America, Africa, and Asia and the Middle East. The methodology adopted in this segment of the study will be the variance decomposition model developed by Asdrubali et al. (1996) and expanded by Sorensen and Yosha (1998). This study's second objective looks to further explore the savings channel specifically. Following Sorensen and Yosha (1998), Balli and Sorensen (2006), and Balli and Sorensen (2007), we seek to decompose the savings channel into its component parts. Although region-centric risk-sharing is already well documented in the literature, (many of these articles have been cited in

Section 2,) they do not provide decompositions of the savings channel. We believe this is a misstep as the savings channel is the most important international risk-sharing mechanism for the majority of (if not all) country groups due to its size and consistency. As such, we believe that further emphasis should be placed on this channel in all international risk-sharing analyses as it could provide further insight. This is exactly what this study intends to do. In the final stage of our study, we attempt to find the factors that influence the savings channel as a whole, as well as the subchannels within. To accomplish this, we follow the methodology of Melitz and Zumer (1999) and Sorensen et al. (2007). Our variable selection process for determinant testing is inspired by a combination of literature and intuition.

3.1. Stage 1: GDP decomposition

Our methodology begins with the variance decomposition model that was developed by Asdrubali et al. (1996) and expanded by Sorensen and Yosha (1998). This model, known as the ASY model (named after the three authors of Asdrubali et al., 1996; Asdrubali, Sorensen, and Yosha), was designed to provide insight into how much risk-sharing actually occurs in our world following the new understanding that risk-sharing is not perfect; proposed by, among others, Mace (1991), Cochrane (1991), and Townsend (1994). The ASY model accomplishes this through decomposing GDP (income) in a period-by-period setting to reveal its covariance with consumption, alongside four risk-sharing channels. The basis of this model is depicted below in Identity 1.

$$GDP^i = \frac{GDP^i}{GNI^i} \frac{GNI^i}{NNI^i} \frac{NNI^i}{DNNI^i} \frac{DNNI^i}{(C^i + G^i)} (C^i + G^i) \quad (1)$$

In this model, GDP represents Gross Domestic Product, GNI Gross National Income, NNI Net National Income, DNNI Disposable Net National Income, and C+G Consumer and Government final expenditures; all values are presented in real per capita terms. These metrics are all interconnected in a linear fashion. When net factor income (comprising of the inflow minus outflow of cross-border employee compensation, investment income, and rents) is added onto GDP, the result is GNI. When depreciation is subtracted from the GNI (gross), the result is NNI (net). Then, after net transfers are accounted for, we arrive at DNNI. Finally, the DNNI (disposable income) is split into the categories of net savings (inclusive investments) and final consumption expenditure (spending). With these definitions in place, the four ratios preceding C+G represent the four risk-sharing channels: the net factor income channel, depreciation channel, international transfers channel, and savings channel, respectively. As such, the ASY model highlights the relationship between GDP and C+G (income and consumption) while also quantifying the magnitudes of the risk-sharing mechanisms that cause these factors to be imperfectly correlated. However, it is important to note that this model is utilized to assess how exogenous shocks to GDP are absorbed into an economy, as opposed to providing a

static accounting. In other words, the ASY model seeks to determine whether an exogenous change in GDP would cause a unitary, subunitary, or in extreme cases, superunitary change in consumption and how the risk-sharing mechanisms impacted this relationship.

Theoretically, if an exogenous GDP shock left GNI unchanged, net factor income in this country entity alone is sufficient in providing perfect consumption smoothing (stable consumption). If GNI varied, but NNI remained unchanged, the cumulation of net factor income and asset depreciation resulted in perfect consumption smoothing. If NNI varies, but DNNI remains constant, then the international transfers, along with the two previous channels, cause perfect consumption smoothing. Finally, if DNNI varied, but C+G remained unchanged, then four risk-sharing channels together provided perfect consumption smoothing. However, this is mainly theoretical as it is highly unlikely for any country to experience perfect risk-sharing as documented in the existing literature, many of which have been referenced in Section 2. Knowing this, Asdrubali et al. (1996), Sorensen and Yosha (1998), and many others have filled numerous gaps in the literature through the provisions of income decompositions to help identify and visualize the actual relationships between income and consumption, along with the prevalence and prominence of the risk-sharing channels in states, countries, and regions. In order to quantify these observations, they utilized Identity 2 below.

$$\begin{aligned}
\Delta \log \widetilde{GDP}_t^i - \Delta \log \widetilde{GNI}_t^i &= v_{K,t} + \beta_K \Delta \log \widetilde{GDP}_t^i + u_{K,t}^i \\
\Delta \log \widetilde{GNI}_t^i - \Delta \log \widetilde{NNI}_t^i &= v_{D,t} + \beta_D \Delta \log \widetilde{GDP}_t^i + u_{D,t}^i \\
\Delta \log \widetilde{NNI}_t^i - \Delta \log \widetilde{DNNI}_t^i &= v_{T,t} + \beta_T \Delta \log \widetilde{GDP}_t^i + u_{T,t}^i \\
\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{C+G})_t^i &= v_{S,t} + \beta_S \Delta \log \widetilde{GDP}_t^i + u_{S,t}^i \\
\Delta \log (\widetilde{C+G})_t^i &= v_{U,t} + \beta_U \Delta \log \widetilde{GDP}_t^i + u_{U,t}^i
\end{aligned} \tag{2}$$

This identity is derived from Identity 1 and provides the groundwork for the empirical analysis of this paper. Specifically, it evaluates how each of the four risk-sharing channels, along with final consumption, respond to exogenous shocks to GDP in regression format. This is the model I utilized in the first stage of my paper. In this model, the subscript K represents the net factor income channel, D the depreciation channel, T the international transfers channel, S the savings channel, and U the unsmoothed consumption (how much consumption changed relative to income). As such, the first four equations assess the prominence of the four risk-sharing channels presented in Identity 1 in respective order, while the final shows how consumption varies with income. The magnitudes of each risk-sharing channel's strength, and the degree of unsmoothed consumption, are portrayed through their respective β 's. As the exogenous changes to GDP must be completely distributed

between the risk-sharing channels and final consumption, the cumulative values of the β 's must equate to 1, as demonstrated in the following equation. $1 = \beta_K + \beta_D + \beta_T + \beta_S + \beta_U$. This indicates that as long as some risk-sharing channels exist and are providing any modicum of benefit, the co-movement between income and consumption should be less than unitary. In some extreme cases, however, a country's risk-sharing channels can aggregately provide negative, dis-smoothing effects on the country's consumption, causing a greater than unitary change in consumption for any income fluctuations. It is also important to note that in Identity 2, the v 's represent time-fixed effects. Including time-fixed effects in the regression helps to account for the idiosyncratic, year-on-year abnormalities affecting growth rates. This will result in the β coefficients reflecting cross-sectional weighted averages.

In the first stage of our study, we will utilize Ordinary Least Squares (OLS) regressions and the equations of Identity 2 to ascertain the risk-sharing positions of various country groups and clusters. We will assess the risk-sharing position of all countries in the sample as a whole, as well as splitting them up into groups such as the OECD, the non-OECD emerging economies, the OECD EU, the emerging EU, the emerging non-EU Europe, as well as the emerging Central and South America, Africa, and Asia and the Middle East. The purpose of this initial assessment is to identify the risk-sharing compositions of all subjects of the study going forth. This will both provide context for further analysis, as well as being the first robustness check verifying consistency (or inconsistency) with the existing literature.

3.2. Stage 2: Savings decomposition

In the second section of this study, we seek to decompose the savings channel further into four subchannels. We specifically chose to dive deeper into the savings channel because, as we have stressed previously in this paper, we believe it is the most important stabilization mechanism both in size and continuity as indicated by the majority of the existing literature. We structured our decomposition following in the footsteps of Sorensen and Yosha (1998) and Balli and Sorensen (2007). However, instead of decomposing the savings channel into three subchannels as in the aforementioned articles, we opted to split the channel into four. Specifically, we are splitting the corporate savings channel into its financial and non-financial counterparts, while keeping the private and government savings channels as is. Our rationale behind utilizing more concise categorization stems from the findings of Sorensen and Yosha (1998). In their paper, Sorensen and Yosha found that with low persistence GDP shocks, pro-cyclical corporate savings generated half of the stabilization experienced in both the OECD and EC in 1966-1990. Although Balli and Sorensen (2007) found that corporate savings are less effective (than Sorensen and Yosha, 1998) in providing risk-sharing in a more recent study, the subchannel still often sees double-digit smoothing/dis-

smoothing. These articles display the potential of the corporate savings channel and brings about the possibility of new findings if further investigated. For this part of our study, we utilized the methodology of Balli and Sorensen (2007) as depicted below in Identity 3.

$$\begin{aligned} \Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{private\ savings}_t^i) &= v_{h,t} + \beta_h \Delta \log \widehat{GDP}_t^i + u_{h,t}^i \\ \Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{government\ savings}_t^i) &= v_{g,t} + \beta_g \Delta \log \widehat{GDP}_t^i + u_{g,t}^i \\ \Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{financial\ corporate\ savings}_t^i) &= v_{f,t} + \beta_f \Delta \log \widehat{GDP}_t^i + u_{f,t}^i \\ \Delta \log \widehat{DNNI}_t^i - \Delta \log(\widehat{DNNI}_t^i - \widehat{nonfinancial\ corporate\ savings}_t^i) &= v_{nf,t} + \beta_{nf} \Delta \log \widehat{GDP}_t^i + u_{nf,t}^i \end{aligned} \quad (3)$$

In this identity, the subscript h represents household (private) savings, g government savings, f financial corporate savings, and nf non-financial corporate savings. Note, the subchannels are denoted in lowercase format. The reason DNNI is included in and consequently subtracted from each equation is for regression viability. Country's net savings positions tend to occasionally dip to the negatives. As it is impossible to log a negative number, a slight adjustment must be made to allow for the regression process to take place. Time-fixed effects are also present in these regressions due to the prior reason of idiosyncrasy. These equations, like those in Identity 2, reveal the co-movements between exogenous GDP shocks and the individual savings subchannels. As usual, these covariance values are depicted through the β 's. However, unlike in Identity 2, these β values do not necessarily summate to anything in particular. This stage of our research provides our first notable contribution to the literature. We aim to provide savings breakdowns for not only the previously studied OECD and EU communities, but also the emerging economies of the developing world. We also look to contribute to the existing literature through our decomposition of the corporate savings subchannel.

3.3. Stage 3: Determinant testing

After the first two stages of our methodology, we can finally begin our determinant testing. However, before we proceed, we must first address the importance of performing our own independent decompositions. Although our initial geographical and bloc GDP and savings decompositions are consistent with some of the literature, this is not the case with others. This is due to, among other things, the many differences in data collection and treatments between studies. First, studies may disagree slightly on data definitions and use different variables. Second, although we have country classifications, such as the split between the OECD and the emerging economies within this study, there are vast differences in the members of each group. As we have split our countries into the categories of OECD and emerging, an unknowing reader could assume this to be the equivalent of developed and developing. However, it should be noted a country's

degree of 'development' does not determine its OECD status. The Trade Union Advisory Committee (TUAC, 2018) states that to gain OECD status, countries must display a readiness and commitment to democratic governance, protecting human rights, and open free-market economies. As such, we are assessing the risk-sharing patterns of different governance mentalities, as opposed to wealth. This classification, although with its flaws, works better than the alternative; classification via development indicators such as per capita wealth, standard of living, and technology access provides subjective results. Regardless, as OECD membership is determined by country mentality, it has a variety of very different member states, ranging from much of the highly developed Western Europe, the United States, and Japan, to the ex-Soviet Union Eastern European Baltic states, Mexico, and the new entrants of Colombia and Costa Rica. The emerging countries would see even greater variation as this category accounts for the remaining 155 member states of the United Nations. This indicates that, depending on data availability from various sources, researchers could potentially produce notably inconsistent GDP variance decompositions. It is important to take this fact into consideration, especially in our study. As we go one step further with our variance decomposition, also decomposing the savings channel, we require complete data for more variables. This leads to an expected decrease in sample size, specifically, in country coverage. This is why we conducted our own independent variance decompositions. Regardless of whether our sample OECD and emerging countries exactly match the characteristics of their populations, we will provide concrete results for the countries in our study noted under each table respectively.

We follow the methodology of Melitz and Zumer (1999), Sorensen et al. (2007), and Balli and Pierucci (2020) to test for savings channel, and subchannels determinants. The model is presented below in Identity 4.

$$\Delta \log \widetilde{DNNI}_t^i - \Delta \log (\widetilde{C + G})_t^i = v_t + \beta_0 \widetilde{GDP}_{it} + \beta_1 \Delta \widetilde{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widetilde{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it} \quad (4)$$

In this identity, t represents the time trend, while \bar{t} the average. Consequently, $(t - \bar{t})$ is the variable that captures the time trend variation in GDP. It is important to capture this trend-based differential in GDP as to accurately ascertain the exact relationship between the savings channel in question and the potential determinant. Similar to the time trend variable, X represents the potential determinant, while \bar{X} the average. $(X_{it} - \bar{X}_t)$ as a result, represents how a variable value in a unique cross-section at a given point in time differs against the unweighted average. The key output of this identity is β_2 . β_2 represents the relationship between the determinant variable and the savings risk-sharing channel after accounting for GDP base and trend changes. This model is replicated for the four risk-sharing channels from Stage 2. These four equations are presented in Identity 5 below.

$$\begin{aligned}
& \Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{\text{private savings}}_t^i) \\
& \quad = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it} \\
& \Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{\text{government savings}}_t^i) \\
& \quad = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it} \\
& \Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{\text{financial corporate savings}}_t^i) \\
& \quad = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it} \\
& \Delta \log \widehat{DNNI}_t^i - \Delta \log (\widehat{DNNI}_t^i - \widehat{\text{nonfinancial corporate savings}}_t^i) \\
& \quad = v_t + \beta_0 \widehat{GDP}_{it} + \beta_1 \Delta \widehat{GDP}_{it} * (t - \bar{t}) + \beta_2 \Delta \widehat{GDP}_{it} * (X_{it} - \bar{X}_t) + u_{it}
\end{aligned} \tag{5}$$

These equations in Identity 5 have identical right-hand-sides to Identity 4. The only difference is the left-hand-side dependent variable, which has been adjusted from the general savings account to each of the four subchannels. Specifically, the β_2 values of Identity 5 represent the relationship between the determinant variable and the savings risk-sharing subchannels after accounting for the GDP base and trend changes.

4. Data

Overview

This study's data was obtained from the United Nations National Accounts Statistics: Main Aggregates and Detailed Tables and The World Bank's DataBank. Specifically, we used the National Accounts Statistics Tables 4.1. Total Economy, 4.3. Non-financial Corporations, 4.4. Financial Corporations, 4.5. General Government, and 4.6. Households, as well as the World Development Indicators, Education Statistics, and World Governance Indicators databases of the Databank. Due to the desire of generating findings best representative of the modern-day world, we decided to initially set the timeframe of the study to be between 1990-2018. We set the commencement year to 1990 as to not include too much history of which is no longer indicative of today's turbulent, ever-changing world. As we are working with global macroeconomic data, inclusive of much of the developing world, we also cannot expect to have sufficient data past 2018. This timeframe was later reduced to now cover 1995-2018 due to the small amount of available savings data in the 1990-1995 time-period. Data definitions are found below in the appendix. Please note, the tables are presented

in three segments (Tables 1-10, 11-21, and 22-33), with the regression analyses of each segment following their own descriptive statistics.

4.1.1. Stage 1 data gathering

For the first two stages of our study, we primarily utilized the United Nations National Accounts Statistics. We obtained GDP, GNI, and final consumption expenditures data from Table 4.1 Total Economy but could not obtain the equivalent NNI and DNNI data to suit our definitions. Hence, we decided to capture depreciation and international transfers as raw variables; and according to the explanation provided above in Section 3, compute NNI and DNNI ourselves. The depreciation data was readily available and passed our diagnostic tests, however, the international transfers section posed a problem. Of the many transfers accounts in the National Accounts Statistics Tables 4.1. Total Economy and 4.2. Rest of the World, we could not ascertain which account accurately represented international net transfers. Of all the accounts observed, none passed the diagnostic tests, each displaying transfers as high as 50% of the nation's GDP. As an alternative, we used the World Bank's Databank's World Development Indicators' international net transfers. This variable met our requirement by definition and passed our diagnostic tests. As this dataset is from a different source, we made sure to use the variation supporting the common currency denomination as the base data. The results from the diagnostic tests are presented in Table 1 in the appendix; they are discussed in the following paragraphs.

As this study works with global macroeconomic data including input from much of the developing world, working with only perfectly balanced panels would result in miniscule sample sizes. As a result, we have chosen to use an unbalanced panel to increase coverage. Although we are working with an unbalanced panel, we ensured that all entries (for each corresponding country and year combination) included in the regression process has existing data for all five categories. This is to avoid biasing towards categories with more complete datasets. To enhance data completeness, we manually input missing data into data entries with four of the five categories available. Depending on the datasets themselves, we chose to either input the missing variable based on trends or averages of the existing data, or based on ratios; for example, filling in missing GNI values with pre-existing GNI/GDP ratios from other years. All adjustments made are listed in the adjustments section of the appendix. In situations where there exists multiple data series for the variable of interest, we prioritized the series that is more complete. If data completeness is equal, we prioritized the higher series number. We then adjusted all variables into real per capita terms using the World Bank's DataBank's World Development Indicator's consumer price index and population data. This process left us with 72 countries, which the diagnostic descriptive statistics in Table 1 list and explain.

4.1.2. Stage 1 data testing

To test the authenticity of the data, specifically the depreciation and international transfers variables, we divided each data entry against the respective country's GDP of the same year. Providing the descriptive statistics of the raw data would be counterintuitive as the values are denominated in local currencies and would likely create more confusion than insight. As depicted in Table 1, we found that in these 72 countries, the mean and median GNI/GDP ratios were at 0.98 and 0.99 respectively. This indicates that there is a slightly negative net factor income experienced by the sample group. If every country in the world was included in the sample, the ratio should be exactly 1, as net factor income is a zero-sum game. The slightly lower yet extremely close to 1 nature of this sample proves intuitive sense. It indicates that the sample is large enough to be representative of the world, but also, as this sample has greater coverage of OECD countries, and less of the developing world (due to data availability), the net factor income is slightly lower than unitary; this is likely fuelled by remittance levels. At the upper extreme, sometimes obtaining a GNI/GDP ratio as high as 1.44 is Tajikistan. As Tajikistan was ranked 4th in personal remittances received as a proportion of GDP in 2020 (World Bank, 2021), this comes without surprise. At the other end of the scale is Luxembourg with a GNI/GDP ratio of as low as 0.64. This is also unsurprising as Luxembourg is a country on the opposite end of the wealth spectrum. In 2020, Luxembourg boasted the 3rd highest GDP per capita, while Tajikistan was in the bottom 25 (World Bank, 2021). In the same year, Luxembourg was also ranked 9th in personal remittances paid (World Bank, 2021). These two countries, although hosting different GNI/GDP ratios to the status quo, are not considered outliers in this study as they are but more extreme versions of other countries in their geographical areas. The sample's Depreciation/GDP ratios centre around 0.14 indicating that for every dollar generated as GDP, their assets lose 14 cents of value. As depreciation is a straight-forward concept, we will not go into further detail here. There are also no significant outliers in this distribution.

When observing international transfers, we notice that although on average, it provides an insignificant contribution to GDP, it does tend to vary greatly from country to country. At the upper end, we tend to see oil-rich countries such as Kuwait, Saudi Arabia, and Bahrain. These countries sometimes see as much as 14% of their GDP act as net outbound international transfers. On the other end are the lower income, less developed countries such as Sierra Leone, Honduras, Serbia, North Macedonia, and Tajikistan, which can receive upwards of 28% of their GDP through inbound international transfers. Finally, the consumption/GDP ratio centres around 0.78. This indicates that most countries consume within their means while also maintaining steady levels of savings and investments. Once again, the oil-rich countries such as Kuwait, Azerbaijan, and Bahrain, the high income-per-capita Luxembourg, and the tax-haven Ireland stand united on the rich side of the

spectrum with very low ratios. This infers that in countries with abundant funds, consumption can potentially only take up less than half of income. All the while, the poorer nations, once again including Sierra Leone, Tajikistan, and Serbia live beyond their means, experiencing greater consumption than their total GDP. In this ever-advancing world, it is unsurprising that these less developed countries need to spend more than their low incomes to subsist. Fortunately, the countries experiencing high consumption/GDP ratios tend to also experience high international transfer inflows.

4.2.1. Stage 2 data gathering

Once the data required to run the generic ASY model was obtained, we looked to further breakdown the savings channel for our study's contributions. In doing so, we utilized five additional variables. These variables are the total savings accounts from each of the following United Nations National Accounts Statistic Tables: 4.1. Total Economy, 4.3. Non-financial Corporations, 4.4. Financial Corporations, 4.5. General Government, and 4.6. Households. These accounts provide the total savings, non-financial corporate savings, financial corporate savings, government savings, and private savings data respectively. As expected, once these five new variables were added into the dataset, the number of countries with complete data entries for any year fell from 72 to 52. We aim to keep our findings consistent in terms of sample size. As 20 of the original 72 countries do not have sufficient savings data, we do not see any potential benefit in including them in our studies. As a result, we have decided to not use the 72-country sample from the first stage of this research, and instead, use this new 52-country sample as the base of our studies.

Of these 52 countries, OECD status was assigned in dummy format to reflect each country's OECD status throughout the study's timeframe (1995-2018). Non-OECD countries are recorded as emerging economies. Although Chile, Costa Rica, and Croatia are OECD members as of 2021, they have not yet accessed in the years in which we have complete data. Hence, these three countries are classified as emerging economies throughout this study. Aside, five other countries received their OECD status within the study period. These countries are Estonia, Hungary, Latvia, Poland, and Slovenia. Hungary and Poland accessed in 1996, Estonia and Slovenia in 2010, and Latvia in 2016. These changes have also been incorporated in the data (emerging pre, OECD post). As a result, our sample hosts 24 OECD countries and 32 emerging; the sum of the two components exceeding the total number of countries is due to overlap.

Aside from OECD classification, regional dummies are also added for further analysis. In the OECD group, we have isolated the EU countries. While for the emerging economies, we have split the entire sample into EU Europe, non-EU Europe, Central and South America, Africa, and Asia and the

Middle East. We treat EU membership in the same manner as that of the OECD. As such, Bulgaria, Croatia, Cyprus, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia all belong to multiple groupings, depending on their year of accession (ranging from 2004-2013). All in all, 20 of the 24 OECD countries are registered as EU members (for at least one year of data availability); the United Kingdom is categorized as EU as the data of this study was in the pre-Brexit era. The emerging economies were split as follows: 7 EU, 13 non-EU Europe, 7 Central and South America, 5 Africa, and 4 Asia and the Middle East. As these geographical divisions lead to sample sizes becoming very small, we decided to not go beyond the savings account decomposition stage for these regional clusters.

4.2.2. Stage 2 data testing

After removing the 20 countries with insufficient savings data from our global sample, we re-ran the diagnostic descriptive statistics. This is depicted in Table 2. (The regressions following this part of the study are displayed in Tables 3-10.) These removals lead to no noticeable differences in the means and medians of the four variables, only the expected decreases in the maxima minima ranges. In this diagnostic test, we also checked how well total savings separates into the four savings subchannels. We did this with the following equation: $(\text{total savings} - (\text{private savings} + \text{government savings} + \text{financial corporate savings} + \text{non-financial corporate savings})) / \text{total savings} * 100$. In doing so, we estimate how the difference between total savings and the summation of the four subchannels compares to total savings as a whole. If the mean and median of the test return 0, the savings split is perfect. If the numbers are close to 0 but not quite there, the split is still good but the effectiveness of the savings subchannels may be slightly over/underestimated. In our test, the mean did return 0 to two decimal places, and median returned 0.29. This implies that the savings breakdown is near perfect. However, as the median slightly exceeds the mean, our savings breakdown data displays a minor left skew. If we were to assume that the split is perfect (according to the mean), our findings will slightly underestimate the effectiveness of the savings subchannels. However, as the difference/original estimation show averages between 0.00 and 0.29 even with a 100x multiplier, this underestimation is less than 1% and should be insignificant.

From these diagnostics, we also found an extreme maxima and minima. The maxima Botswana indicated a 497% difference between total savings and the sum of the four subchannels, while the minima Armenia in the early years (1997-1999) showed a -549% difference. We do not have a plausible explanation for these abnormalities, and thus removed the first 3 years of Armenia along with the entirety of Botswana from our regressions. As Botswana only hosted 4 years of complete data, the removal of these datapoints did not further influence Table 2.

4.2.3. Adjustments

Having assembled the datasets that allow for regression analysis to be performed for the first two parts of this study, we found that with our current sample of 51 countries, our findings are inconsistent with the existing literature. The most obvious anomaly was the excessive risk-sharing effectiveness of the emerging economies savings channel. Upon further inspection, we discovered that this was due to extremely high government savings. This does not prove intuitive sense as the emerging countries are not very well known for hosting effective government bodies. To find the root cause of this problem, we created a new variable denoting the relationship between government savings and GDP. The results for the emerging economies are presented in Figure 1, while that of the OECD is presented in Figure 2.

We noticed that in the emerging economies, there were three countries that stood out as extreme outliers. These countries are Azerbaijan, Kuwait, and Saudi Arabia. The United States' Energy Information Administration ranked these oil-rich countries as the 14th, 1st, and 4th largest oil producers per capita respectively in 2017 (EIA, 2021). There was also an outlier in the OECD. This outlier is Norway. Norway ranked 5th in this aforementioned oil production list (EIA, 2021), the highest-ranking OECD country. As oil-rich countries have unique fiscal structures, we removed these four countries from our regression analysis, reducing the number of countries in our sample from 51 to 47. After this final adjustment, our regression findings became consistent with the existing literature. The findings will be discussed in Section 5 below.

4.3.1 Stage 3 Worldwide Governance Indicators

In our selection process to find potential determinants for the savings risk-sharing channel, we utilized a mixture of literature and intuition. As there is no close precedent in the literature for savings channel determinant testing, we had to improvise. First, we logically collated variables that we deemed as potential determinants, drawing inspiration from financial principles and indirectly related risk-sharing literature. In our initial search, we thought about the two largest factors influencing savings and investment in the modern world: risk and return. We planned to measure risk through some form of governance quality metric, one that indicates the relative safety of holding assets in each country. While for return, we planned on using generic interest rates. Luckily enough, we discovered the Worldwide Governance Indicators (WGIs) in Balli and Pierucci (2020). These WGIs are six variable indicators that together represent the institutional quality of nations. Balli and Pierucci (2020) utilized these indicators to ascertain the relationship between institutional quality and overall risk-sharing. We will be building on this by assessing how they influence the savings channel, along with its various subchannels. The six indicators are control of corruption,

government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law, and voice and accountability. It is worth noting that these metrics are all based off perceptions as opposed to being an exact science. Control of corruption refers to the degree to which public power is utilized for personal gain. Government effectiveness refers to the quality of public and civil services, as well as their underlying policies. Political stability and absence of violence/terrorism indicates the potential of political volatility, as well as the subsequent violence and/or terrorism that may follow. Regulatory quality assesses the government's policy formulation, implementation, and regulation processes regarding private sector development. Rule of law represents the level of public confidence in societal legislation, and the agents' likelihoods to uphold them. Finally, voice and accountability illustrate the degree of democracy in the government selection process, alongside the people's relative freedoms in expression, association, and media scrutiny. All six WGIs are presented in the form of a standard normal distribution, with scores ranging between -2.5 to +2.5. If a country performs well in a metric in a given year, it hosts a positive score, with the best achieving +2.5. The opposite is true for countries that perform poorly. However, as we only utilize this metric to assess the 46 countries in our sample, the minima, maxima, and averages do not abide by this normal distribution. These WGIs have been sourced from The World Bank's Databank, Worldwide Governance Indicators database. Full definitions are provided in the Appendix below. Unfortunately, as we were unable to find sufficient complete data representing national interest rates, we have not incorporated returns as a potential determinant factor in our analysis.

In incorporating the WGIs into our current dataset, we faced two minor problems. First, the WGI dataset does not contain information on the small Caribbean, island nation of Aruba. Aruba was subsequently removed from this analysis, shrinking the total countries in this section of our study from 47 to 46. The second issue is that prior to 2002, the WGIs only published data for even years. As such, there was no data available for 1995, 1997, 1999, and 2001. Since our study works with growth data, the 1995 entry is irrelevant. As we do require data for the other three years, we filled them in using the average between the years on either side of the missing variable (e.g., for 1997, we took the halfway point between 1996 and 1998). After these minor adjustments, we merged the datasets, took descriptive statistics, and ran our required tests. The descriptive statistics are presented in Table 11. (The regressions following this part of the study are displayed in Tables 12-33.) As expected, the OECD country sample scored better across the board in these governance indicators. The highest scoring metric for the OECD countries is government effectiveness with a score of 1.38. Then follows control of corruption, rule of law, and regulatory quality, at 1.36, 1.34, and 1.31 respectively. As these variables have a range of only 0.07 between them, they can be

assumed to be in similar positions. After follows voice and accountability scoring 1.23. But lagging at the tail end, scoring notably less than the other five metrics, is political stability and absence of violence/terrorism, scoring only 0.83. This indicates that, in the OECD countries of our sample, the largest governance issue pertains to political volatility. Upon further analysis, we find that one factor causing the underperforming political stability metric is the outlier of Mexico. We find that of the 36 country year data combinations providing negative values in this metric, Mexico pertains to 16 of them. Specifically, they hold the lowest 13 combinations, experiencing scores between -0.63 and -0.85. All the while, the next worst performer was Spain in 2009, which scored -0.47. For context, in 2009, Spain was just exiting the GFC, experiencing a new strain of the swine flu, and entering the Spanish Financial Crisis. Mexico also consistently bottoms the rankings of the other metrics with the PIIGS nations of Italy, Greece, and Spain, as well as drawing other large negative outliers in control of corruption, and rule of law. If Mexico is removed from the sample, the political stability metric would increase to 0.88, still well below the other five. However, as the OECD categorization is well defined, unlike the developed developing fine line, we will not be removing Mexico from our sample. It is worth noting that many metrics would be understated for the more developed OECD.

When inspecting the WGI values for the emerging economies, we truly find the distinction between the two groups of countries. The averages of these six metrics when describing the emerging economies range between -0.15 and +0.19. When averaging these averages, we find a value of 0.035. This indicates that across all of the governance metrics, these emerging economies perform slightly better than the world average. However, as the OECD mostly place on the upper end of this spectrum and are not included in the emerging countries averages, one could argue that these emerging economies are actually outperforming their peers in this normal distribution. This could potentially be due to the fact that these emerging countries are the ones that have sufficient macroeconomic savings data published in the public domain, which could pertain to some form of public accountability. From Table 11, we can see that the emerging countries perform best in the regulatory quality and voice and accountability metrics, scoring 0.19 and 0.16 respectively. In terms of political stability and government effectiveness, they score averagely at 0.07 and 0.04. Where they lack is in control of corruption and rule of law, where they scored on average, -0.15 and -0.10.

Looking at the differences between the country groups, the largest two are the control of corruption and rule of law. Although neither metric scored the highest in the OECD, their negative values in the emerging economies stood out. As a result, we have a 1.51 differential in the control of corruption, and 1.44 in voice and accountability across the two country groups. Aside from the averages, the standard deviations of Table 11 also provide some crucial insight. Apart from the OECD's control of corruption, the standard deviations of the OECD's WGIs are notably lower than that of the emerging

economies. This makes intuitive sense as the OECD is the selective member group. Although they do have a variety of members, some less advanced than others, the majority of the OECD's members are undisputedly developed countries, who share similar governance structures.

4.3.2. Stage 3 Education

Aside from risk and return, we also considered other potential determinant factors in savings channel risk-sharing. The most notable surround culture, education, and poverty levels.

Unfortunately, we could not find a suitable proxy for either of the first two, as culture is too broad, and poverty levels are subjective in nature. As such, we decided to assess if education, specifically, the average number of years that adults aged 15+ have spent in primary, secondary, tertiary, and total education, affects savings channel risk-sharing. We hypothesize that primary education is unlikely to produce significant results on savings risk-sharing as the Millennium Development Goal of achieving universal primary education has been quite successful. However, following the findings in Balli et al. (2016), we do expect secondary education and tertiary education to have a positive effect on the degree of experienced risk-sharing in the savings channel.

Unfortunately, the most complete years-in-education dataset we found only provided five-yearly data from between 1995 and 2010. As education level adjustments require both infrastructure and time, we do not expect much change in the years between. So, we adopted this dataset and used linear stepping to bridge the gaps (i.e., if 1990 had 4 years of primary education, and 1995 had 4.5 years, we would insert 4.1 in 1991, 4.2 in 1992, etc). In merging the datasets, we also removed Aruba, Burkina Faso, Costa Rica, Guinea, and India due to lack of data availability.

The descriptive statistics are presented in Table 34. (The regressions following this part of the study are displayed in Tables 35-40.) As expected, we find that the OECD experienced more education per adult in all categories. Universal primary education is also well on the way as the OECD and emerging countries scored 5.55 and 5.17 years respectively in primary education. The biggest nominal difference in years-of-education between the two country groups is the secondary categorization (0.49 years). This gap drops dramatically when hitting tertiary (0.16 years). However, if assessing percentage differences, the difference in tertiary education is almost twice that of secondary.

5. Results and Discussion

5.1. Initial sample – keeping oil-rich countries (Tables 3 and 4)

As detailed in Section 4 above, our research began with a sample of 51 countries. Of these, 32 were categorized as belonging to the emerging countries group (at any stage within the study's timeframe), while 24 were of the OECD. As previously mentioned, this sample proved inconsistent

with the existing literature due to the extraordinary prevalence of the savings channel for the emerging economies. This anomaly notably bolstered the consumption smoothing capacity of the emerging world. From Table 3, we see that at the 1% significance level, the unsmoothed consumption of the emerging countries lays at 60%. This implies that their risk-sharing channels are cumulatively stabilizing 40% of exogenous income shocks; a smoothing capacity that is approximately two times greater than the findings produced from many studies that focus on the risk-sharing decompositions of developing regions. Although the emerging countries still experience more unsmoothed consumption (less risk-sharing) than the OECD's 51%, also at the 1% significance level, the risk-sharing capacity of the emerging countries group is almost certainly inflated. Looking at Table 3, we are certain that the cause of this disproportionate level of cumulative risk-sharing in the emerging countries is due to their savings channel estimation. Aside from their savings channel, the only other channel with statistical significance is depreciation, which creates a dis-smoothing effect of 3%. The savings channel is further decomposed in Table 4 for analysis.

It is worth noting that savings channel aside, the findings in Table 3 are within reason. From this initial sample, we found that, the net factor income channel is the second largest stabilization mechanism for the world at 5% with 1% significance. As net factor income comprises of cross-border investment income, rents, and employee compensation, it makes intuitive sense that the OECD, with superior international financial market integration can, at the 1% significance level, extract 14% smoothing through this channel. The emerging countries on the other hand, with poor international financial integration, hosts a statistically insignificant net factor income channel which smooths 3% of shocks. The depreciation and international transfers channels are observed to be low in magnitude, and oftentimes statistically insignificant for both groups. As the depreciation of assets is somewhat continuous over time, and likely displays a lag to newfound growth levels due to the time required to make the necessary investments to ramp up or tune down production, it does not tend to show much co-movement with GDP. International transfers, although having the potential to provide significant smoothing to individual countries such as in the French African colonies in Yehoue (2005), do not provide much if any smoothing as a whole in our poorly integrated world system. This is represented by the statistically insignificant 1% dis-smoothing in Table 3 for all three country groups.

In disassembling the savings channels, we found that the root cause for the great stabilization in the emerging countries is through their government savings channel. This is presented in Table 4. Here, we see that when isolating the government component of the savings channel, the emerging countries allegedly smooth 27% of exogenous income shocks at the 1% significance level, beating out the OECD's 18%. As emerging countries tend to host weaker governing bodies, it is hard to

believe that there is no hidden factor at play causing this 27% stabilization effect. There are two main arguments for why these emerging countries' governments could outperform the OECD. The first is that the emerging countries in this study are likely more publicly accountable than the status quo as they are the ones who kept track of and make public their macroeconomic records. Secondly, one could argue that the OECD in this sample primarily consists of EU countries bound by the Maastricht Treaty, and henceforth its debt requirements. But even with these two positions, it is hard to imagine that the end result could be so profound.

Aside from the government savings channels, the only other statistically significant channel in this breakdown is the OECD's non-financial corporate savings. This coincides with the findings of Sorensen and Yosha (1998) who state that when income shocks have a dissipation frequency of one year, the only two stabilization mechanisms available are government and corporate savings. However, as we have split the corporate savings channel into financial and non-financial counterparts, we discover that this risk-sharing is from the non-financial sector. It is also interesting to note that, although statistically insignificant, the OECD's households negatively contribute to the risk-sharing process. At the same time, although also statistically insignificant, the emerging economies' households are providing 6% additional smoothing. This differential is likely due to the complacency generated in the OECD's private households from their strong corporate savings risk-sharing mechanisms.

5.2.1 New sample – removing oil-rich countries (Tables 5-10)

Following the recognition that an anomaly exists in the government savings levels; we assessed each country's individual government savings/GDP ratios as depicted in Figures 1 and 2 above, below the tables. From this procedure we discovered that, as expected, outlier countries exist in our sample. These are the countries that had the highest oil production to GDP per capita ratios as discussed in Section 4 above. Once these four countries, namely Azerbaijan, Kuwait, Saudi Arabia, and Norway were removed from our sample, we noticed that the risk-sharing decompositions for both emerging and OECD nations adjusted to become more consistent with the literature. The regression estimates of the new sample of 47 countries are presented in Table 5 below. Comparative to Table 3, we discover that the emerging countries savings channel has lost half its magnitude, while remaining statistically significant at the 1% level. At the same time, the removal of Norway alone caused the OECD's savings channel's risk-sharing capacity to fall by 10 percentage points from 34% to 24%, also still significant at the 1% level. These changes brought the emerging economies and OECD's total unsmoothed consumption up from 60% and 51% to 77% and 57% respectively, indicating total consumption smoothing experienced decreasing from 40% and 49% to 23% and 43%; values now consistent with Sorensen and Yosha (1998) as well as the literature cited in Section 2.3.3. above.

The removal of these four countries from the sample did not cause much change outside of savings, (and consequently, unsmoothed consumption). The OECD's reliance on the net factor income channel increased by one percentage point from 14% to 15% smoothing, while the emerging economies still hold the statistically insignificant 3%. The only other noteworthy difference is the three percentage point gain in depreciation stabilization that the OECD has obtained from this adjustment, the increase from 2% to 5%. This risk-sharing mechanism also jumped from being statistically insignificant at any level to being significant at the 1%. The gain of this procyclical depreciation aids the OECD's risk-sharing capabilities acting as the third contributing factor, all the while the emerging economies solely rely on their savings channel's stabilization mechanisms.

When rerunning the savings channel breakdown with the new dataset, we found that, as expected, risk-sharing through government savings dropped substantially, especially for the emerging economies. While the government savings risk-sharing levels for both groups maintained at 1% statistical significance, they fell from 27% and 18% respectively to 9% each. These new figures are presented in Table 6. Although both country groups in this new sample now experience less risk-sharing through government savings, they do see some compensation through improvements in other channels. The OECD, previously seeing 25% risk-sharing through non-financial corporate savings, now experiences 29%, while the emerging countries compensate for this loss by doubling their private savings from 6% to 12%. The emerging economies' private savings also became 1% statistically significant. These regressions bring about an interesting correlation with the free-rider effect. When government savings are strong in the provision of risk-sharing, there is less incentive for both households and corporations to carry the burden. If the government's ability to provide this public risk-sharing wanes, but a strong corporate savings system still stands, households can still remain complacent in providing any semblance of self-stabilization. Only when all else fails, such as in the emerging countries, do households take it upon themselves to achieve an adequate level of consumption smoothing. Going forth, we will be solely utilizing the 47-country sample that has omitted the oil-rich nations. Due to their substantial oil-reserves and exports, these countries have crucially different risk-sharing structures than the rest of the world, as demonstrated in Balli et al.'s (2013) Gulf Cooperation Council states. In ignoring their presence, keeping these countries in our sample, we will be heavily biasing our findings towards the government savings risk-sharing channel, and inflated overall-risk sharing among other things.

5.2.2. New sample period decomposition (Tables 7 and 8)

After determining the overall risk-sharing compositions of the country groups, along with the savings decompositions, we checked the robustness of our results. We chose to split our dataset into two time-periods, namely before and after the GFC of 2007-2008 in order to determine if our results are

consistent irrespective of this depression. The GDP decomposition is displayed in Table 7, while the savings, Table 8. In Table 7, we can see that although the net factor income channel of the developing world remained statistically insignificant, it rose from 2% to 6%, while that of the OECD fell from 21% to 12%, while maintaining 1% significance. This indicates that the GFC significantly affected the relatively financially integrated OECD, effectively cutting smoothing from this channel in half. All the while, as expected, the emerging economies weren't sufficiently financially connected to the rest of the world to get pulled into this depression. For the depreciation channel, the emerging economies maintained a 3% dis-smoothing effect both before and after the GFC. However, with the shorter timeframes, both iterations lost statistical significance. The OECD on the other hand, managed to increase the risk-sharing from this field from dis-smoothing 6% to providing 10% positive smoothing. Although we believe that this change is connected to the risk-sharing lost from the net factor income channel, the analysis of this channel is outside the scope of this paper. The international transfers channel remains much unchanged for both country groups. It's small magnitudes and statistical insignificance is consistent for both groups in both time periods. It is interesting to note that the channel does provide a positive effect (though insignificant) for the emerging economies, while remaining at zero for the OECD. The savings channel also remains much unchanged, with both groups experiencing small improvements following the GFC.

In decomposing this savings channel, we noticed that the GFC induced changes were actually significant below the surface. Our initial oversight was the result of the subchannels within the savings channel itself moving in opposite directions, in effect cancelling each other out to some degree. Due to the size and relative stability of this channel, we expected that this could be the case; further emphasizing the importance of this research. In the decomposition, we found that the emerging economies took a large hit to their private savings channel. This channel fell in magnitude from providing 20% smoothing at the 1% significance level, to an insignificant 1% dis-smoothing. At the same time, their government savings channel's risk-sharing capacity increased from 0% to 25% with 1% significance. Their financial and non-financial corporate savings channels also moved in opposite directions. We believe that the key takeaways from this decomposition are the large, opposite changes in private and government savings. The OECD countries saw a lot less variation in these periods, the largest of which is in non-financial corporate savings. This channel grew from providing an insignificant 2% smoothing to 41% with 1% statistical significance. In the determinants section of this study, we will further assess these channels, namely the emerging economies' private and government savings, and the OECD's non-financial corporate.

5.2.3. New sample geographical decomposition (Tables 9 and 10)

After testing the income and savings decompositions by time consistency, we underwent further analysis, creating additional country groupings through geographical proximities. As previously mentioned in Section 4 above, we isolated the EU from the OECD countries, as well as split the emerging economies into EU Europe, non-EU Europe, Central and South America, Africa, and Asia and the Middle East. In the timeframe of 1996-2018, all non-OECD emerging countries in Europe were, at one stage or another, not EU members. As such, in the periods where they have not yet accessed to the EU, they are reported as non-EU Europe. The overall risk-sharing decompositions of the regions are presented in Table 9. First, in comparing the OECD and emerging economies' EU member states, we see significant differences. The OECD EU enjoys 1% statistical significance positive smoothing in all three main risk-sharing channels, cumulatively smoothing 47% of shocks between them. These three channels all lack statistical significance in their emerging country counterparts. The only significant risk-sharing channel the emerging EU possesses is international transfers, smoothing 6% of shocks at 1% significance: likely due to transfers from the thriving OECD EU.

In the non-EU emerging economies split, we see ample similarities between the region clusters. None of them have statistically significant net factor income channels as expected. What contradicts the literature is the absence of any statistically significant risk-sharing channels in all clusters except Central and South America. We believe that this is the result of stretching our sample too thin, creating higher-than-expected standard errors. This results in non-EU Europe displaying 86% unsmoothed consumption, while Africa 85%. All the while, Asia and the Middle East and Central and South America fared better, displaying 64% and 55% unsmoothed consumption respectively. As Asia and the Middle East are lacking statistically significant risk-sharing channels, it is likely that their degree of unsmoothed consumption is understated by this regression. Central and South America on the other hand experiences a level of consumption smoothing comparable to the OECD EU due to their large savings channel.

When assessing the regional savings breakdown in Table 10, we find that the OECD EU experiences much the same decomposition as the OECD presented in Table 6. As 20 of our 23 OECD members are also part of the EU, this comes as no surprise. As the OECD EU seems to experience 1% additional government savings risk-sharing, it could mean that the debt requirements of the Maastricht Treaty are not as confining as first thought. However, in removing these three non-EU countries from the sample, we removed the aforementioned Mexico, which could have made this difference. The risk-sharing channels of the emerging countries geographical breakdown (the other five columns), much like Table 9, all show very high standard errors relative to their respective

magnitudes, generating low t-statistics and significances. This is especially the case for the Asia and the Middle East classification which only consists of four countries with vast geographical distances between them. As our sample consists of countries all around the world, classifying them by geographical location any-which-way would cause the same problem. As such, we will not be using this regional decomposition going forth in this study.

5.3.1. Determinant testing: Worldwide Governance Indicators (Tables 12-33)

As idiosyncratic, country-specific risks are one of the primary attributes investors observe before making savings or investments in a country, we have decided to analyse how governance institutional quality, proxied through the WGIs, influences the savings channel and subchannels. We do so following Balli and Pierucci (2020), who studies the WGI's effects on overall consumption smoothing. Their study, over the period of 1996-2014 showed that there intuitively exists a negative relationship between institutional quality and unsmoothed consumption. This means that with better governance, the amount of risk-sharing within an economy would increase. In their study, rule of law was omitted in the WGI regressions, assumably due to statistical insignificance. Other than that, the remaining five WGIs provided statistically significant negative relationships with unsmoothed consumption expenditure for OECD countries. The magnitudes ranged from control of corruption at -0.39, to voice and accountability at -1.33. Indicating that independently, a point increase in each WGI would cause its respective decrease in total unsmoothed consumption. At the same time, the WGIs proved statistically insignificant across the board for their emerging economies. Surprisingly, except for the political stability metric, the other four WGIs provided slightly positive correlations to unsmoothed consumption. Although these metrics were statistically insignificant, the difference in expected relationship direction is intriguing.

In our study, we assess the relationship between institutional quality and the various savings channels, as opposed to overall unsmoothed consumption. We begin with Table 12, which depicts the relationship between the OECD's complete savings channel against these WGIs in the timeframe of 1996-2018. (For all non-descriptive statistics tables from Table 12 onwards, the equation identity utilized to generate the displayed outputs are provided below each respective table for clarity.) We found that the metrics of control of corruption, government effectiveness, political stability, and voice and accountability are all statistically significant at the 1% level with coefficients of 0.10, 0.15, 0.16, and 0.21 respectively. Rule of law, unlike in Balli and Pierucci (2020), is statistically significant here at the 5% level with a 0.12 coefficient. The insignificant variable in this regression is of regulatory law. This means that following a unit increase in each metric (except for regulatory law), the risk-sharing ability of the OECD savings channel should improve by the respective coefficient. Although we have adopted our model, Identity 4, from Balli and Pierucci (2020), we have opposite

signed results, both indicating the positive correlation between stronger institutional quality and greater risk-sharing. The reason is that the left-hand-side of our model, Identity 4, is the savings channel, while that of Balli and Pierucci (2020) is unsmoothed consumption. It is also important to note that our coefficients are smaller than those presented in Balli and Pierucci (2020). This is because as Balli and Pierucci (2020) found, there exists a positive relationship between institutional quality and unsmoothed consumption, which equivocally implies a relationship with risk-sharing as a whole. This means that Balli and Pierucci's (2020) coefficients should be the effective summation, or equivalent, to the impacts that institutional quality have on all risk-sharing channels.

We then conducted further tests with the OECD savings subchannels. These are presented in Tables 13-16. Unsurprisingly, we found that none of the WGIs show any statistical significance in determining private (Table 13) or financial corporate (Table 15) savings. As these channels were statistically insignificant to begin with as previously seen on Table 6, these relationships were expected. However, when observing Table 14, we find that every WGI is statistically significant at the 1% level in determining the government savings subchannel's risk-sharing. The coefficients of this subchannel are also similar to that of the savings channel as a whole. This, coupled with the greater significances displayed in Table 14, could indicate that institutional quality primarily impacts the government savings channel. The final savings subchannel, the one that provides the majority of the risk-sharing for the OECD countries, non-financial corporate savings, is presented in Table 16. Here we see that the only two WGIs of significance, both at the 5% level, are control of corruption and rule of law. The greater significance of the WGIs on the government savings channel relative to non-financial corporate over the long-term is intuitive. This is because the primary goal of government is to pool resources to improve the lives of its citizens, while corporations exist mainly for profit. This means that WGIs, indicators of government institutional quality, would undoubtedly display strong positive correlations with the government savings channel. Indicating that, the stronger the institutional quality, the more public risk-sharing the government savings channel will provide through procyclical savings and countercyclical dis-saving. The weaker significance in the WGIs ability to determine non-financial corporate savings is likely due to opposing forces. Countries with high institutional quality are definitely favourable to corporations and will attract investment and migration. However, these countries also support strong government savings channels that may provide sufficient risk-sharing for the corporations. As Donadelli and Gufler (2021) suggest in their article, nothing is simple, the respective magnitudes of the counteracting forces must first be determined to form our conclusions. In saying that, the two significant WGIs in determining non-financial corporate savings intuitively best represents corporate interests. A higher score in control of corruption reduces the chances of asset seizures while rule of law endorses safe continuity.

When assessing the WGI's relationships with the savings channel of the emerging economies, we found surprising results, presented in Table 17. Unlike in Balli and Pierucci (2020), we found that there is a significant relationship in this analysis belonging to the voice and accountability metric. However, the coefficient is negative. This means that at the 5% significance level, a unit increase in voice and accountability is expected to result in a small drop in savings risk-sharing in these emerging countries. Although the other WGIs are statistically insignificant, they also host negative coefficients. This trend tends to hold even after breaking down the savings channel into its components. Tables 18-21 represents the four subchannels. Both financial (Table 20) and non-financial (Table 21) corporate savings channels seem to be unaffected by the governance indicators, while private (Table 18) and government (Table 19) savings take some effect. Table 19 indicates that the government savings subchannel is affected by the voice and accountability WGI metric in the same negative way at 5% significance. While Table 18 shows that private savings is affected by both voice and accountability, at the 5% significance level, as well as government effectiveness at the 10% significance level, also both hosting negative coefficients. Although we also see coefficients hosting signs opposite-to-expectation in Balli and Pierucci (2020) for many statistically insignificant WGIs, they are theoretically indistinguishable from zero and can be more easily ignored. We believe that in our study, the negative relationship between savings risk-sharing and voice and accountability could be due to the presence of some activation energy-esque hurdles in regime transition. The sitting governance could potentially set hurdles to dissuade the populous from vying for change. The small, expected decreases in savings risk-sharing in the face of improving voice and accountability could be a result of such. However, we must admit that we are entering conjecture territory. On a different note, we believe that the negative relationship between private savings risk-sharing and government effectiveness in these emerging economies could be due to achieving greater or sufficient satiation. When the governing body can provide more essential public goods and services, citizens would be less reliant on their private savings as the bare minimum will be provisioned for.

5.3.1.1. Worldwide Governance Indicators period decomposition (Tables 22-33)

As both country groups have experienced drastic changes in one subchannel or another in the period following the GFC as presented on Table 8, we will continue our determinant testing of the WGIs in a period decomposition analysis. We do so following our period decomposition in Tables 7 and 8, splitting the study's timeframe into pre- (1996-2007) and post-GFC (2008-2018). The OECD's period decomposition descriptive statistics are presented in Table 22, while that of the emerging economies is in Table 23. For both country groups, we notice that each and every WGI has fallen in magnitude by approximately 0.17 to 0.18 points following the GFC-induced economic downturn. The most interesting finding from these two tables is that the standard deviations increased across the

board for OECD countries following this depression, while the emerging countries seemed to experience more convergence. This indicates that if a correlation exists between the two variables, the emerging countries were hit more uniformly by the GFC's economic shocks, while the OECD countries' savings channels were impacted based on their relative institutional qualities, among other potential determinants.

We look further into this phenomenon in Tables 24 and 25 by running regression analyses following Identity 4 in Section 3. Surprisingly, we find that before the GFC, none of the WGIs had any statistically significant relationships with the OECD's savings risk-sharing channel. However, following the GFC in 2008-2018, every channel gained statistical significance, mostly at the 1% level. Even rule of law, the WGI that had no statistical significance in predicting OECD savings risk-sharing in the study's full timeframe, gained 10% statistical significance, with a coefficient of 0.13. These coefficients are also all positive, and notably larger than those initially presented in Table 12. The two most influential determinants in this scenario are voice and accountability and political stability, supporting magnitudes of 0.35 and 0.34 respectively. This contrast in the WGI's magnitudes and significances between these two periods indicates that in times of plenty, the governing bodies of the OECD, with their relatively strong institutional qualities, do not experience differences in their savings risk-sharing channel due to WGI differences. However, in the more volatile times following the GFC, the importance of institutional quality shines through. In these times, OECD countries with higher institutional quality are expected to experience notably higher risk-sharing through their savings channel. Although these findings are the opposite of that in Balli and Pierucci (2020), it is in no way contradictory. This is because Balli and Pierucci (2020) test the WGIs against total risk-sharing inclusive of the other main risk-sharing channel of the OECD, net factor income. As the net factor income channel suffered a significant hit from the GFC almost halving in magnitude, while savings remained somewhat constant as shown in Table 7, it likely triggered the fall in WGI significance. From the combination of our findings and theirs, we assume that institutional quality does not affect net factor income. But to confirm this suspicion, further studies must be undertaken as it is not in the scope of this paper.

After establishing this, we then inspected the non-financial corporate savings subchannel specifically, as this was the channel that showed the largest change in risk-sharing from the period shift. These results are presented in Tables 26 and 27. Table 26 shows the pre-GFC relationships between the WGIs and non-financial corporate savings risk-sharing. Here, we find that once again, all WGIs provided statistically insignificant negative relationships. Following the GFC (Table 27), these WGIs all became statistically significant at the 1% level with coefficients ranging between 0.25 to 0.47. In conjunction with Table 8, we find that countries with stronger institutional quality

experienced the greater gains in non-financial corporate savings following the GFC relative to their weaker governing peers.

When reviewing the emerging economies in Tables 28 and 29, we see that once again, before the GFC, there are no statistically significant relationships between any WGs. These significances only appear in the post-GFC timeframe of Table 29. This leads us to believe that WGs only influence savings channels risk-sharing intertemporally during times of turbulence irrespective of their original scores. This is the same for their private and government savings subchannels as documented in Tables 30 and 31, and 32 and 33 respectively. However, these gains in significance comes with the unexpected negative relationship. This means that in following the volatile GFC, emerging countries with relatively weaker institutional qualities tended to experience more savings channel risk-sharing.

5.3.2. Years of education period decomposition (Tables 34-40)

After assessing the effects institutional quality has on savings channel risk-sharing, we looked towards years in education as another potential determinant. In Table 35, we found that for the OECD in the period of 1995-2010, years spent in secondary education is 1% statistically significant with a coefficient of 0.17. This indicates that with every additional year of secondary education for the average adult aged 15+, the country should experience 17% increased savings channel risk-sharing. The number is increased to 47% for years in tertiary education at 5% significance. This is contradictory to Balli et al.'s (2016) findings on UK households. In their study, they found that if the head of the household has greater education, they are less likely to deposit large proportions of their holdings into savings accounts and are more likely to explore other investment options. However, once we decompose the savings channel, our findings become more consistent with this statement. This decomposition is displayed in Tables 36-39, in order of household, government, financial, and non-financial savings subchannels. We find that, as expected, both corporate savings channels (Tables 38 and 39) are unrelated to years adults spend in education. However, we do notice that when assessing private savings, the equivalent channel in Balli et al. (2016), both magnitudes and significances fall dramatically. In Table 36, we see that the relationship between years in secondary education and OECD private savings fall to 0.07, with 5% significance, while tertiary has no significance at all. As Balli et al. (2016) defines low education as less than 11 years, this Table's secondary education is included in the assessment so provides no inconsistencies. The defining feature that causes the OECD countries to experience higher savings risk-sharing in relation to years spent in education comes from the government savings subchannel. This is displayed in Table 37. Here, we see that both years spent in secondary and tertiary education have 1% significance relationships with OECD government savings risk-sharing, holding coefficients of 0.09 and 0.43 respectively. This indicates that greater secondary and tertiary education does not cause

households to increase their savings. Instead, these findings suggest that countries that focus on human capital investment also focus on providing greater risk-sharing for its citizens.

Conclusion

Empirical summary

As our study consists of 40 tables and many empirical findings, we will begin our conclusion by providing a summary. First, our analyses and findings are derived from the 47-country sample introduced in Tables 5 and 6. In the period of 1996-2018, we found that the emerging economies experienced 77% unsmoothed consumption, with their only statistically significant risk sharing channel being savings, smoothing 20% of exogenous shocks. On the other hand, the OECD experienced a much smaller 57% unsmoothed consumption, utilizing both net factor income and savings channels, smoothing 15% and 24% of shocks respectively. When observing the savings decomposition in the same time period, we found that outside of government savings risk-sharing, the OECD experience a great 29% from their non-financial corporate savings channel. This channel is missing, even providing negative smoothing for their emerging country counterparts. As a result, the emerging economies rely on 12% smoothing from their private savings. In our determinant testing for this period, we found that the WGIs strongly influenced the OECD's savings-based risk-sharing, specifically the government and non-financial corporate subchannels indicating that strong institutional quality results in greater savings-channel risk-sharing. However, for the emerging economies, we found mainly statistically insignificant relationships. When an indicator was shown to be significant, the values were consistently negative indicating that countries with better institutional quality tends to have lesser savings channel risk-sharing if they are an emerging economy. Our rationale is that this relationship either represents the potential activation energy-esque hurdles set by the existing government acting as a sort of poison pill, or that governments transitioning from autocracy to democracy don't tend to be efficient in the transitory phase.

When the study period was split into pre- and post-GFC, we found that the savings channels of both country groups remained constant, only experiencing small improvements. However, as the OECD is more financially integrated with the world than the emerging countries, and thus felt greater impacts from the GFC, saw their net factor income channel's risk-sharing fall by almost half from 21% to 12%. At the same time, the emerging economies saw their net factor income channel increase from 2% to 6%, although remaining statistically insignificant. In decomposing the savings channel, we found that although the savings channel appears to not have experienced much volatility, the internal subchannels within did. However, as they moved in opposite directions, they contributed to cancelling each other out, resulting in minor adjustments in overall savings channel

risk-sharing. The emerging countries saw a massive decrease in private savings, and the opposite change in their government savings, while the OECD saw a notable increase in non-financial corporate savings. In the determinant testing section for this period decomposition, we found that both country groups had statistically insignificant relationships with most WGI's prior to the GFC. They only became statistically significant post. This leads us to believe that potentially, this is because governance indicators work best in intertemporal times of volatility. Following the GFC, all six WGI's gained statistical significance with positive coefficients, indicating that stronger institutional quality in the presence of uncertainty causes greater savings channel risk-sharing. We found that this was driven by the changes in the non-financial corporate savings subchannel. When it comes to the emerging economies, although some WGI's become statistically significant following the GFC, the relationships are all negative, contrary to expectation. This shares the same potential reasoning as provided at the bottom of the previous paragraph.

We also analysed how years spent in various levels of education for the average adult in each country act as potential determinants to savings channels risk-sharing in 1995-2010. We found that although there is a large, statistically significant relationship, it acts upon the unexpected channel. Instead of higher education causing greater private savings, it actually enhances the government savings subchannel. We believe that this is because governments that focus on investing in their country's human capital also looks to smooth the consumption levels of its citizens.

Concluding remarks

From this study, we found that both institutional qualities proxied by the WGI's, and years in secondary and tertiary education are significant determinants of the savings risk-sharing channel. For OECD countries, our study highlights the importance of improving or at least maintaining their levels of institutional quality as we believe that they are paramount in determining the amount of risk-sharing the savings channel can produce in these turbulent covid-era times. The relationship between these indicators and the emerging country's savings channel risk-sharing is more unclear. As the coefficients produced in our analyses between the WGI's and emerging countries' savings risk-sharing are negative, this indicates that improving governance quality, especially voice and accountability, creates the undesired opposite effect. However, for both country groups, the significances of the WGI's only come into effect after the GFC, potentially indicating that institutional quality only influences savings-based risk-sharing in turbulent times. We have also found that greater exposure to tertiary education also has a statistically significant positive effect on government savings risk-sharing in OECD countries. When it comes to the emerging countries, there are no significant relationships in the years in education metrics we tested. Once again, the directive for the OECD is much simpler than the rest of the world.

However, we must note that this is only the start of the conversation in savings channel determinant testing. As this is the first study in this specific niche to the best of our knowledge, we only managed to cover the basics. In future, it would be interesting to look into other potential determinants of the savings channel and subchannels. We would recommend assessing the subchannels piecemeal as opposed to this wide analysis, so that the researcher can find a multitude of determinants in order to run multivariate analysis following Balli and Ozer-Balli (2011), and Balli and Rana (2015). This would provide a clearer picture as to how much impact the determinants actually provide. Specifically, we would recommend deeper dives into the OECD's government and non-financial corporate savings channels, as well as the emerging economies' private household savings channel.

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Appendix

Data adjustments

Australia: GNI 1995-2018 = GDP * 0.968258 (average GNI/GDP ratio 1990-1994)

Austria: Savings Private 1995-2011 = trend Savings Private 2012-2018

Bahrain: Final Consumption 2014 = trend Final Consumption 1994-2013

Botswana: Savings Total 1995 = average Savings Total 1992-1994

Burkina Faso: Depreciation 2015 = GDP * 0.074982 (average Depreciation/GDP ratio 1999-2014)

Ecuador: Depreciation 2014-2018 = GDP * 0.123151 (average Depreciation/GDP ratio 2007-2013)

Estonia: International Transfers 1995-1999 = average International Transfers 2000-2018

Germany: Savings Private 1995-2011 = trend Savings Private 2012-2018

Greece: International Transfers 1995-2005 = average International Transfers 2006-2018

Guinea: CPI 2003 = trend CPI 2004-2010

Ireland: Savings Private 1995-2009 = average Savings Private 2010-2018

Malta: International Transfers 1995-2003 = average International Transfers 2004-2018

Namibia: CPI 2000-2001 = trend CPI 2002-2018

Panama: Depreciation 2007-2018 = GDP * 0.076563 (average Depreciation/GDP ratio 1997-2006)

Philippines: International Transfers 1992-1997 = trend International Transfers 1998-2008

Saudi Arabia: International Transfers 2002-2004 = average International Transfers 2005-2009

Sierra Leone: CPI 2001-2005 = trend CPI 2006-2017

Index

Gross Domestic Product	United Nations National Accounts Statistics – Table 4.1. Total Economy (S.1) at current prices. I. Production account – Uses. GROSS DOMESTIC PRODUCT. B.1*g.
Gross National Income	United Nations National Accounts Statistics – Table 4.1. Total Economy (S.1) at current prices. II.1.2 Allocation of primary income account– Uses. GROSS NATIONAL INCOME. B.5g.
Depreciation	United Nations National Accounts Statistics – Table 4.1. Total Economy (S.1) at current prices. I. Production account – Uses. Less: Consumption of fixed capital. K.1.
International Transfers	World Bank DataBank World Development Indicators. Current transfers comprise transfers of income between residents of the reporting country and the rest of the world that carry no provisions for repayment. Net current transfers from abroad is equal to the unrequited transfers of income from nonresidents to residents minus the unrequited transfers from residents to nonresidents. Data are in current local currency.
Final Consumption Expenditure	United Nations National Accounts Statistics – Table 4.1. Total Economy (S.1) at current prices. II.4.1 Use of disposable income account – Uses. Final consumption expenditure. P.3.
Consumer Price Index	World Bank DataBank World Development Indicators. Consumer price index reflects changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used. Data are period averages.
Population	World Bank DataBank World Development Indicators. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.
Savings Total	United Nations National Accounts Statistics – Table 4.1. Total Economy (S.1) at current prices. II.4.1 Use of disposable income account – Uses. SAVING, GROSS. B.8g.
Savings Private	United Nations National Accounts Statistics – Table 4.6. Households (S.14) at current prices. II.4.1 Use of disposable income account – Uses. SAVING, GROSS. B.8g.
Savings Government	United Nations National Accounts Statistics – Table 4.5. General Government (S.13) at current prices. II.4.1 Use of disposable income account – Uses. SAVING, GROSS. B.8g.

Savings Financial Corporations	United Nations National Accounts Statistics – Table 4.4. Financial Corporations (S.12) at current prices. II.4.1 Use of disposable income account – Uses. SAVING, GROSS. B.8g.
Savings Non-Financial Corporations	United Nations National Accounts Statistics – Table 4.3. Non-Financial Corporations (S.11) at current prices. II.4.1 Use of disposable income account – Uses. SAVING, GROSS. B.8g.
Control of Corruption	World Bank Databank World Governance Indicators. Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.
Government Effectiveness	World Bank Databank World Governance Indicators. Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.
Political Stability and Absence of Violence/Terrorism	World Bank Databank World Governance Indicators. Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.
Regulatory Quality	World Bank Databank World Governance Indicators. Regulatory Quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.
Rule of Law	World Bank Databank World Governance Indicators. Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on

the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.

Voice and Accountability

World Bank Databank World Governance Indicators. Voice and Accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.

Primary Education

World Bank Databank World Development Indicators. Barro-Lee. Average years of primary schooling, 15+, total is the average years of primary education completed among people over age 15.

Secondary Education

World Bank Databank World Development Indicators. Barro-Lee. Average years of secondary schooling, 15+, total is the average years of secondary education completed among people over age 15.

Tertiary Education

World Bank Databank World Development Indicators. Barro-Lee. Average years of secondary schooling, 15+, total is the average years of tertiary education completed among people over age 15.

Total Education

World Bank Databank World Development Indicators. Barro-Lee. Average years of secondary schooling, 15+, total is the average years of total education completed among people over age 15.