PRELIMINARY DRAFT

BOOMS, CRISES, AND RECOVERIES

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International Monetary Fund

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Abstract

This paper builds on our work on booms, crises, and recoveries (Cerra and Saxena, AER 2008) and discusses the policy implications of the findings. Contrary to common belief, we find no evidence that crises follow unsustainable output booms. In addition, we find that *all* recessions, not just those associated with financial and political crises, lead to a permanent loss in the level of output on average. These findings have far-reaching conceptual and policy implications. First, we may need to revise the concept of the business cycle and the measurement of the output gap. Second, persistent output losses imply more need for buffers and crisis avoidance policies, thus affecting the tradeoffs in prudential, monetary, and reserve management policies. Third, if we ignore the stylized fact of output loss, we risk misinterpreting the impact of policies and determinants of long-term growth. Fourth, these facts lead to a revised model of economic development, driven by the frequency and depth of crises. Finally, the measurement of recovery needs to be carefully considered, as it may lead to biased inference.

JEL Classification Numbers: E30, E32, E60, F43, G01

Keywords: recovery, crisis, boom, recession, growth, output loss, output gap, macroeconomic policy, reserves, monetary policy, development, measurement

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I. INTRODUCTION

Globalization leads to an increase in the degree of synchronization of business cycles, especially trade and financial-market integration enhance global spillovers of macroeconomic fluctuation (Kose, Prasad, and Terrones, 2003). Such integration has both benefits and costs. On the upside, the benefits of financial integration include easing of financing constraints for productive investment projects, fostering the diversification of investment risks, promoting international trade, and contributing to the development of financial markets. On the downside, periods of financial integration are also responsible for many boom-bust cycles that have ended in crises. Such crises have serious macroeconomic costs.

Cerra and Saxena (2008) established that balance of payments and banking crises, *on average*, generate permanent loss in the *level* of output. Moreover, such a persistent loss in output holds, on average, for *all recessions* (Cerra and Saxena, 2005). Our work implies that actual and permanent output levels fall concomitantly, leaving the output gap unchanged from before the shock. Nonetheless, the recent literature on "secular stagnation" (rekindled by Larry Summers 2014) is seeking explanations for the continuous downward revision in the estimates of U.S. potential output in the aftermath of the Great Recession. Such output gaps, as created by using HP filters, are purely mechanical. So what does it all mean for policymaking?

In this paper, we analyze the following questions about booms, crises, and recoveries:

- Do unsustainable output booms occur before crises?
- What are the policy implications of persistent output loss following crises and recessions? In particular, how do concepts of the output gap and business cycle have to be revised?
- What are the tradeoffs for macroeconomic policies to prevent and mitigate crises?
- Do we risk misinterpreting the impact of policy (or other determinants of long-run growth) if we ignore the existence of persistent output losses?
- What are the implications of output loss in crises for economic development?

II. UNSUSTAINABLE BOOMS AND FINANCIAL CRISES

In recent years, growth forecasts have continually been revised down, raising the question of whether growth was unsustainably high before the global financial crisis. If so, then the current lower growth rates could be just a return to normal times.

Using several decades of historical data for a large panel of at least 160 countries, we tested whether GDP growth tends to be abnormally high before a recession, banking crisis, or currency crisis. We compared the rate of growth during the 3-years up to and including the peak year, with each country's historical average rate of growth during expansion years.

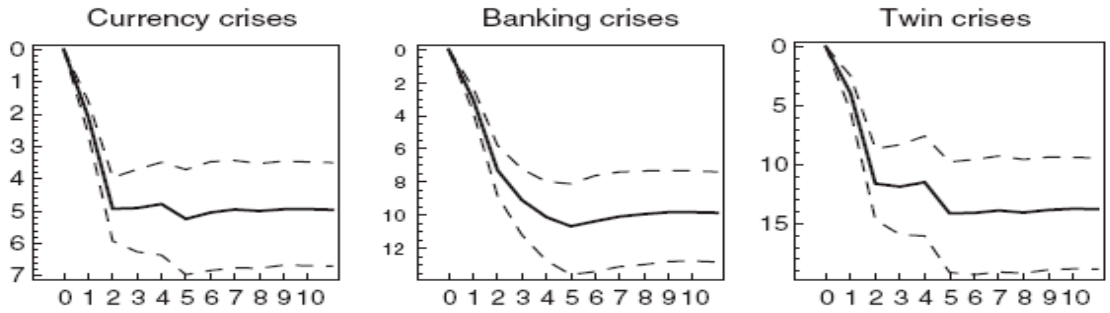
We find that GDP growth is actually lower just before the peak of a business cycle and just before a banking or currency crisis than in an average expansion year. In fact, growth is significantly lower before a crisis.

Table 1. Tests of Strong Boom Prior to Recession

Dependent Variable	Expansion growth rate		Expansion growth rate		Expansion growth rate	
3 years prior to the peak	-0.21	-0.33 **				
3 years prior to banking crises			-1.00 ***	-0.70 **		
3 years prior to currency crises					-0.55 ***	-0.32 **
No. of Observations	6528	6528	4917	4917	5608	5608
Time period	1961-2012	1961-2012	1970-2012	1970-2012	1961-2013	1961-2013
Fixed Effects	No	Yes	No	Yes	No	Yes

Other literature has found that some financial variables, including credit growth and house prices, tend to rise strongly before financial crises. But our results show that these indicators of imbalances do not manifest themselves in higher GDP growth. In short, there is no evidence of stronger output growth leading up to the crisis or recession.

FIGURE 1. IMPULSE RESPONSES OF OUTPUT TO CRISIS SHOCK



SOURCE: CERRA AND SAXENA, "GROWTH DYNAMICS: THE MYTH OF ECONOMIC RECOVERY," *AMERICAN ECONOMIC REVIEW*, MARCH 2008

Using a large cross country panel, Cerra and Saxena (2008) provides evidence from that BOP and banking crises lead to a persistent loss in the level of output.

The analysis controlled for normal cyclical fluctuations in growth, and showed that output would fall relative to a baseline and remain permanently lower following a financial crisis (as well as a political crisis).

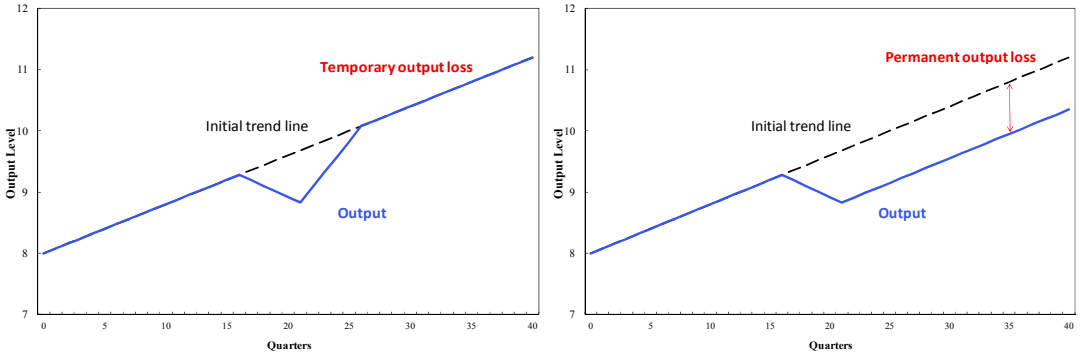
On average, the magnitude of persistent loss in output was about 5 percent for bop crises, 10 percent for banking crises, and 15 percent for twin crises.

In related work, Cerra and Saxena (2005) provide evidence that persistent output loss is a feature of *all* recessions *on average* and not just financial crises. This result from a decade ago still holds when we add 12 years of additional data.

III. REVISED CONCEPT OF THE BUSINESS CYCLE

These facts require a fundamental revision to our concept of the business cycle. Output does not cycle around a long-term upward trend, as traditionally believed. Instead, shocks result in a complete shift in the trend line itself.

FIGURE 2. CONCEPTS OF THE BUSINESS CYCLE



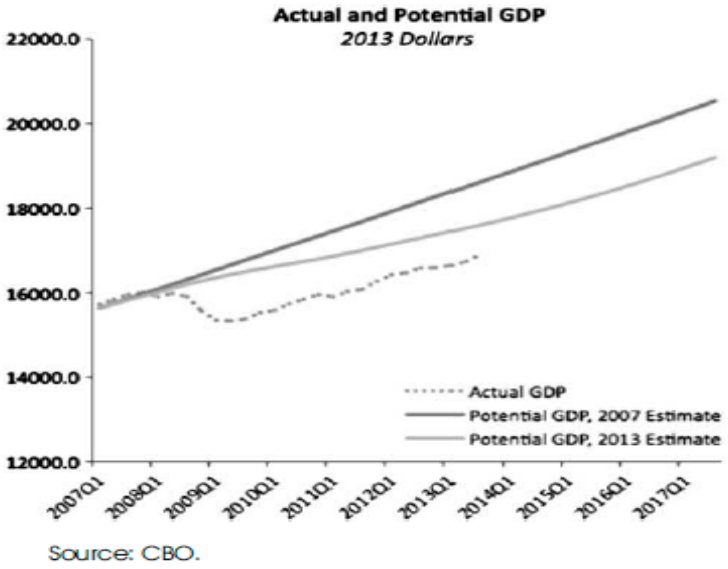
The left hand graph in Figure 2 shows the traditional view of the business cycle. A recession consists of a temporary decline in output below its trend line, but a fast rebound of output back to its initial upward trend line during the recovery phase of the business cycle.

In contrast, the right hand graph illustrates our evidence that at the end of a recession, recovery consists only of a return of growth to its long term expansion rate without a high-growth rebound back to the initial trend.

One implication of this new stylized fact on the shift in trend is that potential output and the output gap may be extremely difficult to measure and interpret, especially around severe recessions. This is a concern. A good measurement of the output gap is needed as an input to policy analysis, which often involves constructing cyclically-adjusted fiscal positions and Taylor rules for monetary policy.

Figure 3, copied from the Congressional Budget Office, shows that the estimated path of potential GDP has been revised down over time after US output fell sharply during the crisis. Moreover, the output gap has been closing in recent years, but this has happened through potential GDP coming down to actual GDP, not the other way around as normally assumed.

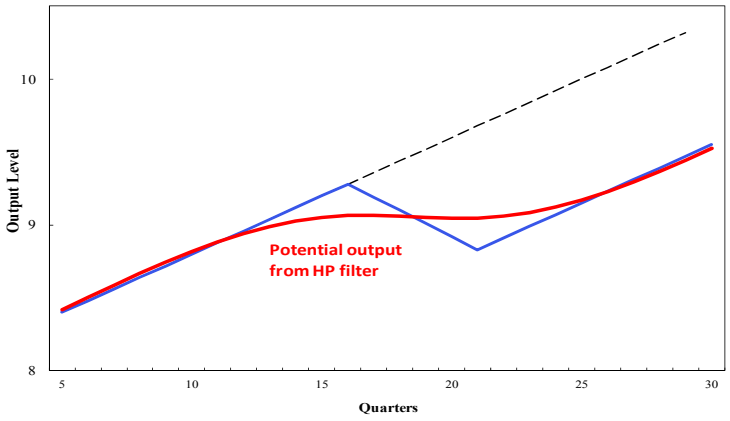
FIGURE 3. DOWNWARD REVISION IN POTENTIAL GDP, U.S.



In fact, this recent pattern of continued downward revisions of potential GDP and potential growth has contributed to the debate on secular stagnation. But this may be partly just an artifact of measurement issues.

Figure 4 shows the estimate of potential GDP when we apply a statistical smoothing method to output data a few years after a recession. The filter artificially constructs a positive output gap before the downturn and a negative one afterward, even if such gaps may not exist.

FIGURE 4. MEASUREMENT OF OUTPUT GAPS BASED ON A FILTER

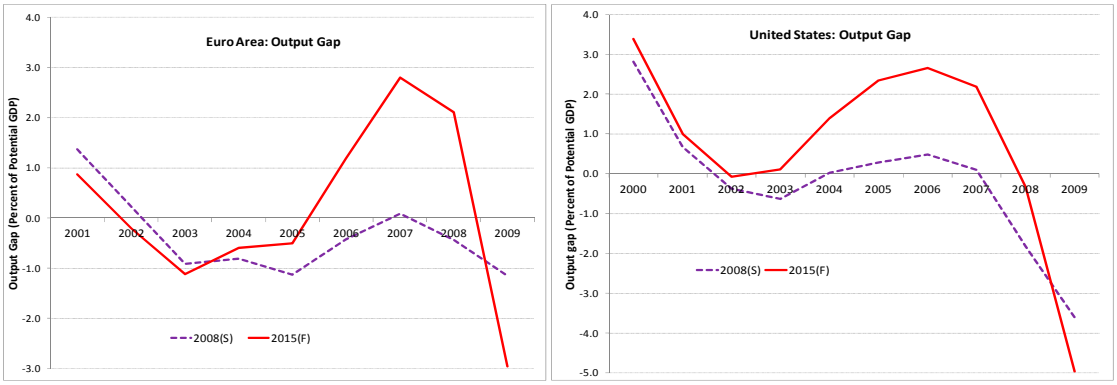


This faulty measurement of the output gap could mislead policymakers, and it occurs precisely at the time when we most need a good calibration of the output gap.

The problem with measuring the output gap is not just hypothetical. In the April 2008 World Economic Outlook, output gaps in the U.S. and Euro area were measured to be broadly closed, as shown in the blue dotted lines.

But the view of history has since changed. When output data after the crisis is added to the sample, the estimated path of potential GDP is pulled down and the output gap at the peak becomes positive, as shown by the red lines for the US and Euro area using the October 2015 WEO database. Ex-post, the pre-peak period appears to as if it were overheating.

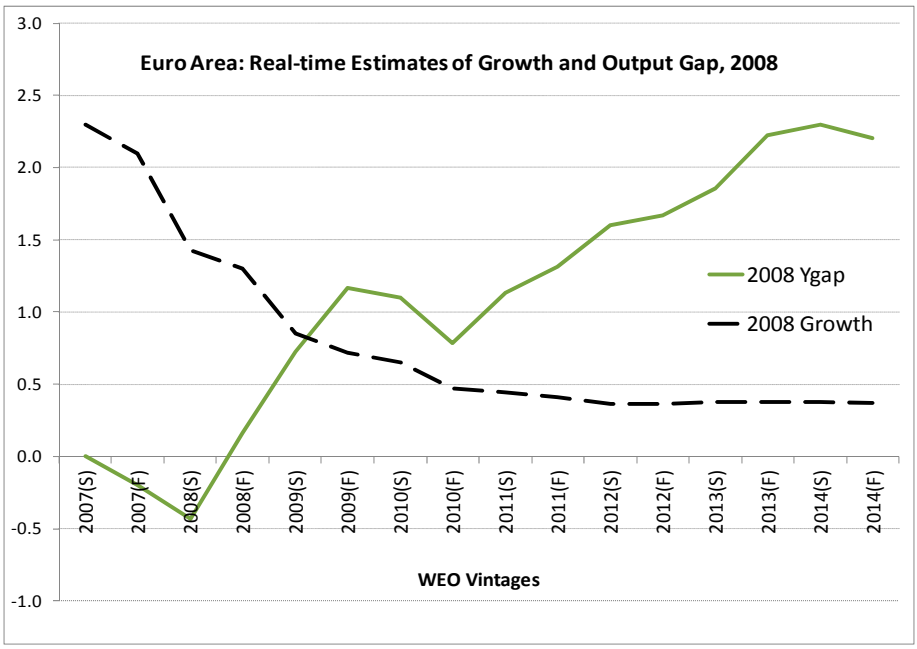
Figure 5. 2008 versus 2015 Measurement of Euro area and U.S. Output Gaps



Source: April 2008 and October 2015 vintages of WEO database

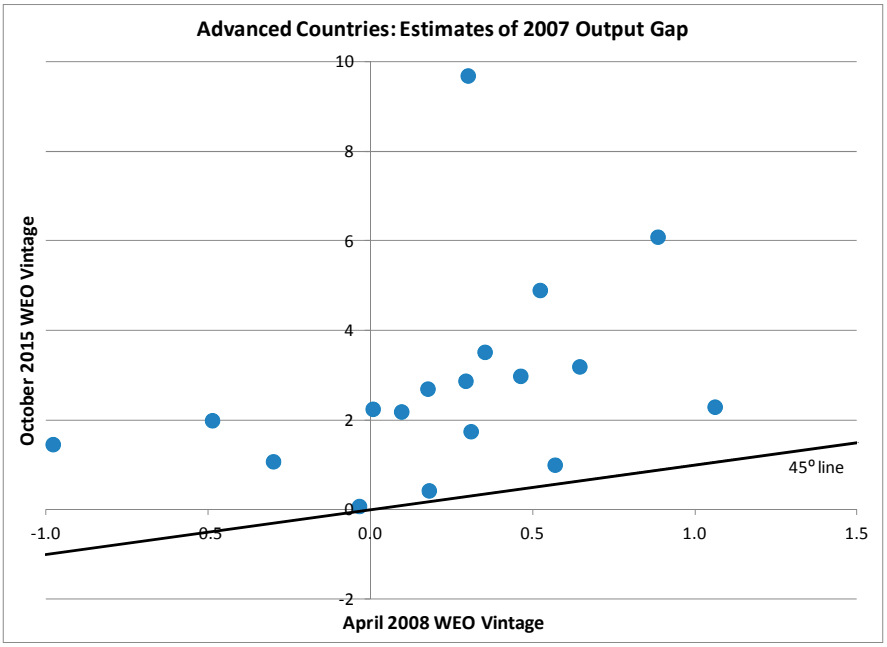
In fact, the estimate of the 2008 output gap in the Euro area continued to increase, even though the 2008 growth rate turned out much lower than originally projected.

Figure 6. Estimates of Euro Area Output Gap and Growth by Vintages



The issue is pervasive. In a sample of 18 advanced countries, current estimates of the 2007 output gaps are all higher than the estimates made at the time.

Figure 7. Revisions of Output Gap Estimates for Advanced Countries



This problem is not limited to the use of HP filters. Even more sophisticated multivariate models can lack robustness in real time versus ex-post estimates.

IV. Macroeconomic Policy Responses

Although output losses are persistent on average, there is a lot of heterogeneity in recoveries. Expansionary macro policies can help to boost growth during recoveries. Cerra, Panizza, and Saxena (2013), shows that policies such as fiscal and monetary policies stimulus and exchange rate depreciation have increased the speed of recovery.

But even so, there may be some deeper hysteresis effects at work, operating through the real or financial sectors, which could prevent macro policies from fully restoring the lost output. Other policy responses may also be needed, such as structural reforms or measures to repair financial balance sheets.

Another issue is that we should be careful how we use the output gap for policy analysis. Normally, potential output is defined such that resources are fully used and inflation is stable. The associated output gap would reflect slack in the economy and could be useful for monetary policy.

However, this output gap (used for monetary policy) could be the wrong object to use to determine public debt sustainability.

That is, tax revenues tend to move with GDP. So a persistent decline in the level of output also implies a persistent decline in the tax base. This could require fiscal retrenchment to preserve debt sustainability.

If the fiscal authorities use the standard output gap to calculate structural revenues after a crisis, they might incorrectly and dangerously assume no need for fiscal retrenchment. Why? Because the standard output gap is likely to be negative after the crisis, due to inflation falling and unemployment rising. The fiscal authorities would be misled into believing that structural revenues are higher than current actual revenues and that

revenues would rebound during the recovery as the slack disappears. But as already discussed, the output gap may be closed with potential GDP coming down, not with actual GDP rising up.

The high uncertainty of the output gap also has implications for the policy mix. Monetary policy is more nimble than fiscal policy and it's easier to claw back any mistakes. This would be an argument to keep a higher threshold for using fiscal policy to try to stimulate output after a recession.

In addition, because output losses of financial crises are large and persistent, there are stronger arguments for policies to avoid them or mitigate their consequences. For instance, in the trade-off between financial liberalization to stimulate innovation versus stricter regulatory and prudential policies to ensure financial stability, large persistent output losses weigh on the side of being more prudent.

As another important example, policy makers are often engaged in the analysis of the costs and benefits of holding foreign exchange reserves. Jeanne and Ranciere (2011) use a model to conduct cost-benefit analysis of foreign exchange reserves, which assumes a temporary loss in output and consumption associated with sudden stops or BOP crises. In the model, foreign exchange reserves serve as insurance to support consumption until output returns to its trend line. However, our findings of permanent output loss in BOP and other crises suggest the need for a larger stock of foreign exchange reserves, as this insurance must cover losses for a longer period than assumed in the Fund's model.

V. Inference of Determinants of Economic Growth

It is important to pay attention to the impact of financial crises on output, to avoid misinterpreting the role of policies and other determinants of growth.

For example, Sweden was ranked 3rd of OECD countries in per capita GDP in 1970, but fell to 14th place in the 1991 rankings. Some Swedish economists argued that this

relative decline was caused by the fiscal and social policies of the Swedish welfare state model.

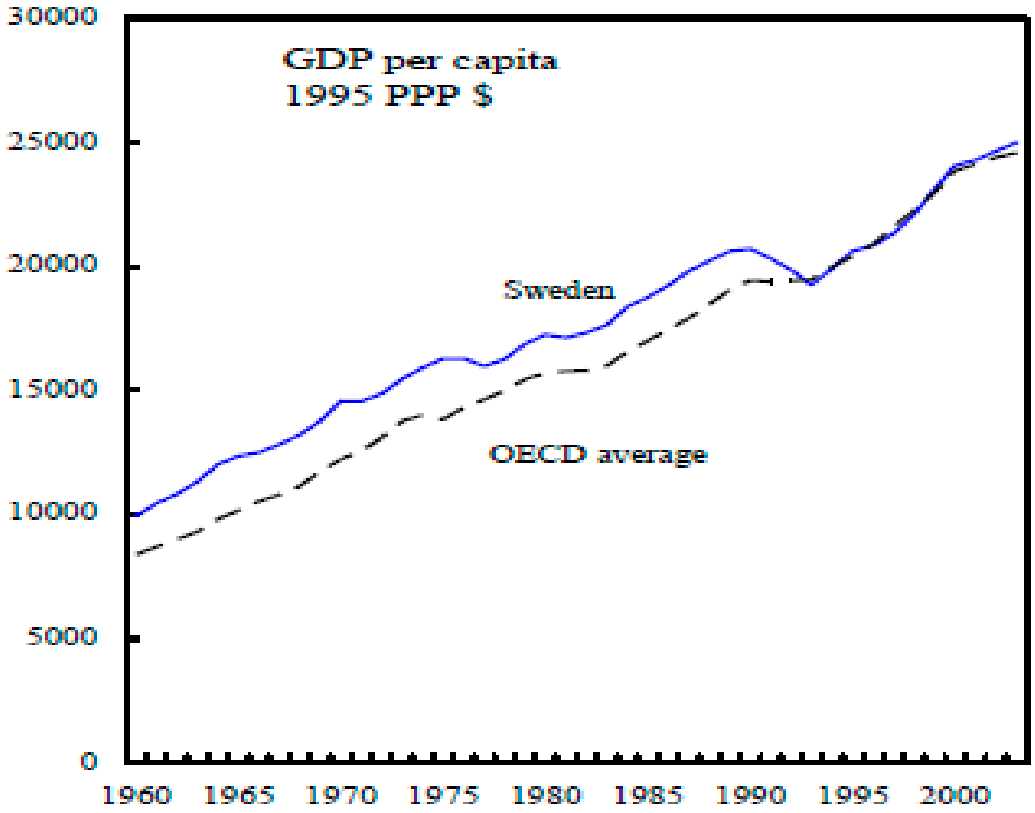
Table 2. Sweden: Relative Ranking Between 1970 and 1991

1970 Rank		Index	1991 Rank		Index
1	Switzerland	145	1	United States	125
2	United States	141	2	Switzerland	122
3	Luxembourg	108	3	Luxembourg	120
3	**Sweden**	**108**	4	Germany	110
5	Germany	105	5	Canada	108
6	Canada	102	5	Japan	108
7	Netherlands	101	7	France	103
8	Denmark	100	8	Denmark	99
8	France	100	9	Belgium	98
10	Australia	99	10	Austria	97
11	New Zealand	98	10	Iceland	97
12	United Kingdom	93	12	Italy	95
13	Belgium	90	12	Norway	95
14	Austria	86	**14**	**Sweden**	**94**
15	Italy	85	15	Netherlands	93
16	Finland	82	16	Australia	91
17	Japan	80	17	Finland	90
18	Norway	33	18	United Kingdom	88
19	Iceland	75	19	New Zealand	78
20	Spain	64	20	Spain	72
21	Ireland	50	21	Ireland	65
22	Portugal	42	22	Portugal	52
23	Greece	41	23	Greece	44
24	Turkey	17	24	Turkey	20

Sources: OECD National Accounts; Lindbeck et al. (1994).

But the time series in Figure 8 shows that Sweden's financial crisis in 1991-92 was the culprit for the decline in its rankings and not its welfare state model.

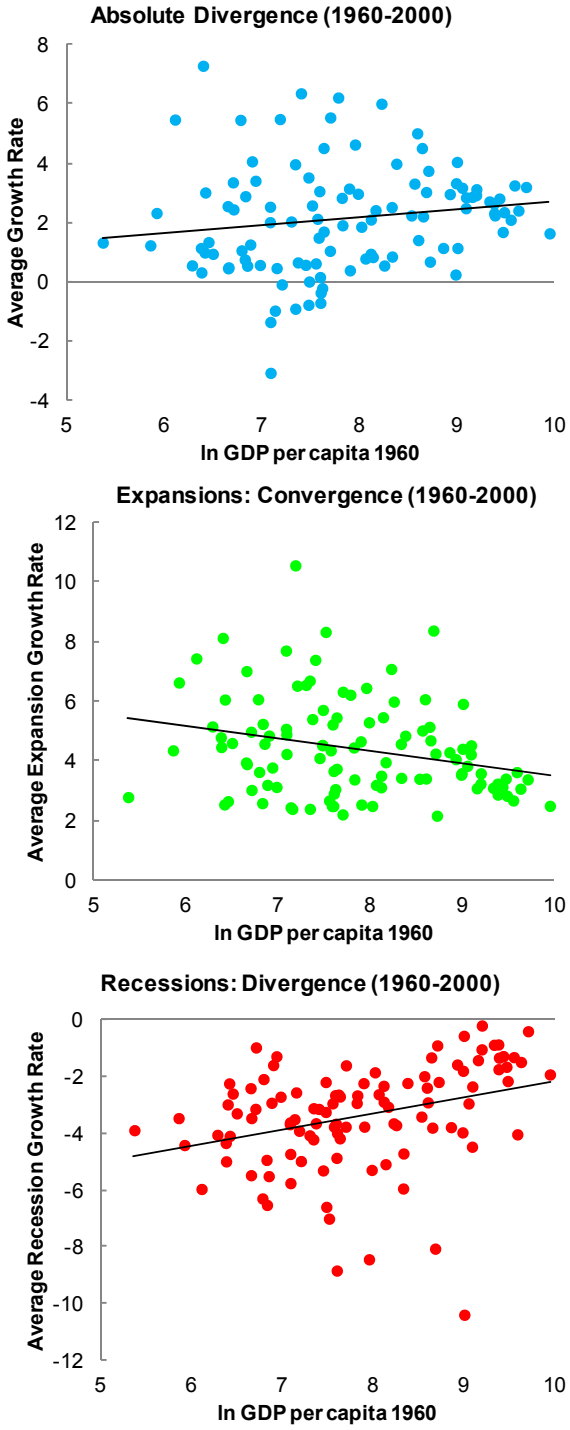
Figure 8. Sweden versus OECD. GDP per capita



VI. A Crisis-Driven Stylized Model of Economic Development

In the literature on economic development, the standard neoclassical growth model would predict that poor countries which are those with lower capital would grow faster than rich countries because of diminishing returns to capital. This would imply convergence in per capita income. However, the growth literature has previously found that the empirical evidence contradicts this prediction.

Figure 9. Absolute Divergence: Convergence in Expansions, Divergence in Recessions

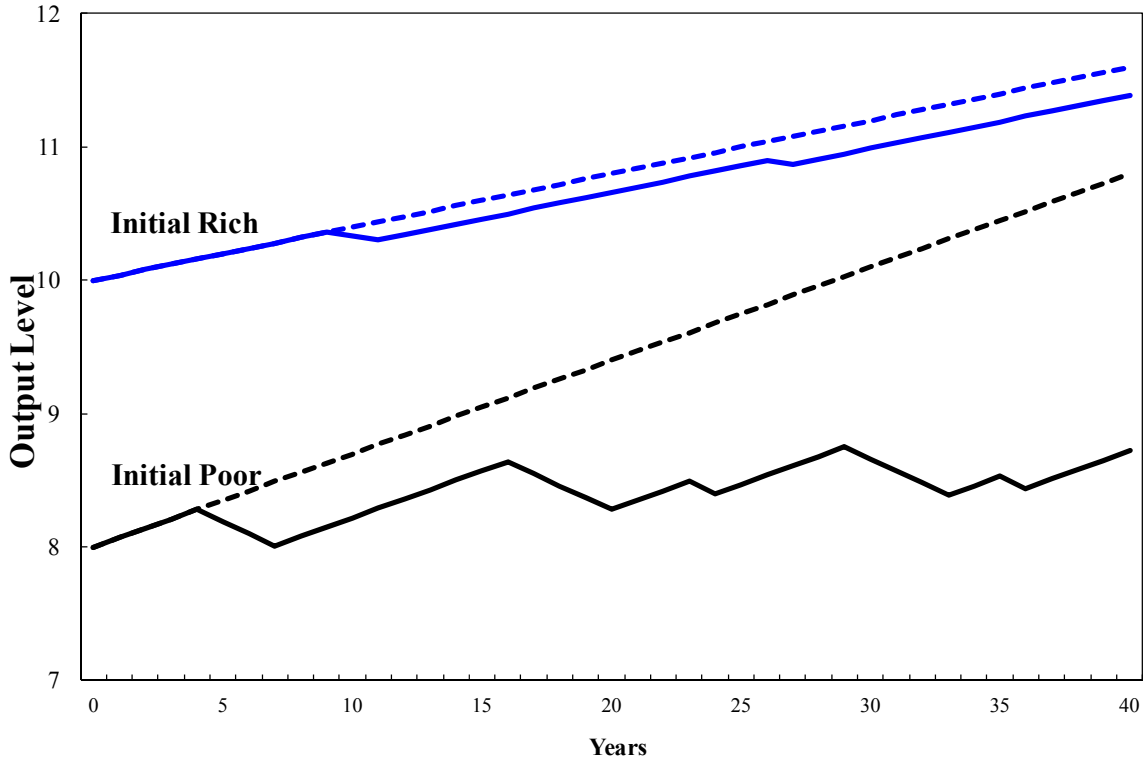


In the first graph, we can see that countries that were rich in 1960 grew faster than poor countries between 1960 and 2000, a stylized fact that has been termed absolute divergence.

We have separated each country's average long run growth rate into the average during expansions and the average during recessions. In the second graph, we find that convergence does indeed hold when we look at average growth during countries' expansion phase.

The finding of absolute divergence seems to come from the fact that poor countries' recessions are much deeper than those from rich countries as well as the fact that poor countries have more frequent recessions. This evidence combined with our previous evidence of permanent output loss leads us to propose a new stylized model of economic development.

FIGURE 10. STYLIZED MODEL OF ECONOMIC DEVELOPMENT

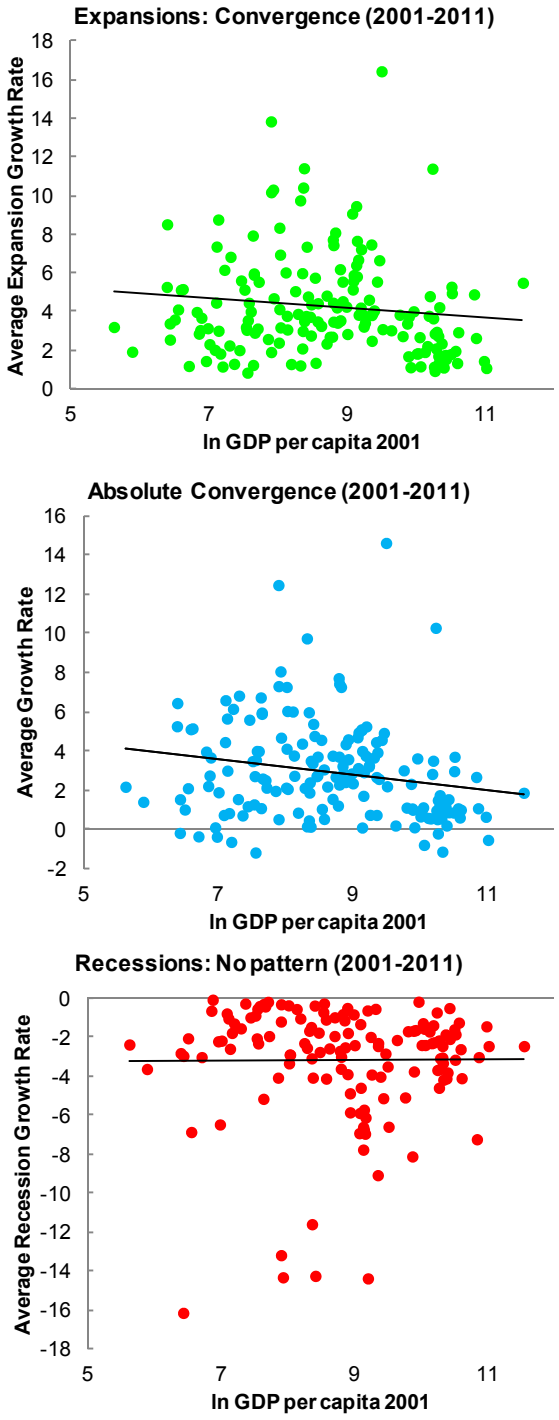


In line with neoclassical growth theory, economic expansions in poor countries are stronger than in rich countries, which in the absence of negative shocks could over time lead to a convergence in the levels of output per capita. Both sets of countries have negative shocks with persistent impacts. However, recessions in rich countries are shallow and infrequent compared to those in poor countries.

Thus it is poor countries' policies and institutions, and external shocks that generate large crises and large recessions which keep pushing them back.

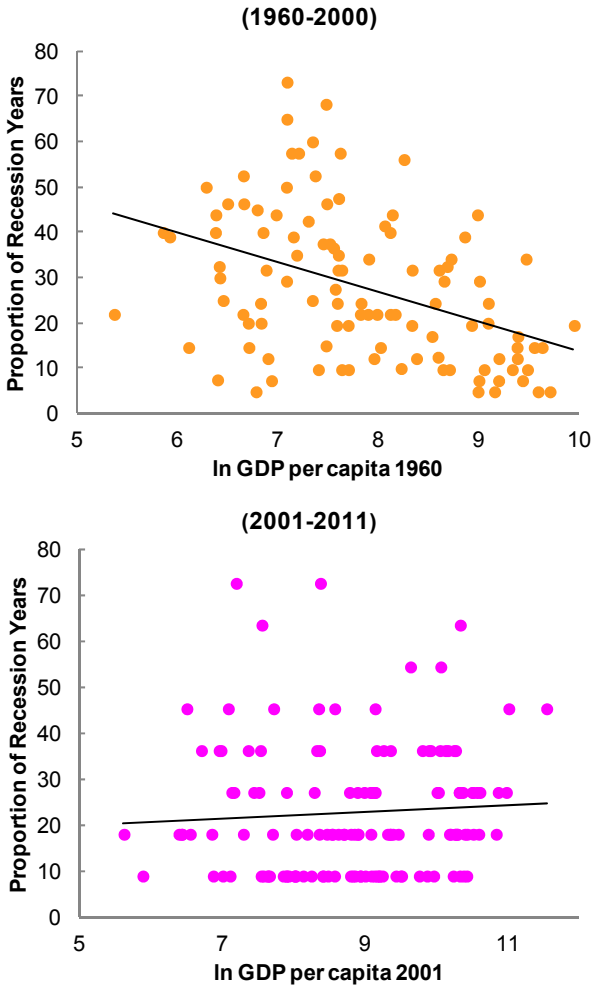
However, the past decade has been different. From 2001-2011, there has been absolute *convergence*, which comes from convergence during expansions yet again. But this time, there is no pattern of divergence in recessions.

Figure 11. Absolute Convergence in Recent Decade



In addition, although poor countries had more frequent recession years during the period 1960-2000, this did not happen in the latest decade, where if anything, rich countries had more frequent recession years. Thus in the last decade, financial crises in advanced countries have set them back.

Figure 12. Frequency of Recessions



VII. CONCLUSIONS

Our work has shown that crises and recessions can permanently push down the level of a country's output. This fact has powerful implications for our concept of the business cycle and for macroeconomic and prudential policies to avoid and react to crises and recessions.

In addition, poor countries have had more frequent crises and deeper recessions than rich countries over most of the last several decades. This has held back poor countries' development.

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BABIES PROLONG RECESSIONS: A COMMENT ON "RECOVERY FROM FINANCIAL CRISES: EVIDENCE FROM 100 EPISODES"

By VALERIE CERRA AND SWETA CHAMAN SAXENA*

Carmen Reinhart and Kenneth Rogoff estimate the costs of financial crises based on real GDP per capita, defining recovery as the return to the pre-crisis level of per capita GDP. Our analysis shows that defining recovery to the pre-crisis level introduces a bias in estimating the duration of crises, as slow growing economies take longer to reach that threshold. We also show that using GDP in per capita terms more than doubles the measured duration and severity of crises when compared with using GDP in levels.

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I. Motivation: Pitfalls in the Measurement of Recoveries

Following the global financial crisis (GFC), there has been increased attention in the literature to sluggish economic recoveries, including a study by Reinhart and Rogoff (2014, thereafter RR) on the duration and severity of historical financial crises.

RR define the *duration* of a financial crisis as the number of years it takes to reach the prior peak in real per capita GDP. They acknowledge that this definition does not capture a return to potential output and does not account for a permanent deviation from a pre-crisis trend as in Cerra and Saxena (2008). However, they

feel that normalizing by population does allow for some time variation in the underlying trend output. Also, unlike NBER dating, their approach treats any renewed downturn that takes place before the economy reaches the prior peak as a double dip and part of the same cycle.

In contrast, Cerra and Saxena (2005) define the duration of crises as years of negative growth rates, and the "trough" as a year of negative growth that is followed by a year of positive growth. The "recovery phase" is then one or more years of positive growth after the trough.

In addition, RR measure the recovery of GDP from financial crises in *per capita* terms for three reasons:

i. Recovery following financial crises is often a five-to-ten-year process. As long as the population is growing, a recovery of the prior peak in real GDP will still leave the average person worse off than prior to the crisis.
ii. They compare crises that are decades and sometimes centuries apart. During the 1850s, US population growth peaked at about 3.8 percent per annum, while it is less than 1 percent at present.
iii. There are substantive cross-country variations that persist to this day.

Our paper argues that the RR measurement of the duration of a recovery from a financial crisis, defined as the years to reach the pre-crisis level of GDP per capita, has certain pitfalls:

i. This definition is biased, as fast growing economies will reach the previous peak faster than slow growing economies.
ii. The use of *per capital* GDP may not be a counterproductive to measuring welfare in some circumstances. RR use per capita GDP so as to compare crises spanning centuries when population growth rates have changed and to approximate the loss in living standards. However, in cases of civil wars

and natural catastrophes, where death toll can be very high, a quick return to the pre-crisis per capita GDP level due to a precipitous decline in population can hardly be characterized as a small loss in living standards.

iii. Even abstracting from episodes in which loss of lives could be substantial, their measure of duration of recoveries could be entirely driven by population growth rates, where macroeconomic policy has no role to play.

II. Estimation and Data

We disaggregate the duration of recession into the components related to GDP growth versus population growth, and contrast the results based on both per capita GDP and real GDP in levels (both measured in USD). For both indicators, we apply the RR definition of duration as the number of years it takes to reach the level of the prior peak.

As the source of data, we use the World Bank's World Development Indicators to obtain real GDP and real per capita GDP in levels (in constant 2005 USD) from 1960—2013. The online appendix to RR contains 38 episodes during the period 1960—2013. However, given the short duration since the GFC, this includes 14 recessions and recoveries in which RR use IMF forecasts to extend the data. [We exclude these episodes.]

Our analysis replicates RR's definitions of the duration and severity of financial crises, as follows:

Peak-to-trough: Number of years it takes to reach the trough before output reaches the pre-crisis level (e.g., 2 years in Figure 1).

Peak-to-recovery: Number of years it takes to reach the pre-crisis level of output (e.g., 6 years in Figure 1).

Severity Index: The sum of (absolute) output loss and the number of years from peak to recovery (e.g., 20.2 in Figure 1).

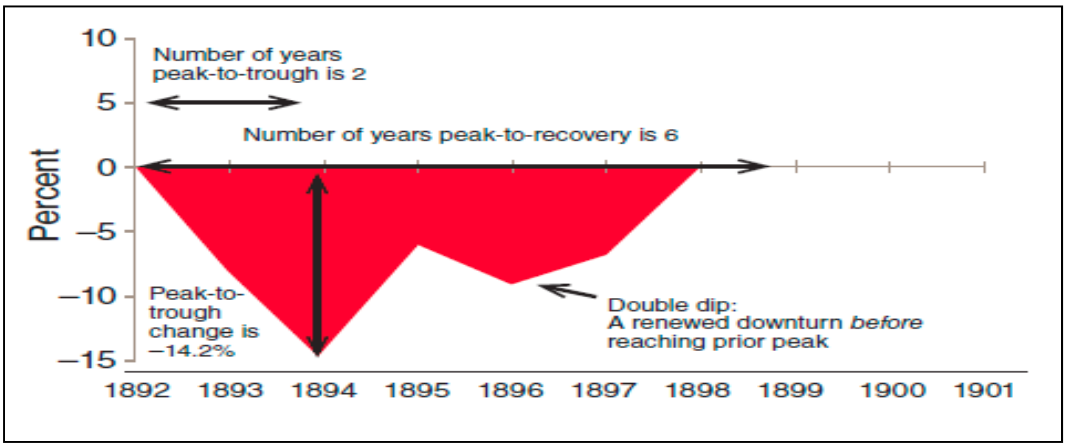

FIGURE 1. BASIC CONCEPTS: AN ILLUSTRATION WITH THE US BANKING CRISIS OF 1893

Notes: The severity index for this episode is 20.2. This is Figure 1 from Reinhart and Rogoff (2014).

We also measure output loss and years to recovery using an alternative definition consistent with Cerra and Saxena (2008). The duration to recovery is the total number of years during which output growth was negative, and output loss is measured as the cumulative loss during this period. The recovery begins immediately following the trough.

III. Results

A. Significant bias in the definition of recovery to prior peak

The first pitfall in the RR approach to measuring the duration of recoveries arises from their focus on reaching the level of the previous peak. We argue that the RR definition suffers from a bias in that fast growing countries will reach their previous peak faster than slow growing countries. As an example, Figure 2 illustrates that for the same magnitude of output loss over a one-year period, the

fast growing country reaches its previous peak in 3 years while it takes 6 years for the slow growing country to recover.

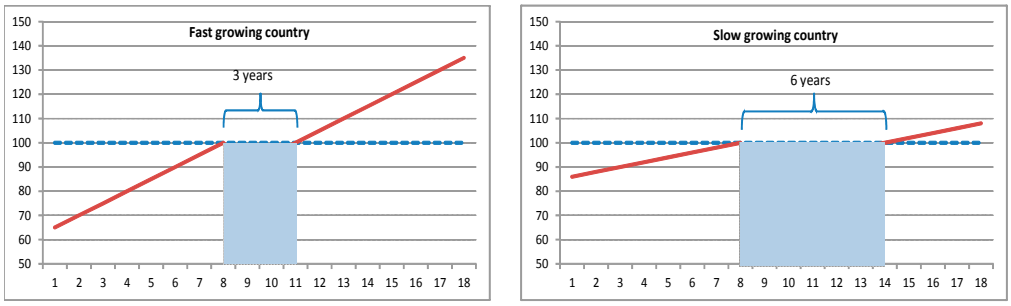

FIGURE 2. ILLUSTRATION: DURATION OF CRISIS FOR A FAST VERSUS SLOW GROWING ECONOMIES FOR THE SAME MAGNITUDE OF OUTPUT LOSS

We find strong empirical support that this bias occurs in the data. In the first two columns of Table 1, we find that controlling for the magnitude of output loss, a country which grows 1 percent faster on average than another country will recover about one quarter of a year faster.

Dividing that result into the period of contraction and the period from trough to the recovery of the prior level, we find that most of the action happens in the period from trough to recovery of the prior level, consistent with our illustration.

Under an alternative definition of recovery, which begins the year growth becomes positive, we find that the recovery time is only marginally faster for fast growing countries (last two columns). Thus, defining a recovery as the year in which growth turns positive generates a considerably smaller bias than the RR definition based on reaching the pre-crisis peak level.

Table 1: Relationship between Duration and Output loss from Recessions and Country's Growth Rate

	Double Dip						No double dip	
	Time to level recovery		*Duration of Contraction*		*Trough to level recovery*		*Duration of Contraction*	
Output loss	0.32 ***	0.33 ***	0.12 ***	0.12 ***	0.20 ***	0.21 ***	0.06 ***	0.07 ***
Average Growth	-0.26 ***		-0.09 ***		-0.17 ***		-0.04 **	
Average Positive Growth		-0.21 ***		-0.06 **		-0.15 **		-0.04 ***
Adjusted R-squared	0.68	0.68	0.44	0.43	0.64	0.65	0.56	0.56
Number of Observations	567	567	567	567	567	567	811	811

Note: Output loss represents peak-to-trough output loss with or without double dips.

B. Use of per capita GDP in the definition of recovery

The first column of Tables 2 and 3 below present the RR estimates of the peak-to-trough output losses and the number of years to recovery following major financial crises. In the second column, we reasonably well reproduce their results using World Bank data on per capita GDP.

[Insert Tables 1 and 2 Here]

Next, we decompose the results into the component related to GDP and the component related to population growth. The third column presents the estimates of the analysis based on GDP, rather than GDP per capita. The time to recover to the pre-crisis level of GDP is only 5 years compared with 13-14 years using per capita GDP. This demonstrates that population growth drives at least half of the RR recovery time. Hence, babies prolong recessions![1]

Furthermore, as shown in the fourth column, the average duration of a crisis is only 2 years when the recovery is defined as the year of positive growth following a trough.

[1] Even with 38 episodes of crises and recoveries, output loss is twice as large when using per capita GDP compared with GDP, while the duration is two and a half times longer.

Finally, the severity of crises is twice as large when measured using GDP per capita compared with GDP, and almost three times as large as using the alternative definition of recovery (Table 4).

[Insert Table 4 Here]

IV. Conclusions

The sluggish recovery from the Global Financial Crisis has generated much interest from the academic and policy community. However, the definition and the measurement of recovery is not a trivial issue. Reinhart and Rogoff measure recovery as the year in which real GDP per capita regains its pre-crisis peak level.

The results in this paper suggest that the RR definition has a significant bias as it ignores a country's average growth rate. A fast growing country reaches the pre-crisis level of output faster than a country that grows slower on average. In addition, we show that the use of real per capita GDP in defining recoveries tends to overestimate the duration of recessions from financial crises. On average, it takes 5 years for the level of real GDP to return to pre-crisis level, but 12 years to return to per capita GDP level. Hence, the RR estimates are driven largely by population growth rates rather than real GDP growth.

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Table 2: Comparison of Peak-to-Trough Output Losses

		Double Dip			No Double Dip
		RR GDP pc	World Bank GDP pc	GDP	GDP
		(1)	(2)	(3)	(4)
Year	Country				
1980/1985	Argentina	-21.8	-25.9	-14.6	-10.7
					-7.6
1980	Chile	-18.9	-16.4	-13.7	-14.1
1981	Mexico	-14.1	-12.5	-4.9	-4.8
1983	Peru	-32.0	-31.6	-10.5	-10.6
1981	Philippines	-18.8	-19.0	-14.1	-14.6
1994	Venezuela	-24.2	-26.4	-2.5	-2.4
1997	Indonesia	-15.1	-14.6	-13.0	-13.1
2001	Argentina	-20.9	-21.7	-18.5	-19.5
2002	Uruguay	-18.9	-15.6	-14.5	-15.4
2008	*Greece*	-24.0	-	-	-
2007	*Iceland*	-12.2	-	-	-8.1
2007	*Ireland*	-12.9	-	-	-9.3
2008	*Italy*	-11.3	-	-	-6.5
2008	*Ukraine*	-14.4	-	-	-14.8
Average (all available)		-18.5	-20.4	-11.8	-10.8
Average (common sample)		-20.5	-20.4	-11.8	-10.8

Note: Column 1 replicated RR results from online data. Column 2 replicates RR results on data from the World Bank on pc GDP and real GDP in level (column 3) using RR definition to include double dip recessions. Column 4 is cumulative loss from all negative years of output growth. RR used WEO projections through 2018 to calculate the output losses.

Table 3: Comparison of Years to Recovery

		Double Dip			No Double Dip
		RR GDP pc	World Bank GDP pc	GDP	GDP
		(1)	(2)	(3)	(4)
Year	Country				
1980/1985	Argentina	18	16	11	2
					1
1980	Chile	8	5	4	2
1981	Mexico	17	15	3	2
1983	Peru	25	24	4	2
1981	Philippines	21	20	5	2
1994	Venezuela	14	13	1	1
1997	Indonesia	8	7	5	1
2001	Argentina	8	7	6	4
2002	Uruguay	8	8	7	4
2008	*Greece*	12	-	-	-
2007	*Iceland*	11	-	-	2
2007	*Ireland*	12	-	-	3
2008	*Italy*	12	-	-	2
2008	*Ukraine*	8	-	-	1
Average (all available)		13.0	12.8	5.1	2.1
Average (common sample)		14.1	12.8	5.1	2.1

Note: Column 1 replicated RR results from online data. Column 2 replicates RR results on data from the World Bank on pc GDP and real GDP in level (column 3) using RR definition of recovery (returning to pre-crisis level of GDP). Column 4 is total number of negative years of output growth.

Table 4: Comparison of Severity Index

		Double Dip			No Double Dip
		RR GDP pc	World Bank GDP pc	GDP	GDP
		(1)	(2)	(3)	(4)
Year	Country				
1980/1985	Argentina	39.8	41.9	25.6	12.7
					8.6
1980	Chile	26.9	21.4	17.7	16.1
1981	Mexico	31.1	27.5	7.9	6.8
1983	Peru	57.0	55.6	14.5	12.6
1981	Philippines	39.8	39.0	19.1	16.6
1994	Venezuela	38.2	39.4	3.5	3.4
1997	Indonesia	23.1	21.6	18.0	14.1
2001	Argentina	28.9	28.7	24.5	23.5
2002	Uruguay	26.9	23.6	21.5	19.4
2008	*Greece*	36.0	-	-	-
2007	*Iceland*	23.2	-	-	10.1
2007	*Ireland*	24.9	-	-	12.3
2008	*Italy*	23.3	-	-	8.5
2008	*Ukraine*	22.4	-	-	15.8
Average (all available)		31.5	33.2	16.9	12.9
Average (common sample)		34.6	33.2	16.9	12.9

Note: Column 1 replicated RR results from online data. Column 2 replicates RR results on data from the World Bank on pc GDP and real GDP in level (column 3) using RR definition of peak-to-trough output loss plus years to recovery. Column 4 is cumulative output loss plus years of negative growth.