Scarring vs cleansing: A historical perspective

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Objective and contribution

- Main Objective: Test for the effect of recessions on growth (the cleansing vs scarring hypothesis) in three European countries (England, Holland, and Italy) using data for 7 centuries and the local projections methodology.

- Contribution:
  1. Use of a very long sample size that spans over seven centuries (1348-2010) and a different econometric methodology.
  2. The consideration of a much-longer time horizon relative to other studies allows the inclusion of a greater variety of economic episodes and a much more defensible definition of "long run" effects.
  3. Performance of various robustness tests that include panel estimation, sub-period analysis, and control for wars and pandemics.

Main results

- Strong evidence in favour of Schumpeter's creative destruction process known as cleansing hypothesis (recessions, despite their undeniable costs, can also be beneficial for long-run economic development, i.e., they have a positive effect on output growth).
- This evidence is consistent across the three countries, sub-periods, and panel analysis and is insensitive to the occurrence of wars and pandemics.
- No evidence for the scarring hypothesis. This result is consistent across all specifications.
- The effect of volatility on growth is also positive but is subject to hysteresis effects.
- GARCH evidence indicates no uniform simultaneous effects of volatility on growth.

Motivation

- A large theoretical and empirical literature on the effects of recessions on aggregate output growth originating with Joseph Schumpeter's idea of the *Creative Destruction* process in 1942. This literature (both theoretical and empirical) is inconclusive, as evidence for both cleansing and scarring effects has been provided.

- The empirical literature examines the standard post-WW II setting and ignores the merits of utilizing a longer time horizon. The use of a longer data set has the potential to shed clearer light not just because it has a larger number of observations, but chiefly because it includes a substantially greater variety of economic episodes and a much more defensible definition of the "long run".
- A large GARCH literature on the effects of output volatility on aggregate output growth (Fountas and Karanasos, 2006, 2007; Bakas et al., 2018). This literature is inconclusive as evidence for both positive and negative effects on growth has emerged. This GARCH modeling methodology usually allows for only contemporaneous effects and cannot capture the dynamic impact of volatility on growth. This could be remedied by, for example, a local projections approach used to estimate impulse response functions.

- Schumpeter (1942): The process of creative destruction drives the business cycle. During a recession, innovative and highly productive firms drive unproductive firms out of business, thus raising the productive capacity of the economy and improving its growth prospects.
- The argument advanced by Schumpeter has been formalized by theoretical models (Caballero and Hammour, 1994; Mortensen and Pissarides, 1994) which show that during recessionary periods, firms modify their production techniques and the lines of manufactured products. Firms modernize their production techniques and they switch from the production of obsolete to new products. In this way, they make more productive use of their limited resources, thus improving the productive capacity of the economy and boosting output growth.

- Blanchard *et al.* (2015): They look at 122 recessions over the past 50 years in 23 countries. They find that a high proportion of recessions (70%) are followed by a persistent downturn in economic activity.
- Dunne at al. (1989): Evidence shows that the majority of the failing firms during recessions have been in business for only a few years and hence are at an infant stage. Even though infant businesses are unproductive in the early years of operations, they are expected to become much more productive in later years. As a result, the impact of a recession on the growth prospects of an economy may be negative (the Scarring effect) as new and promising firms are not given the chance of reaching their full (but long term) potential.

Ouyang (2009) presents a theoretical model to capture both the cleansing and the scarring effects. Recessions impede the developments of potentially superior firms by destroying them during their infancy. The model suggests that the scarring effect dominates the cleansing effect, and gives rise to lower average productivity during recessions.

Literature Review

Empirical evidence

- Some recent studies investigate various contraction episodes since the 1970s and attempt to determine whether Scarring effects are linear. Aikman *et al.* (2022) using data for 24 advanced and emerging economies find that the Scarring effects of contractions are indeed *asymmetric*: more severe recessions seem to cause Scarring as long-term growth rates remain depressed. The authors find that Scarring occurred following the deep recessions of the 1970s and 1980s caused by monetary policy and oil price shocks.
- Larch *et al.* (2022) focus on 26 OECD economies since 1970 and identify more than 100 episodes of Scarring effects where real GDP does not return to the pre-downturn trend but follows a lower growth path. The authors investigate the role of fiscal policy and provide evidence that government reaction in tackling Scarring effects is only successful if it is based on higher government investment rather than higher current expenditure.

- Evidence for cleansing effects is also provided for Lithuania during the Great Recession by Garcia-Louzao and Tarasonis (2023).

We first construct *volatility* and *downturn severity* series for each of the three economies over the entire time period.
For volatility, we compute rolling measures of the average standard deviation of the real GDP per capita growth rate over decade-long windows.

We define *volatility* as:

$$\sigma_{i,t} = \sqrt{\sum_{s=t}^{t+9}(dy_{i,s} - \overline{dy_{i,t}})^2/10} \quad (1)$$

where

$$\overline{dy_{i,t}} = \sum_{s=t}^{t+9} \frac{dy_{i,t}}{10}$$

For the *downturn severity*, we compute rolling measures of the average negative change (decrease) in real GDP per capita growth over decade-long rolling windows.

$$\overline{sev_{i,t}} = \sum_{s=t}^{t+9} \frac{|dy^{-}_{i,t}|}{10} \tag{2}$$

where

$$dy^{-}_{i,t} = min(dy_{i,t}, 0)$$

Our first LP model estimates the dynamic effect of a volatility shock on subsequent growth. Thus, for each horizon h we estimate:

$$\begin{aligned} \overline{dy_{i,t+10+h}} &= w_i^h + v_t^h + \beta^h \sigma_{i,t} + \Sigma_{j=1}^{J} \beta_j^h \sigma_{i,t-j} \\ &+ \Sigma_{j=1}^{J} \alpha_j^h \overline{dy_{i,t-j}} + u_{i,t} \end{aligned} \tag{3}$$

where w_i^h and v_t^h are country and time fixed (or random) effects, and impulse response functions (IRFs) are obtained by the estimated coefficients (β^h) which will be reported together with estimated standard errors.

The second LP model examines the effect of downturn severity on subsequent growth, estimating for each horizon h :

$$\begin{aligned} \overline{dy_{i,t+10+h}} &= w_i^h + v_t^h + \delta^h \overline{sev_{i,t}} + \Sigma_{j=1}^{J} \delta_j^h \overline{sev_{i,t-j}} \\ &+ \Sigma_{j=1}^{J} \gamma_j^h \overline{dy_{i,t-j}} + u_{i,t} \end{aligned} \tag{4}$$

where again w_i^h and v_t^h are country and time fixed (or random) effects, and IRFs are obtained by the estimated coefficients (δ^h) which will be reported together with estimated standard errors.

- This methodology was introduced by Jordà (2005). A survey article is provided by Jordà and Taylor (2025).
- The properties of LP, and the relationship with VAR methodologies, have been analyzed by Plagborg-Møller and Wolf (2021); Li, Plagborg-Møller, and Wolf (2024); and Jordà (2023).
- The consensus is that local projections are considerably more flexible and, while their estimates are asymptotically identical to VAR estimates, they have lower bias but higher variance at longer horizons (the "bias-variance" trade off).

Historical data

- Sample period is 1348-2010
- Series is real GDP per capita
- Details on the dataset given by Fouquet and Broadburry (2015)
- Various sources: Broadberry (2015) for Great Britain, van Zanden and van Leeuwen (2012) for Holland, and Malanima (2011) for Italy.
- Sub-periods considered:
  1. First period: Medieval period (1348-1499)
  2. Second period: Early modern period (1500-1699)
  3. Third period: Industrialization period (1700-1869)
  4. Fourth period: Modern economic period (1870-2010)

Economic activity in sub-periods: Medieval period (1348-1499)

Output was dominated by the agricultural sector, in particular for England and Holland. During this period, Italy had a much more urban population and was very much the dominant economy in Europe. England and Holland on the other hand were subject to prolonged stages of considerable fluctuations, primarily as a result of adverse weather and disease implications on agriculture. However, the plague led to a dramatic reduction in population, which economic theory would indicate would lead to higher nominal wages. Evidence indicates that the reduction in output was less than the reduction in population and that output per capita rose after 1350 across Europe (see Pamuk, 2007).

Economic activity in sub-periods: Early modern period (1500-1699)

The early modern period reflects an increased share of industry and services in English output, although still dominated by agriculture. During this period the Italian economy was in decline, a decline that continued until the later part of the 19^{th} century. While, the first half of the early modern period was relatively peaceful, this changed with the advent of the English civil war between 1642-1651 and subsequent conflicts (see Nef, 1942). This period was also representative of revolts and civil wars in Holland, as well as quite significant economic expansion. Holland replaced Italy as the dominant economy in Europe during this time. The economic expansion was dominated by a large service sector, which was also highly unstable (see van Zanden and van Leeuwen (2012)).

Economic activity in sub-periods: Industrialization period (1700-1869)

England replaced Holland as the dominant economy in Europe. While growth continued in Holland, it was relatively stagnant compared to the Dutch Golden Age.

Economic activity in sub-periods: modern economic period (1870-2010)

As we reach 1800, the rates of urbanisation in England and Holland surpass those of Italy reflecting the extent of the service- focused nature of their respective economies. At the peak of the *First Industrial Revolution* in the mid 18^{th} century Britain was universally viewed as the engine of world economic growth. The period 1700-1869 (*Industrialized period*) was a period of sustained economic growth, however it was not until 1830s that growth exceeded 1% per year (Broadberry *et al.*, 2015). Our final sub-sample is certainly associated with a decline in the manufacturing sector and textiles in England, with unemployment, in particular in regions associated with economic success in the previous period, being a serious issue. The fundamental technological advances associated with the late nineteenth century, *Second Industrial Revolution*, were more likely to be located in the US and Germany, in particular (see Harley, 2014).

Table 1: GDP at factor cost growth (annual percentages)

Sample	Observations	Mean	Standard deviation	Minimum	Maximum
England (Britain)					
1348-2010	662	0.567	5.950	-31.198	26.203
1348-1499	151	0.229	6.154	-19.189	19.551
1500-1699	200	0.147	8.001	-31.197	26.203
1700-1869	170	0.507	4.182	-17.147	16.862
1870-2010	141	1.596	3.613	-15.465	16.865
Holland					
1348-2010	662	0.548	7.964	-51.738	51.531
1348-1499	151	0.343	4.761	-18.659	13.045
1500-1699	200	0.259	11.090	-51.738	41.808
1700-1869	170	0.208	6.568	-24.596	27.958
1870-2010	141	1.585	6.850	-40.925	51.530
Italy					
1348-2010	662	0.449	5.201	-27.541	32.365
1348-1499	151	0.017	7.785	-27.541	32.365
1500-1699	200	-0.042	4.137	-11.926	13.353
1700-1869	170	-0.008	2.843	-8.311	7.564
1870-2010	141	2.158	4.998	-21.706	29.424

Figure 1a

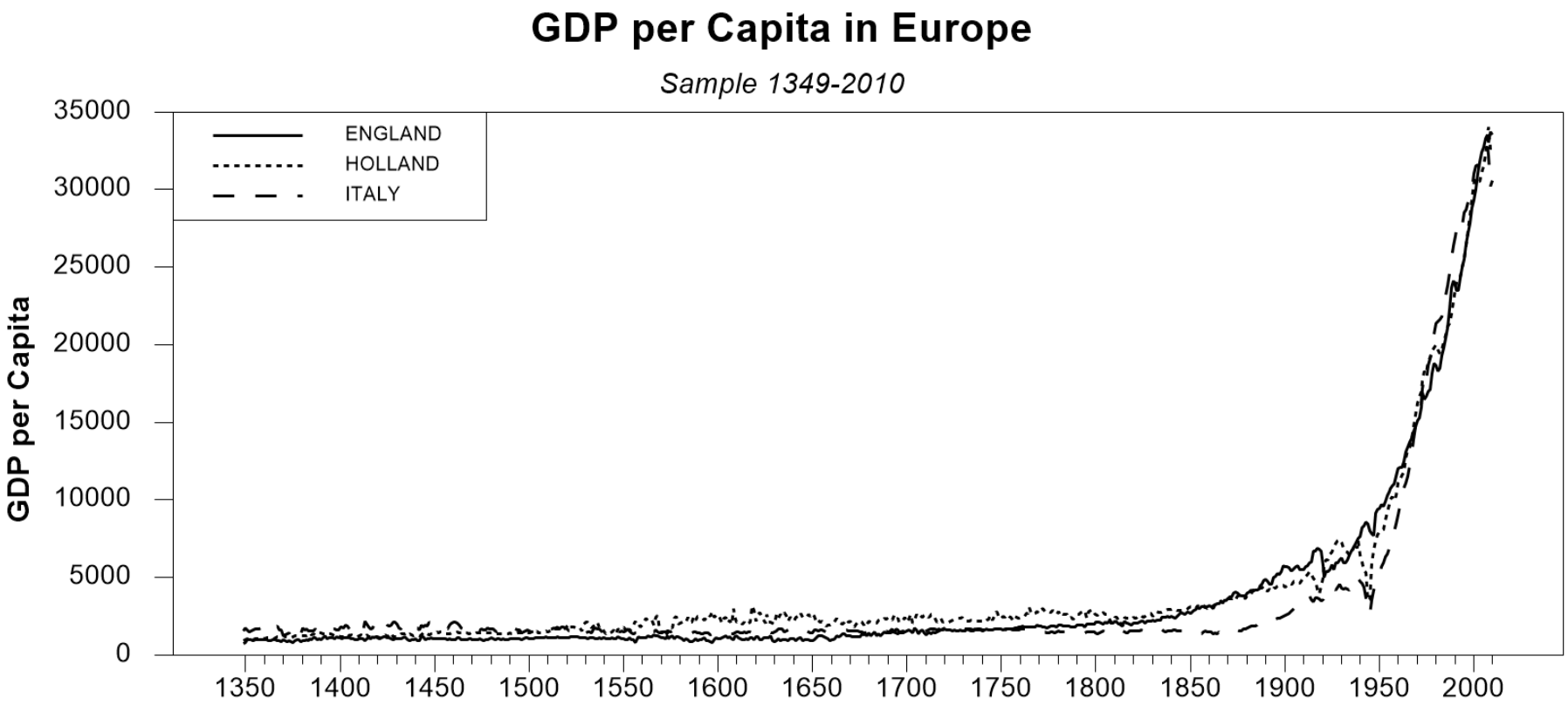

GDP per Capita in Europe
Sample 1349-2010
ENGLAND
HOLLAND
ITALY
GDP per Capita
35000
30000
25000
20000
15000
10000
5000
0
1350
1400
1450
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000

Figure 1b

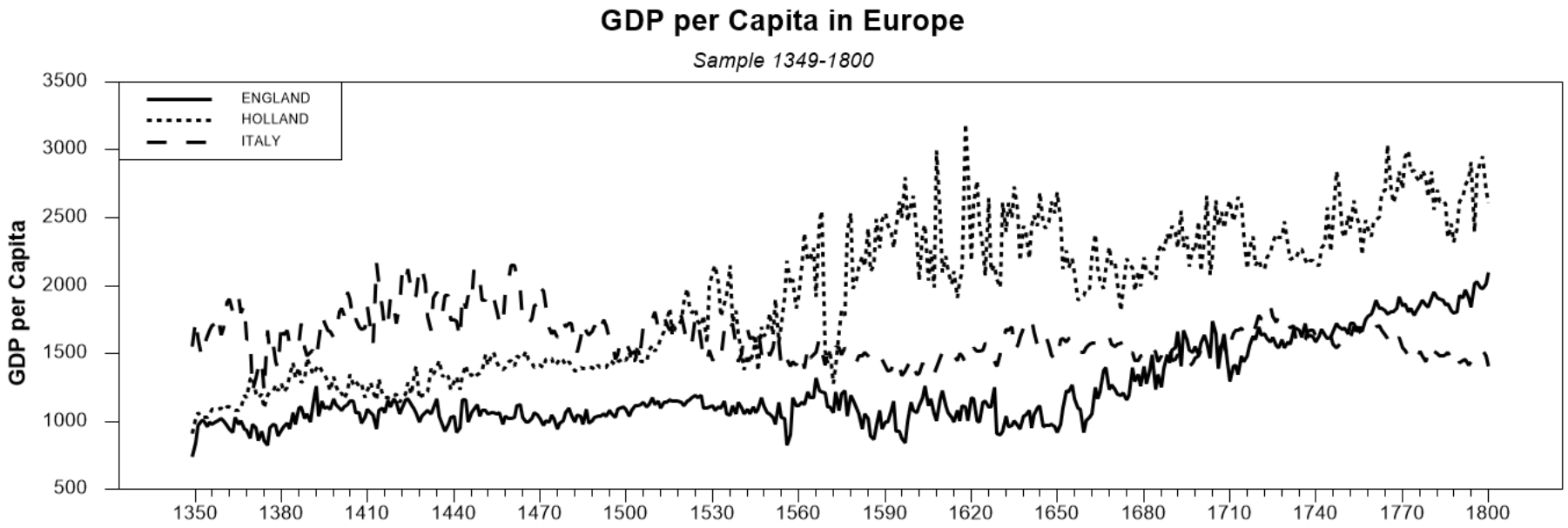

GDP per Capita in Europe
Sample 1349-1800
ENGLAND
HOLLAND
ITALY
GDP per Capita
3500
3000
2500
2000
1500
1000
500
1350
1380
1410
1440
1470
1500
1530
1560
1590
1620
1650
1680
1710
1740
1770
1800

Figure 2

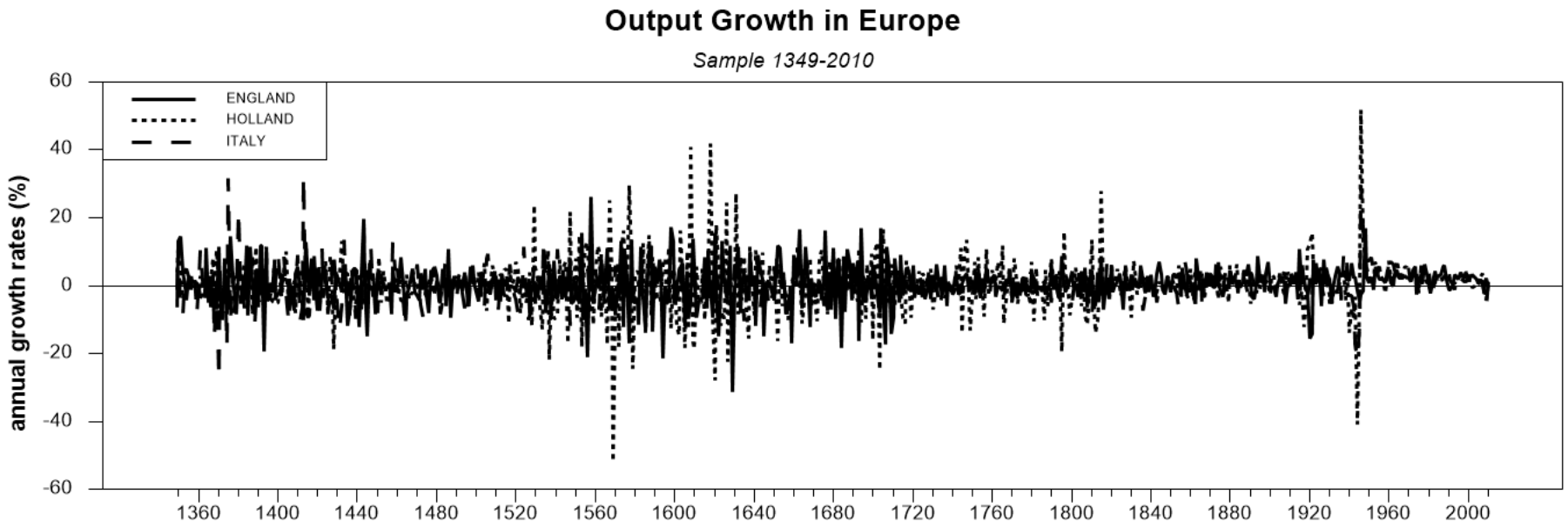
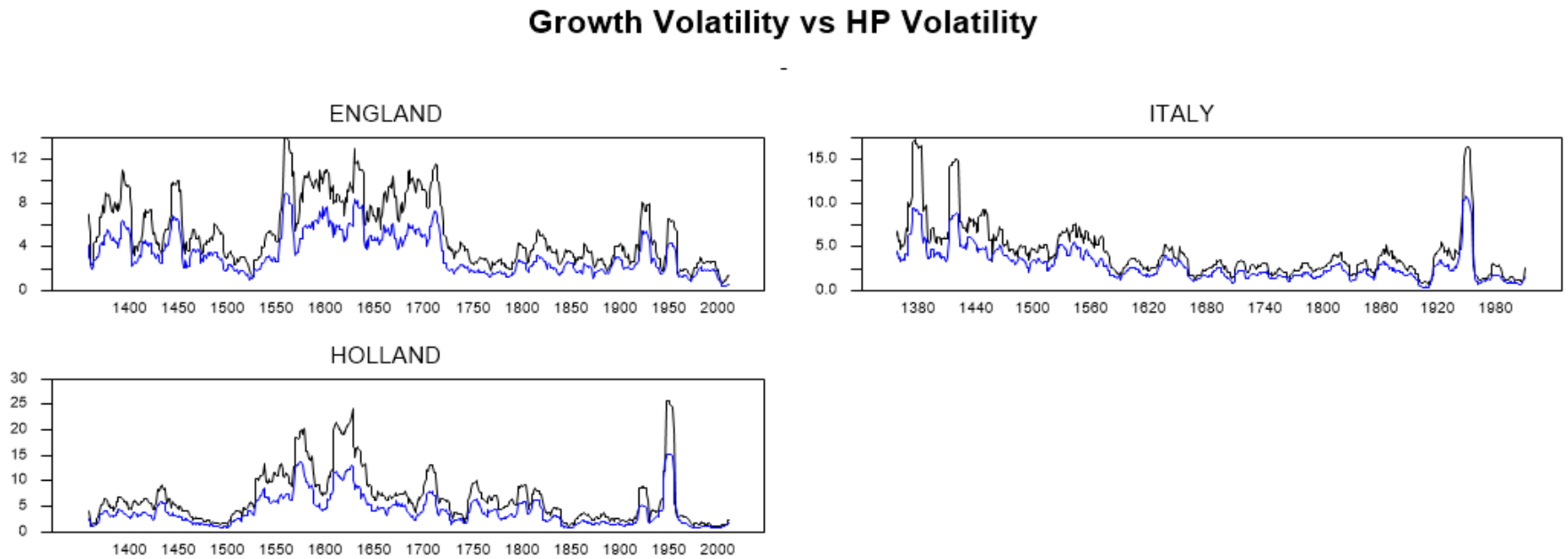
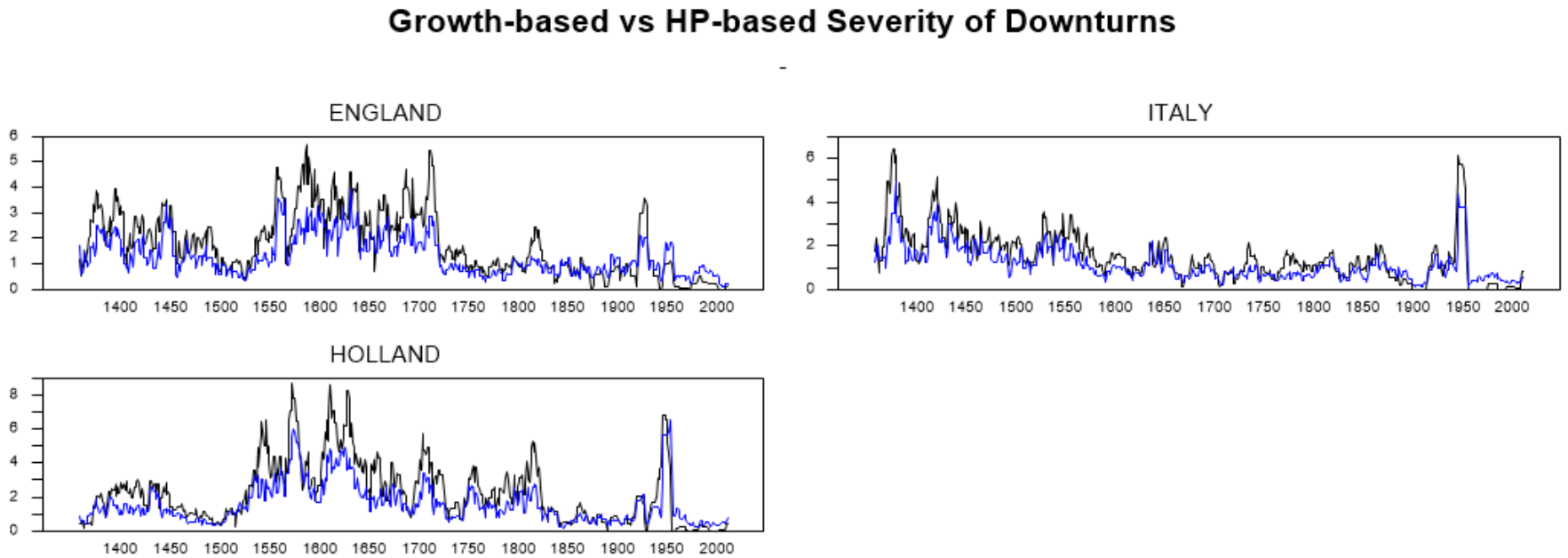

Output Growth in Europe
Sample 1349-2010
ENGLAND
HOLLAND
ITALY
annual growth rates (%)
60
40
20
0
-20
-40
-60
1360
1400
1440
1480
1520
1560
1600
1640
1680
1720
1760
1800
1840
1880
1920
1960
2000

Figure 3



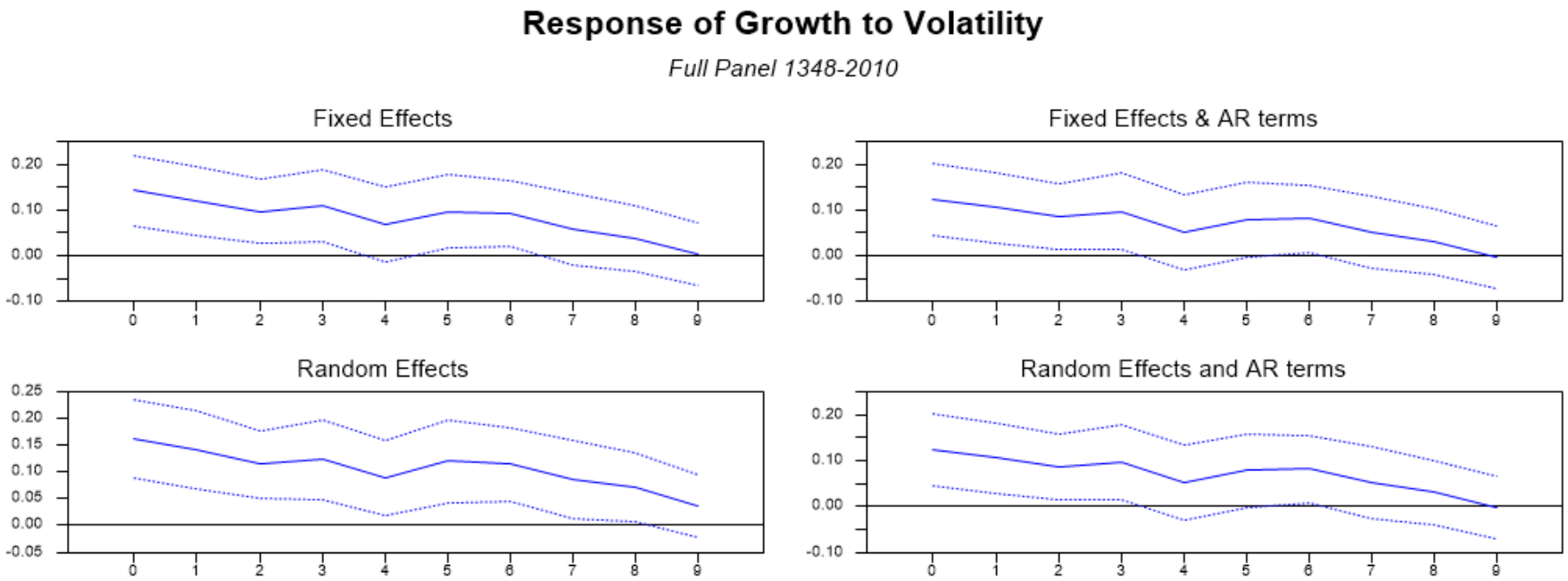
Notes: Volatility measures are standard deviations of the growth rate and the Hodrick-Prescott cyclical component, defined over 10-year rolling windows. See text (section 4) for details.

Figure 4



Notes: Downturn severity measures are (absolute values of) averages of negative changes (decreases) in real income per capita over 10-year long rolling windows. See text (section 4) for details.

Figure 5



Notes: Impulse Response Functions from estimated LP model (3). The solid line shows the effect of a volatility shock on subsequent growth. Dashed lines are two-standard deviation confidence intervals.

Figure 6

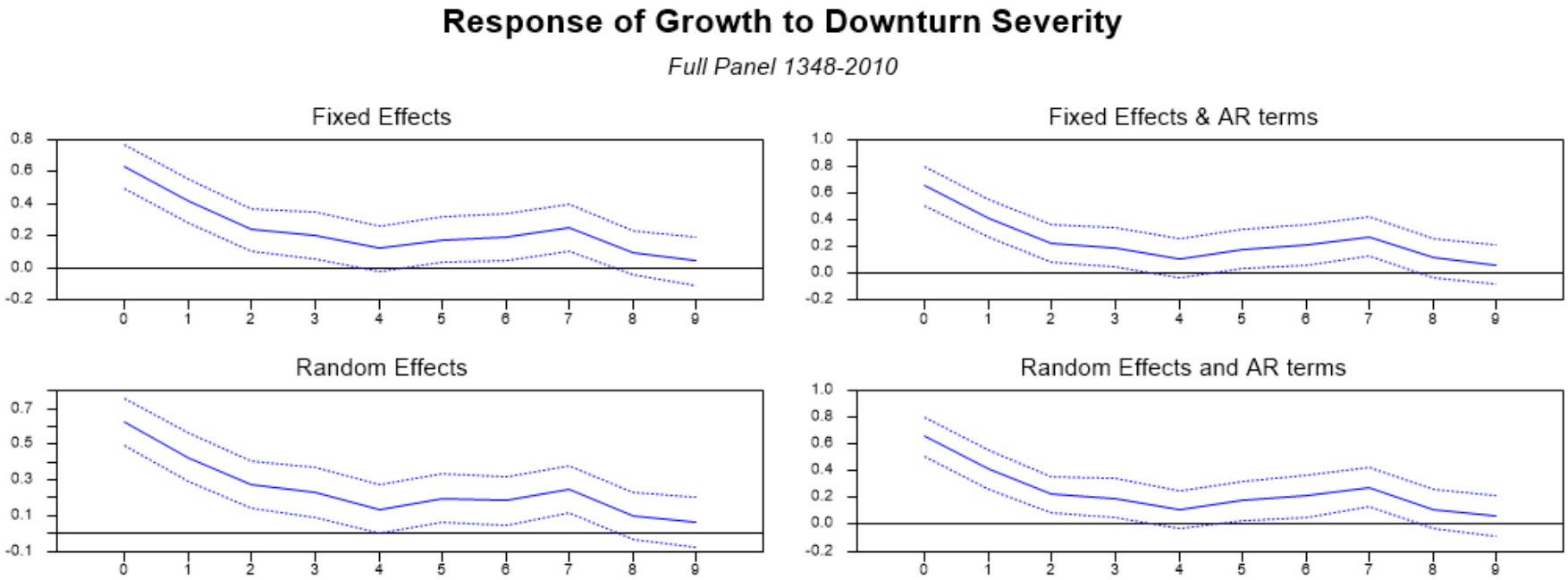


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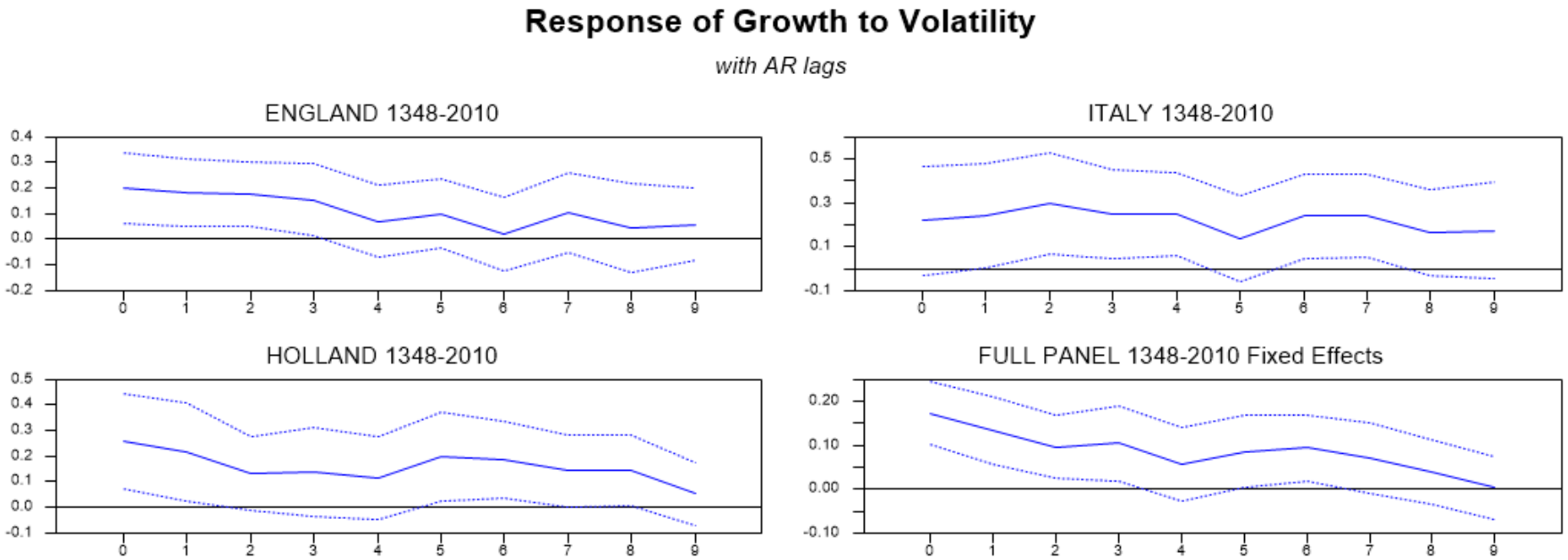
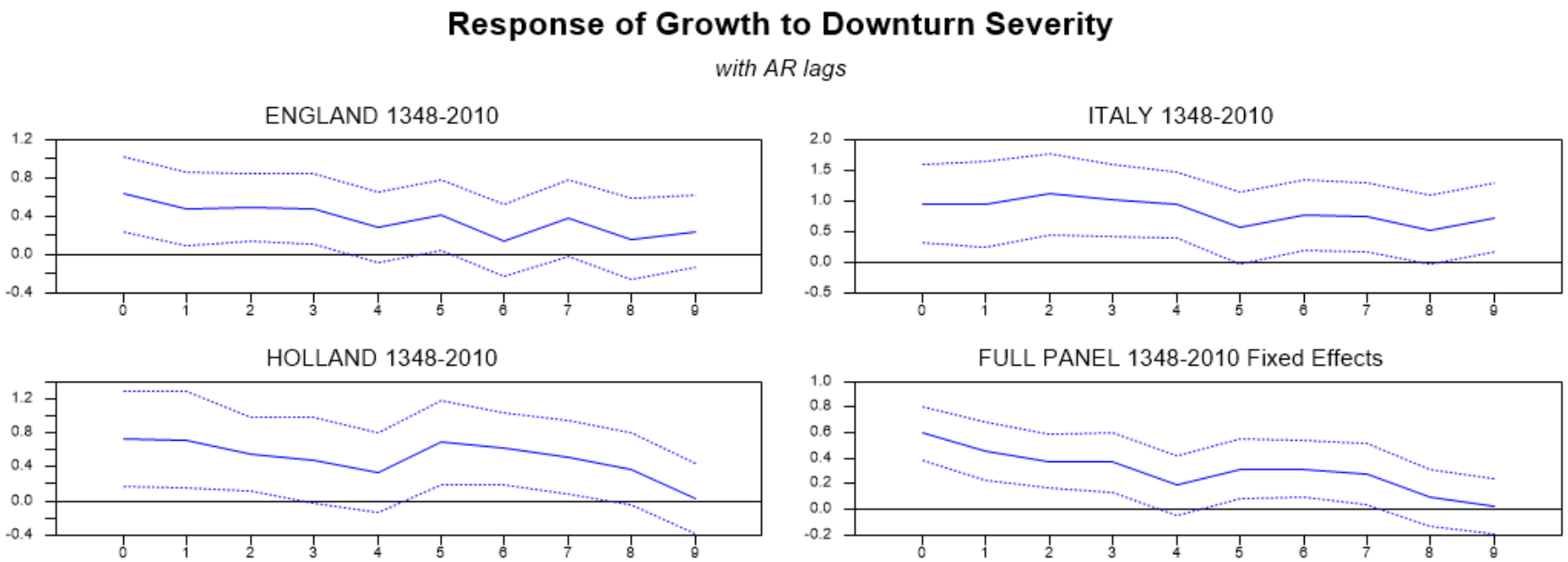
Figure 7



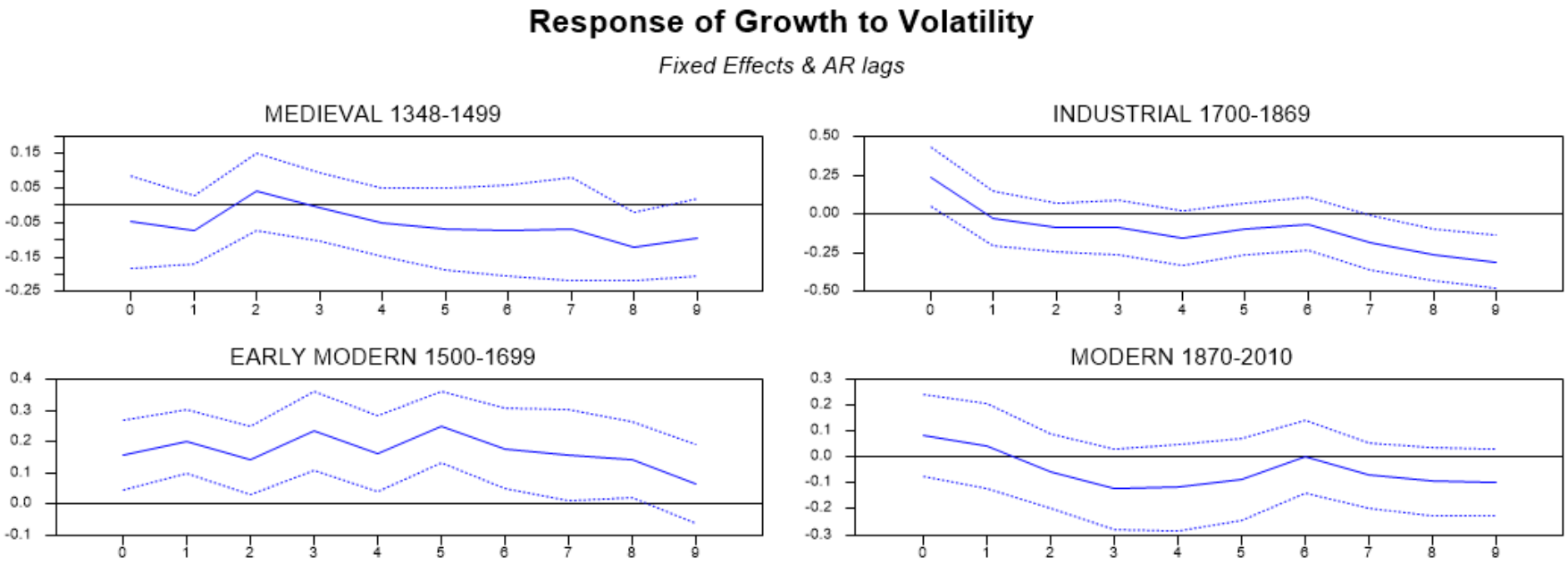
Notes: Impulse Response Functions from estimated LP model (3). The solid line shows the effect of a volatility shock on subsequent growth. Dashed lines are two-standard deviation confidence intervals.

Figure 8



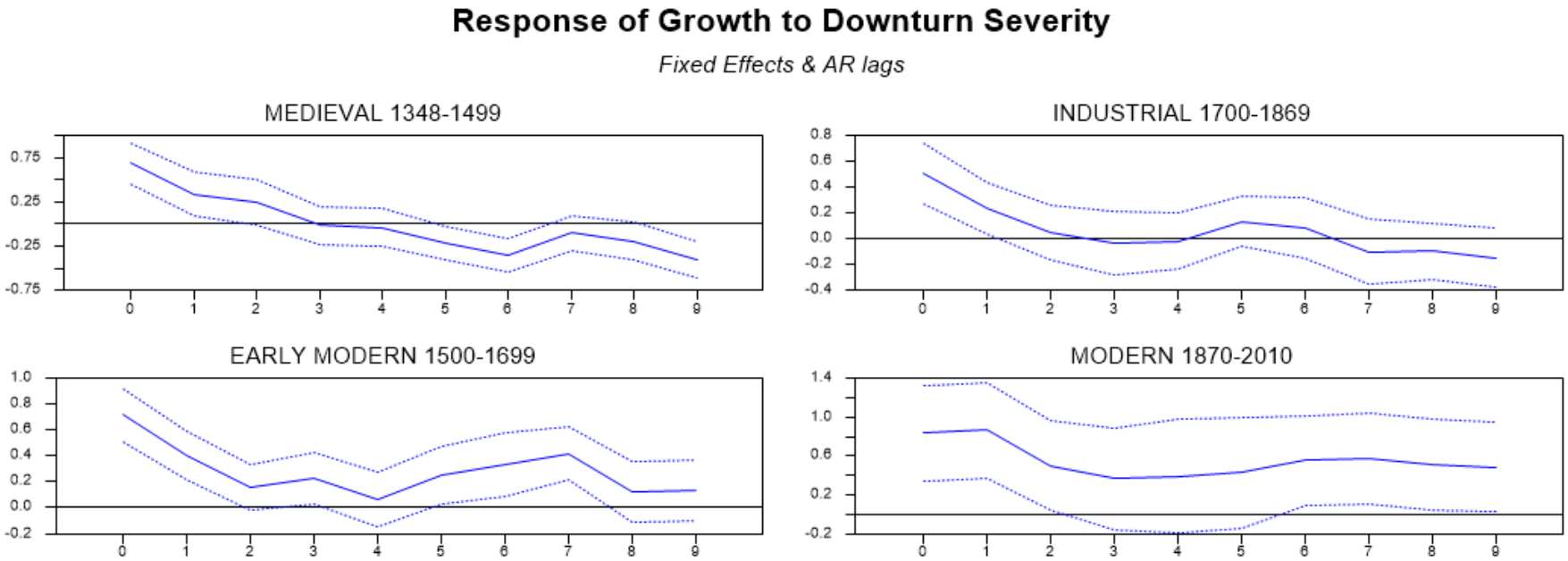
Notes: Impulse Response Functions from estimated LP model (4). The solid line shows the effect of a downturn severity shock on subsequent growth. Dashed lines are two-standard deviation confidence intervals.

Figure 9



Notes: Impulse Response Functions from estimated LP model (3). The solid line shows the effect of a volatility shock on subsequent growth. Dashed lines are two-standard deviation confidence intervals.

Figure 10

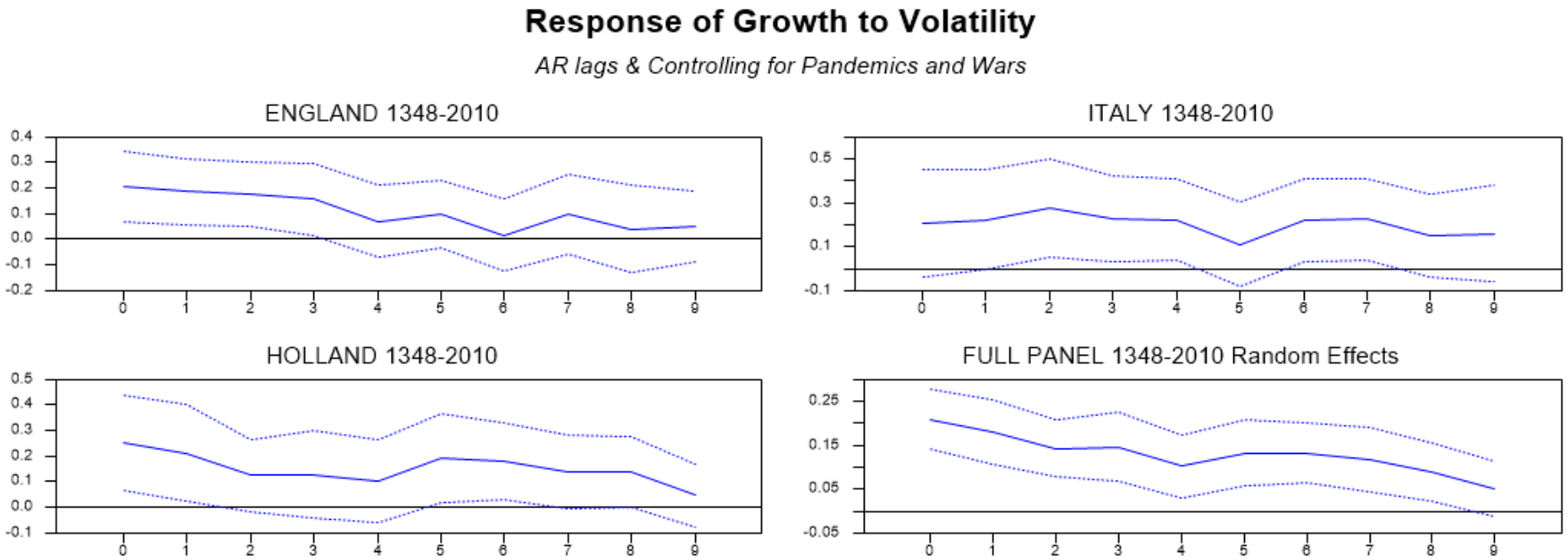


Notes: Impulse Response Functions from estimated LP model (4). The solid line shows the effect of a downturn severity shock on subsequent growth. Dashed lines are two-standard deviation confidence intervals.

Robustness results allowing for pandemics and wars

panel sub-period Impulse responses from local projections: volatility shocks

Figure 11

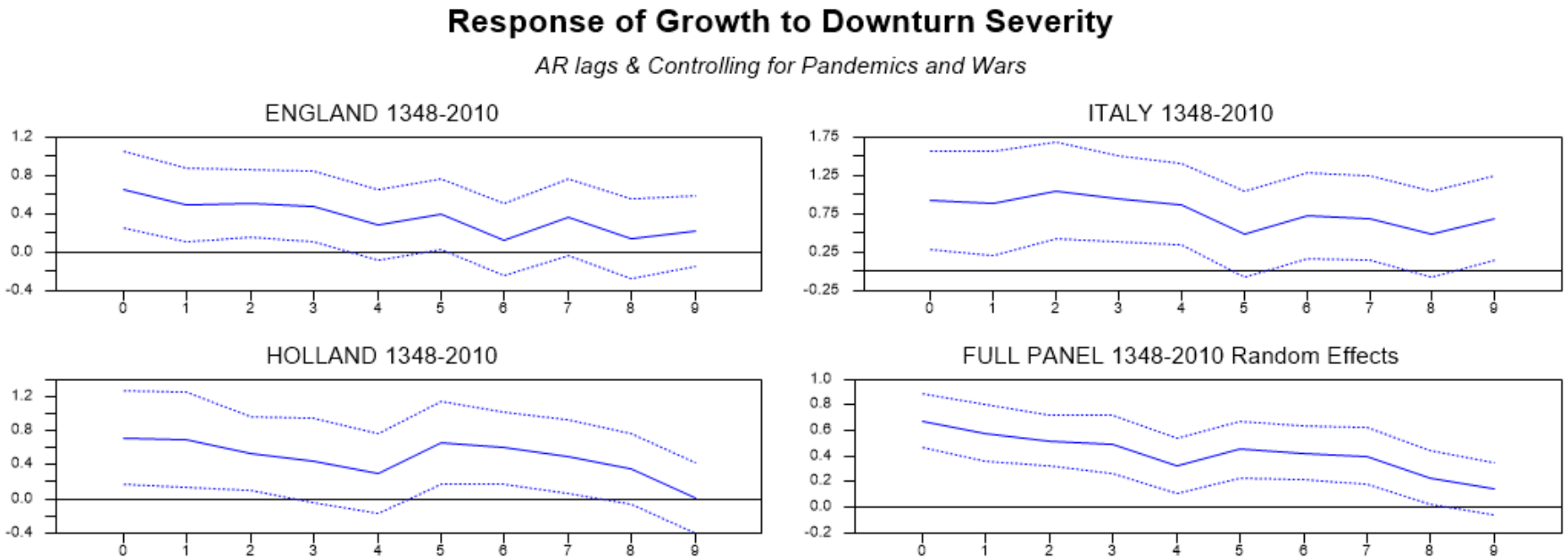


Notes: Impulse Response Functions from estimated LP model (3). The solid line shows the effect of a volatility shock on subsequent growth. Dashed lines are two-standard deviation confidence intervals.

Robustness results allowing for pandemics and wars

panel sub-period Impulse responses from local projections: downturn severity shocks

Figure 12



Notes: Impulse Response Functions from estimated LP model (4). The solid line shows the effect of a downturn severity shock on subsequent growth. Dashed lines are two-standard deviation confidence intervals.

Conclusions

- *Scarring vs cleansing hypothesis*:
  1. Strong evidence in favour of the *cleansing hypothesis* (recessions have a positive effect on output growth).
  2. This evidence is consistent across the three countries, sub-periods, and panel analysis and is insensitive to the occurrence of wars and pandemics.
  3. No evidence for the *scarring hypothesis* (recessions do not have a negative effect on growth). This result is consistent across all specifications.
  4. The policy implication of our findings is that new technologies, including AI at the current technological frontier, should be embraced, and any recession, while clearly costly, should be considered in the light of the Cleansing Hypothesis.
- *Volatility and growth*:
  1. The effect of volatility on growth is also positive but is subject to hysteresis effects.
  2. GARCH evidence indicates no uniform simultaneous effects of volatility on growth.

Thank you for your attention!