Monetization, wars, and the Italian fiscal multiplier

Michele Fratianni Federico Giri
Riccardo Lucchetti Francesco Valentini

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Michele Fratianni* Federico Giri†
Riccardo Lucchetti‡ Francesco Valentini §

Abstract

This paper investigates the size of Italian fiscal multipliers under different business-cycle phases over the period 1872–2006. Using pre-WWII public defense expenditures as an instrument of total expenditures, we quantify the magnitude of the fiscal multiplier. Controlling for the business cycle phase, the multiplier is higher in recessions than in expansions. Furthermore, the multiplier is higher with the joint occurrence of monetization and slackness. Monetization alone does not exert a significant impact on the multiplier. Our results are confirmed using a time-varying parameter methodology that captures the country's structural changes over a long stretch of time.

Keywords: Fiscal multipliers; War defense spending; Slackness; Monetization; Time-varying parameters.

JEL classification codes: E32; E58; E62; N13; N14.

1 Introduction

After the Great Financial Crisis (GFC) of 2007-2009, there has been a resurgence of research on the impact higher public expenditures may have on the real growth of the economy; that is, the size of the fiscal multiplier (FM). The GFC was a game-changer.

Before that event, the consensus was that government spending had limited power in affecting real GDP growth (Ramey, 2011, 2019); that is, the FM was estimated to be less than one. After the event, Blanchard and Leigh (2013) found evidence that not only the FMs were much bigger than previously estimated, but that they were also critically dependent on the underlying state of the economy. The FM dependence on the state of the economy has been investigated also by Auerbach and Gorodnichenko

*Michele Fratianni,Kelley School of Business, Bloomington, Indiana, USA and Università Politecnica delle Marche, Ancona, Italy. E-mail: fratiann@indiana.edu.

†Corresponding author: Federico Giri, Università Politecnica delle Marche, Piazzale Martelli n 8 Ancona, Italy. E-mail: f.giri@univpm.it.

‡Riccardo Lucchetti, Università Politecnica delle Marche, Piazzale Martelli n 8 Ancona, Italy. E-mail: r.lucchetti@univpm.it.

§Francesco Valentini, Università Politecnica delle Marche, Piazzale Martelli n 8 Ancona, Italy. E-mail: f.valentini@univpm.it.

(2012), Canzoneri et al. (2016), and Ramey (2019). Other sources of state dependence are: degree of trade openness (Cacciatore and Traum, 2020), the exchange rate regime (Ilzetzki et al., 2013), the presence of lower bounds on policy interest rates (Klein and Winkler, 2021), domestic vs. foreign ownership of the public debt (Broner et al., 2022), the level of uncertainty in the economy (Fritsche et al., 2021), and whether recessions are driven by supply or demand factors (Ghassibe and Zanetti, 2021).

The estimation of FMs is complicated by the endogeneity arising from the contemporaneous movements of public expenditures and GDP. One way to go around this problem involves estimating FMs with Structural Vector Autoregressions (SVAR) (Blanchard and Perotti, 2002) and identifying the multipliers by imposing time restrictions. A drawback of this approach is that the researcher must employ external estimates of the income elasticity to public spending and taxation; moreover, as argued by Caldara and Kamps (2017), small changes in their values can produce large differences in the FMs.

An alternative strategy is to employ instrumental-variable techniques, e.g, by using public defense expenditure as an instrument for total public expenditure (Barro, 1981; Barro and Redlick, 2011; Ramey and Zubairy, 2018). This approach, however, entails further assumptions. First, the data must display enough variability to ensure instrument strength; this can be achieved if the data sample goes back in time to include war-related events (in practice, the pre-WWII years). Second, to identify a pure demand shock from war-related events, one has to impose the restriction of fixed supply during the period of investigation, which is hardly justifiable in the light of the strong military buildup during wartime. Third, economic agents might anticipate changes in public expenditures due to the fact that military build-up can occur way before the outbreak of a conflict. If this is the case, the point estimate of the FM can be biased if "news" shocks are not considered.

In short, the research question on "How big (or small) are the fiscal multipliers?" (Ilzetzki et al., 2013) is still open. Unsurprisingly, according to Valery Ramey (2011, p. 673) "Reasonable people can argue [...] that the data do not reject [a fiscal multiplier of] 0.5 or 2.0".

Although smaller and different in methods and coverage of time periods than the US literature, the Italian literature is comparably mixed about the size of the FM. For example, Giordano et al. (2007), using a SVAR methodology applied to data from 1980 to 2007, estimated the impact of a fiscal expansion on GDP to be close to 0.6%, far away from unity, let alone higher. However, Acconcia et al. (2014) relied on a quasi-natural experiment where some municipalities were placed under temporary receivership due to Mafia infiltration and estimated the Italian (local) FM of about to 2 over the decade 1990-1999. Therefore, the range of estimates for the Italian FM is comparable to the range for the US estimates, reported above.

In this paper, we investigate the size of the Italian fiscal multiplier over a time span of 135 years (1872-2006), which encompasses several business cycles; specifically, among possible factors that can bring about a change, we especially focus on the dependence of the FM on the monetization of the public expenditure. These elements are an original contribution compared to the literature for the US. Our framework of analysis starts by adopting the empirical model proposed by Barro and Redlick (2011), modified to include some important features of the Italian economy such as trade openness and the size of government debt, together with the historical propensity of Italian monetary authorities to monetize government debt. A long record history of high inflation (before the European Monetary Union in 1999) and high public debt in the country has fostered a regime of fiscal dominance where money creation, periodically, has been subservient to fiscal policy requirements (Fratianni and Spinelli, 2001a). Recently, Galí (2020) found that money-financed fiscal expansions are more effective than debt-financed ones. In sum, Italy is a good case study to undertake an empirical study of FMs under monetization.

Our findings show that the inclusion of pre-WWII data is crucial in identifying the Italian FMs. Instrumental-variable estimation confirms that, once estimation takes into account the possibility of different regimes, for the longer period including pre-WWII data the FMs are equal to or greater than one. When we interact government expenditures with a measure of business cycle stance, the FM is significantly higher in recession than in expansion phases. Moreover, a higher FM emerges when a sharp recession combines with a significant degree of monetization; in contrast, the growth of the monetary base has a very limited effect when the economy is running above its long-run trend. Finally, the results hold when we estimate the model with a time-varying parameter IV model, which can control for structural changes that are bound to occur over almost a century and a half of economic history.

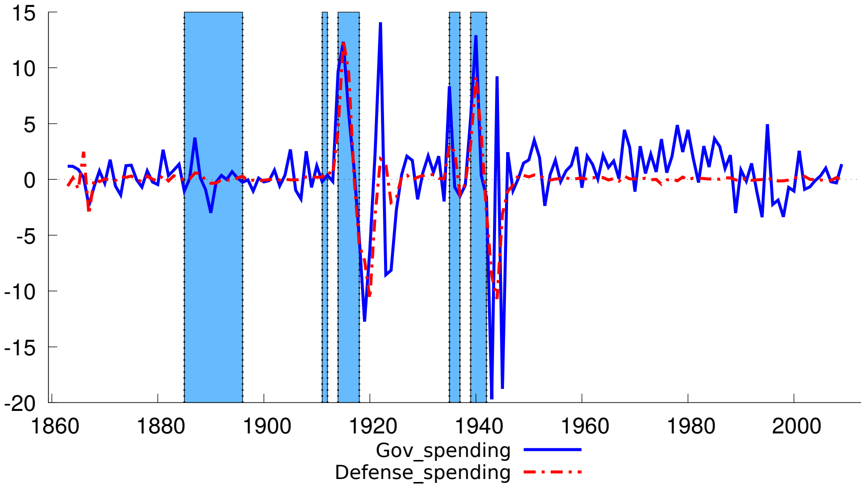
The paper is organized as follows: Section 2 provides an introduction to the major military events in Italy and on the reason why Italy is a good laboratory to study the FM. Section 3 provides a detailed description of the data used in the estimation exercises. Section 4 reports empirical findings concerning the fiscal multiplier under different specifications. Section 5 presents the time-varying parameter estimation results. Finally, Section 6 concludes.

2 Why Italy?

In this section, we investigate the three issues raised in the Introduction on the defense expenditure approach to the identification of the FM:

- Do Italian data include major war-related events and enough defense spending volatility?
- Did Italy incur a significant loss of physical capital and labor supply?

Figure 1: Real per capita total and defense spending growth



Note: change in real per capita total spending and defense spending as a percent of GDP at time $t-1$ (Ragioneria Generale dello Stato, 2009). Blue vertical bars represent war events: from the left to the right, Eritrea war (1885–1895), Libya (1911–1912), WWI (1915–1918), Ethiopia (1935–1936) and WWII (1939–1945).

- Do war-related "news" play an important role in the Italian case?

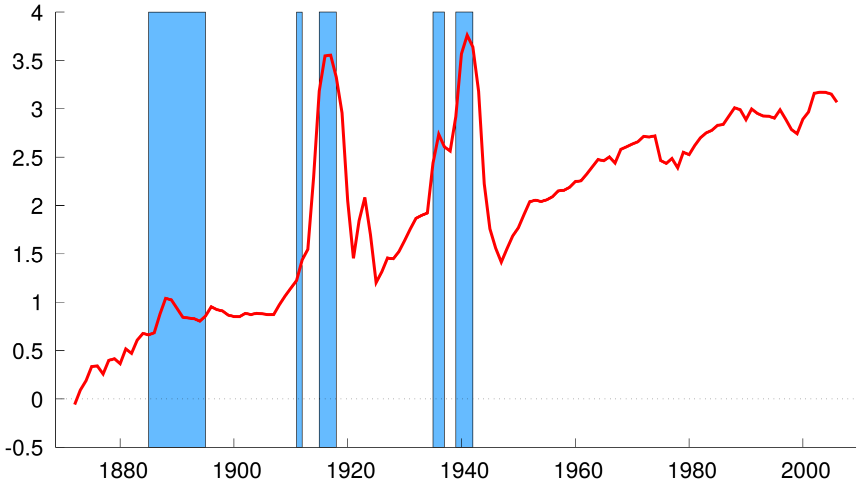
To answer these questions we outline, in what follows, a brief history of the main Italian military undertakings and then argue that Italy is a good candidate to meet the assumptions underlying the aforementioned identification strategy.

2.1 A brief summary of Italian military history

Italy was involved in five major wars during the time span covered by our dataset: Eritrea (1885–1895), Libya (1911–1912), WWI (1915–1918), Ethiopia (1935–1936) and WWII (1939–1945); see Figure (1). We describe each event briefly with an emphasis on the evolution of real defense expenditure (see Figure 2) and on the implications for our identification strategy. The conquest of Eritrea (1885-1896), the first war in our sample, started with the Italian occupation of Massaua in 1885, continued with several battles in favor of Italy, and ended with a disastrous Italian defeat in Adua and a peace treaty, both in 1896; see Naitza (1975, p. 16–21). Defense spending rose, on average, by 49 percent in the period 1885–1896 compared to the 1875–1885 years. According to Maione (1991, Table 1), the cost of this war was 339 million lire, 3.8 percent of total government spending.

The second war, the Libya conquest (1911–1912), started with Italy declaring war to Turkey on September 29, 1911; Italian troops quickly took over Tobruk, Tripoli, Derna, Bengasi, and ultimately annexed Tripolitania and Cyrenaica. Subsequently, in 1912 Italy occupied the Dodecanese islands off the Anatolian coast. The Treaty of

Figure 2: Log real defense spending



Note: the figure shows the log of real defense spending. Blue vertical bars represent major war events: from the left to the right, Eritrea war (1885-1895), Libya (1911-1912), WWI (1915-1918), Ethiopia (1935-1936) and WWII (1939-1945).

Ouchy of October 1912 put an end to belligerence between the two countries, but not to local Islamic insurgency in Libya, that remained a serious problem for Italy until WWII. According to Maione (1991, Table 1), the cost of this war was 2,261 million lire or 5 percent of total government spending. Defense rose by 26 percent in 1911-12 over the previous two years, and continued to grow all the way to the end of WWI; see Figure (1).

In WWI, the third war in our sample, Italy fought against both the Austro-Hungarian and German Empires along a relatively small front in the Italian North-East. Most of the critical battles took place along three rivers: Isonzo, Tagliamento and Piave. The conflict lasted three years, from November 24, 1915 to November 4, 1918 and its toll was extraordinary: 1.24 million military and civilian deaths and 953,866 of wounded military personnel. The fact that real per capita GDP did not return to the pre-war level until 1920 suggests the persistence of labor supply constraints. Defense spending in the years 1914–1918 were 23 percentage points of the corresponding real GDP, 17 times the defense expenditure of the Libyan war.

The fourth event, the Ethiopian war of 1935–36, started with an armed invasion of Addis Abeba on October 7, 1935; this led the League of Nations to put economic sanctions on Italy, but incomplete support among member countries made the sanctions ineffective. The Italian conquest was completed by May 5, 1936. According to Maione (1991:Table 1), the cost of this war was 57,202 million lire or 20.9 percent of total government spending. Not surprisingly, the Fascist government did its best to hide this cost from the public through creative off-budget accounting Maione (1991,

Table 4). It is worth mentioning that some scholars date the start of WWII, insofar as Italy is concerned, with the Ethiopian war (Hailemarium, 1991). However, we treat the Ethiopia war as separate from WWII.

Finally, the last war in our sample is WWII, that we divide into two phases. The first goes from June 10, 1940 to July 9, 1943, a period during which war expenditure is exogenous to aggregate income because most war activities took place outside Italy. The second phase starts when Allied forces landed in Sicily, on July 10, 1943, all the way to war end on May 8, 1945. For almost two years, Italy was the battleground of a ferocious struggle between the Allied forces moving North and a tenacious German army slowly losing ground. No area of the country was spared by the ravages of the war, although the human cost did not match that of WWI. Defense expenditure for the period 1939-1945 accounted for 16.7 percent of real GDP, less than in WWI, much of which supported by monetary financing. On the other hand, the destruction of infrastructure and physical capital was much higher in WWII than in WWI. The fact that real per capita GDP did not return to pre-war level until 1949 suggests that labor supply constraints due to the lingering effects of the wars lasted longer after WWII than after WWI.

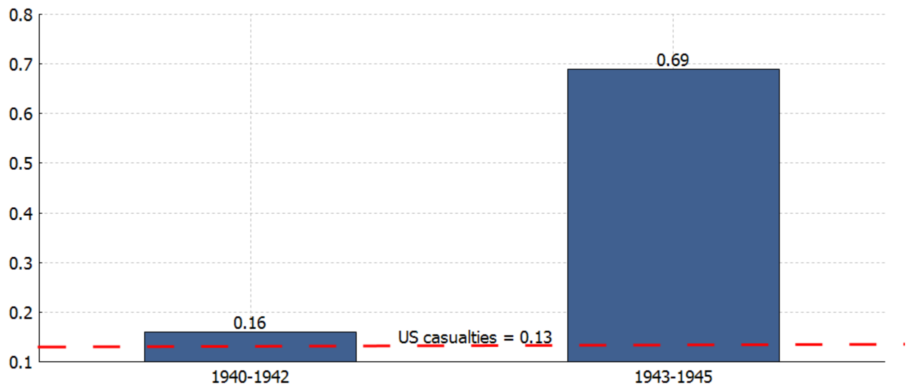
2.2 Supply shocks and the anticipation of fiscal expansion

In this section, we investigate whether Italy is a suitable candidate to identify a pure public expenditure shock and whether the possible anticipation of fiscal expansion play a crucial role in determining the size of the FM: the former assumption requires that no sizable supply-side shocks occurred during the period of investigation whereas the latter entails that fiscal expansions are unexpected and not anticipated in the economic decision of the agents.

An important reason why US data are widely employed to estimate FMs stems from the fact that all wars were fought abroad and did not create massive destruction of domestic physical capital. As discussed in the previous section, this condition holds true in Italy for the three colonials wars — Eritrea (1885-1895), Libya (1911-1912), and Ethiopia (1935-1936) – and to a large extent for WWI (1915-1918), but definitely not for WWII (1940-1945). Yet, from 1940 to July 9, 1943, the war was fought outside Italy, and aerial bombings were limited. Only in July 10, with the Allied invasion of Sicily, the conflict entered Italian territory and air strikes became systematic. Therefore, it can be safely assumed that between 1940 and 1942, destruction of physical capital was minimal.

In addition to capital, we need to control for negative supply-side shocks due to a decline of the labor force driven by forced enlistment and war casualties. Since this effect appear to be relevant, particularly for WWII, we report in Figure (3) statistics on Italian war casualties and compare them with those in the US. The death casualties

Figure 3: War casualties, Italy vs US



Note: The upper panel reports statistics by Istat (1957) on Italian casualties (military and civilian) during the WWII split into the periods 1940-1942 (left column) and 1943-1945 as a share of 1939 population. The red dashed line is the same share for the United States across the whole WWII (Kesternich et al., 2014).

of these two countries are very close to each other in the 1940-1942 period, from which we can infer, as it is true for the US, that there is no significant effect on the Italian labor supply that can undermine our identification strategy.

Finally, we need to discuss the possible anticipation of a fiscal expansion by economic agents due to military build-up. Differently from to Ramey (2019), a time series of "news" shock on military expenditure is not available to us. Yet, the historical narrative suggests that the absence of this kind of data may not be a problem in the Italian context because unpreparedness and improvisation have been the keywords common to all Italian war events, but especially for WWII (Del Boca, 1991; Ceva, 1991; and Oliva, 2019). In sum, the absence of news shocks is of minor relevance for the Italian case. As a result, changes in defense expenditure should be able to identify exogenous government spending variations.

3 Data description

To implement our estimation exercise, we gathered data from different sources. Our measure of real per capita GDP growth (ΔY_t) is taken from Baffigi (2011) and is defined as $(Y_t - Y_{t-1}/Y_{t-1})$, where Y_t denotes real per capita GDP.

Variations of real per capita public expenditure (ΔG_t) and real per capita defense expenditure (ΔD_t) were computed by normalizing absolute variations by real GDP at time $t-1$. Therefore:

$$\begin{aligned} \Delta G_t &= (Exp_t - Exp_{t-1})/Y_{t-1} \\ \Delta D_t &= (Def_t - Def_{t-1})/Y_{t-1}. \end{aligned}$$

Table 1: Summary Statistics (percentage), observations 1872-2006

Variable	Mean	Median	S.D.	Min	Max
ΔY	2.054	1.780	5.170	−19.55	34.38
ΔG	0.514	0.418	4.150	−19.71	14.08
ΔD	0.011	0.040	2.493	−10.71	12.50
Δatr	0.098	0.158	1.465	−4.510	8.250
DR	86.00	94.64	33.04	25.43	159.5
$Empl^C$	−0.030	0.167	1.633	−5.444	6.187
M^C	−2.877	−0.595	19.88	−69.40	40.16
Spr^2	8.382	5.081	10.21	0.000	52.04
ΔWg	1.874	2.219	2.491	−8.383	7.393

NOTES: Period: 1872-2006. ΔY = growth of real per capita GDP, ΔG = growth of real per capita total public expenditure, ΔD = growth of real per capita defense expenditure, Δatr = first difference in the ratio between tax revenues and nominal GDP, DR= ratio of government debt to GDP, $Empl^C$ = cyclical component of full-time equivalent employment, M^C= cyclical component of the monetary base under the direct control of Italian Treasury, Spr^2 = squared difference between the Italian long-term nominal interest rate and the average of French, British, and US equivalent interest rates, ΔWg = growth of world real GDP

The raw series Exp_t and Def_t come from Ragioneria Generale dello Stato (2009). Population data are taken from Jorda et al. (2016).

Our business cycle measure ($Empl_t^C$) is defined as the cyclical component of the full time equivalent employment, detrended using the one-side Hodrick-Prescott filter with $\lambda = 100$ (Broadberry et al., 2011).[1] In the same way, our monetization index (M_t^C) which is given by the cyclical component of the monetary base under the direct control of the Italian Treasury (Fratianni and Spinelli, 2001b). Both measures can be interpreted as deviation from their long-run trend, expressed in percentage points.

The change of average tax rate (Δatr_t) is defined as the first difference in the ratio between tax revenues and nominal GDP; the data come from Jorda et al. (2016). ΔWg_t is the growth of world real GDP, constructed as the weighted average of the real GDP of countries included in the database of Jorda et al. (2016); the series is taken from Fratianni and Giri (2017). The spread variable (Spr_t) is the difference between Italian long-term interest rate and the average of French, British, and US equivalent interest rates; the series are drawn from Fratianni and Spinelli (2001b). Table (1) summarizes the main descriptive statistics.

[1] Other studies use unemployment rate instead of employment here; in our case, however, data on unemployment rate covering the entire sample is not available. The cyclical component, however, should be comparable.

4 Estimation of the Italian fiscal multiplier

This section presents empirical evidence on the Italian FM. Section (4.1) introduces the baseline model specification which is then extended in Sections (4.2) and (4.3).

4.1 The baseline model

Equation (1) mirrors the one in Barro and Redlick (2011), with only minor modifications to capture some peculiar features of the Italian economy:

$$\Delta Y_t = \boldsymbol{X}'_{t-1}\beta + \beta_G \Delta G_t + \varepsilon_t, \tag{1}$$

where ΔY_t is the growth of the real per capita GDP, and ΔG_t is the change in total real per capita public expenditure normalized by the real per capita GDP (see Section 3).

The coefficient β_G is the FM, as it measures the "ceteris paribus" variation in the real per capita GDP induced by a variation, at time t, of the real per capita public expenditure. The $\mathbf{X_{t-1}}$ vector contains several control variables (lagged): ΔG_{t-1}, $Empl^C_{t-1}$, Δatr_{t-1}, ΔWg_{t-1}, Spr^2_{t-1}, DR_{t-1} and two world war dummies. $Empl^C_{t-1}$ captures business cycle fluctuations. Variable Δatr_{t-1} controls for marginal tax variation and allows for fiscal expansion to be financed either through debt or an increase of the monetary base. ΔWg_{t-1} captures variation in world demand; this control variable was included on the grounds that Italy is a small open economy, whose growth has historically been export driven, and thus external demand is an important factor affecting Italy's business cycle.

Furthermore, Spr^2_{t-1} captures an international risk factor. While Barro and Redlick (2011) focused on the spread between long and short US interest rates, we focus instead on the flows of international capital affected by the spread between Italian long term interest rates and an average of the long term interest rates of France, the UK and the US. This change is justified by the fact that Italy's limited domestic financial markets have made it dependent on external sources of funds. Variable DR_{t-1} is a measure of the country's fiscal stance and controls for the historically high Italian public debt.

Finally, most specifications include two dummy variables with value 1 in years 1915-1920 for WWI and 1942-1948 for WWII, and zero otherwise. Their role is to capture different regimes of economic activity in wartime periods.

We take care of the two-way causation between real GDP growth and real public expenditure by using the ΔG_t variable as an instrument for real changes in public defense expenditure, ΔD_t (as in Ramey and Zubairy, 2018; Klein and Winkler, 2021). We estimate Equation (1) using backward-increasing samples: the last year of the sample is always 2006; the first model uses data the start in 1956, the second one in 1939, and so forth; war-related dummies are added as needed. Estimated coefficients

Table 2: Baseline Model

	1956-2006	1939-2006	1935-2006	1915-2006	1911-2006	1872-2006
			Dependent Variable: ΔY_t			
Equation	(1)	(2)	(3)	(4)	(5)	(6)
ΔG_t	-21.8391	1.393	1.127	**0.718****	**0.618****	**0.633****
	(264.1)	(0.874)	(0.709)	(0.273)	(0.294)	(0.317)
Hausman test	5.165	38.30	33.78	25.15	20.63	25.42
	[0.023]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Weak Instruments F-test	0.007	19.58	28.03	132.39	152.1	151.75
Wald test	0.008	0.202	0.032	1.067	1.682	1.339
$H_0 : \beta_G = 1, H_1 : \beta_G \neq 1$	[0.931]	[0.653]	[0.858]	[0.302]	[0.195]	[0.248]
One-sided t-test	-0.087	0.449	0.180	-1.033	-1.297	-1.157
$H_0 : \beta_G = 1, H_1 : \beta_G > 1$	[0.535]	[0.327]	[0.429]	[0.849]	[0.903]	[0.876]
Obs.	51	68	72	92	96	135

Notes: TSLS estimates. ΔD_t is used as an instrument for ΔG_t, control variables (omitted) include ΔG_{t-1}, $Empl^C_{t-1}$, Δatr_{t-1}, ΔWg_{t-1}, Spr^2_{t-1}, $PDebtgdp_{t-1}$ and two world war dummies. Heteroskedasticity and autocorrelation (HAC) robust standard errors in round brackets. Reported p-values: $^{***}\, p < 0.01,^{**}\, p < 0.05,^{*}\, p < 0.10$. Test statistics p-values are reported in square brackets.

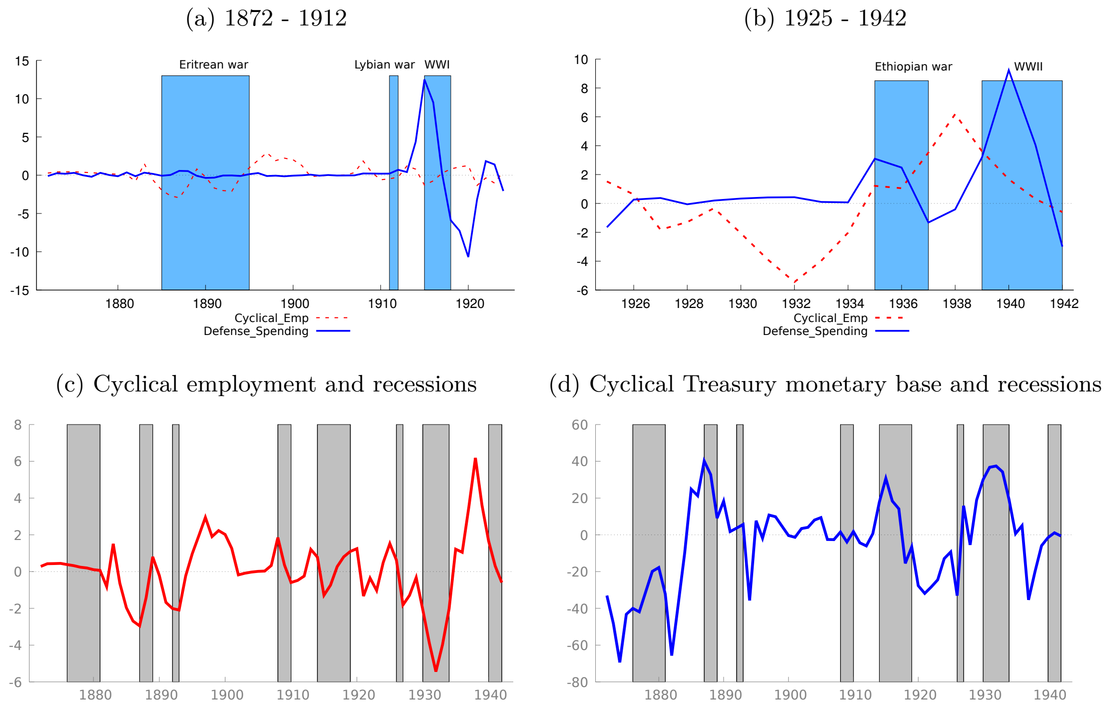
are reported in Table (2).

Column (1) of the table shows estimates from the post-WWII sample, 1956 through 2006. Unsurprisingly, given the absence of wars in this sub-period, ΔD_t is an extremely weak instrument for ΔG_t (the value of the weak-instrument F statistic is only 0.007).

Columns 2-6 progressively include the five Italian wars covered by our sample: WWII (1939-1945), Ethiopia (1935-1936), WWI (1915-1918), Libya (1911-1912), and Eritrea (1885-1895), respectively. Note that the weak-instrument F statistic increases almost uniformly as the sample includes increasingly more war events. Furthermore, the estimated FM is always not different from 1, but lacks statistical significance in columns 2-3. The lack of significance could be due to factors such as: sample size and potentially weak identification strategy stemming from a limited number of wars in the data; and factors that may account for relatively large standard errors for the estimates of the β_G coefficient.

In contrast, columns 4-6, covering respectively the larger periods of 1915-2006, 1911-2006 and 1872-2006 years, display much smaller standard errors of β_G –the estimate is slightly higher than 0.6 and the range [0, 1.2] has a 95% confidence level – together with large F values for the weak instruments test statistics. The inference is in support of the reliability of the adopted identification strategy. The main conclusion from this exercise is that we find no evidence of the Italian FM being greater than one, regardless of the selected subsamples.

Figure 4: Defense spending, cyclical employment and recessions, 1872-1942



Note: In Panel a) and b) the light solid blue line shows real per capita defense spending over real per capita GDP. The red dashed line plots the cyclical component of the full time equivalent employment obtained using the one-side HP filter (λ= 100). In Panel c), the red solid line shows the cyclical component of real per capita GDP. In Panel d), the heavy blue line plots the cyclical component of the monetary base under the direct control of the Treasury. Green vertical bars represent major war events. Grey bars represent recessions according to Fratianni and Spinelli (2001b).

4.2 The fiscal multiplier in recessions and expansions

In this section, we investigate whether FM can display substantial changes as the economy moves from a state of slackness to a state of expansion, as argued in Auerbach and Gorodnichenko (2012).

Figure 4 shows the time profile of the cyclical component of employment, changes in defense spending as a percent of GDP, and war events. Note that the two world wars occurred during expansion phases of the economy, while the three colonial wars coincided with economic slackness. The presence of opposite cyclical phases across war events makes the Italian historical data set an ideal laboratory to estimate the values of the FM under different economic states.

We augment our model, as in Barro and Redlick (2011), by including an interaction between our measure of business cycle ($Empl^C_{t-1}$) and real per capita government expenditure (normalized by GDP), ΔG_t; a corresponding instrumental variable is given by the interaction between the variation in the defense expenditure and $Empl^C_{t-1}$. Table (3) reports estimates from the 1925–2006 subsample, and the full sample 1872–2006,

Table 3: Fiscal multipliers and the business cycle

	1925-2006	1872-2006
Dependent Variable: ΔY_t		
Equation	(1)	(2)
ΔG_t	**1.998****	**0.838****
	(0.768)	(0.327)
$\Delta G_t \cdot Empl^C_{t-1}$	**-80.04****	**-47.28***
	(34.21)	(26.45)
Hausman test	59.59	48.78
	[0.000]	[0.000]
Weak instruments test		
Cragg-Donald F-statistic	5.011	21.8791
Maximal size	[>10%]	[<10%]
Obs.	82	135

Notes: TSLS estimates. ΔD_t is used as an instrument for ΔG_t, control variables (omitted) include ΔG_{t-1}, $Empl^C_{t-1}$, Δatr_{t-1}, ΔWg_{t-1}, Spr^2_{t-1}, $PDebtgdp_{t-1}$ and two world war dummies. HAC robust standard errors in round brackets. Reported p-values: $^{***}\, p < 0.01,^{**}\, p < 0.05,^{*}\, p < 0.10$. Test statistics p-values are reported in square brackets. Maximal size is obtained comparing the Cragg-Donald F-statistics (Cragg and Donald, 1993) with their simulated critical values showed by Stock and Yogo (2005).

so as to disentangle the impact of WWII and the Ethiopian war.

Since the FM is defined as

$$FM = \frac{\partial \Delta Y_t}{\partial \Delta G_t} = \beta_G + \beta_{GE} Empl^C, \tag{2}$$

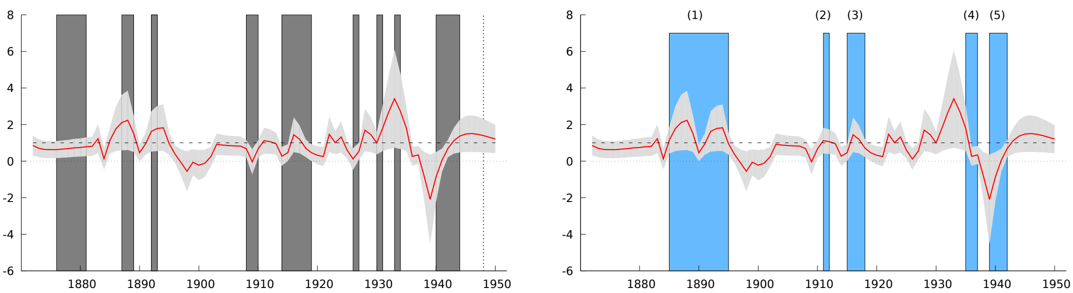
where β_{GE} is the unadjusted FM and β_{GE} denotes the coefficient associated to the interaction term between ΔG_t and $Empl^C_{t-1}$: $\beta_G + \beta_{GE} Empl^C$ is the FM adjusted for the state of the economy, it is clear that in the augmented model the FM is time-varying.

Given the estimates in Table (3), column (2), the point estimate of FM is about 0.84 when the employment reaches the long run equilibrium while it rises (falls) by 0.47 when $Empl^C_{t-1}$ is a percentage point below (above) its long run path.[2] These results are in line with previous contributions in the literature highlighting the state dependence of the FM to the business cycle (Auerbach and Gorodnichenko, 2012). The time path of the FM in this augmented model, together with a 95% error band, is displayed in

[2] As a robustness check, we run an alternative version of Table (3) where the business cycle is captured by a dummy variable that takes the value 1 in expansion and 0 in recession. The dummy variable is taken from Fratianni and Spinelli (2001b). The results hold for this different specification.

Figure 5: Fiscal multiplier through time, 90% CI

(a) FM and recessions (b) FM and wars



Recessions according to Fratianni and Spinelli (2001b);
Wars: (1) Eritrean war 1885-1895, (2) Libyan war 1911-1912, (3) WWI 1915-1918, (4) Ethiopian war 1935-1937, (5) WWII 1939-1942.

Figure 5.

4.3 The fiscal multiplier under monetization

In this subsection, we refine our analysis by considering the effect of an increase in the monetary base during fiscal expansions. According to Galí (2020), FMs are higher when the fiscal deficit is monetized rather than being financed through debt. We define monetization as an increase in the Treasury component of the monetary base aimed at financing larger government spending. Panel (d) of Figure (4) plots the cyclical component of the Treasury monetary base, M_t^C, against periods of slackness and expansion of the economy: M_t^C tends to be higher during contraction phases of the business cycle and falling during expansion phases.

Specification (3) below adds three adjustments to the unadjusted FM model (1). With the first one, we take into account the business-cycle phase, as already done in Section 4.2. The second adjustment is due to the monetized increase in government spending, captured by β_{GM}. The third one provides for the possibility that the effect of monetized government spending may vary depending on the business cycle conditions; the effect of this joint condition is captured by β_{GEM}. The result is:

$$\begin{aligned} \Delta Y_t &= \boldsymbol{X}'_{t-1}\boldsymbol{\beta} + \beta_G \Delta G_t + \\ &+ \beta_{GE}(\Delta G_t \cdot Empl^C_{t-1}) + \\ &+ \beta_{GM}(\Delta G_t \cdot M^C_{t-1}) + \\ &+ \beta_{GEM}(\Delta G_t \cdot Empl^C_{t-1} \cdot M^C_{t-1}). \end{aligned} \tag{3}$$

Table (4) reports the estimates of three different model specifications over two different samples. Columns (1) and (2) give the unadjusted FM, β_G, which is comparable

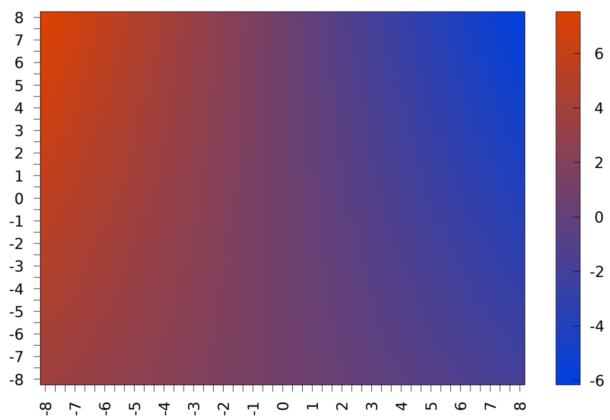
Table 4: Fiscal Multipliers, business cycle, and monetization

	1925–1999	1872–1999	1925–1999	1872–1999	1925–1999	1872–1999
Equation	(1)	(2)	(3)	(4)	(5)	(6)
ΔG_t	0.747	**0.624****	**0.846***	**0.630****	**1.094***	**0.787*****
	(0.462)	(0.290)	(0.491)	(0.315)	(0.581)	(0.299)
$\Delta G_t \cdot Empl^C_{t-1}$	-	-	-	-	**-74.18***	**-60.31****
	-	-	-	-	(38.85)	(25.84)
$\Delta G_t \cdot M^C_{t-1}$	-	-	3.696	1.213	-2.903	-1.274
	-	-	(2.629)	(0.902)	(4.081)	(0.972)
$Empl^C_{t-1} \cdot M^C_{t-1}$	-	-	-	-	5.749	**5.270***
	-	-	-	-	(4.270)	(2.711)
$\Delta G_t \cdot Empl^C_{t-1} \cdot M^C_{t-1}$	-	-	-	-	-282.4	**-315.9*****
	-	-	-	-	(181.5)	(116.2)
Hausman test	21.48	24.44	30.66	34.71	49.11	73.58
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Weak instruments test						
F-test	32.33	153.8	-	-	-	-
Cragg-Donald F-statistic	-	-	18.49	21.64	1.921	10.02
Maximal size	-	-	$< 10\%$	$< 10\%$	-	-
Obs.	75	128	75	128	75	128

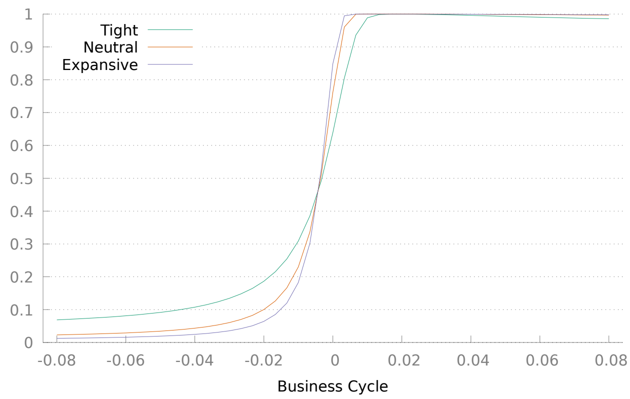
Notes: TSLS estimates. ΔD_t is used as an instrument for ΔG_t, control variables (omitted) include ΔG_{t-1}, $Empl^C_{t-1}$, Δatr_{t-1}, ΔWg_{t-1}, Spr^2_{t-1}, $PDebtgdp_{t-1}$, M^C_{t-1} and two world war dummies. HAC robust standard errors in round brackets. Reported p-values: $^{***}\, p < 0.01,^{**}\, p < 0.05,^{*}\, p < 0.10$. Test statistics p-values are reported in square brackets. Maximal size is obtained comparing the Cragg-Donald F-statistics (Cragg and Donald, 1993) with their simulated critical values showed by Stock and Yogo (2005), when available.

Figure 6: Simulated combinations of $Empl^C$ and M^C

(a) Fiscal Multiplier



(b) p-value for one-sided t-test, $H_0 : FM = 1; H_1 : FM > 1$



Note: FM computed from Table (4), column 6, according to Equation (2). Horizontal axis reports values for $Empl^C$ while vertical axis reports those for M^C, expressed in percentage points. In the bottom panel we show results for three monetary policy regimes: "Tight", "Neutral" and "Expansive" correspond to values of M^c_{t-1} equal to -8%, 0 and $+8\%$, respectively.

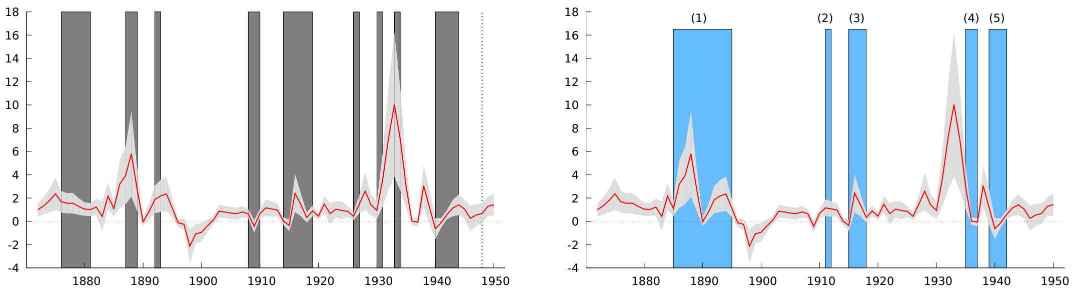
to that shown in Section (4.1). Columns (3) and (4) add a monetized term in public spending variable, which is not statistically significant. Finally, columns (5) and (6) include the full set of interaction terms.[3] The coefficient of the three-way interaction variable, β_{GEM}, is negative and statistically significant. Given that the cyclical component of employment is negative in the downward phase of the cycle, a monetized fiscal expansion under a state of economic slackness exerts an additional push to the size of the FM and ultimately leads to a higher growth of real GDP.[4]

[3] In what follows, we will refer to the model in Column (6). Table (6) in Appendix B reports the regression output for the complete model using data 1872–1999.

[4] As a robustness exercise, we run an additional set of regressions controlling for the variation in the capital stocks, a proxy supply shocks during wartime. The results are reported in Appendix (C),

Figure 7: Time path of the FM, time-constant parameters, 90% CI

(a) FM and recessions (b) FM and wars



Recessions according to Fratianni and Spinelli (2001b);
Wars: (1) Eritrean war 1885–1895, (2) Libyan war 1911–1912, (3) WWI 1915–1918, (4) Ethiopian war 1935–1937, (5) WWII 1939–1942.

Note, however, that these impacts are not symmetric. To disentangle the asymmetry, we perform a series of simulation exercises based on the FM expressed as the following partial derivative of ΔY_t with respect to ΔG_t:

$$FM_t = \frac{\partial \Delta Y_t}{\partial \Delta G_t} = \beta_G + \beta_{GE} Empl^C_{t-1} + \beta_{GM} M^C_{t-1} + \beta_{GEM}(Empl^C_{t-1} \cdot M^C_{t-1}). \quad (4)$$

In the exercise, we set the business cycle and the cyclical component of the monetary base variables between -8% and $+8\%$ and compute the FM for all combinations. The resulting FMs are reported in the top panel of Figure (6).

The x-axis displays the deviation of employment from its trend, while the y-axis shows the deviation of monetary base growth from its long-run trend. It is clear from the color that the combination of unfavorable economic cycle and a high increase of money growth (North-West corner of the top panel in Figure 6) yields the highest values of the FM. The bottom panel of Figure (6) gives the graphical representation of the one-side t-test p-value for the null hypothesis $H_0 : FM = 1$ against the alternative $H_1 : FM > 1$, for three monetary regimes. In short, the highest values of the FM occur when a deep recession is accompanied by an aggressive monetary expansion. Straight monetized fiscal expansion alone does not produce a higher FM, unless the economy is in a recession.

Finally, we can generate a time profile of the fiscal multiplier, in the same way as in Section 4.2. Figure (7) plots time-varying coefficients of FM, defined by Equation (2), using the estimates of column (6) of Table (4) over the period 1872–1950 with a 90% confidence band. The obvious inference from Figure (7) is that the estimates of the FM vary greatly over the period, ranging from approximately -2 to +10, and with the highest values occurring in recessions and/or during wartime.

Table (7). The estimated coefficients are almost identical to those provided in Table (4), Column (6).

5 More on Time-Varying Parameters

It may be argued that our analysis, with data stretching from 1872 to 2006, may fail to capture fundamental structural changes. To tackle this issue in greater depth, we employ an estimation method that allows for the model parameters to vary over time and thus reflect fundamental changes in the economy.

5.1 Methodology

Several methods are available to estimate time-varying parameter state-space representation and use the Kalman filter apparatus under the Gaussian assumption (see eg Hamilton, 1994, section 13.8). Recently, Giraitis et al. (2021) have proposed a semi-parametric estimator for an IV model with time-varying parameters relying on inference based on smoothing kernels. In principle, this technique can be seen as a generalization of the rolling-window regression, and it is very general and easy to implement. Furthermore, Lucchetti and Valentini (2021) find that the estimator is fairly robust to the choice of the kernel parameters.

Consider the following model, for $t = 1 \dots T$,

$$\begin{cases} y_t = \boldsymbol{x}_t' \boldsymbol{\beta}_t + u_t \\ \boldsymbol{x}_t = \boldsymbol{z}_t' \boldsymbol{\psi}_t + \boldsymbol{\nu}_t \end{cases} \tag{5}$$

where y_t is the dependent variable, $\boldsymbol{x}_t$ is a $p \times 1$ vector of (possibly endogenous) regressors, $\boldsymbol{z}_t$ denotes a $q \times 1$ vector of instruments and the parameters $\boldsymbol{\beta_t}$ and $\boldsymbol{\psi}_t$ are allowed to vary over time.

The time-varying IV estimator is defined as

$$\tilde{\boldsymbol{\beta}}_t = \left(\sum_{j=1}^{T} b_{H,|j-t|} \hat{\boldsymbol{\psi}}_j' \boldsymbol{z}_j \boldsymbol{x}_j' \right)^{-1} \left(\sum_{j=1}^{T} b_{H,|j-t|} \hat{\boldsymbol{\psi}}_j' \boldsymbol{z}_j y_j \right) \tag{6}$$

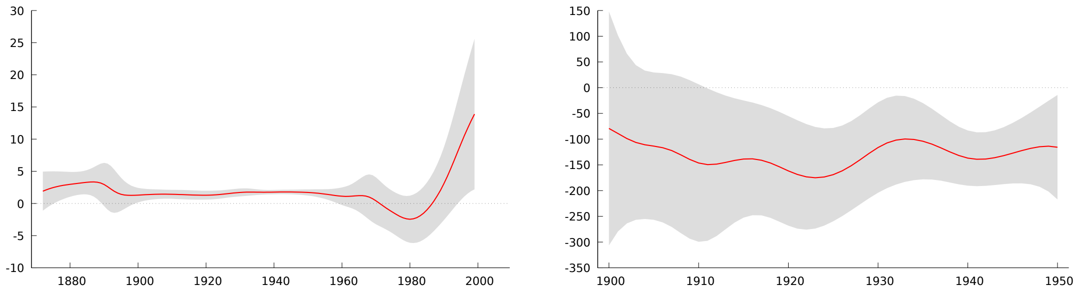
where $b_{H,|j-t|} = K\left(\frac{|j-t|}{H}\right)$ is a kernel weight with bandwidth parameter $H = T^{h_1}$ and $\hat{\boldsymbol{\psi}}_t$ indicates the time-varying first-stage OLS estimates of $\boldsymbol{\psi}_t$, based on a different kernel bandwidth $L = T^{h_2}$ (see Giraitis et al., 2021, for details).

Given the generality of this approach, we perform the same empirical analysis outlined in Section 4.3. As for the kernel specification, we use in both stages a Gaussian kernel with $h_1 = h_2 = 0.4$ as bandwidth parameters.[5]

[5] As argued in Lucchetti and Valentini (2021) the results are generally robust to the choice of the kernel. We run a set of robustness checks not reported here: the bandwidth parameters are set to 0.5 and 0.6 and we also adopt a simple exponential kernel of the type $K(x) = \exp\{-x\}$. Although point estimates are sensitive to the kernel setup, the results are almost qualitatively equivalent. It is worth noticing that the nature of the data makes it impossible to compute the estimator combining a finite support kernel functions (e.g., Epanechnikov) and a bandwidth smaller than 0.9, which would imply

Figure 8: Time-varying IV regression: estimated coefficients

(a) I stage: coefficient of ΔD_t (b) II stage: coefficient of $\Delta G_t \cdot Empl^C_{t-1} \cdot M^C_{t-1}$



Note: both panels report the time path of estimated coefficients along with their 95% and 90% confidence intervals (CI), respectively.

In sum, we should be able to prove the robustness of the results shown above and, at the same time, to investigate whether the amplification effect on the FM provided by monetization is stable over time.

5.2 The fiscal multiplier with time-varying parameters

We report in this section the main findings obtained by the time-varying parameters regression method. The discussion focuses on three key points: the validity of the identification strategy; the role of monetization; and the construction of the FM.

First, we examine whether our identification strategy is valid under the time-varying scheme. More in detail, the flexibility of the time-varying parameter regression makes it possible to question not only *if* but also *when* an instrument is valid, in the sense of not being weak. If, on the one hand, our instrument still relies on the same theoretical arguments supporting its exogeneity (see Section 2), on the other we are able to verify if its explanatory power for the endogenous variable is stable over time.

We now consider the simple model with no interactions, as the one in Table 4, column 2. Figure (8a) shows the time path of the estimated coefficient related to the excluded instrument in the first stage regression. The coefficients appear to be durably and statistically different form zero in the period ranging from 1900 to 1950, suggesting that for that period the instrument is strong. This is consistent with our identification strategy, since the main military events occurred at the beginning of the 20th century. Given that a potentially weak instrument could undermine the conclusions of our findings, we report results for the time span 1900-1950.

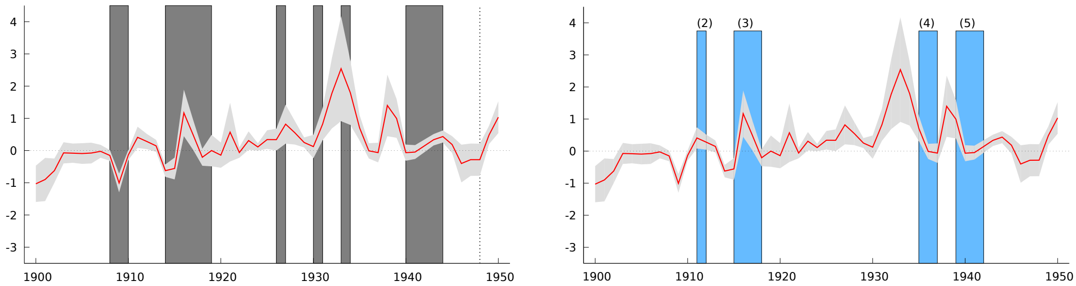
Secondly, we argued in Section 4.3 that monetary base-financed public spending during a state of slackness pushes the fiscal multiplier up. When we consider the model specification as the one is Table 4, column 6, this result appears to be stable in the

almost no time-variation in parameters. For this reason we rely on infinite support kernel functions.

Figure 9: Time path of the FM with time-varying parameters

(a) Time varying FM and recessions

(b) Time varying FM and wars



Recessions, indicated by bars, are defined according to Fratianni and Spinelli (2001b); Wars: (2) Libyan war 1911-1912, (3) WWI 1915-1918, (4) Ethiopian war 1935-1937, (5) WWII 1939-1942.

time-varying framework. Figure (8b) shows the time path of the estimated coefficient of the triple interaction between public expenditure, our measures of business cycle, and changes in the monetary base. The key result of a boosting effect to the fiscal multiplier from a monetized increase in public expenditure, combined with a state of economic slackness, seems to be robust to structural changes in the economy.

The third result consists of an estimate of the historical path of the Italian FM, see Equation (4) above. Both panels in Figure (9) display the estimated FM with its 90% confidence bands. Further, Figure (9a) also reports in the background recession bars while Figure (9b) shows main war events. Again, these results are consistent with those in Section 4.3: the FM assumes values between zero and one for the largest part of the sample but tends to rise during recessions (e.g., in 1917 and 1933), as expected. In 1933, in particular, the estimated FM takes a value larger than two and is statistically larger than one. However, the magnitude of this peak is lower by time-varying parameters than obtained with the standard framework (see Figure (7)). It is also confirmed that the FM rises during wars or soon before.

6 Conclusions

In this paper, we use Italian data for a contribution to the ongoing debate on the size of the fiscal multiplier and its stability through time. The events that have marked the history of Italy over the last 150 years offer an excellent test bed for doing so. Our data set stretches from 1872 to 2006 and encompasses several wars, most fought abroad, and many phases of the business cycle; these are novel features compared to previous literature, that focused on the US.

Our key findings are: the Italian FM, generally, is not statistically different from unity; it is state dependent, in agreement with previous empirical works; when we control for the business cycle, the multiplier is 40 to 50 basis points higher in recession than in expansion phases; the FM receives a boost when a sharp recession combines with a significant degree of monetization. In contrast, the growth of the monetary base has a very limited effect when the economy is running above its long-run trend. The results are confirmed when we re-estimate the model with time-varying parameter IV methodology.

The result of the upward push of the FM, in the presence of economic slackness and debt monetization, has a significant resonance in present times, when the COVID pandemic has triggered a large fiscal expansion and an extremely accommodating monetary policy.

Finally, a word of caution is in order: although we find stable results on the size of the fiscal multiplier under different states of the economy, we would be very cautious to extend them to regimes marked by high economic stress and high inflation.

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A Full model estimation

This appendix reports, with reference to the results showed in Table 2, the full set of estimated coefficients.

Table 5: Dependent variable: real per capita GDP growth

	1956	1939	1935	1915	1911	1872
ΔG_t	-21.8	1.39	1.13	**0.72****	**0.62****	**0.63****
	(264)	(0.87)	(0.71)	(0.27)	(0.30)	(0.32)
ΔG_{t-1}	-3.79	0.19	0.03	**−0.33****	**−0.32****	**-0.32****
	(47.7)	(0.65)	(0.53)	(0.15)	(0.15)	(0.15)
$Empl^C_{t-1}$	-3,69	**−1.12****	-0.66	-0.25	-0.30	-0.22
	(41.9)	(0.55)	(0.46)	(0.31)	(0.30)	(0.24)
Δatr_{t-1}	0.33	**1.89***	**1.93****	**1.96*****	**1.88*****	**1.59****
	(8.30)	(0.95)	(0.89)	(0.68)	(0.70)	(0.66)
ΔWg_{t-1}	-0.98	**−1.03****	**−0.93***	-0.08	-0.06	-0.03
	(17.1)	(0.53)	(0.50)	(0.34)	(0.33)	(0.32)
Spr^2_{t-1}	48.9	**−34.6****	**−29.8****	**−22.8****	**−21.0***	**−19.1***
	(640)	(16.6)	(14.0)	(10.9)	(10.6)	(10.5)
$PDebtgdp_{t-1}$	-0.69	-0.02	-0.04	**−0.03****	**−0.04****	**−0.03****
	(7.98)	(0.05)	(0.03)	(0.02)	(0.02)	(0.02)
$WWII$		0.07	0.05	0.03	0.02	0.02
		(0.09)	(0.08)	(0.06)	(0.06)	(0.06)
WWI				-0.03	-0.02	-0.02
				(0.02)	(0.02)	(0.02)
Weak Instruments	0.00	19.6	28.0	132.4	152.1	151.8
Hausman	5.16	38.3	33.8	25.2	20.6	25.4
F	0.02	12.4	13.5	11.3	10.5	12.3
R^2	0.01	0.34	0.38	0.34	0.31	0.27

Notes: TSLS estimates. ΔD_t is used as an instrument for ΔG_t, control variables (omitted) include ΔG_{t-1}, $Empl^C_{t-1}$, Δatr_{t-1}, ΔWg_{t-1}, Spr^2_{t-1}, $PDebtgdp_{t-1}$ and two world war dummies. Heteroskedasticity and autocorrelation (HAC) robust standard errors in round brackets. Reported p-values: *** $p < 0.01$,** $p < 0.05$,* $p < 0.10$.

B Full model with monetization

This appendix reports the full regression results reported in Table 4, column (6).

Table 6: Dependent Variable: ΔY_t

	Coefficient	Std. Error	t-ratio	p-value
const	0.060	0.018	3.340	0.001
ΔG_{t-1}	−0.065	0.269	−0.242	0.809
Δatr	1.437	0.573	2.508	0.014
$Empl^C_{t-1}$	0.215	0.475	0.453	0.651
Spr^2_{t-1}	−26.22	13.60	−1.928	0.056
ΔWg_{t-1}	−0.179	0.366	−0.490	0.625
DR_{t-1}	−0.032	0.016	−1.974	0.051
M^C_{t-1}	−0.056	0.039	−1.433	0.155
$Empl^C_{t-1} \cdot M^C_{t-1}$	5.271	2.711	1.944	0.054
WWII	0.035	0.049	0.717	0.475
WWI	−0.016	0.022	−0.710	0.479
ΔG_t	0.787	0.299	2.636	0.010
$\Delta G_t \cdot Empl^C_{t-1} \cdot M^C_{t-1}$	−315.9	116.1	−2.720	0.008
$\Delta G_t \cdot M^C_{t-1}$	−1.274	0.972	−1.311	0.193
$\Delta G_t \cdot Empl^C_{t-1}$	−60.31	25.84	−2.334	0.021

Notes: TSLS estimates. ΔD_t is used as an instrument for ΔG_t. HAC robust standard errors.

C Controlling for capital shocks

Our identification strategy relies on the strong assumption that war events did not generate sizable supply shocks due to capital destruction and casualties. In order to test the robustness of our results to a violation of this hypothesis, we consider additional model specifications. The starting point is the specification in Table 4, column (6). Here, we control for capital accumulation shocks. We gather data from Broadberry et al. (2011) and we generate the series Tot_cap and $Resid$ as the cyclical component[6] of the logarithm of the per capita "total capital" and "residential capital" stocks as defined in Broadberry et al. (2011), respectively. These variables are able to capture supply side effects .

[6] One sided Hodrick-Pescott Filter, $\lambda = 100$

Table 7: Robustness: controlling for capital shocks

ΔG_t	**0.741****	**0.747****	**0.681*****	**0.683*****
	(0.290)	(0.290)	(0.234)	(0.236)
$\Delta G_t \cdot Empl^C_{t-1}$	**-57.10****	**-55.73****	**-51.32*****	**-50.38*****
	(24.31)	(23.75)	(18.30)	(18.06)
$\Delta G_t \cdot M^C_{t-1}$	-1.361	-1.361	-1.171	-1.095
	(0.933)	(0.940)	(0.848)	(0.816)
$Empl^C_{t-1} \cdot M^C_{t-1}$	**5.296***	**5.117***	**5.870***	**5.806***
	(2.682)	(2.615)	(3.033)	(2.615)
$\Delta G_t \cdot Empl^C_{t-1} \cdot M^C_{t-1}$	**-317.9*****	**-314.8*****	**-325.6*****	**-323.9*****
	(112.3)	(110.1)	(113.9)	(113.1)
Tot_cap_t	0.238	-	0.177	-
	(0.164)	-	(0.164)	-
$Resid_t$	-	**0.221***	-	0.139
	-	(0.119)	-	(0.117)
WWI	Yes	Yes	No	No
WWII	Yes	Yes	No	No
Hausman Test	72.10	69.49	71.74	69.49
	[0.000]	[0.000]	[0.000]	[0.000]
Cragg-Donald F-statistic	10.17	9.967	10.56	9.97

Notes: TSLS estimates. ΔD_t is used as an instrument for ΔG_t, control variables (omitted) include ΔG_{t-1}, $Empl^C_{t-1}$, Δatr_{t-1}, ΔWg_{t-1}, Spr^2_{t-1}, $PDebtgdp_{t-1}$, M^C_{t-1} and two world war dummies. HAC robust standard errors in round brackets. Reported p-values: $^{***} p < 0.01$,$^{**} p < 0.05$,$^{*} p < 0.10$ .Test statistics p-values are reported in square brackets.