BANCA D'ITALIA
EUROSISTEMA

Gli effetti della crisi sul potenziale produttivo e sulla spesa delle famiglie in Italia

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Indice

L'IMPATTO MACROECONOMICO DELLA CRISI DEL DEBITO SOVRANO: UN'ANALISI CONTROFATTUALE PER L'ECONOMIA ITALIANA

Fabio Busetti* e Pietro Cova*

Sommario

Il lavoro analizza l'impatto macroeconomico della crisi del debito sovrano, stimando il contributo dei principali fattori alla base degli impulsi recessivi che hanno investito l'economia italiana a partire dalla seconda metà del 2011. Mediante un'analisi controfattuale realizzata con l'ausilio del modello econometrico della Banca d'Italia, si valuta che: (i) rispetto a uno scenario di "assenza di crisi", la perdita di PIL ammonterebbe complessivamente a circa 6,5 punti percentuali nel biennio 2012-13; (ii) la caduta degli investimenti rifletterebbe in misura preponderante il peggioramento delle condizioni di finanziamento, mentre la contrazione dei consumi deriverebbe soprattutto dall'impatto sul reddito disponibile delle manovre di finanza pubblica e dagli effetti dell'incertezza e del calo della fiducia; (iii) diversamente dalla recessione del 2008-09, durante la crisi del debito sovrano il deterioramento dell'attività economica sarebbe prevalentemente ascrivibile a fattori di origine interna, che spiegherebbero circa due terzi della discesa del PIL.

Classificazione JEL: E27, E37, E65, F34.
Parole chiave: fluttuazioni cicliche, simulazioni, crisi finanziaria, economia italiana.

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1. Introduzione e principali risultati[1]

Nell'arco di pochi anni l'economia italiana si è trovata ad affrontare due recessioni di gravità eccezionale. La crisi finanziaria internazionale, culminata con il dissesto della banca d'affari Lehman Brothers, si è tradotta in una riduzione del PIL dell'Italia di circa il 6,5 per cento nel biennio 2008-09. Ne è seguita una ripresa di moderata intensità e breve durata, bruscamente interrotta nella seconda parte del 2011 dall'ampliarsi delle tensioni sul debito sovrano e dall'aggravarsi delle preoccupazioni degli investitori riguardo la tenuta stessa dell'architettura europea. L'attività economica nel nostro paese è quindi tornata a scendere a ritmi elevati, così come la fiducia delle famiglie, con un tasso di disoccupazione in aumento di oltre 2 punti percentuali nell'arco di pochi trimestri. Alla fine del 2013 il livello del PIL dell'Italia era ancora inferiore di oltre l'8 per cento rispetto ai valori di 6 anni prima, gli investimenti più bassi del 26 per cento.

In questo lavoro analizziamo le ripercussioni sull'economia italiana di questa seconda crisi, legata al drastico cambiamento della percezione dei mercati sulla solvibilità degli emittenti sovrani nell'area dell'euro, stimando uno alla volta l'impatto dei diversi fattori che hanno contribuito al deterioramento dell'attività produttiva; un'analisi paragonabile alla nostra, ma relativa alla recessione del 2008-09, è contenuta in Caivano, Rodano e Siviero (2010).

Per misurare gli effetti della crisi sul PIL e sulle altre principali variabili macroeconomiche si utilizza un approccio controfattuale. In particolare, gli sviluppi effettivamente osservati vengono paragonati, con l'ausilio del modello econometrico trimestrale della Banca d'Italia, con quelli desunti da uno scenario fittizio corrispondente all'ipotesi di 'assenza di crisi'. Rispetto a questo scenario si valuta che la perdita di PIL ammonti complessivamente a circa 6,5 punti percentuali nel biennio 2012-13. Al deterioramento dell'attività economica avrebbe contribuito in misura sostanziale, oltre al peggioramento delle condizioni di finanziamento e alle misure restrittive di bilancio indotte dall'estendersi della crisi del debito sovrano all'economia italiana, anche il rallentamento del ciclo internazionale, che nel biennio avrebbe sottratto circa 2 punti percentuali alla crescita del prodotto. Tra le componenti della domanda aggregata, la caduta degli investimenti avrebbe riflesso in misura preponderante il peggioramento delle condizioni di finanziamento, mentre la contrazione dei consumi delle famiglie sarebbe derivata soprattutto dall'impatto sul reddito disponibile delle manovre di finanza pubblica e dagli effetti dell'incertezza e del calo della fiducia sulle decisioni di spesa.

La valutazione del contributo dei canali di trasmissione della crisi proposta in questo lavoro è basata su un modello complessivo dell'economia italiana e tiene pertanto conto in maniera coerente delle interrelazioni tra i comportamenti dei diversi agenti economici – famiglie, imprese, pubblica amministrazione. Essa va tuttavia interpretata con cautela, in quanto i diversi fattori qui trattati come a sé stanti (anche a fini di chiarezza espositiva) sono invece almeno in parte interconnessi: parte del deterioramento della fiducia e dell'aumento dell'incertezza è infatti ascrivibile all'aumento degli spread sovrani; analogamente, il rallentamento del commercio internazionale è parzialmente attribuibile al consolidamento fiscale, dal momento che politiche di bilancio restrittive sono state perseguite in altri paesi europei simultaneamente al nostro. Un ulteriore motivo di cautela risiede nell'impossibilità di tenere conto, con il modello utilizzato, di tutti gli effetti associati ai diversi canali di trasmissione della crisi. In particolare, le manovre di finanza pubblica, a fronte dell'impatto diretto qui riportato, hanno verosimilmente contribuito a evitare aumenti ancor più elevati degli spread e un più forte deterioramento delle condizioni del credito, i cui costi in termini di PIL sarebbero stati ben superiori a quanto effettivamente osservato.

Il resto del lavoro è organizzato come segue: nel secondo paragrafo si ripercorrono brevemente i principali passaggi della crisi e si definisce lo scenario controfattuale rispetto al quale valutare l'impatto sul PIL e sulle altre principali variabili; nel terzo si stimano separatamente i contributi dei

[1] Le opinioni qui espresse sono degli autori e non impegnano l'Istituto di appartenenza.

diversi fattori al deterioramento del quadro macroeconomico nel biennio 2012-13; nel quarto si confrontano queste stime con quelle relative alla crisi finanziaria del 2008-09; seguono le conclusioni.

2. L'impatto della crisi del debito sovrano sull'economia italiana: differenze negli andamenti macroeconomici rispetto alle stime pre-crisi

2.1 *L'evoluzione della crisi del debito sovrano*

A fini espositivi possiamo suddividere l'evoluzione della crisi del debito sovrano in tre diverse fasi; la ricostruzione qui proposta trae spunto dai lavori di Rossi (2012) e Visco (2013) a cui si rimanda per maggiori dettagli.

L'attenzione degli investitori internazionali al rischio sovrano nell'area dell'euro si intensifica nella primavera del 2010, quando la Grecia – a fronte del dissesto dei conti pubblici e dell'impossibilità di collocare i propri titoli sul mercato – si vede costretta a ricorrere all'aiuto dell'Unione europea e del Fondo monetario internazionale. In rapida successione la crisi debitoria si estende, per motivi diversi, prima all'Irlanda (novembre 2010) e poi al Portogallo (aprile 2011), a loro volta destinatarie del medesimo tipo di programmi di aggiustamento macroeconomico[2]. Durante questa *prima fase* della crisi lo spread dei titoli a 10 anni italiani rispetto ai corrispettivi titoli tedeschi rimane relativamente stabile (in media intorno ai 150 punti base), sostanzialmente in linea con i fondamentali macroeconomici tipicamente individuati in letteratura[3] (fig. 1).

A partire dal luglio del 2011, con l'annuncio del secondo piano di assistenza alla Grecia che prevede il coinvolgimento degli investitori privati nella ristrutturazione del debito sovrano ellenico (il cosiddetto *Private Sector Involvement*, PSI), la crisi si inasprisce e si avvia una *seconda fase*. Nonostante le rassicurazioni circa l'unicità del PSI[4], da quel momento gli spread rispetto alla Germania di tutte le economie periferiche, tra cui anche l'Italia, aumentano in maniera sostanziale e diventano molto più volatili. Per l'Italia pesano l'elevato debito pubblico, cui gli investitori dedicano crescente attenzione, e le prospettive di bassa crescita. Il differenziale con i titoli di stato tedeschi sale fino a raggiungere il picco di 550 punti base nel novembre del 2011 (con tassi di interesse che oltrepassano il 7% per le scadenze pari o superiori all'anno); aumenta nel contempo anche lo spread nei confronti degli altri paesi periferici, quali ad esempio la Spagna. I differenziali di rendimento dei titoli di Stato dell'area dell'euro rispetto al Bund tedesco raggiungono nuovi massimi, dall'introduzione dell'euro, anche in Grecia, Portogallo, Spagna, Belgio e Francia, nonostante gli ingenti acquisti di titoli di Stato effettuati dalla BCE nell'ambito del Securities Markets Programme[5]. Le tensioni si riducono sul finire del 2011, dopo l'annuncio di nuove, incisive

[2] Nel caso dell'Irlanda la crisi è inizialmente riconducibile alla forte caduta delle quotazioni degli immobili, cresciute per un lungo periodo a ritmi insostenibili, e al conseguente repentino peggioramento della solidità patrimoniale del settore bancario. La crisi bancaria si è riverberata in un rapido peggioramento delle finanze pubbliche e un innalzamento degli *stock* di debito da livelli di partenza piuttosto contenuti. Nel caso del Portogallo, hanno inciso i problemi di competitività, responsabili del forte squilibrio nei conti con l'estero, e l'elevato grado di indebitamento delle famiglie.

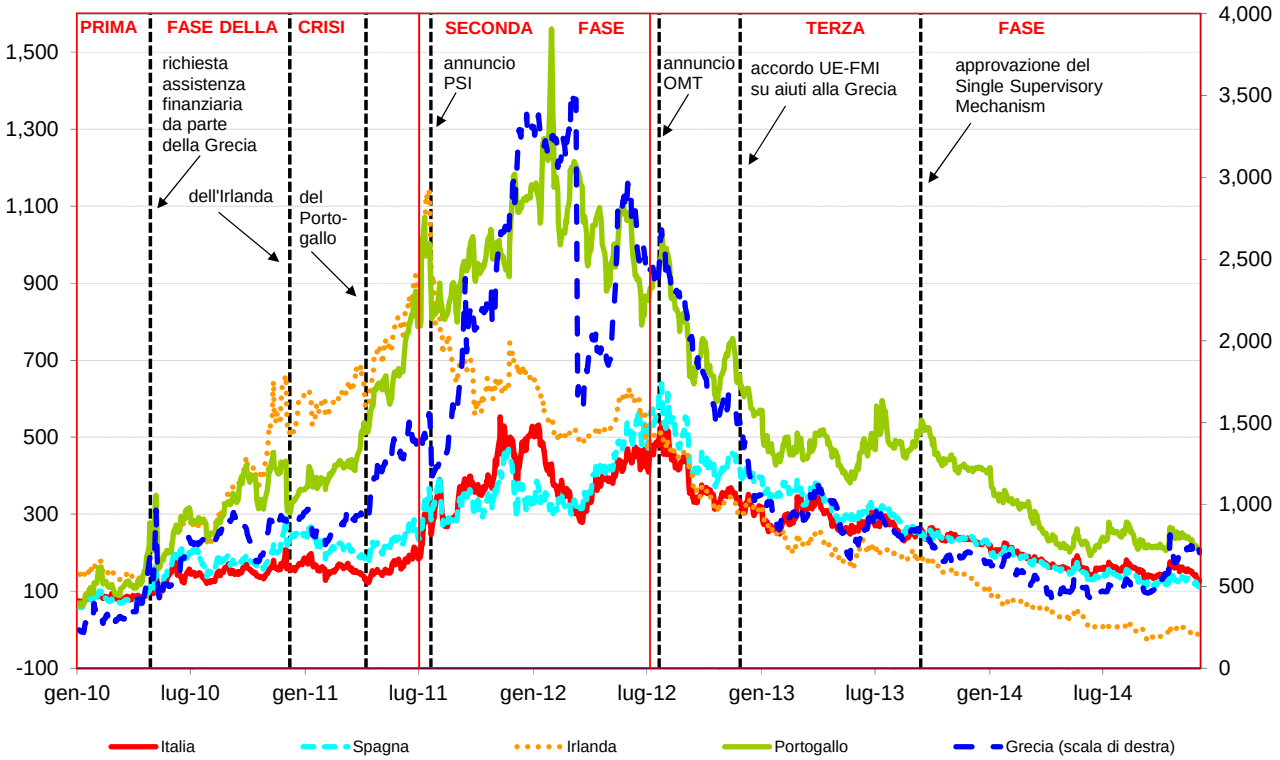
[3] Per un'analisi del legame tra l'andamento dei differenziali d'interesse a dieci anni con la Germania dell'Italia e di altri paesi dell'area dell'euro e i principali fondamentali fiscali e macroeconomici si veda Di Cesare *et al.* (2012) "Stime recenti dei premi per il rischio sovrano di alcuni paesi dell'area dell'euro (*Recent estimates of sovereign risk premia for euro-area countries*)", *Questioni di Economia e Finanza* n. 128.

[4] Al punto 6 della dichiarazione finale del Consiglio europeo del 21 luglio 2011 si afferma: "Relativamente al nostro approccio generale al coinvolgimento del settore privato nella zona euro, teniamo a precisare che la Grecia necessita di una soluzione eccezionale e senza uguali."

[5] Il programma di acquisti dei titoli di debito del settore pubblico, il *Securities Markets Programme* (SMP), è stato introdotto dal Consiglio Direttivo il 10 maggio del 2010, per far fronte al malfunzionamento che si era prodotto in determinati segmenti dei mercati dei titoli suddetti e ripristinarne lo spessore e la liquidità, garantendo in questo modo

misure correttive del bilancio pubblico[6], e nei primi mesi del 2012 soprattutto grazie alle misure di sostegno della liquidità varate dalla BCE[7].

Figura 1. Differenziali di rendimento sui titoli di stato
(*punti base; dati giornalieri*)



Fonte: Bloomberg. Note: differenziali tra i rendimenti sui titoli di Stato a 10 anni dei paesi indicati in legenda e quelli tedeschi.

Un nuovo aumento delle tensioni sui titoli sovrani, che questa volta investe prevalentemente la Spagna, si verifica però a partire da marzo del 2012, quando emergono delle incertezze circa lo stato delle istituzioni finanziarie di quel paese. Contestualmente all'ulteriore deterioramento delle condizioni macroeconomiche in Grecia, si accentuano tra gli investitori internazionali dei timori di reversibilità dell'unione monetaria (il cosiddetto "rischio di ridenominazione"). Il tasso sui titoli di Stato a scadenza decennale dell'Italia ritorna su livelli molto elevati, collocandosi intorno al 6%, anche se lo spread nei confronti della Spagna torna negativo, in media pari a 50 punti base tra marzo e luglio del 2012.

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l'efficace e omogenea trasmissione della politica monetaria nel complesso dell'area dell'euro. Con l'introduzione a inizio settembre del 2012 delle c.d. operazioni definitive monetarie (OMT), l'SMP è stato contestualmente terminato. Per maggiori dettagli si veda il *Bollettino economico*, n. 70, 2012 e in particolare il riquadro ivi contenuto: *Le operazioni definitive monetarie della BCE*.

[6] La manovra approvata dal Parlamento il 22 dicembre – la terza correzione da luglio del 2011 dei conti pubblici per il triennio 2012-14 – mirava a rispettare l'impegno, assunto in ambito europeo, di conseguire il pareggio di bilancio nel 2013.

[7] Nel dicembre del 2011 e nel febbraio del 2012 l'Eurosistema ha condotto due operazioni di rifinanziamento a tre anni al tasso fisso dell'1,0 per cento e con pieno soddisfacimento della domanda; sono stati inoltre ampliati i requisiti di stanziabilità del collaterale ed è stato dimezzato il coefficiente di riserva obbligatoria. L'ammontare netto di fondi immessi nel sistema è stato pari a circa 500 miliardi e ha raggiunto direttamente un elevato numero di banche.

Per fronteggiare la frammentazione lungo linee nazionali dei mercati bancari e finanziari dell'area dell'euro, che impedisce la corretta trasmissione della politica monetaria, il Consiglio direttivo della BCE annuncia, nell'agosto del 2012, nuove modalità di intervento sul mercato secondario dei titoli di Stato (le c.d. operazioni definitive monetarie, OMT[8]), volte a rassicurare gli investitori dell'irreversibilità della moneta unica[9]. Comincia di fatto una *terza fase* nell'evoluzione della crisi del debito caratterizzata da una decisa riduzione dei rischi sovrani, che riflette anche la prospettiva dell'Unione bancaria nonché il ridimensionamento dei timori di contagio indotto dalla definizione degli interventi in favore del sistema bancario spagnolo.

2.2 *Le ripercussioni sull'economia italiana*

L'economia italiana entra in recessione nel secondo semestre del 2011, con l'inizio della *seconda fase* della crisi. Il repentino e drastico aumento del differenziale tra il rendimento dei BTP decennali e quello dei corrispondenti titoli tedeschi ha ricadute negative sulla capacità di raccolta, sulle valutazioni di borsa degli intermediari e di conseguenza sulle condizioni del credito (per una discussione, Gaiotti (2012)). Tra la metà di settembre e la prima decade di ottobre le tre principali agenzie di rating (*Standard & Poor's*, *Moody's* e *Fitch Ratings*) riducono il merito di credito dell'Italia e di diversi istituti bancari, con prospettive negative[10]. Aumentano, molto più che nei principali paesi europei, i differenziali di rendimento tra le obbligazioni emesse da società non finanziarie italiane con elevato merito di credito e i titoli di Stato dell'area dell'euro considerati più sicuri (di circa 200 punti base); si irrigidiscono i criteri di erogazione dei prestiti alle imprese (fig. 2). Rispondendo al rischio di una crisi di liquidità dalle conseguenze potenzialmente molto gravi, il Governo vara due manovre correttive dei conti pubblici per il quadriennio 2011-14, anticipando di un anno, al 2013, il pareggio di bilancio concordato in sede europea[11].

Il PIL scende dello 0,3% e dello 0,8% rispettivamente nel terzo e quarto trimestre del 2011; peggiorano le condizioni sul mercato del lavoro, interrompendo il recupero dell'occupazione in atto dall'ultimo trimestre del 2010.

Lo scenario macroeconomico non muta in maniera sostanziale nella prima parte del 2012, nonostante i miglioramenti sui mercati finanziari seguiti agli interventi dell'Eurosistema a sostegno della liquidità, ai provvedimenti del Governo in materia di finanza pubblica e di riforme strutturali (liberalizzazione, stimolo dell'attività economica e riforma del mercato del lavoro) e alle decisioni prese dai Capi di Stato e di governo dell'area dell'euro e dal Consiglio europeo di fine giugno[12]. Le tensioni sul debito sovrano continuano a influire sulle difficoltà di raccolta all'ingrosso delle banche italiane, mentre il deterioramento dell'attività economica incide negativamente sulla qualità del credito. I premi per il rischio richiesti sui finanziamenti alle imprese e alle banche italiane diminuiscono rispetto ai picchi raggiunti alla fine del 2011, ma permangono su livelli storicamente

[8] Le modalità operative delle OMT verranno poi definite dal Consiglio direttivo nella successiva riunione, tenutasi il 6 settembre del 2012; sono descritte in dettaglio nel riquadro: *Le operazioni definitive monetarie della BCE*, in *Bollettino economico*, n. 70, 2012.

[9] Testualmente, nel suo intervento alla Global Investment Conference, tenutasi a Londra il 26 luglio 2012, il Presidente della BCE afferma "*Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough.*".

[10] Le agenzie di rating ridurranno il merito di credito dell'Italia e delle principali banche anche in altre occasioni susseguenti. Complessivamente, dall'inizio della crisi debitoria europea alla fine del 2014, il rating sul debito pubblico italiano è stato abbassato di sei "*notch*" da *Moody's* (da Aa2 a Baa2), di cinque "*notch*" dall'agenzia *Standard&Poor's* (da A+ a BBB-) e di quattro da *Fitch* (da AA- a BBB+).

[11] Le manovre sono descritte nel riquadro: *Le manovre di finanza pubblica approvate nell'estate 2011*, in *Bollettino economico*, n. 66, 2011.

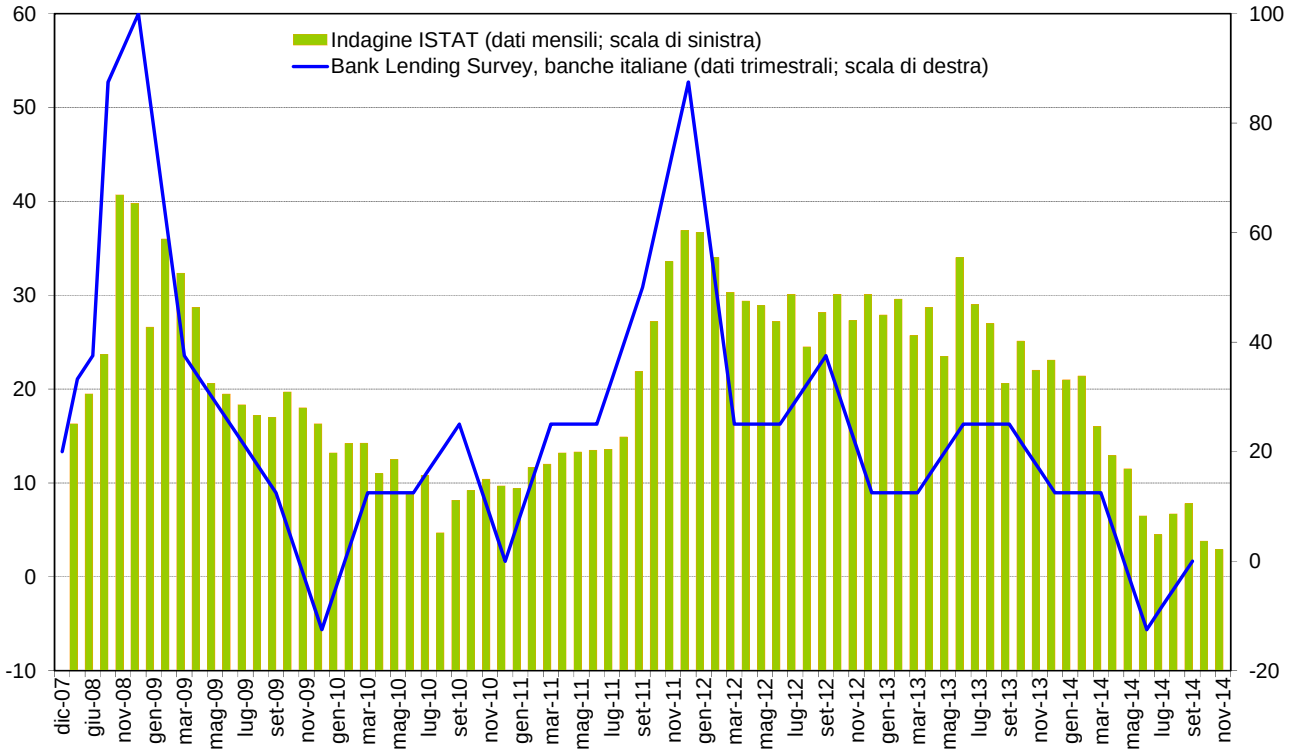
[12] Per maggiori dettagli sui principali provvedimenti del Governo e sulle decisioni dell'Eurogruppo e del Consiglio europeo si rimanda ai riquadri: *La manovra correttiva approvata nel dicembre 2011*, in *Bollettino economico*, n. 67, 2012; *I provvedimenti in materia di liberalizzazioni e semplificazioni*, in *Bollettino economico*, n. 68, 2012; *Le decisioni dell'Euro Summit e del Consiglio Europeo del 28 e 29 giugno 2012*, in *Bollettino Economico*, n. 69, 2012.

elevati. Si accentua la debolezza dell'occupazione e dei redditi reali, nonché la caduta della fiducia delle famiglie, presumibilmente anche per effetto delle manovre di bilancio. Nella media del 2012 il PIL scende del 2,3 per cento, con contrazioni di eccezionale intensità dei consumi (4,1) e degli investimenti (7,5).

La fase recessiva si attenua temporaneamente nell'estate del 2012. Le azioni dell'Eurosistema si traducono in una forte discesa dei rendimenti dei titoli di Stato su tutte le scadenze e di quelli delle obbligazioni emesse da banche e imprese. Si stabilizzano le condizioni di accesso al credito del settore privato, che tuttavia rimangono restrittive.

La discesa dell'attività economica prosegue nella prima metà del 2013, ma a ritmi meno intensi di quelli medi dell'anno precedente. Nei due trimestri successivi il prodotto sostanzialmente ristagna, per poi ridursi ancora lievemente nel corso del 2014. In media d'anno, il PIL diminuisce dell'1,9 per cento nel 2013.

Figura 2. Restrizioni nelle condizioni di accesso al credito



Fonti: Banca d'Italia e ISTAT.

2.3 *Lo scenario controfattuale: scostamenti tra andamenti effettivi e stime pre-crisi*

Al fine di valutare l'impatto della crisi del debito sovrano sul PIL e sulle altre principali variabili macroeconomiche, utilizziamo un approccio controfattuale, nel quale si paragonano gli sviluppi effettivamente osservati con quelli di uno scenario fittizio costruito sulla base dell'ipotesi di assenza di crisi[13]. Gli andamenti controfattuali (e quindi la valutazione degli scostamenti tra questi e quelli osservati) sono stati realizzati con il modello econometrico trimestrale della Banca d'Italia (METBI)[14].

[13] I limiti e le potenzialità di questo tipo di analisi sono discussi in Caivano, Rodano e Siviero (2010).

[14] Il modello contiene circa 800 equazioni, di cui quasi 100 stocastiche, con una descrizione articolata sia del settore privato, sia della finanza pubblica. Nel breve periodo, la dinamica dell'attività economica è determinata dall'evoluzione della domanda aggregata, tenendo conto delle rigidità nei meccanismi di formazione dei prezzi e dei salari; nel lungo

Le principali ipotesi alla base dello scenario controfattuale sono le seguenti: (1) La domanda estera – ponderata per i mercati di sbocco delle esportazioni – cresce di circa il 7% all'anno nel biennio 2012-13, un ritmo in linea con quello medio osservato nel decennio precedente alla crisi finanziaria globale; (2) il tasso di cambio è mantenuto fisso al livello medio osservato tra la fine di giugno e i primi di luglio del 2011, pari a 1,43 dollari per euro; (3) l'andamento dei corsi petroliferi è ricavato dalle quotazioni medie dei contratti futures di quel periodo (113,2 dollari al barile nel 2012 e 110,9 l'anno successivo); (4) l'evoluzione dei tassi di interesse sui titoli di stato italiani riflette le aspettative dei mercati in quel periodo, coerenti con un graduale aumento dei rendimenti sull'orizzonte previsivo e uno spread BTP-BUND pressoché costante, pari a circa 200 punti base per la scadenza decennale; (5) le varie misure di correzione dei conti pubblici disposte a partire dall'estate del 2011 non sono ovviamente incluse. Ulteriori dettagli sulle ipotesi controfattuali in relazione agli andamenti effettivi sono forniti nel paragrafo successivo.

La simulazione controfattuale (tav. 1), costruita con il METBI, è coerente con gli scenari previsivi che erano stati formulati dalle principali organizzazioni internazionali nella primavera del 2011, antecedentemente all'inasprirsi della crisi del debito (l'inizio della *seconda fase* nella ricostruzione qui proposta). In questo scenario la crescita del PIL dell'Italia nel 2012 è pari all'1,1 per cento, in linea con la previsione pubblicata nel *Bollettino economico* della Banca d'Italia di luglio 2011; nel 2013 vi è una ulteriore lieve accelerazione dell'attività economica, all'1,3 per cento.

Tavola 1. Quadro macroeconomico dell'Italia e scenario controfattuale

		Andamenti effettivi				*Scenario Controfattuale*		*Scostamenti*	
		2010	2011	2012	2013	2012	2013	2012	2013
Prodotto interno lordo	(1)	1,7	0,7	-2,3	-1,9	*1,1*	*1,3*	*-3,4*	*-3,2*
Importazioni di beni e servizi	(1)	12,1	1,2	-8,2	-2,6	*4,8*	*4,9*	*-13,0*	*-7,5*
Esportazioni di beni e servizi	(1)	11,3	6,1	1,6	0,9	*5,3*	*5,2*	*-3,7*	*-4,3*
Consumi finali nazionali famiglie	(1)	1,2	0,0	-4,1	-2,7	*0,9*	*1,0*	*-5,0*	*-3,7*
Investimenti fissi lordi	(1)	-0,6	-1,7	-7,5	-5,4	*2,9*	*2,9*	*-10,4*	*-8,3*
IPCA	(1)	1,6	2,9	3,3	1,3	*1,9*	*1,8*	*1,4*	*-0,5*
Competitività export	(1)	5,7	1,2	3,1	-2,9	*-1,4*	*-1,2*	*4,5*	*-1,7*
Saldo di conto corrente B.P./PIL	(2)	-3,5	-3,1	-0,5	1,0	*-3,4*	*-3,0*	*2,9*	*4,0*
Tasso medio BOT a 1 anno	(3)	1,3	3,2	2,3	1,0	*2,4*	*2,8*	*-0,1*	*-1,8*
Tasso medio lordo sui BTP	(3)	3,4	4,9	4,6	3,4	*5,2*	*5,5*	*-0,6*	*-2,1*
Domanda estera ponderata	(1)	10,5	6,0	1,9	2,3	*7,4*	*7,1*	*-5,5*	*-4,8*
Dollaro/euro	(3)	1,33	1,39	1,29	1,33	*1,43*	*1,43*	*-10,4*	*-0,1*
Prezzo del greggio Brent	(3)	79,6	111,0	112,0	108,8	*113,2*	*110,9*	*-1,2*	*-2,1*

(1) Variazioni percentuali.
(2) In rapporto al PIL; valori percentuali.
(3) Medie annue.

Fonti: Istat e elaborazioni Banca d'Italia.

periodo prevalgono i fattori di offerta e la crescita economica è il risultato dell'accumulazione di capitale, della produttività e degli andamenti demografici. Per una descrizione dettagliata della struttura del modello econometrico, si veda Banca d'Italia (1986); una esposizione sintetica di una versione più recente del modello è contenuta in Terlizzese (1994) e in Busetti, Locarno e Monteforte (2005).

Nel complesso, rispetto a questo scenario di assenza di crisi la dinamica effettiva del PIL nel biennio 2012-13 è stata inferiore complessivamente di 6,6 punti percentuali (tav. 1). La crisi si è riflessa prevalentemente in un crollo della domanda interna, con uno scostamento complessivo dal controfattuale pari a 8,7 punti percentuali per i consumi e 19,1 per gli investimenti; sono scese sia le esportazioni, sia - in misura nettamente più accentuata - le importazioni. La forte contrazione delle importazioni, che ha in larga parte riflesso la caduta della domanda interna, ha più che compensato il calo delle vendite all'estero derivante dal rallentamento dello scenario internazionale (pari a oltre 10 punti percentuali per la domanda estera pesata per i mercati di destinazione delle nostre esportazioni), portando a un miglioramento del conto corrente della bilancia dei pagamenti (circa 7 punti percentuali di PIL).

3. Il contributo dei principali fattori

Presentiamo i risultati di alcune simulazioni effettuate con il modello econometrico nelle quali si stima il contributo dei principali fattori responsabili del deterioramento del quadro macroeconomico nel biennio 2012-13. Consideriamo i seguenti fattori: (A) i costi di finanziamento per il settore privato, su cui incide il forte aumento degli spread sui titoli di Stato; (B) la difficoltà di accesso al credito per le imprese, derivante in larga misura dalle tensioni sulla raccolta bancaria all'ingrosso; (C) gli effetti delle manovre di risanamento dei conti pubblici; (D) il peggioramento dello scenario internazionale; (E) i riflessi dell'incertezza e del calo della fiducia di famiglie e imprese. Un aspetto che qui non viene identificato separatamente (ma che è ricompreso nei fattori A e B) è l'effetto delle misure "non convenzionali" di politica monetaria adottate dall'Eurosistema a fronte della crisi [15], che di fatto hanno contribuito a contenere il peggioramento delle condizioni di finanziamento; escludendo tali misure, l'impatto dei fattori (A) e (B) sul PIL risulterebbe decisamente più elevato.

La tavola 2 presenta le nostre stime dell'impatto dei diversi fattori sulle principali variabili macroeconomiche dell'Italia[16]. Per ciascun fattore gli effetti sono calcolati come differenza tra i valori (in termini di tassi di crescita annui) dello scenario controfattuale 'pre-crisi' e quelli di una simulazione alternativa che tiene conto dell'evoluzione effettiva solo di quel fattore, tenendo tutti gli altri sui valori dello scenario controfattuale. I dettagli sul disegno e sui risultati di ciascuna simulazione sono descritti nei paragrafi 3.1-3.5 seguenti. La componente residuale (F) riportata nella tavola coglie la parte non spiegata della scomposizione, riconducibile soprattutto alle variazioni intercorse nelle stime dei parametri del modello e alle revisioni storiche dei dati di contabilità nazionale normalmente effettuate dall'ISTAT.[17]

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[15] Una quantificazione e un'analisi approfondita di questo tema sono in "*Unconventional Monetary Policy, Credit Conditions and the Macroeconomy: A Focus on Italy 2011-12*" di Casiraghi, Gaiotti, Rodano e Secchi (2013).

[16] Questo tipo di scomposizione, per il PIL, è stato presentato in *Bollettino economico*, n. 71, 2013.

[17] I risultati per le principali variabili macroeconomiche nello scenario controfattuale (riga 'O' della tavola 2) e in quello effettivo (riga 'G') possono essere rappresentati dalla seguente relazione 'in forma ridotta'

$$y_t^i = f^i\left(y_{t-1}^i,...,y_{t-k}^i, x_t^i, \varepsilon_t^i, \vartheta^i\right), \quad i = O,G$$

in cui y_t^i sono le variabili 'endogene' del modello, x_t^i le variabili 'indipendenti' (o 'esogene' ai fini previsivi), ε_t^i gli *shock* e ϑ^i i parametri stimati della funzione f^i. I due scenari differiscono anche quanto alla forma funzionale e alle stime dei parametri dei modelli utilizzati: ciò è segnalato dal fatto che sia f sia ϑ sono differenziati sulla base dell'indice *i*. Inoltre, i dati storici di contabilità nazionale, $y_{t-1}^i,...,y_{t-k}^i$, utilizzati nella costruzione dello scenario controfattuale sono stati successivamente rivisti dall'ISTAT. La tavola contiene la disaggregazione dello scostamento complessivo tra i due scenari, $y_t^G - y_t^O$, nei contributi forniti dalle principali determinanti (A, B, C, D, E), ciascuna delle quali corrisponde a una variazione di un sottoinsieme di variabili esogene, $x_t^G - x_t^O$, o di *shock*, $\varepsilon_t^G - \varepsilon_t^O$. La

Tavola 2. Contributo dei fattori di crisi alla recessione del 2012-13

	PIL		Consumi		Investimenti		Esportazioni		Importazioni		IPCA	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
O. Scenario controfattuale	**1,1**	**1,3**	**0,9**	**1,0**	**2,9**	**2,9**	**5,3**	**5,2**	**4,8**	**4,9**	**1,9**	**1,8**
A. Tassi di interesse	-0,4	-0,1	-0,2	0,0	-2,9	-0,8	0,0	0,1	-1,2	0,2	0,0	0,0
di cui: spread sovrani	-0,8	-0,5	-0,7	-0,5	-3,7	-1,9	0,0	0,1	-1,5	-0,5	0,0	-0,1
B. Accesso al credito	-0,6	-0,4	-0,6	-0,4	-4,9	-3,0	0,0	0,0	-2,5	-1,0	0,0	-0,1
C. Finanza pubblica	-1,1	-1,2	-1,9	-1,9	-1,5	-1,8	0,0	0,0	-1,8	-1,6	0,8	0,0
D. Scenario internazionale	-0,7	-1,2	-0,5	-0,5	-0,9	-1,8	-3,8	-5,0	-3,7	-4,6	0,6	-0,2
E. Incertezza e fiducia	-0,6	-0,3	-1,6	-0,5	-1,4	-1,1	-0,1	0,0	-1,5	-0,6	0,0	-0,1
F. Componente residuale	0,0	0,0	-0,2	-0,4	1,2	0,2	0,2	0,6	-2,3	0,1	0,0	-0,1
G. Andamenti effettivi* (G=O+A+B+C+D+E+F)	**-2,3**	**-1,9**	**-4,1**	**-2,7**	**-7,5**	**-5,4**	**1,6**	**0,9**	**-8,2**	**-2,6**	**3,3**	**1,3**
Scostamenti complessivi (G-O)	-3,4	-3,2	-5,0	-3,7	-10,4	-8,3	-3,7	-4,3	-13,0	-7,5	1,4	-0,5

Fonte: Elaborazioni Banca d'Italia.

In sintesi, alla recessione del biennio 2012-13 avrebbero contribuito in misura sostanziale non solo le condizioni di finanziamento dell'economia (A+B) e le misure restrittive di bilancio (C) indotte dall'estendersi della crisi all'economia italiana, ma anche gli effetti del deterioramento dello scenario internazionale (D) che avrebbe sottratto quasi 2 punti percentuali di crescita del PIL nel biennio; si stima inoltre un contributo non trascurabile, soprattutto nel 2012, derivante dall'incertezza e dal calo della fiducia di famiglie e imprese. Tra le componenti della domanda aggregata, gli investimenti sarebbero frenati in misura considerevole (11,6 punti percentuali nel biennio) dal peggioramento delle condizioni di finanziamento, mentre la discesa dei consumi delle famiglie rifletterebbe principalmente l'impatto sul reddito disponibile delle manovre di finanza pubblica e gli effetti dell'incertezza e del calo della fiducia sulle decisioni di spesa (complessivamente per quasi 6 punti percentuali). Sul calo delle esportazioni peserebbe il simultaneo rallentamento degli scambi mondiali (D); la più marcata contrazione delle importazioni sarebbe invece attribuibile sia ai fattori 'interni' di crisi (A+B+C+E) sia agli effetti recessivi del peggioramento dello scenario internazionale (D).

La scomposizione presentata nella tavola è indicativa e va comunque valutata con cautela. Nella realtà i diversi fattori di rischio qui considerati come indipendenti possono invece essere in larga misura tra loro correlati. In particolare, parte del deterioramento della fiducia e dell'aumento dell'incertezza potrebbe essere *indirettamente* attribuibile al consolidamento fiscale, così come una quota del rallentamento del commercio internazionale, dal momento che politiche di bilancio

scomposizione è in grado di spiegare quasi completamente lo scostamento del PIL e dell'inflazione tra i due scenari. Le discrepanze (F) che si osservano per alcune componenti del PIL sono riconducibili a tre ordini di motivi: (i) il modello è cambiato tra il luglio del 2011 (quando venne realizzato lo scenario 'O') e oggi; riportando tutte le variabili esogene e tutti gli *shock* ai valori di allora, i risultati per le variabili endogene non sono necessariamente gli stessi; (ii) il modello è nonlineare, cosicché la somma dei contributi delle varie determinanti degli scostamenti tra i due scenari non è necessariamente pari allo scostamento complessivo; (iii) le osservazioni passate delle variabili endogene, $y^i_{t-1},...,y^i_{t-k}$, non sono oggi le stesse di quelle disponibili a luglio 2011 a seguito delle periodiche revisioni dei dati operate dall'ISTAT; in alcuni casi tali variazioni sono cospicue. Tale fattore rileva soprattutto per la scomposizione della dinamica nel 2012. In termini generali l'impatto delle revisioni dei dati di contabilità nazionale sugli errori di previsione dei modelli econometrici è analizzato in Busetti (2006).

restrittive sono state perseguite simultaneamente in più paesi. D'altro canto le manovre di consolidamento fiscale, a fronte dei loro effetti *diretti* riportati nella tavola, hanno verosimilmente contribuito a evitare ulteriori aumenti degli spread e delle condizioni restrittive di offerta del credito, i cui costi in termini di PIL sarebbero stati più elevati di quanto effettivamente osservato.

3.1. I tassi di interesse e gli spread sovrani

Nello scenario controfattuale l'evoluzione dei tassi di interesse sui titoli di stato italiani riflette le aspettative dei mercati tra la fine di giugno e i primi di luglio del 2011, quando gli investitori anticipavano un graduale aumento dei rendimenti sull'orizzonte previsivo (circa 130 punti base per i BTP a medio-lungo termine, quasi 100 per i BOT a un anno) e uno spread BTP-BUND pressoché costante e pari a circa 200 punti base per la scadenza decennale. La figura 3 riporta le differenze tra gli andamenti effettivamente osservati[18] e le ipotesi dello scenario controfattuale sui tassi di interesse sui titoli di stato. Rispetto al controfattuale, il brusco inasprimento dei rendimenti delle obbligazioni sovrane alla fine del 2011 viene sostanzialmente annullato nel corso del 2012; nel 2013 i tassi di interesse sono inferiori a quelli attesi dai mercati immediatamente prima dello scoppio della crisi, per effetto della sostanziale espansione monetaria.

Si stima che questo andamento dei tassi di interesse abbia avuto un impatto sulla crescita del PIL pari a -0,4 punti percentuali nel 2012 e -0,1 nel 2013, riconducibile principalmente agli effetti sulle scelte di investimento delle imprese; solo per questo canale l'accumulazione di capitale si sarebbe ridotta, complessivamente, di circa il 4 per cento nel biennio. Nonostante spread molto più elevati rispetto allo scenario controfattuale, l'impatto sul PIL di questo fattore è relativamente contenuto, a seguito del forte allentamento della politica monetaria a fronte della crisi[19]; la componente derivante soltanto dall'aumento degli spread sovrani avrebbe contribuito, complessivamente, per ben 1,3 punti percentuali alla diminuzione del PIL nel biennio 2012-13.

3.2. Le condizioni di accesso al credito

In questo paragrafo forniamo una stima dell'impatto sull'attività economica dei vincoli all'offerta di credito osservati nell'ultimo biennio, che sono evidenziati sia dalle rilevazioni dell'indagine sul credito bancario (*Bank Lending Survey*, BLS)[20] sia dai sondaggi congiunturali condotti dall'ISTAT presso le imprese (fig. 2).

L'identificazione di restrizioni nell'offerta di credito non è un compito agevole, in quanto i dati osservati sull'andamento dei prestiti riflettono semplicemente gli importi erogati. Utilizziamo la metodologia descritta in Caivano, Rodano e Siviero (2010), basata sull'ipotesi che esista una relazione positiva tra l'andamento del differenziale tra il tasso di interesse medio sui prestiti bancari

[18] Con l'estendersi della crisi all'economia italiana nella seconda metà del 2011 i rendimenti dei titoli di stato sono rapidamente aumentati, in media di circa 200 punti base sulle scadenze a medio lungo termine e 300 per quelle più brevi; a novembre lo spread BTP-BUND sul titolo decennale ha raggiunto il picco di 550 punti base. Le pressioni sui nostri titoli di Stato si sono fortemente ridimensionate nel corso del 2012, principalmente per effetto delle misure non convenzionali di politica monetaria della BCE, delle manovre di risanamento dei conti pubblici e delle riforme strutturali del governo Monti, nonché dei progressi nella riforma dell'architettura europea.

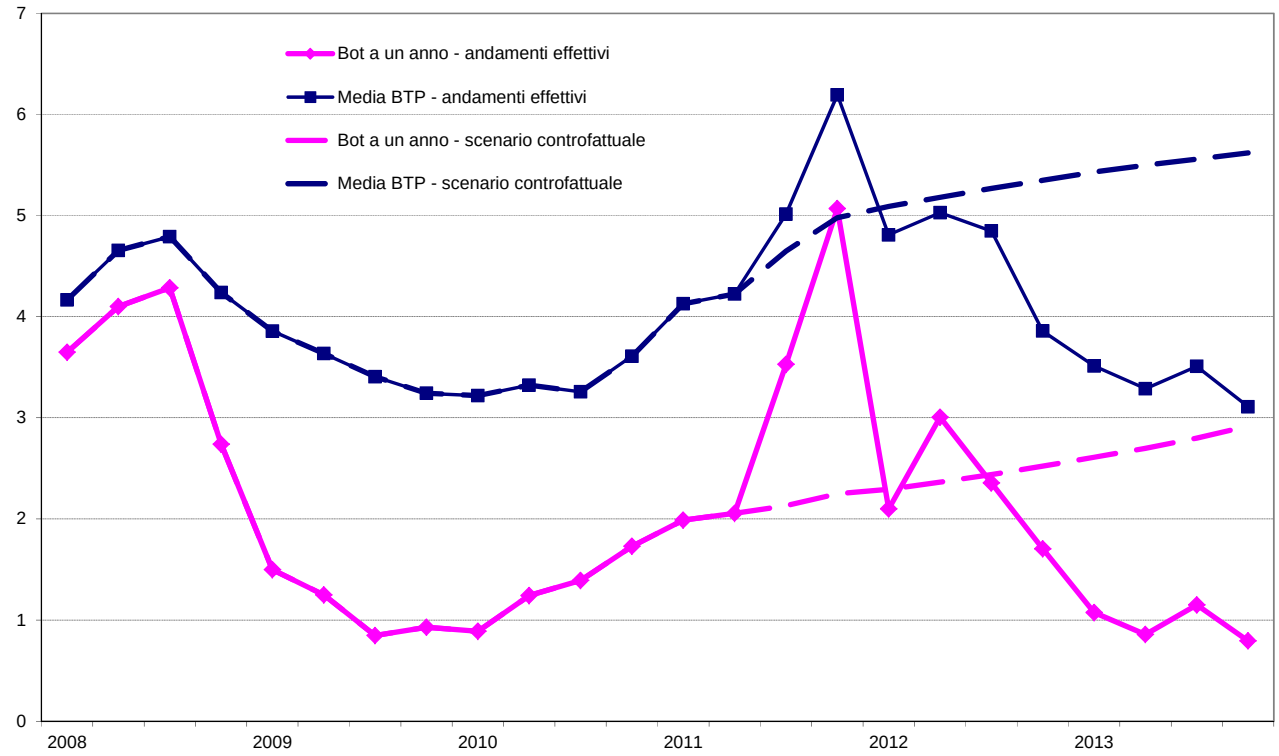
[19] Tra il luglio del 2011, periodo di riferimento per le ipotesi alla base dello scenario controfattuale, e lo stesso mese del 2013, il tasso sulle operazioni di rifinanziamento marginale presso l'Eurosistema è stato ridotto complessivamente di 100 punti base, allo 0,5 per cento. La politica monetaria ha inoltre contribuito a sostenere l'attività economica dell'area dell'euro attraverso misure non convenzionali (SMP, LTRO e OMT); gli effetti di queste misure, che hanno contrastato l'inasprimento delle restrizioni all'erogazione del credito, non sono quantificati separatamente in questo lavoro; per una loro valutazione si rimanda a Casiraghi, Gaiotti, Rodano e Secchi (2013).

[20] I risultati dell'indagine trimestrale sul credito bancario sono normalmente commentati all'interno del *Bollettino economico* della Banca d'Italia; si veda ad esempio il riquadro: *L'offerta e la domanda di credito in Italia,* in *Bollettino economico*, n. 73, 2013.

a breve termine e il tasso di interesse *overnight* sul mercato monetario e l'eventuale eccesso (non osservabile) di domanda di prestiti. Un modello di questo tipo fornisce una stima della discrepanza tra domanda e quantità effettivamente erogate e sull'osservazione di condizioni di disequilibrio nel mercato del credito, identificate sulla base delle indicazioni della BLS. La restrizione nella concessione dei prestiti così stimata viene successivamente inserita tra le variabili esplicative dell'equazione degli investimenti, e tramite questa influenza l'andamento dell'attività economica.

Si valuta che il deterioramento delle condizioni di accesso al credito abbia sottratto complessivamente 1 punto percentuale alla crescita del PIL nel biennio 2012-13. Questi effetti, di entità considerevole, appaiono tuttavia coerenti con il forte inasprimento degli indicatori di restrizione delle politiche di offerta dei prestiti; per ulteriori evidenze, basate su dati microeconomici, si rimanda allo studio di Del Giovane, Nobili e Signoretti (2013). Tra le componenti della domanda aggregata la contrazione riguarderebbe in modo particolare gli investimenti, che per questa via risulterebbero inferiori di circa l'8 per cento (quasi la metà della riduzione complessiva). I consumi delle famiglie scenderebbero in modo meno marcato, dell'1 per cento. Questi effetti dei vincoli all'offerta di credito risultano maggiormente persistenti e nel complesso più pronunciati rispetto a quanto stimato in Caivano, Rodano e Siviero (2010) per la recessione del 2008-09, come risulta dal confronto tra le due crisi (cfr. sezione 4).

Figura 3. Tassi di interesse sui titoli di stato
(valori percentuali; dati trimestrali)



Fonte: Banca d'Italia.

3.3. Le manovre di finanza pubblica

L'impatto sull'attività economica delle manovre di finanza pubblica è stato calcolato attraverso una simulazione controfattuale in cui si è ipotizzato che non abbiano avuto luogo le misure di correzione dei conti pubblici approvate a partire dall'estate del 2011. Tali misure ammontano

complessivamente a circa il 3 per cento del PIL per il 2012 e a un ulteriore 1,5 per cento l'anno successivo.[21]

Secondo le nostre valutazioni le misure di bilancio avrebbero sottratto oltre un punto percentuale alla crescita del PIL sia nel 2012 sia nel 2013. La composizione delle manovre si sarebbe tradotta in una forte decurtazione del reddito disponibile e quindi dei consumi delle famiglie, che solo per questa via sarebbero diminuiti cumulativamente di circa il 4 per cento nel biennio 2012-13 (quasi la metà della contrazione complessiva); alla riduzione del potere d'acquisto avrebbero contribuito anche gli aumenti dell'imposizione indiretta disposti dalle manovre, con un impatto di circa un punto percentuale sull'inflazione misurata con l'Indice dei Prezzi al Consumo Armonizzato (IPCA). Ne avrebbero risentito anche gli investimenti privati.

Le nostre stime, data questa composizione delle manovre, implicano un moltiplicatore fiscale[22] pari a circa 0,35 nel primo anno e 0,6 nei primi due anni. E' noto che il valore del moltiplicatore fiscale non è un parametro fisso nei modelli econometrici, ma dipende da diversi fattori, tra i quali la natura delle misure di bilancio, la fase ciclica, la reazione della politica monetaria, i vincoli di liquidità cui è soggetto il settore privato. E' stato argomentato di recente, ed enfatizzato da economisti del Fondo Monetario Internazionale (Blanchard e Leigh, 2013), che misure di consolidamento fiscale adottate in condizioni di spiccata debolezza dell'attività economica, e simultaneamente in più paesi, possano avere effetti sulla crescita assai più elevati di quelli medi desumibili dagli andamenti passati, traducendosi in un moltiplicatore fiscale di molto superiore all'unità. Le nostre valutazioni non danno un forte sostegno a questa tesi. Nell'esercizio qui proposto, in cui si tiene conto di tutti i principali fattori responsabili della debolezza dell'attività economica nel biennio 2012-13, i valori prossimi a zero della componente residuale non sembrano infatti suggerire scostamenti molto pronunciati del moltiplicatore fiscale rispetto alle nostre stime[23]. Anche tenendo conto di possibili interrelazioni tra i fattori, e quindi per esempio ammettendo che una parte degli effetti sul PIL dell'incertezza e della fiducia delle famiglie sia attribuibile alle misure di riequilibrio dei conti pubblici, i valori risultanti del moltiplicatore fiscale rimarrebbero relativamente contenuti. D'altro canto – come precedentemente ricordato – le manovre di consolidamento fiscale, a fronte dei loro effetti diretti qui stimati, hanno verosimilmente contribuito a evitare ulteriori aumenti degli spread e delle condizioni restrittive di offerta del credito, i cui costi in termini di PIL sarebbero stati più elevati.

3.4. Lo scenario internazionale

Anche per effetto dell'estendersi della crisi del debito, l'evoluzione dell'economia mondiale si è rivelata assai meno favorevole di quanto prefigurato nella primavera del 2011 e nello scenario controfattuale.[24] La crescita della domanda estera nel biennio 2012-13 è stata in media inferiore al 2 per cento all'anno, complessivamente oltre 10 punti percentuali in meno rispetto allo scenario controfattuale (Tav. 1 e fig. 4). La debolezza dell'area dell'euro si è riflessa in un forte deprezzamento del cambio (in media pari a circa l'8 per cento nei confronti del dollaro nel biennio, 3 per cento in termini effettivi) che ha sostenuto la competitività delle nostre esportazioni,

[21] I dettagli sulla composizione di queste manovre sono riportati in *Bollettino economico*, n. 67, 2012 e in *Bollettino economico*, n. 69, 2012; ulteriori valutazioni sono contenute nell'audizione preliminare all'esame della legge di stabilità del 2013, disponibile all'indirizzo internet http://www.bancaditalia.it/interventi/intaltri_mdir/Audizione-Legge-stabilita-2013.pdf.

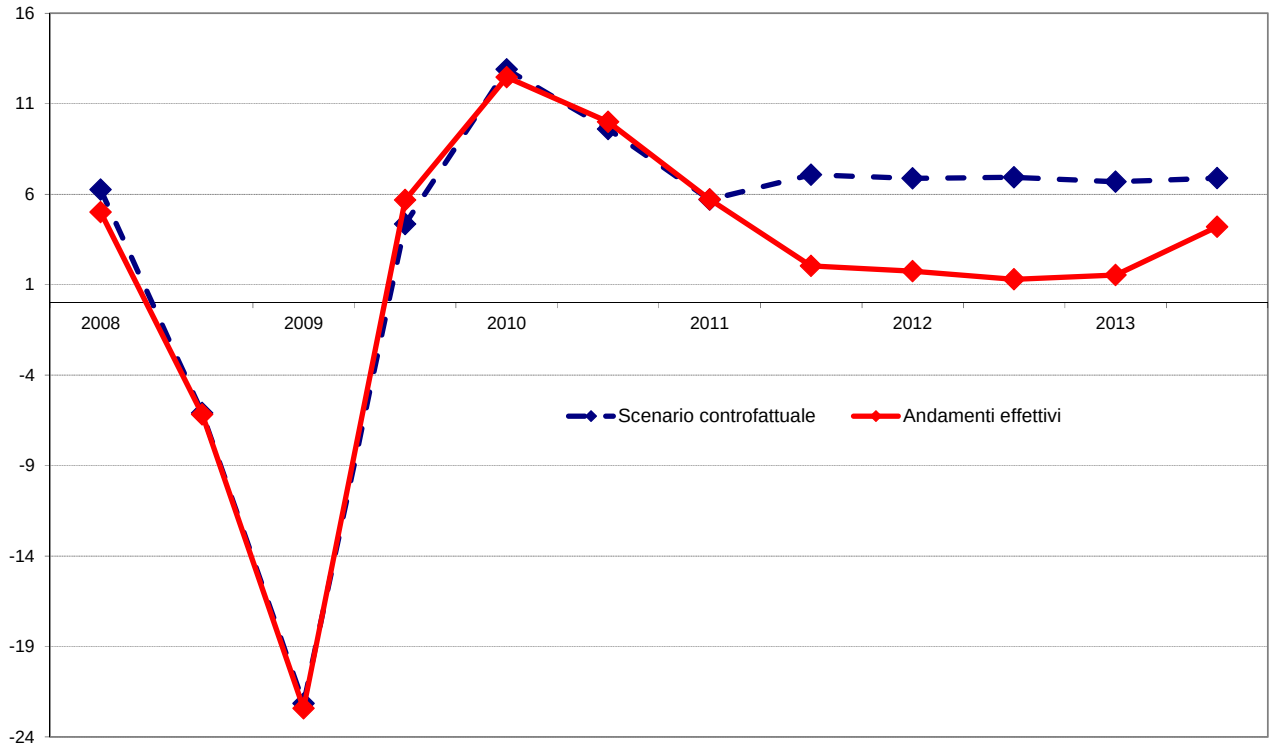
[22] Definito come l'effetto cumulato sul livello del PIL di un miglioramento permanente del saldo del bilancio pubblico di un punto percentuale del PIL.

[23] La parte non spiegata della scomposizione, pressoché nulla per il PIL, ha tuttavia un rilievo maggiore per le componenti della domanda e per le importazioni, sebbene gli effetti tendano a compensarsi.

[24] Al peggioramento dello scenario internazionale ha inoltre contribuito l'incertezza in merito alla politica di bilancio negli Stati Uniti e all'evoluzione della domanda nei paesi emergenti, dove si è assistito a un diffuso rallentamento dell'attività dalla seconda metà del 2012.

compensando parzialmente gli effetti della minore domanda. Le quotazioni dei prodotti energetici, pur non discostandosi significativamente in dollari dalle ipotesi controfattuali, hanno avuto effetti macroeconomici non trascurabili per via del deprezzamento dell'euro.

Figura 4. Crescita della domanda estera
(valori percentuali; tassi di crescita semestrali annualizzati)



Fonte: Elaborazioni Banca d'Italia.

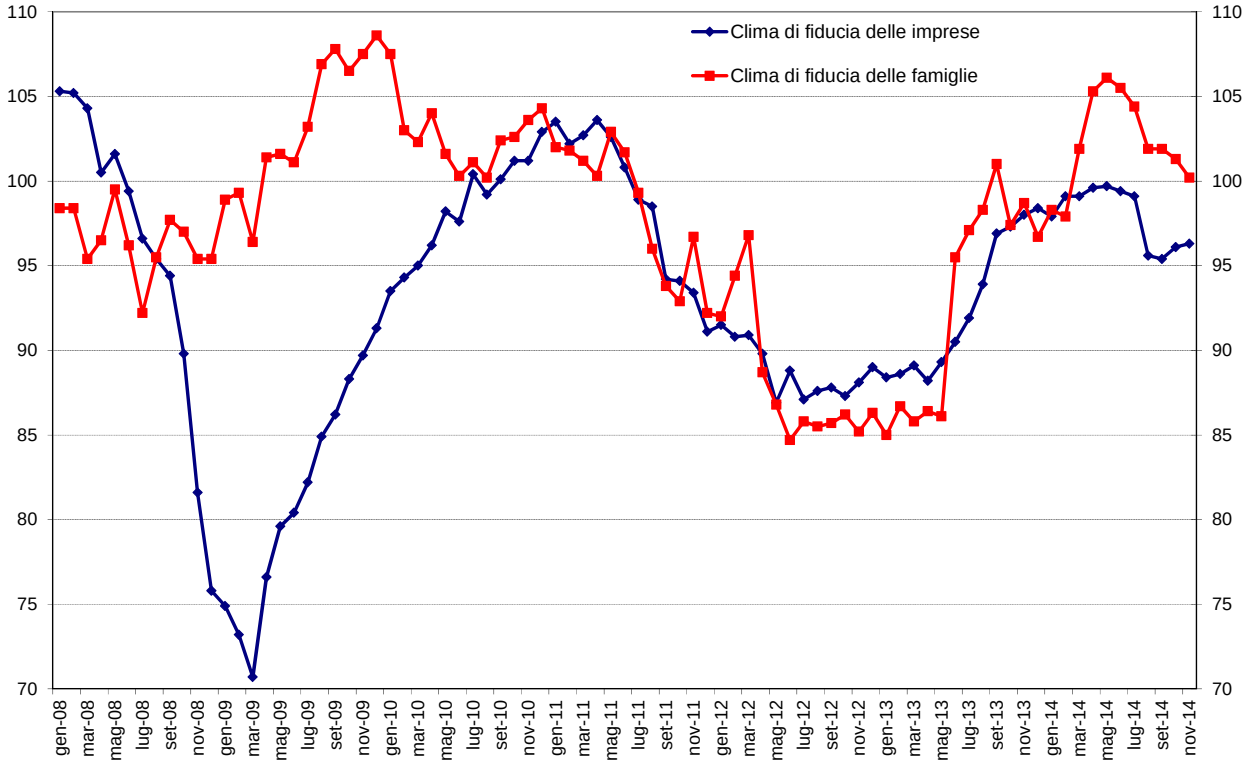
Il rallentamento internazionale ha avuto un impatto rilevante sulla dinamica recessiva dell'economia italiana, sottraendo 0,7 punti percentuali di crescita del PIL nel 2012 e 1,2 nel 2013. Rispetto al controfattuale le esportazioni sono diminuite di quasi il 9 per cento nel biennio, meno della domanda estera, grazie ai guadagni di competitività associati al deprezzamento dell'euro. Quest'ultimo si è inoltre riflesso in un aumento dei prezzi, complessivamente pari allo 0,4 per cento, e una conseguente decurtazione della capacità di spesa e dei consumi delle famiglie. Anche le importazioni si sono contratte a un ritmo significativo, simile a quello delle vendite all'estero.

3.5. L'incertezza e la fiducia di famiglie e imprese

L'estendersi della crisi del debito all'economia italiana ha alimentato un clima di diffusa incertezza tra famiglie e imprese, che ha verosimilmente generato una maggiore cautela nelle decisioni di spesa, non spiegata dall'evoluzione delle variabili cosiddette 'fondamentali'. Le rilevazioni dell'ISTAT sul clima di fiducia di famiglie e imprese mostrano un deterioramento nella seconda parte del 2011, che prosegue l'anno dopo, con miglioramenti di poco conto fino all'estate del 2013 (fig. 5).

Figura 5. Clima di fiducia delle famiglie e delle imprese

(indici mensili)



Fonte: Istat.

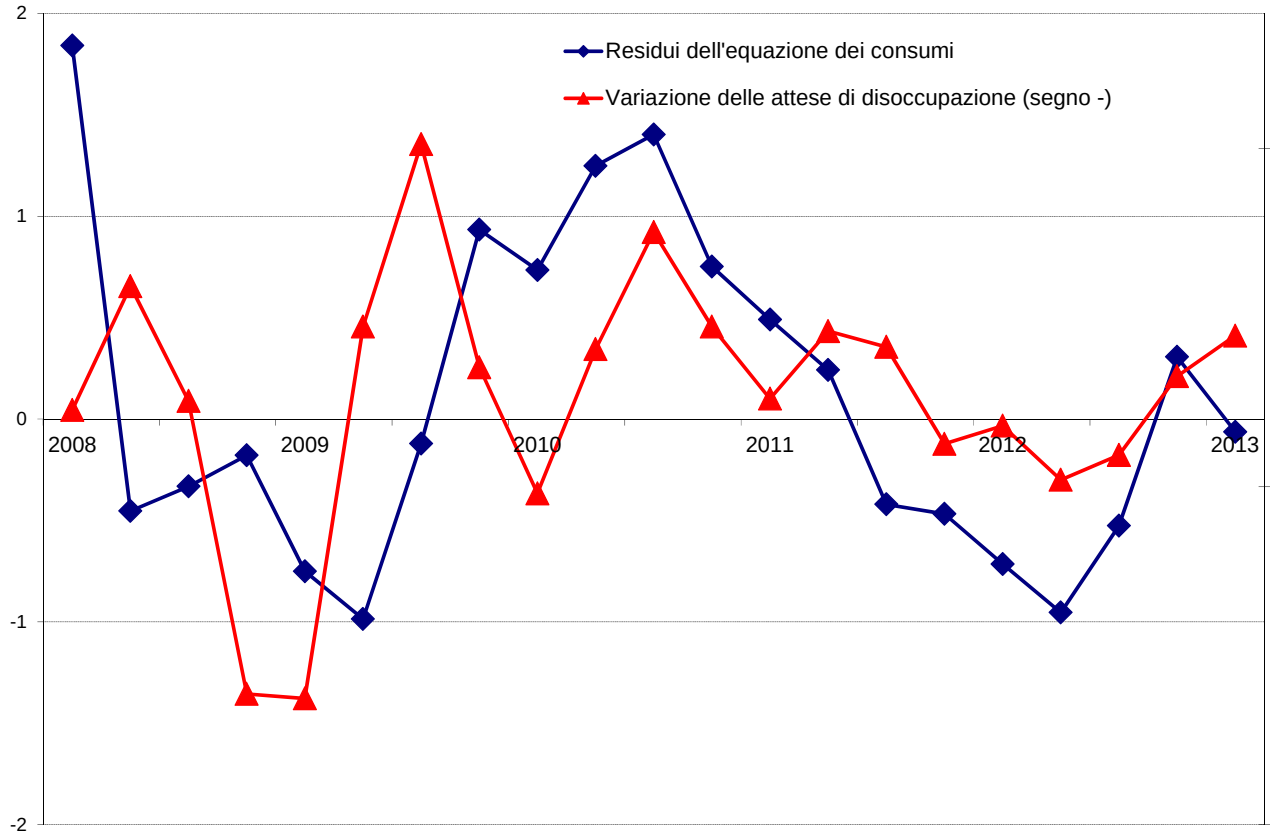
Le equazioni del modello econometrico che descrivono le decisioni di spesa delle famiglie non includono tra le variabili esplicative indicatori qualitativi di fiducia. Per valutare l'impatto macroeconomico di questo fattore nel biennio 2012-13 si è fatto ricorso a una equazione ausiliaria, che mette in relazione i residui dell'equazione del consumo del modello econometrico con una componente dell'indicatore di fiducia dell'ISTAT, le attese di disoccupazione, come *proxy* dell'incertezza sul mercato del lavoro. La figura 6 mostra che negli ultimi anni vi è stata una stretta relazione tra le variabili: la parte non spiegata dei movimenti dei consumi – i residui dell'equazione del modello econometrico – si è mossa nella stessa direzione della variazione nelle attese di disoccupazione. Nel 2012, durante la fase più acuta della crisi del debito sovrano, a dei residui negativi (una sovrastima dei consumi[25]) ha corrisposto un marcato peggioramento delle attese di disoccupazione. Sfruttando questa correlazione è stato valutato l'effetto dell'incertezza e della fiducia sulle decisioni di spesa delle famiglie.

La fiducia delle imprese è invece una delle determinanti (di breve periodo) dell'equazione degli investimenti in attrezzature, macchinari e mezzi di trasporto del modello econometrico[26]; nello scenario controfattuale si presupponeva un graduale miglioramento della fiducia nel biennio 2012-13, coerente con le prospettive di consolidamento della ripresa ciclica in assenza di crisi.

[25] Un residuo negativo si ottiene allorquando le variabili esplicative dei consumi – i regressori – non sono in grado di "spiegare" per intero il livello osservato dei consumi. In altre parole, tenendo solo conto dei regressori, si otterrebbe un livello stimato dei consumi superiore rispetto a quello effettivamente osservato.

[26] Nel modello gli investimenti fissi lordi sono suddivisi tra investimenti in attrezzature, macchinari e mezzi di trasporto e investimenti in costruzioni.

Figura 6. Equazione dei consumi e attese di disoccupazione



Fonte: Elaborazioni Banca d'Italia.

Nel complesso si stima che l'incertezza e il calo della fiducia di famiglie e imprese abbiano avuto un impatto non trascurabile sull'andamento dell'attività economica, sottraendo alla crescita del PIL 0,6 punti percentuali di crescita di PIL nel 2012 e 0,3 nel 2013. L'effetto sarebbe prevalentemente riconducibile ai consumi delle famiglie (-2,1 per cento nel biennio, circa un quarto della riduzione complessiva dovuta alla crisi), che avrebbero tenuto un atteggiamento di maggiore cautela nelle decisioni di spesa a fronte dell'aumentata incertezza. Il peggioramento della fiducia e delle prospettive di domanda avrebbe inoltre scoraggiato l'accumulazione di capitale, anche se in misura meno rilevante rispetto agli altri fattori di crisi.

4. Un confronto con la recessione del 2008-09

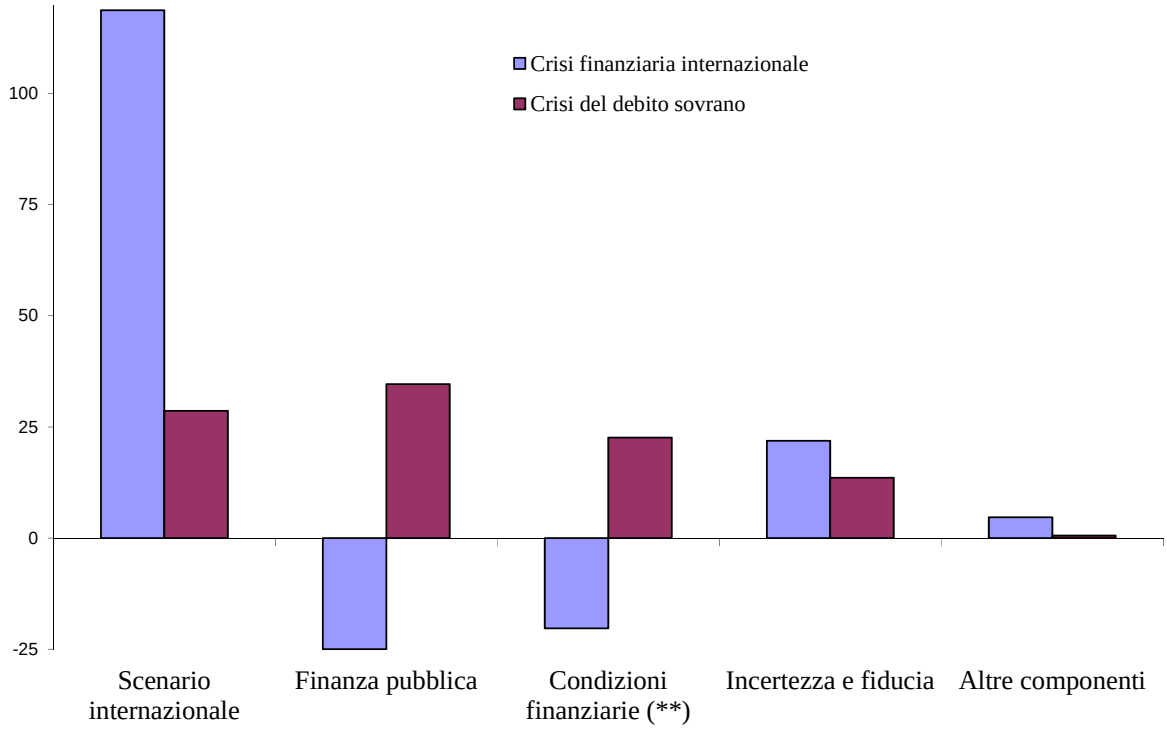
Un esercizio simile a quello qui proposto era stato realizzato da Caivano, Rodano e Siviero (2010) in occasione della crisi finanziaria internazionale. I risultati, in termini di contributi percentuali alla perdita complessiva di prodotto, sono riportati sinteticamente nella figura 7 e confrontati con le nostre stime relative al biennio 2012-13.

La figura mostra che la precedente recessione è stata per lo più riconducibile all'evoluzione dello scenario internazionale e, in particolare, al crollo eccezionale degli scambi mondiali a cavallo tra la fine del 2008 e l'inizio del 2009. Si è trattato, di fatto, di una crisi "importata". Rispetto a uno scenario di "assenza di crisi", la componente estera spiegherebbe oltre il 100 per cento della perdita di PIL. Un contributo negativo non trascurabile (circa il 20 per cento) proverrebbe inoltre dall'incertezza e dal calo della fiducia, in particolare quella delle imprese, scesa a livelli storicamente minimi. Tuttavia, in quell'occasione, un sostegno parziale alla dinamica del PIL è provenuto sia dalle manovre di finanza pubblica (attraverso un'estensione dell'ambito di copertura

degli ammortizzatori sociali e interventi discrezionali a sostegno dei consumi e degli investimenti) sia dalle condizioni finanziarie. Su queste ultime ha inciso negativamente l'inasprimento dei vincoli all'offerta di credito, che però è stato più che compensato dalla reazione della politica monetaria, che in pochi mesi ha ridotto di 3,25 punti percentuali il tasso di interesse di *policy* e ampliato l'offerta di liquidità attraverso misure non convenzionali (cfr. ad esempio Cecioni, Ferrero e Secchi, 2011).

Nell'ultima recessione, invece, tutti i fattori rappresentati in figura hanno contribuito nella stessa direzione alla più debole dinamica del PIL. Anche in questo caso la politica monetaria ha reagito con forza alla crisi, ma non ha del tutto compensato l'aumento degli spread sovrani e l'inasprirsi delle condizioni di offerta di credito. Nel complesso, tra il 2011 e 2013 la discesa dell'attività economica è stata prevalentemente attribuibile a fattori di origine interna, che hanno compresso la domanda delle famiglie e le prospettive di investimento delle imprese, anche se il rallentamento dello scenario internazionale ha in ogni caso fornito un contributo non trascurabile, pari a circa il 30 per cento del totale.

Figura 7. Contributi percentuali alle recessioni del 2008-09 e 2012-13 (*)



(*) La somma algebrica delle barre relative a ciascuna recessione è uguale a 100.
(**) Comprende anche gli effetti degli interventi di politica monetaria.

Fonte: Elaborazioni Banca d'Italia.

5. Conclusioni

I risultati presentati in questo lavoro suggeriscono che il deterioramento dell'attività produttiva verificatosi nel corso della crisi del debito sovrano - innescato dall'insorgere di timori circa la tenuta stessa dell'unione monetaria - è stato aggravato dalle debolezze strutturali dell'economia italiana: un basso potenziale di crescita mina la sostenibilità del debito pubblico e aumenta la

percezione del rischio da parte dei mercati finanziari; squilibri di finanza pubblica aumentano i costi di approvvigionamento delle banche e riducono la quantità di credito a disposizione dell'economia; livelli eccessivi di pressione fiscale diminuiscono la competitività delle imprese e la capacità di spesa delle famiglie. La risposta alla crisi del debito sovrano ha richiesto l'accelerazione del processo di riforma e il consolidamento fiscale nel nostro paese, ma ha anche portato a ridisegnare l'architettura istituzionale dell'unione europea.

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Recent Trends of Industrial Production in the Euro Area Major Countries*

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Abstract

This paper evaluates the dynamics of industrial production in Italy since the start of the financial crisis in 2008, both at the aggregate and sector level, focusing on the main differences observed with respect to France and Germany. We find that the severe decline experienced by the Italian industrial output, in particular since the sovereign debt crisis, has been almost completely driven by a deep compression in internal demand. Furthermore, the mild recovery in activity that was starting to materialize in the summer of 2013 came to a halt a year later in all the three major Euro area economies, again on the backdrop of continuous weakness in internal demand. We estimate a FAVAR model to quantify the reaction of production in specific sectors to the different structural shocks that hit the Euro area during the double dip crisis. We show that sovereign risk shocks have been (*i*) a non-negligible source of economic fluctuations in the euro area, exerting a strong impact on loans to non-financial corporations, and (*ii*) the main driver for the deeper decline of manufacturing production in Italy compared to Germany and France.

JEL classification: C32, E32, F34.

Keywords: Industrial Production; Global Financial Crisis; Sovereign Debt Crisis; Heterogeneity; FAVAR.

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1 Introduction

In the last six years industrial production in Italy has registered a strong contraction, unprecedented for intensity and length since the Second World War. This work analyzes the evolution of industrial activity in Italy by sector, focusing on different sub-periods, in particular the Global Financial Crisis (GFC) and the Sovereign Debt Crisis (SDC). In doing so the dynamics of Italian production is compared with that of France and Germany. In a first step, we provide descriptive evidence on the stylized facts that characterized the two temporal horizons mentioned above. We then provide formal evidence of the reaction of industrial sectors to the shocks that hit the Euro area (EA), comparing their behavior across countries. The main results of the first part are the following. While the GFC, that spurred a collapse in international trade, had a similar impact on the industrial output of the three considered countries, the SDC that erupted in the summer of 2011 weighted mainly on Italy, through a severe drop in internal demand caused by both credit and fiscal restrictions as a reaction by banks and the Government to the increase in sovereign risk. The more traditional "Made in Italy" sectors, which became progressively more dependent on internal demand, registered considerable losses of production, while high value-added sectors like chemicals and pharmaceuticals suffered relatively less. Transport equipment goods, that sustained Germany's activity to a great extent, declined dramatically in Italy and currently represent one of the weakest sectors of Italian production in comparison with its main European partners.

In order to establish econometric evidence and some causal linkages, in the second part of the paper we evaluate the dynamic response of industrial sectors to the most important shocks responsible for the two crises by estimating a Factor Augmented VAR model (FAVAR; Bernanke et al. (2005); Forni et al. (2009)) including monthly macroeconomic variables and factors estimated on the set of industry–specific sectors. The FAVAR approach looks suitable for our research aims because industrial activity in Italy, Germany and France displays a reasonable degree of comovement (see Figure 1a), while still allowing for idiosyncratic developments within countries, i.e. across sectors (Figure 1b). Indeed, while the pairwise correlation between the three indices on the sample 1995:1 – 2014:1 is roughly equal to 0.75, the same statistics computed across sectors and across countries falls in a range between 0.15 and 0.90.

On the basis of standard identification techniques, our results show that the Global Financial Crisis produced transitory effects on the EA economy and overall similar effects across the three major countries. By contrast, the SDC displayed a larger impact on the dynamics of the Eurozone, by severely and persistently reducing loans to non-financial corporations. Furthermore, it induced a divergent dynamics between Italy, that suffered a deep ad prolonged downturn, and France and Germany, that were relatively untouched by the crisis.

The remainder of the paper is organized as follows. In Section 2 we highlight some stylized facts on the evolution of industrial activity in France, Germany and Italy over the last six years. Section 3 briefly sketches the econometric approach adopted to evaluate the dynamic reaction to the crises, while Section 4 presents the main results of our analysis. Section 5 concludes.

2 Stylized Facts

The Italian industrial production index has decreased by 24% in the period between January 2008 and August 2014, against a fall of 15% in France and 6% in Germany. The overall period can be divided into four main phases. The first one coincided with the GFC and was characterized by a substantial drop in industrial output (2008m1-2009m4); it was followed by a temporary recovery (2009m4-2011m8) which ended abruptly into the SDC (2011m8-2013m7). Economic activity has since stagnated in all the three major Euro area economies around levels comparable to those of one year ago and it is still threatened by a number of downside risks. In order to analyze the dynamics of the domestic and foreign components of activity, we have looked at the industrial turnover index deflated by the producers price's index. During the GFC, Italy's and Germany's turnovers have been almost identically affected, both in the overall change and across components (see Figures 2, 3 and 4)): in particular, the fall in foreign revenue reached almost 30% in both countries, while the domestic component declined by less (20%). France recorded a 20% reduction in its foreign turnover against just 7 for the domestic component; French foreign turnover, in particular, benefited from a smaller exposure to extra-EU trade compared to the other two countries. Since the middle of 2011, the dynamics of turnover suggests that the fundamental difference between Italy and its two main European partners rested on the different evolution of domestic revenue, which was negative for our country and flat for the other two, signaling more broadly that the lack of a clear recovery in production has been associated to the continuous weakness in internal demand at the Euro area level. Indeed, between August 2011 and July 2014, real domestic revenue suffered a drop of 10% in Italy against a much smaller decline in France (-2%) and a stability in Germany. By comparison, over the same period Italian foreign turnover was stable, against a small increase in Germany (3%) and a mild reduction in France (-2%). France's turnover component, in the period between 2008 and July 2014, shows a dynamic which inversely mirrors that of Italy, with domestic revenue that has recovered its pre-crisis level while foreign revenue is still 10% below its 2008's level. On the contrary, Italian domestic revenue is still 25% below its beginning-of-2008's level whereas its foreign turnover has almost completely recovered its losses. Its interesting to notice that the relative performance of the Italian foreign turnover is broadly comparable to that of Germany's, whose foreign revenues are currently just 5% above their pre-crisis level.

The descriptive evidence we provided on the decomposition of industrial revenue in its domestic and foreign components suggests that, in Italy, the latter component does not seem to have suffered relative to its main European partners, while the former - over the entire 2008-2014 period - has been the main driver of the dramatic loss of industrial output that has occurred since the beginning of 2008 (see Figures 2, 3 and 4).

2.1 The Heritage of the Crisis

The legacy of the double-dip crisis in terms of industrial production has been quite heterogeneous among the three countries considered, both at the aggregate and sectoral level, yet none of the three countries has still recovered its pre-crisis production levels, see Figure 5. In particular, while Germany's industrial output is relatively close to recovering its pre-crisis level (-6% in August 2014 compared to the level at the beginning of 2008), France's activity is still 15% below, and Italian production has lost a quarter of its pre-crisis level (see Table 1). From a sectoral point of view, between January 2008 and August 2014, Italian production losses have been widespread (see Table 1): of the 17 sectors considered, 15 suffered reductions close to or in excess of 15%; only the "chemicals and pharmaceuticals"' and the "food" sectors recorded less intense contractions (-8 and -7%, respectively). An important sector which was severely affected in Italy and much less so in France and Germany is the "transport equipment" one. Transport equipments represent 6.8% of the Italian index, against 10% in France and nearly 15% in Germany; this sector experimented a particularly severe contraction in Italy (-36%), which contrasts with the mild reductions recorded both France and Germany (see Table 1 and Accetturo et al. (2013)).

The difference bewteen Italy and the other two countries were not confined exclusively to the transport equipment sector. Between 2008 and 2013 France managed to contain, contrary to Italy, the negative effects of the crisis on its industrial output by recording limited losses on some of the sectors that matter most in its general index, especially the "food", "electricity" and "chemicals" ones, which overall account for almost 40% of its total production, against 28 in Italy. Germany registered a steep contraction in just two sectors, the "textile" and the "mining" ones (-26 and -36%, respectively), which however have a combined weight of only roughly 2% in its general production index. The cumulated changes of industrial activity registered over the last six years hides the heterogeneity, both within and between countries, that can be found in the aforementioned four sub-periods.

2.2 The Global Financial Crisis and the Temporary Recovery

The GFC, originated in the US with the subprime crisis, was followed by a generalized collapse in world trade, that recorded an exceptional drop, by 18% from January 2008 to June 2009 according to the CPB trade volume index. Consequently, in the three countries the downturn impacted mainly on the production of those goods whose demand is more dependent on foreign

components, namely intermediate and capital goods. Between January 2008 and April 2009, the index of industrial production decreased by almost 25% both in Italy and Germany and by 19% in France (see Tables 2, 3 and 4). As world trade resumed (2009m4-2011m8), at the national level the recovery in economic activity was mainly driven by intermediate and capital goods, i.e. the same items that had declined most in the previous year and a half. By summer 2011, the Italian industrial production index was 15% below its pre-crisis level, against -11 in France and -2% in Germany.

2.3 The Sovereign Debt Crisis

The SDC (2011m8-2013m7) had a severe impact on the Italian industrial production, leaving France and Germany relatively unaffected, see Table 5. The fall in industrial output was around three times bigger in our country than in the other two (-11% against -4 and -2% in France and Germany, respectively). The divergent dynamics of the domestic and foreign components of the Italian industrial turnover for the main industrial groupings (see Figures 7,8 and 9) strongly points to the domestic component as the main driver of the observed contractions in consumption, intermediate and capital goods.

2.4 The Current Stagnation

In the summer of 2013 there were signals, both qualitative and quantitative, that a moderate recovery in activity was materializing; yet those early positive signals came to a halt, on the backdrop of continuous weakness in internal demand at the Euro area level. By August 2014, industrial activity was substantially flat with respect to a year earlier in all the three major European economies. Between 2013m7 and 2014m8, Italian industrial production benefited from small increases in capital and consumption goods (see Table 2) whereas intermediate goods' production and, above all, energy declined further. Among sectors, "chemicals and pharmaceuticals", "metals", "rubber and plastic" and "transport equipment" increased the most in our country (by 7% the first three sectors and 12 the latter, respectively; see Table 6), while the "textiles and wearing apparels" output has declined further, against a stabilization in France and a moderate growth in Germany.

The recovery in activity has been hampered by a decline in the production of consumption goods in France (see Table 3) and capital goods in Germany (see Table 4), again suggesting that the weakness in internal demand, which has caused so much damage to the Italian manufacturing system over the last few years, has been holding back the recovery of industrial production in both France and Germany.

In order to capture to what extent, over the last few years, periods of growth in industrial production have been widespread throughout the production system, we have calculated a "diffusion index" as follows. First, we take the three-terms moving average variations of each sector's monthly industrial production (working days and seasonally adjusted). Second, a

specific sector is defined in "expansion" if it has recorded positive growth, as defined above, both in the current month as well as in the three months before. Finally, we compute the share of sectors in expansion according to the definition outlined above, multiplied by their 2010-weight in the respective general production index. Figure 6 shows that by January 2014 Germany had the highest share of sectors in expansion (around 60% of its index of industrial), Italy was coming in second with roughly 40% of its general index in expansion followed by France with only 10% of its total production which was growing at that time

By the summer of 2014 those signs of recovery progressively faded away. The reversal in growth prospects has been particularly acute for Germany which, as of August 2014, does not have anymore a significant share of sectors in expansion. In comparison, France and Italy still have about 15-to-20% of industrial sectors in expansion, a share that is however comparable to previous periods of stagnation.

The evidence provided so far hinges on stylized facts that are *per se* informative, yet incomplete under at least two aspects. First, they lack a proper statistical validation and are taken in isolation, in that we cannot be sure, for example, that the business cycle shock which originated the first crisis was the sole responsible for the observed dynamic of industrial activity, nor that the same shock can give rise to responses in other sectors of the economy which are in line with observed data. Second, the descriptive evidence provided above is mute about future developments, and can only give rise to informed guesses about the direction and strength of the current recovery.

3 Empirical analysis

In this Section, we move to an econometric approach to evaluate the dynamics of industrial production in France, Germany and Italy with the aim of investigating three main issues:

(i) how the GFC of 2008-09 propagated among different sectors (ii) how the SDC affected the three major countries and (iii) to what extent, if any, the recessionary effects produced by the double dip crisis changed the dynamics of industrial production in the EA major countries. We estimate a Factor Augmented VAR model (FAVAR) on some key macroeconomic series and industry-specific indicators. This empirical approach follows the one implemented by Peersman and Smets (2005) and Dedola and Lippi (2005) in investigating the industry effects of macroeconomic shocks, but develops further these contributions. The first paper adopts a univariate approach, while the second one uses a VAR model. However, the authors are forced to evaluate one sector at a time because of the curse of dimensionality, which is precisely what we address by resorting to factor models. Furthermore, they do not provide a structural analysis in terms of dynamic reaction to the shocks that hit the EA in the last two crises. More recently, Billio et al. (2013) use a Bayesian Panel VAR model on industrial production to evaluate the interaction between US and EA business cycle, covering all EA countries.

Indeed, we model simultaneously all the sectors of the industrial production index and, above all, investigate the effects of two different shocks other than monetary policy. In particular, we model the GFC as a business cycle shock which hit the EA and then propagated to the single member states economies, whereas the SDC of 2011-12 will be simulated by means of an increase in sovereign risk.

3.1 Structural Factor Models framework

The econometric framework here adopted is the FAVAR methodology introduced by Bernanke et al. (2005). The FAVAR model is also related to the Structural Dynamic Factor Model proposed by Giannone et al. (2005), Stock and Watson (2005) and Forni et al. (2009) being a particular case of the latter, in which the number of static factors coincides with the number of dynamic factors. The factor approach is receiving a growing attention in macroeconomic analysis and is increasingly used in structural analysis as an alternative tool to VAR models (see, among others, Boivin et al., 2009; Forni and Gambetti, 2010; Barigozzi et al., 2014; Neri and Ropele, 2014) because of some crucial appealing features. First, it allows for handling a large number of time series without suffering from the curse of dimensionality. In particular, this means that we are able to properly characterize the response of all the series of interest to a certain exogenous innovation, i.e. the macroeconomic shock of interest such as a business cycle or a sovereign risk shock. Moreover, it has an edge in the identification of structural shocks with respect to SVAR models by explicitly recognizing the large amount of data exploited by policymakers in the implementation of their decisions. Second, it provides a very realistic representation of macroeconomic dynamics by assuming that the business cycle is driven by a few common shocks, while labeling the others as sector or country-specific shocks. In this sense, the FAVAR approach is particularly suitable to the joint modeling of comovement and heterogeneity across the series of interest, a feature closely related to our research question. In what follows, we sketch our empirical framework, referring to Bernanke et al. (2005), Boivin et al. (2009) and Buch et al. (2014). We assume that there exist two different sources of economic fluctuations: (i) a few structural shocks common to all the variables entering the dataset and (ii) many idiosyncratic shocks, capturing, for example sector / industry specific shocks. In terms of time series, this means that each individual time series can be decomposed in the sum of a common and an idiosyncratic component. Formally, we have

$$\mathbf{X}_t = \boldsymbol{\chi}_t + \boldsymbol{\xi}_t \tag{1}$$

$$\boldsymbol{\chi}_t = \boldsymbol{\Lambda}\mathbf{C}_t \tag{2}$$

$$\mathbf{C}_t = \mathbf{B}(L)\mathbf{C}_{t-1} + \mathbf{u}_t, \tag{3}$$

where $\mathbf{X}_t$ is a $n \times 1$ vector of observables, $\boldsymbol{\chi}_t$ is a $n \times 1$ vector of common components and $\boldsymbol{\xi}_t$ is a $n \times 1$ vector of idiosyncratic components uncorrelated with the factors but allowed to be serially correlated and mildly cross-correlated, while $\mathbf{C}_t$ is a $r \times 1$ vector of common factors, $\boldsymbol{\Lambda}$ is a matrix of loadings linking the factors to the observables, $\mathbf{B}(L)$ is a $r \times r$ polynomial matrix in the lag operator, $\mathbf{u}_t \sim iid(\mathbf{0}, \mathbf{I})$ is a $n \times 1$ vector of common structural shocks. Equation (3) is a VAR on the common components. However, the latter are a mix of observed and unobservable factors, respectively $\mathbf{Y}_t$ and $\mathbf{F}_t$, i.e. $\mathbf{C}_t = [\mathbf{Y}_t, \mathbf{F}_t]$. In particular, we are going to use a set of key EA macroeconomic indicators as observable factors and augment them by means of estimated sector-specific factors.

Estimation of the model takes place in four steps, similarly to Buch, Eickmeier and Prieto (2014). First, we extract principal components from the industrial production dataset to achieve consistent estimates of the unobservable factors (see Stock and Watson, 2002 and 2005). In a second step, we regress on the observable macroeconomic factors to purge the former from the correlation with the latter. Third, we collect together and the purged and we run a VAR model on them. Fourth, we identify the structural shocks of interest and we display the impulse responses. Since our sample is constrained to start in 2003m01, in order to avoid breaks in definitions of data on loans, we are going to use Bayesian methods for better estimation of the VAR, in particular when facing the sovereign shock. Indeed, as shown by Neri and Ropele (2014), Bayesian estimation may help in correctly identifying tensions on sovereign risk on a very short sample, taking into account the peculiar dynamics of the series: the sovereign risk spread is almost flat until 2008m9, before displaying an abrupt rise (see Figure 10). Once terminated the procedure, we are able to discuss the results of the structural analysis.

3.2 Identification strategy

We adopt a simple identification strategy. We model the whole set of country-specific sectors as latent factors, whereas Euro Area aggregate variables are employed as observed factors to capture the economic fluctuations (for a similar approach see, among others, Buch et al., 2014). In particular, the vector of observable factors is given by

$$\mathbf{Y}_t = [y_t, p_t, l_t, sov_t, s_t, q_t] \tag{4}$$

where y_t is the real GDP, p_t denotes the harmonized index of consumer prices (HICP), l_t stands for the loans to non-financial corporations, sov_t is the sovereign spread between the 10 years Greek bond and the German Bund, s_t is the ECB policy rate here proxied by the euribor at 3 months, q_t is the nominal US dollar / euro exchange rate. This specification allows for a good description of the stance of the business cycle in the euro area and for conducting a number of dynamic simulations in response to the identified structural shocks. Beyond

the standard three variables representing economic activity, prices and monetary policy, we include the exchange rate in order to have a measure of foreign demand, while we add credit and sovereign spread since they are two of the most important variables in order to describe recent developments in the EA. We augment the $\mathbf{Y}_t$ vector by using the first two principal components extracted by the panel of sector-specific industrial production indices: hence, our baseline vector of common factors is given by

$$\mathbf{C}_t = [y_t, p_t, l_t, sf_{1t}, sf_{2t}, sov_t, s_t, q_t] \tag{5}$$

The identification of the structural shocks is recursive. We simply assume that economic activity, prices, loans and country-specific factors do not respond contemporaneously to the sovereign risk shocks, while we allow for a policy reaction to all exogenous disturbances but exchange rate ones. By doing so, we provide a simple and intuitive interpretation of the sources of economic fluctuations: (i) a (common) business cycle shock is defined as a (negative) innovation to the EA wide industrial production and (ii) a sovereign risk shock is modeled in terms of a rise in the spread between Greek and German yields on 10 years bonds. Our identification scheme, especially concerning the distinction between a non-monetary and a monetary downturn, is broadly consistent with the one adopted by den Haan et al. (2007) for US economy and Giannone et al. (2012) for the EA.

4 Results

In Figures 11–16 we present some results of our empirical analysis, starting from the macroeconomic variables, i.e. the observable factors. The evolution of the identified structural shocks is described in Figures 11–12. We can see that both patterns trace fairly well the economic developments in the EA, e.g. the expansion phase up to 2007:08 followed by the recession (upper panel), and the recovery before the spike in sovereign risk in summer 2011 (lower panel).

4.1 Macroeconomic variables

Adverse business cycle shock. Figure 13 reports the impulse responses of macroeconomic EA factors to the business cycle shock. The shock to the EA-wide industrial production is equal to -0.5 on impact, and it takes about 10 months before reverting back to its pre-shock level. HICP inflation is reduced by almost 0.1 percentage points, displaying a very sluggish adjustment. The policy rate moves downward, capturing a countercyclical reaction of the monetary authorities to the adverse business cycle. Consistently, the exchange rate is lowered for about 6 periods. Loans to non-financial corporations strongly react to the downturn, reverting to their steady state level only after two years and half. Finally, sovereign risk rises on impact but only stays statistically significant above its baseline level for about 3 periods, consistently with the behavior of the variable during the crisis of 2008-09.

Sovereign risk shock. The impulse responses to the sovereign shock uncover some stylized facts of the recent crises (see Figure 14). First, industrial production is reduced for over one year, displaying a maximum reaction by almost 1.5 percentage points. Second, inflation tends to rise on impact and for a bunch of periods subsequent to the shock, before starting to decrease. This result may reflect the heterogeneity reaction across countries. For example, the rise in inflation may be related to changes in indirect taxes and administrative prices (in the peripheral countries), or loose financial conditions in a low-unemployment environment (core countries; see Neri and Ropele, 2014). Third, the central bank strongly reacts to uncertainty shocks by lowering the policy rate strongly and long-lastingly. Fourth, loans to non-financial corporations are severely and persistently depressed by the rise in sovereign risk, reflecting the exposure of banks to this kind of assets.

4.2 Country–specific variables

We now move to describe the effects of the two different crises on sector-specific variables, i.e. on different industrial production sectors. For each country we focus on the general index, capital goods, intermediate goods, consumption goods and energy goods. Then, we also show the median response across sectors.

Adverse business cycle shock. Figure 15 reports the impulse responses of macroeconomic EA factors to the business cycle shock. Figure 9 displays the IRFs to the business cycle shock, aimed at capturing the GFC impact on manufacturing sectors. We can observe that the three countries experiment a similar response, both in terms of shape and magnitude. The only exception is the French energy sector, which shows a flatter response than Germany and Italy: this stems from a lower elasticity of this sector to economic fluctuations with respect to the other two countries.

Sovereign risk shock. Figure 16 displays the IRFs to the sovereign shock that occurred in summer 2011, aimed at replicating the feature of the SDC impact on manufacturing sectors. The picture is very different from the one commented before. Indeed, apart from intermediate goods, which display a more or less similar reaction across countires, Italy experiments the biggest and deepest fall in each sector. The contraction of the general index is almost two and a half times greater than the French and German counterpart, highlighting how deeply Italy suffered from the crisis that started in summer 2011. Furthermore, it should be stressed that the decline in Italy is more persistent (by about 18 periods after the shock) than the one observed in France and Germany.

5 Concluding remarks

The paper focuses on the recent behavior of industrial production in Italy, Germany and France. First, it describes the main stylized facts emerging from the double-dip crisis that hit

the EA, comparing not only the general index but also the activity sectors. Then, a FAVAR model is estimated to evaluate the dynamic response of manufacturing sectors to a business cycle shock, mimicking the 2008-09's downturn, and a sovereign risk shock, which originated the crisis of 2011-12. Our main findings are the following. First, between 2008 and 2013 the loss of industrial activity in Italy, which has been much larger overall than the one recorded in France and Germany over the same period, has been widespread across most sectors and particularly severe in the "machinery and equipment", "electrical equipment" and "transport" ones, while "chemicals and pharmaceutical" and "food" experimented milder contractions. Second, the strong decline in industrial output, particularly since the SDC, has been almost entirely driven by a marked fall in domestic demand, as shown by the contraction of the domestic component of real turnover; on the other hand, Italian foreign turnover has recovered most of the cumulated loss since 2008. Third, the recovery that started in the summer of 2013 has so far diffused to only half of the Italian industrial production index, a value similar to the one observed in the brief recovery that occurred between the two crises. Fourth, the econometric analysis we provided is able to capture the main features of the recent macroeconomic dynamics in the EA. The estimates of a FAVAR model show that the GFC produced a similar impact on manufacturing sectors in Italy, France and Germany, whereas the SDC exerted a stronger impact on Italian sectors, producing a large and persistent fall in industrial production. Hence, the rise in sovereign risk has been the main source of divergence of Italian industrial output from that of its main EA partners. Moreover, impulse response functions show that the slow resumption of credit growth, following the SDC, could also negatively impact on the current Italian industrial recovery. In future developments, we propose to conduct a variance decomposition in order to assess the relevance of the estimated shocks for fluctuations observed in each industrial grouping. Finally, counterfactual simulations on alternative paths for the Italian sovereign risk would allow for estimating the share of activity losses directly linked to the sovereign shocks, after controlling for other macroeconomic factors.

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The views here expressed are those of the authors and do not necessary reflect those of the Bank of Italy.

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Tables and Figures

Table 1: Cumulated changes in industrial activity: 2008m1-2014m8.

	Italy	France	Germany
General Index	-24	-15	-6
Food	-7	-3	-3
Textiles and wearing apparel	-25	-37	-20
Leather	-12	-17	19
Wood	-46	-24	-3
Paper	-23	-23	-8
Chemicals and pharmaceutical	-8	-2	-1
Rubber and plastic	-19	-18	1
Metals	-30	-27	-5
Machinery and equipment	-27	-30	-6
Electrical equipment	-32	-18	-3
Transport equipment	-36	-9	-6
Coke and refined petroleum	-31	-37	-11
Non-metallic products	-31	-28	-10
Mining	-27	-25	-42
Electricity	-17	-5	-9
Furniture and other manufacturing	-17	-18	0
Repair and installation of machinery	-14	-4	0

Note: working days and seasonally adjusted indices.

Table 2: Italian industrial production cumulated changes

	General index	Intermediate	Capital	Consumption	Energy
GFC	-25	-34	-32	-13	-11
First recovery	14	20	24	5	2
SDC	-11	-13	-15	-8	-7
Current stagnation	-1	-1	1	2	-4
Overall period	-24	-31	-27	-15	-20

Source: Eurostat. *Note*: GFC: 2008m1-2009m4; First recovery: 2009m4-2011m8; SDC: 2011m8-2013m7; Current stagnation: 2013m7-2014m8; Overall period: 2008m1-2014m8.

Table 3: French industrial production cumulated changes

	General index	Intermediate	Capital	Consumption	Energy
GFC	-19	-29	-23	-9	0
First recovery	10	17	10	5	3
SDC	-4	-8	-2	-2	-2
Current stagnation	0	1	1	-2	1
Overall period	-15	-22	-15	-8	-1

Source: Eurostat. *Note*: GFC: 2008m1-2009m4; First recovery: 2009m4-2011m8; SDC: 2011m8-2013m7; Current stagnation: 2013m7-2014m8; Overall period: 2008m1-2014m8.

Table 4: German industrial production cumulated changes

	General index	Intermediate	Capital	Consumption	Energy
GFC	-24	-26	-30	-9	-9
First recovery	28	35	40	4	5
SDC	-2	-4	-2	0	3
Current stagnation	-2	0	-2	1	-9
Overall period	-6	-5	-5	-4	-11

Source: Eurostat. *Note*: GFC: 2008m1-2009m4; First recovery: 2009m4-2011m8; SDC: 2011m8-2013m7; Current stagnation: 2013m7-2014m8; Overall period: 2008m1-2014m8.

Table 5: Cumulated changes in industrial activity during the soverign debt crisis: 2011m8-2013m7.

	Italy	France	Germany
General Index	-11	-4	-2
Food	-5	-2	1
Textiles and wearing apparel	-10	-1	-7
Leather	-5	1	-7
Wood	-18	-10	4
Paper	-16	-8	-5
Chemicals and pharmaceutical	-7	-3	2
Rubber and plastic	-10	-7	0
Metals	-11	-7	-2
Machinery and equipment	-10	1	-4
Electrical equipment	-11	-6	-9
Transport equipment	-18	0	-2
Coke and refined petroleum	-15	-10	-1
Non-metallic products	-22	-13	-2
Mining	-10	1	-8
Electricity	-7	-2	7
Furniture and other manufacturing	-12	-6	5
Repair and installation of machinery	-28	0	0

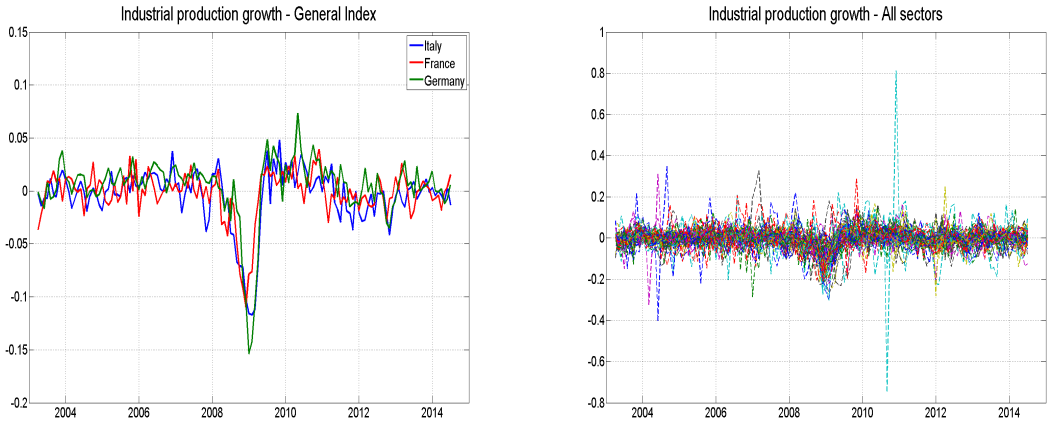
Note: working days and seasonally adjusted indices.

Table 6: Cumulated changes in industrial activity during the current stagnation: 2013m7-2014m8.

	Italy	France	Germany
General Index	-1	0	-2
Food	0	-1	-3
Textiles and wearing apparel	-3	0	4
Leather	1	-7	18
Wood	-1	3	-5
Paper	2	1	0
Chemicals and pharmaceutical	7	0	1
Rubber and plastic	7	3	-1
Metals	7	0	2
Machinery and equipment	0	0	4
Electrical equipment	-3	-4	4
Transport equipment	12	8	-10
Coke and refined petroleum	-8	-6	0
Non-metallic products	-8	0	-5
Mining	-9	-9	-8
Electricity	-3	2	-11
Furniture and other manufacturing	6	-4	0
Repair and installation of machinery	5	-1	3

Note: working days and seasonally adjusted indices.

Figure 1: Comovement and heterogeneity in industrial production.



Notes: 3-month growth rates of industrial production in France, Germany and Italy (general index, left panel; all sectors, right panel).

Figure 2: TOTAL INDUSTRIAL TURNOVER

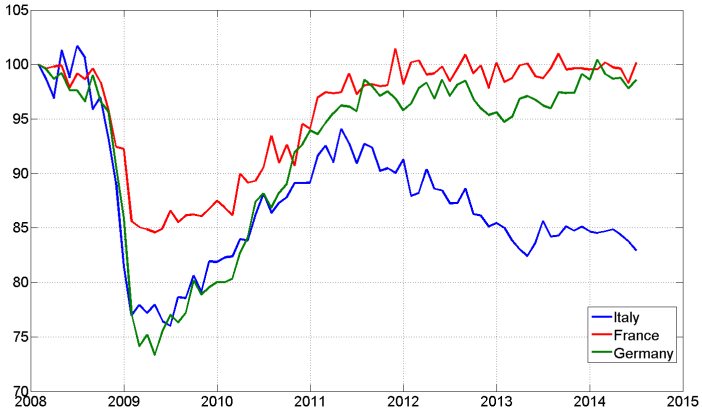


Figure 3: DOMESTIC INDUSTRIAL TURNOVER

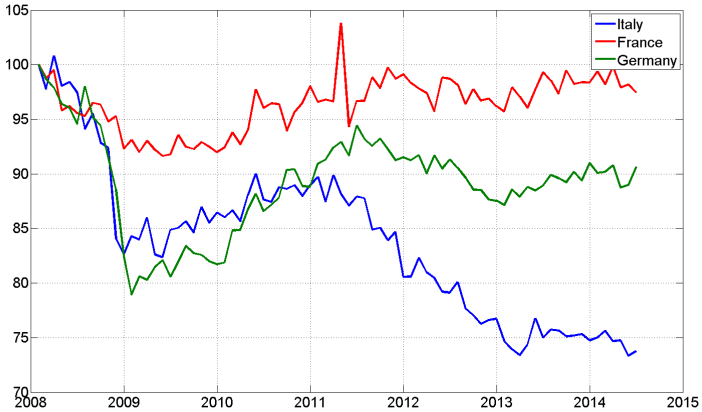
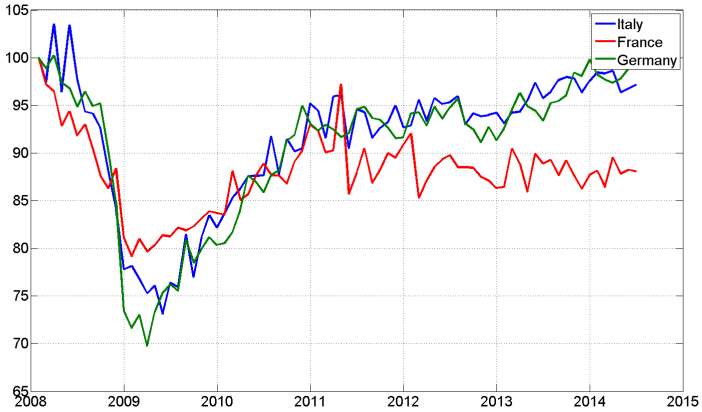
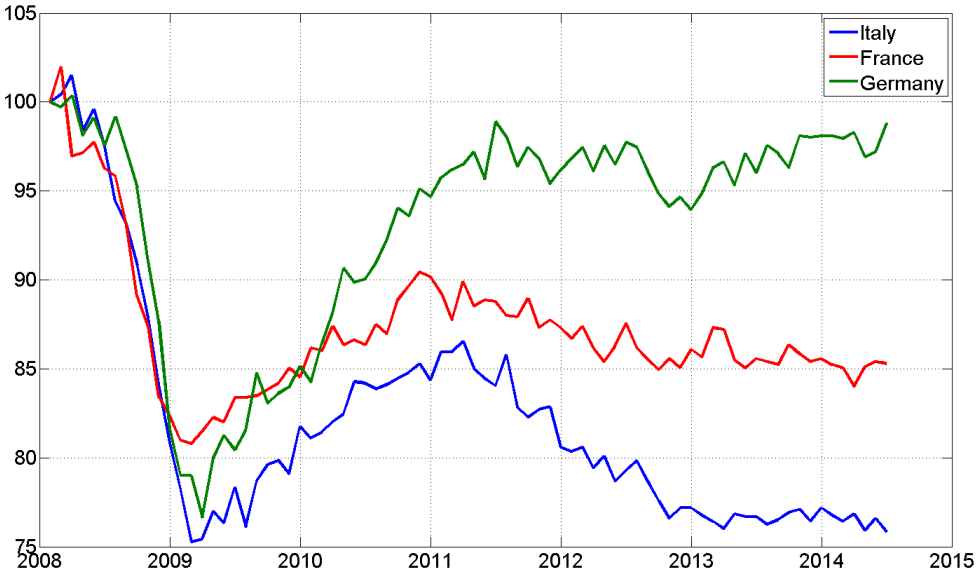


Figure 4: FOREIGN INDUSTRIAL TURNOVER



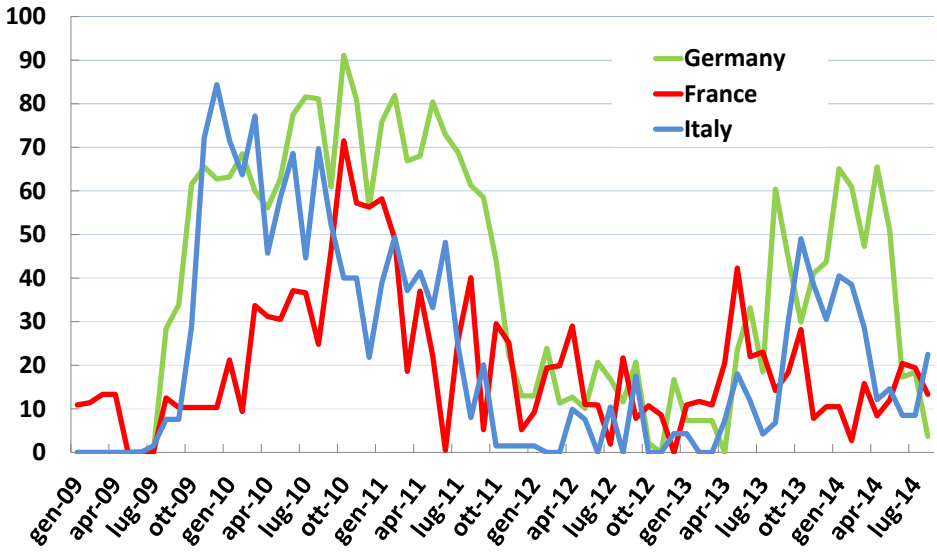
Source: Eurostat. Real terms, seasonally adjusted. 2008=100.

Figure 5: INDUSTRIAL PRODUCTION INDEX



Source: Eurostat. Working days and seasonally adjusted indices. 2008=100.

Figure 6: THE DIFFUSION OF PERIODS OF GROWTH THROUGH SECTORS



Source: Istat. Working days and seasonally adjusted indices.

Figure 7: Italian industrial turnover: intermediate goods

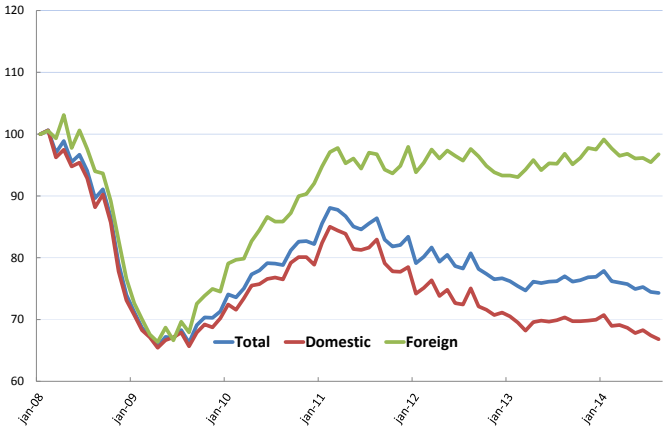


Figure 8: Italian industrial turnover: capital goods

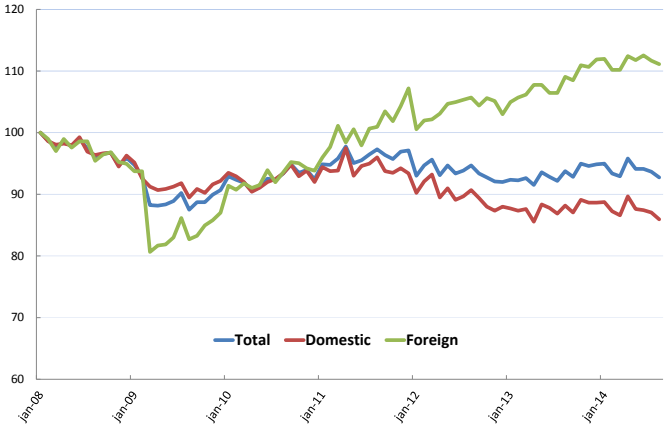
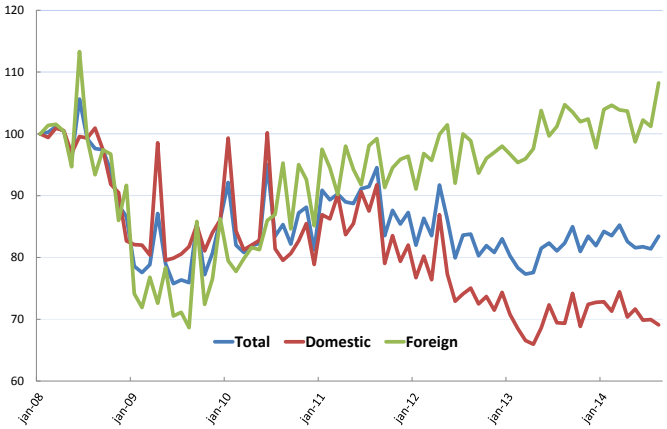
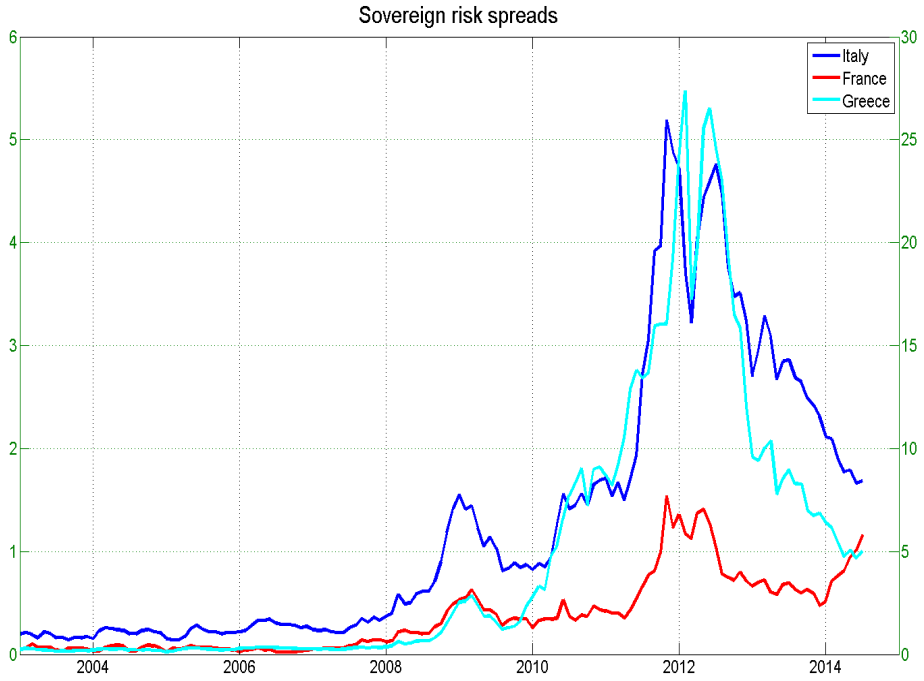


Figure 9: Italian industrial turnover: consumption goods



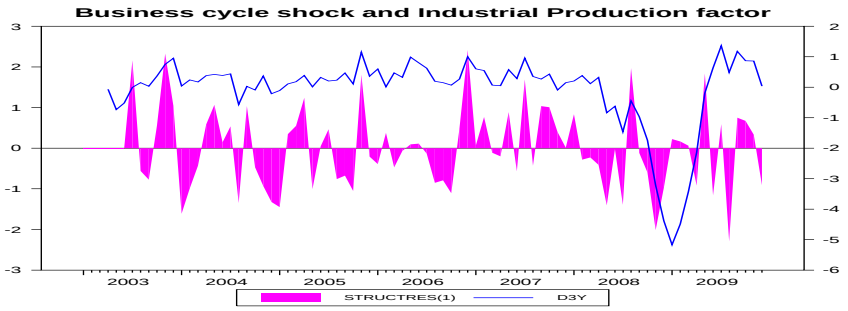
Source: ISTAT. Nominal terms, seasonally adjusted. 2008=100.

Figure 10: Sovereign risk tensions in the Euro Area.



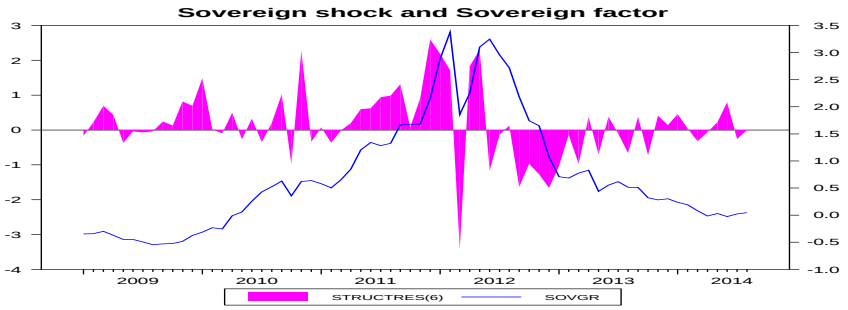
Notes: Percentage values. The dark blue solid line represents the sovereign spread between Italy and German 10 years bond yield (left axis), the magenta solid line denotes the sovereign spread between France and German 10 years bond yield (left axis), while the light blue line displays the sovereign spread between Greek and German 10 years bond yield (right axis).

Figure 11: Identified business cycle shock



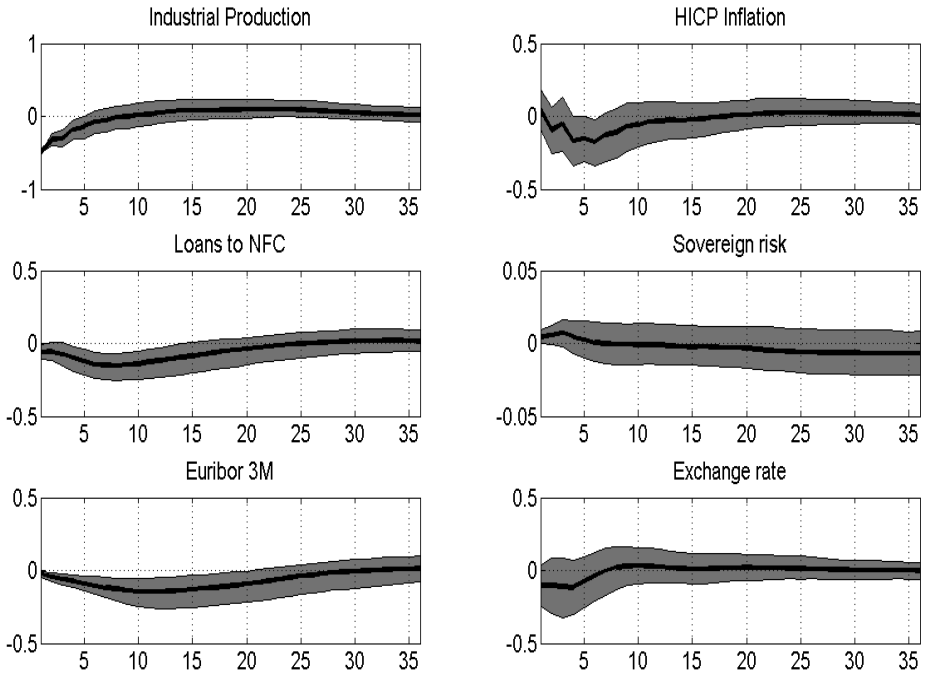
Notes: The dark magenta area denotes the identified business cycle shock, while the blue line represents the euro area industrial production (observable) factor. Sample is 2003:04 - 2009:12.

Figure 12: Identified sovereign risk shock



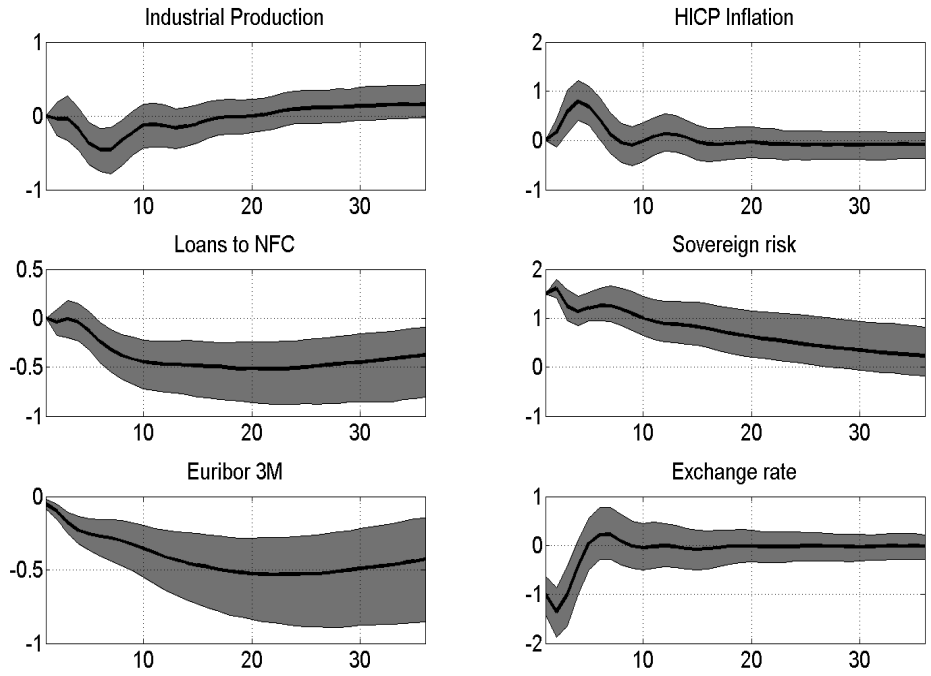
Notes: The dark magenta area denotes the identified sovereign risk shock, while the blue line represents the euro area sovereign risk (observable) factor. Sample is 2009:06 - 2014:07.

Figure 13: Impulse response functions to a Business cycle shock.



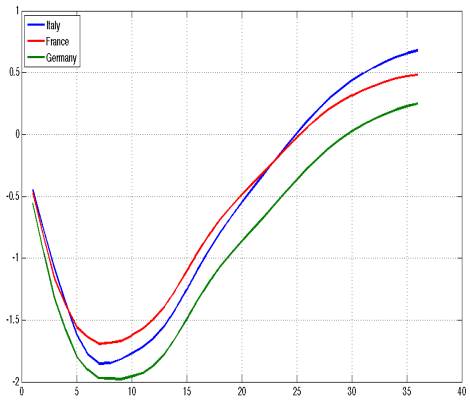
Notes: Standardized percentage values. The dark black line represents the estimated median impulse response, while the grey shaded area denotes its 68% confidence interval. Sample is 2003:04 - 2014:07.

Figure 14: Impulse response functions to a Sovereign risk shock.

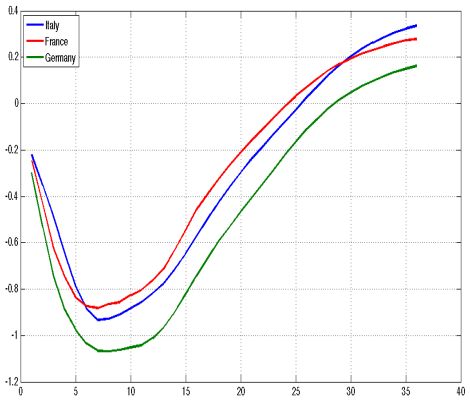


Notes: Standardized percentage values. The dark black line represents the estimated median impulse response, while the grey shaded area denotes its 68% confidence interval. Sample is 2003:04 - 2014:07.

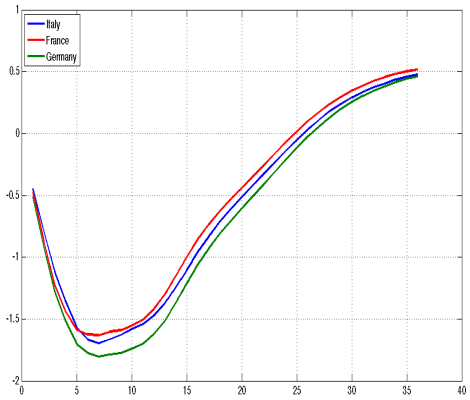
Figure 15: Impulse response functions to a Business cycle shock: selected sectors.



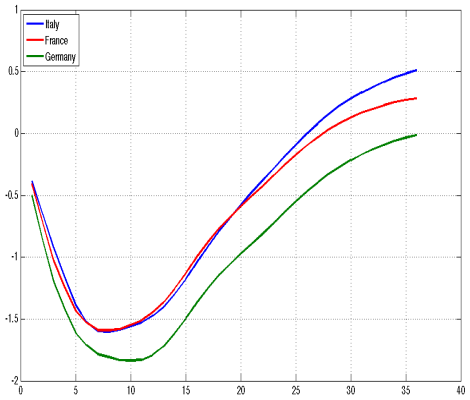
(a) General Index



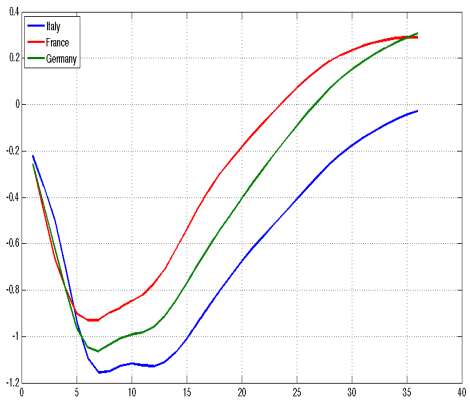
(b) Median across sectors



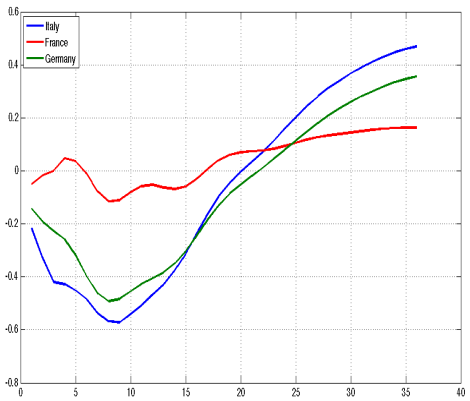
(c) Intermediate goods



(d) Capital goods

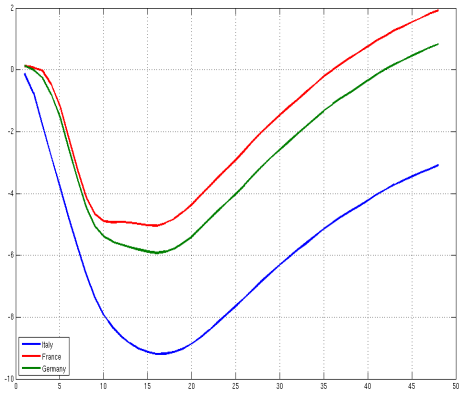


(e) Consumption goods

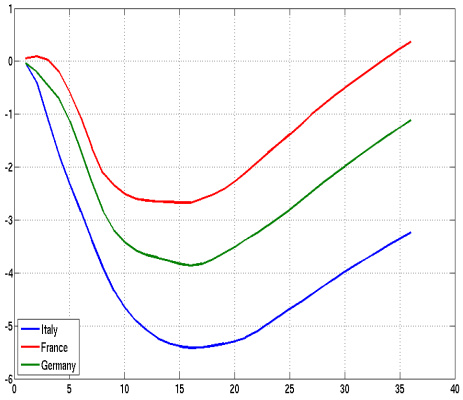


(f) Energy goods

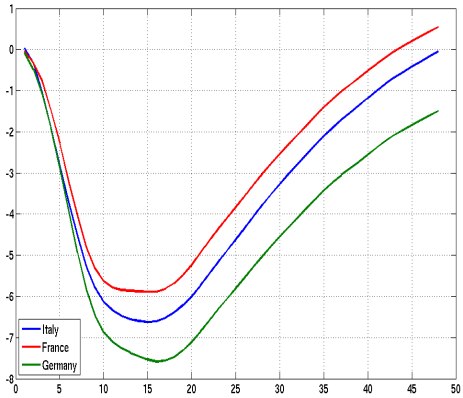
Figure 16: Impulse response functions to a Sovereign risk shock: selected sectors.



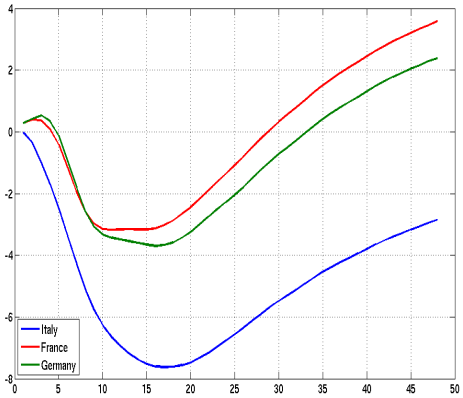
(a) General Index



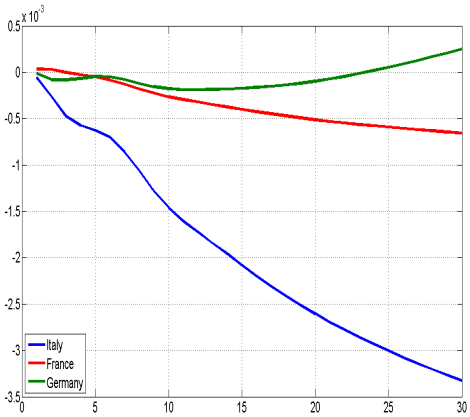
(b) Median across sectors



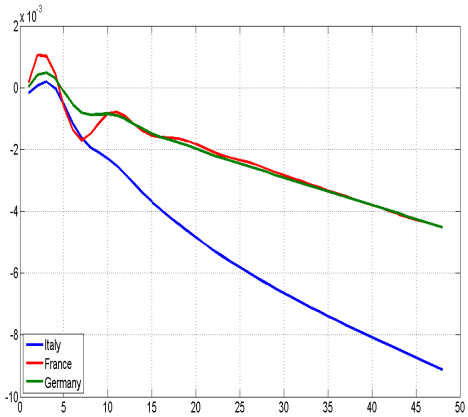
(c) Intermediate goods



(d) Capital goods



(e) Consumption goods



(f) Energy goods

An inquiry on manufacturing capacity in Italy after the double-dip recession

Libero Monteforte[1] and Giordano Zevi[1]

Gauging the extent to which the recent recessions impacted potential production is crucial to assess the size of the slack in the economy, and hence to estimate the resulting inflationary pressures and to appraise the speed of the recovery. In this paper we investigate the effects of the prolonged double-dip recession on the productive capacity of the Italian manufacturing sector, employing three methods to quantify the loss of potential (a production function approach, a survey based method and statistical filtering of the industrial production series). We estimate that between 2007 and 2013 capacity contracted by 11 to 17%, depending on the method. For each approach we conduct a simple exercise to quantify the loss with respect to a counterfactual evolution of capacity in a "no-crisis" scenario in which pre-2008 trends are extrapolated: in this case the loss is close to 20% for all methods. Finally, we pin down the main activity sectors responsible for the reduction in capacity in the baseline and in the counterfactual scenario, and find that they don't always coincide, reflecting the heterogeneous dynamics across sectors before and during the recession.

1. Introduction

Between 2008 and 2013 the Italian economy underwent two consecutive recessions, with a 9.0% loss of GDP from peak to trough, making this the hardest shock to the Italian economy, in peace time, since 1861.[2] Most of the fall was concentrated in the manufacturing sector, where production fell by 23.5%. In response to these developments, capital and labor demand and productivity have contracted by sizable amounts: investment is now below the peak of 2007 by more than one fourth and around one million of people have lost their job in the same time frame.

In this work we assess the combined effect of the double-dip recession on potential output of the manufacturing sector using three methods, respectively based on a production function approach, on surveys among industrial firms and on statistical filters. In Sections 2 to 4 we also assess, with each of those three methods in turn, the extent to which the result for the whole manufacturing sector hinge on developments in specific subsectors.

The three methods employed do not capture the same definition of potential. The survey-based method, dealt with in Section 2, in line with Malgarini and Paradiso (2010) pins down a concept close to the "full capacity" of firms' productive physical capital. The statistical filtering approach (Section 3) captures the long run properties of the time series of industrial

1 Bank of Italy, Economic Outlook and Monetary Policy Directorate.
2 See Baffigi (2011).

production, deriving potential output by assuming that over long periods the manufacturing sector operates, on average, close to potential. Finally, the production function approach, described in section 4, is closer to an economic definition of potential output, and rests on the assumption that production capacity which is technically feasible takes place when economically convenient.

With these caveats, we find that the peak-to-trough (2007-13) loss of productive capacity in the Italian manufacturing sector amounts to about 11% according to the lowest estimates and reaches 17% according to the highest. However, the overall contraction in potential output of the manufacturing sector conceals, no matter what approach one chooses, non-trivial heterogeneity among subsectors. Large losses of potential capacity are recorded in the rubber, plastic and non-metallic mineral sector, as well as in the wood and in the basic metals and fabricated metal products sectors. On the other hand, capacity increased in the pharmaceutical sector and was broadly stationary in the food, beverages and tobacco sector.

This quantification of the loss of potential production allows identifying the remaining slack in each of the segments of the manufacturing sector which, in turn, is likely to affect both the speed of the (recently started) economic recovery and the strength of demand-driven inflationary pressures.

Given that in many manufacturing sectors production was on a declining trend well before the crisis, the 2007-13 loss in potential output may provide an inaccurate estimate of the loss of capacity due to the crisis. In order to identify more precisely the latter component we conduct a simple counterfactual exercise, in which actual developments in potential production are compared with an evolution of capacity in 2008-13 in line with pre-crisis historical trends.

In a few cases the finding from the counterfactual exercise differ considerably from those based on historical data. As an example, in the textiles, wearing apparel and leather sector, according to the counterfactual analysis there was no sharp acceleration in the fall of potential output during the crisis, contrary to what a simple comparison of potential in 2007 and 2013 would suggest. In other cases, as for the basic and fabricated metal products sector and for the machinery and equipment sector, the downturn in capacity during the crisis was relatively large. Finally, in some sectors which withstood well the double-dip recession, such as the food sector, while the actual decline in potential output from 2007 to 2013 was overall modest, the fall versus the counterfactual scenario was instead substantial.

2. Survey based methods

In this section we follow the survey-based methodology, used for the whole manufacturing sector by Malgarini and Paradiso (2010) and De Nardis (2013), to gauge both the overall size of the loss of capacity output and the contribution of its subsectors.

Potential production (PP) is computed as the ratio between the Manufacturing Production Index (MPI) and the Capacity Utilization rate (CU), obtained from survey data:[3]

$$PP = MPI / CU * 100 \qquad (1)$$

A bottom-up approach, in which the loss in potential manufacturing output is measured by first computing the loss attributable to each NACE rev.2 activity sector and then aggregating the results, shows that in the 2007-13 period the reduction in potential manufacturing production amounted to 16.5%; using a top-down approach (i.e., directly applying eq. (1) to the overall manufacturing sector), the loss is roughly the same (16.7%; Table 1 and Chart B1).

Table 1

Capacity changes by activity sector

(percentages)

Capacity changes by activity sector and MIGs (2007-13)	*Survey based method*		*HP Filter*		*CF Filter*	
	Baseline	Cfactual	Baseline	Cfactual	Baseline	Cfactual
CA Manufacture of food, beverages and tobacco products	-1,8	-9,4	-1,4	-11,8	-1,6	-4,5
CB Manufacture of textiles, wearing apparel and leather	-18,2	-8,0	-16,3	-9,1	-17,2	-9,8
CC Manufacture of wood, paper products and printing	-23,3	-27,8	-24,8	-28,9	-27,3	-31,5
CD Manufacture of coke and refined petroleum products	-18,1	-21,6	-22,0	-19,0	-24,2	-20,4
CE Manufacture of chemicals	-12,9	-25,6	-12,7	-18,9	-15,9	-21,1
CF Manufacture of pharmaceutical products	10,1	5,6	5,8	1,7	6,1	1,8
CG Manufacture of rubber, plastic and non-metallic mineral products	-24,0	-24,9	-25,4	-27,3	-27,8	-30,0
CH Manufacture of basic metals and fabricated metal products	-21,7	-30,6	-19,0	-25,9	-22,3	-28,6
CI Manufacture of computer, electronic and optical products	-17,3	3,4	-17,3	-0,1	-18,5	0,3
CJ Manufacture of electrical equipment	-28,7	-22,6	-27,9	-24,0	-31,3	-27,3
CK Manufacture of machinery and equipment n.e.c.	-20,8	-30,0	-15,7	-23,3	-18,2	-25,0
CL Manufacture of transport vehicles	-18,6	-17,7	-20,5	-25,5	-26,6	-29,6
CM Other manufacturing	-9,5	-10,0	-10,8	-15,9	-11,9	-17,6
TOTAL MANUFACTURING (1)	**-16,7**	**-19,4**	**-15,4**	**-17,9**	**-17,9**	**-20,1**
Consumer durables	-27,0	-24,4	-28,8	-29,7	-31,4	-32,7
Consumer non-durables	-5,9	-6,2	-5,6	-7,6	-6,6	-8,6
Consumer TOTAL	-9,7	-9,2	-9,9	-11,4	-11,3	-12,9
Energy	-5,3	-15,6	-14,0	-22,2	-16,0	-23,8
Intermediate goods	-22,7	-26,0	-21,8	-24,1	-24,6	-26,6
Capital goods	-16,5	-20,9	-12,9	-18,7	-16,2	-21,0

Source: own calculation based on Istat data; percentage points.
Notes: (1) direct estimates.

3 The series of CU are those obtained by Istat when manufacturing firms answer to the question "During the quarter your current rate of capacity utilization with respect to the maximum was … (in percentage)?". The questionnaire with the exact wording of the question in Italian is available here: http://ec.europa.eu/economy_finance/db_indicators/surveys/questionnaires/index_en.htm.
The resulting potential production refers to a "technical" concept of potential output, related to the production possibility frontier, and disregards the incentives for economic activity.

Excluding the manufacture of pharmaceutical products (in which potential output rose), all activity sectors and all Main Industrial Groupings (MIGs) show a fall in production capacity ranging from -1.8% in the food, beverages and tobacco sector to -28.7% in the electrical equipment sector (Chart B2). Based on 2010 weights, the main culprits of the reduction in manufacturing potential are: the basic metals and fabricated metal products sector (3.5pp); the machinery and equipment not elsewhere classified (n.e.c.) sector (2.8pp); the manufacture of rubber, plastic and non-metallic mineral products (2.3pp). These sectors, together accounting for slightly less than 40% of total manufacturing production, jointly explain more than 50% of the potential loss (Table B2).

In interpreting these developments we should consider that potential output in some sectors was already contracting before 2008 (see Chart B2).[4] We therefore conduct a counterfactual exercise, in which, for each manufacturing sector, we assume a rate of growth in 2008-13 in line with the respective average growth over 1999-2007; we further assume that, without the crisis, the survey based measure CU would have converged to the average recorded in the pre-crisis period, 1999-2007. The resulting simulated capacity in 2013 can be interpreted as an estimate of the potential output that could have been achieved in each sector, had the Italian economy not been stricken by the double-dip recession.[5] According to such counterfactual exercise (Table B2, column 2), the total loss amounted to 19.4%. While the overall figure is not much different from that of the peak-to-trough comparison, the assessment of the role of individual sectors may sensibly deviate from the one above. The contribution to the overall fall in manufacturing capacity accruing from sectors that were already shrinking before the crisis is drastically downsized (textiles and computer production, and the electrical equipment sector); on the contrary, for the pharmaceutical, the food industry, and machinery and equipment sectors, which had experienced an expansion of capacity in the run-up to the crisis, the impact of the latter is magnified by counterfactual analysis. Overall, the sectoral breakdown of the total manufacturing loss appears more polarized on the basis of counterfactual analysis: the basic metals and fabricated metal products, and the machinery and equipment n.e.c. sectors (whose weight in the MPI amounts to less than 30%) account for about 46% of the loss of capacity (37.1% if one looks at the decline from 2007 to 2013).

4 See Accetturo et al. (2013).
5 Notice that by 2013 the simulated CU has reached the average 1992-2007 rate, therefore most of the action is attributable to the MPI dynamics.

As a sensitivity exercise, the counterfactual analysis was repeated imposing to each sector, for the 2008-13 period, the same average growth as in 1992-2007. In this case the total loss for the manufacturing sector reaches almost 23% (Chart 4).

2.1 A validation of the capacity utilization data

In order to validate the results of the survey based method, we make use of the microdata of the Bank of Italy *Survey of Industrial and Service Firms* (Invind) and of a new measure based on electricity consumption.

Invind is a sample survey of industrial and service firms with 20 or more workers, collected each year in spring; while the survey is conducted since 1972, microdata are available since the mid-nineties.

Manufacturing firms are asked to report their rate of capacity utilization, turnover and the average annual percentage change in the selling prices of their own goods and services. One may thus derive a measure of each individual firm's actual output and, by aggregating across firms, (a proxy of) the MPI series. Equation (1) can then be computed using the latter aggregate figure, combined with the CU rate, in order to recover series of potential output for both the manufacturing sector and its subsectors.[6] Chart B3 compares the Istat and the Bank of Italy survey measures of CU. The dynamics is very similar in most sectors; higher CU in Invind data reflects sample selection, as this latter survey mostly includes large firms. In some sectors, however, the possibility to use Invind data as a comparison with Istat is hampered by the small number of observations. Chart 1 (left panel) plots the average growth rate of real output derived from Invind data against the one derived from Istat official MPI data. Given the clear upward bias in Invind, we correct its growth rate by subtracting the difference between the average growth rate of Invind and that of the Istat series over the 1992-2007 period and we use this corrected series to compute the potential output, plotted in Chart 1 (right panel), together with the estimates derived from Istat data. Invind data are only available up to 2012; in that year, the cumulated loss with respect to 2007 amounted to 8.5%, vs. 12.1% according to the Istat data over the same period; the dynamics is remarkably similar.

Following Burnside *et al.* (1995), we also construct an index of unutilized capacity based on the ratio between electricity consumption and the stock of capital. We combine data on electricity consumption in the manufacturing industry (provided by Terna, the Italian

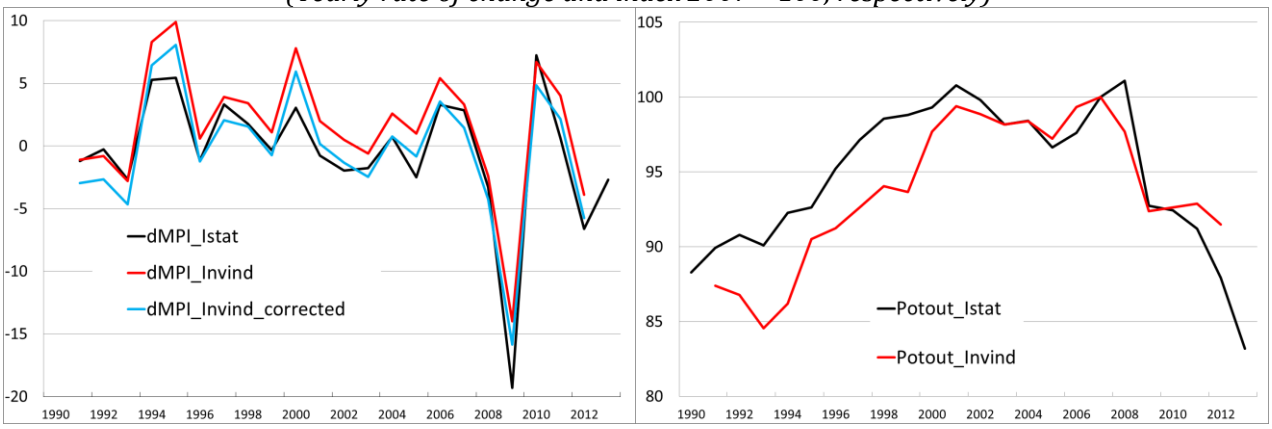
6 More details on the sample and the weights structure are in Banca d'Italia (2013). In our elaboration we build the output series by recovering the real growth rate in output at the firm level (considering only the firms present in year T and year T-1) and aggregating them weighting by the firm average employment in year T.

electricity transmission grid operator) and on the stock of net capital (by Istat). The ratio is rescaled to equal the Istat CU rate in 1991. The bottom of Chart B3 shows that this electricity based measure tracks well the changes of the Istat series, but contracted more sharply during the recession.

Chart 1

Growth in output and level of potential output

(Yearly rate of change and index 2007 = 100, respectively)



Source: own calculation based on Istat and Invind data.

3. Statistical filters methods

A second approach to estimate potential output rests on statistical filters. Specifically, we apply the Hodrick-Prescott filter (HP) and the Band-Pass Christiano-Fitzgerald filter (CF) to the quarterly series of industrial production. The overall loss so obtained is in line with those estimated with the survey based method: the average of the two filters indicates that total manufacturing capacity loss during the crisis amounted to 16.6% (-15.4% with HP; -17.9% with CF), which is basically the same estimate as with the survey based approach.

Looking at the sectoral breakdown, there is only one sector for which the discrepancy between the statistical filter estimate and the survey based one is larger than 3 pp in absolute value (machinery and equipment n.e.c.); only in two other sectors it exceeds 1.5 pp; overall the mean absolute discrepancy is 1.0 pp, pointing to fairly consistent findings with these two methods (Table B2).

The counterfactual experiment leads to similar conclusions.[7] The total loss amounts to 19.0% in the average of the two filters (17.9% for HP and 20.1% for CF). At a sectoral level, the mean absolute discrepancy with respect to the survey-based measure is somewhat larger (1.6 pp, with four sectors differing more than 4 pp).

7 As in section 2, counterfactual values are computed projecting from 2008Q1 onwards the pre-crisis growth trend.

4. Production function approach

The estimates of the dynamics of production capacity based on surveys and statistical filters are very much in line with the dynamics of output itself. Those methods ignore the economic motivations underlying production choices and the demand for production factors. The production function (PF) approach overcomes such limitation, by allowing an explicit role for economic considerations in determining production and factor demand.

Consider a standard Cobb-Douglas function:

$$Y = TFP \cdot L^{\alpha} \cdot (U_k \cdot K)^{(1-\alpha)} \qquad (2)$$

The level of production (Y) is the result of the contribution of employment (L), the stock of capital (K) and multi-factor productivity (TFP). The overall contribution of capital depends on K itself, as well as on a measure of capital utilization (U_k).

In this framework, potential output is the production that can be attained if labor, capital, U_k and the TFP are at their respective equilibrium levels. Potential employment (L*) is derived according to the following relation:

$$L^* = LF^* \cdot (1\text{-}NAIRU) \qquad (3)$$

where LF* is the trend labour force participation and NAIRU is the Not Accelerating Inflation Rate of Unemployment.

This representation of potential output relies on a number of crucial assumptions. The choice of the simple standard Cobb-Douglas in equations (2) and (3) implicitly amounts also to assuming: a) malleability of capital and fixed elasticity of substitution between factors; b) constant returns to scale; c) the existence of an equilibrium rate of unemployment (NAIRU). The equilibrium values of the factors are at least to some extent obtained with statistical filters: in our case, the estimates of the equilibrium values of *LF* and TFP are extracted by means of a Christiano-Fitzgerald filter, applied to actual data.

An advantage of the PF approach is that it allows to quantify the contribution to potential output of each production factor. In our case, this advantage has also a drawback: since we are interested in potential production of one sector of the economy, the labor input should in principle be appropriately defined at a sectoral level too. In this work, the NAIRU for the whole Italian economy is used for the manufacturing industry and all its subsectors.[8]

We estimate potential output for the various sectors (NACE rev.2) and for manufacturing as a whole (see Appendix A for a description of the data). In Chart B4 we compare the series of the estimated potential output, with and without the U_k correction. In

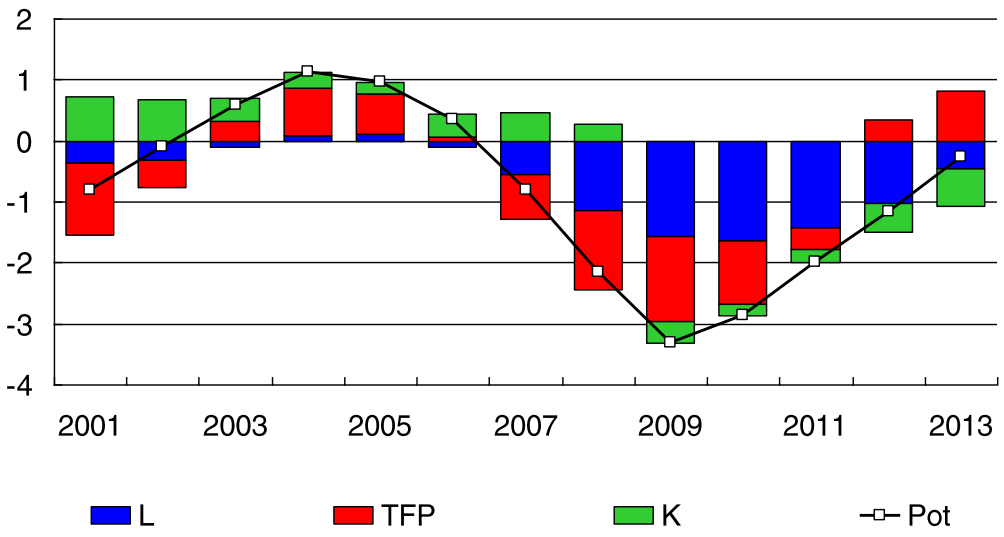
8 The perfect homogeneity of the NAIRU across sectors implicitly relies on the hypothesis of perfect mobility of labour across sectors.

the standard estimates, which do not correct for U_k, the 2013 potential in the manufacturing industry was 11.3% lower than in 2007. This estimate is considerably smaller than the one obtained with the previous two approaches (Table 3). Such finding was to be expected: the PF approach hinges on computing the potential output that is consistent with the long run equilibrium levels of the determinants of production; therefore, the resulting potential output series tends to be relatively less volatile. Despite that difference, the PF approach leads to conclusions that are qualitatively similar to the ones reached above: the size of the recent shock was unprecedented in historical comparison. Indeed, in the last six years the potential of the manufacturing sector recorded the largest fall since the start of the series in 1970; in 2013 it was back to the level of about twenty years earlier.

Chart 2

Contribution to growth to the potential output

(Yearly rate of change)



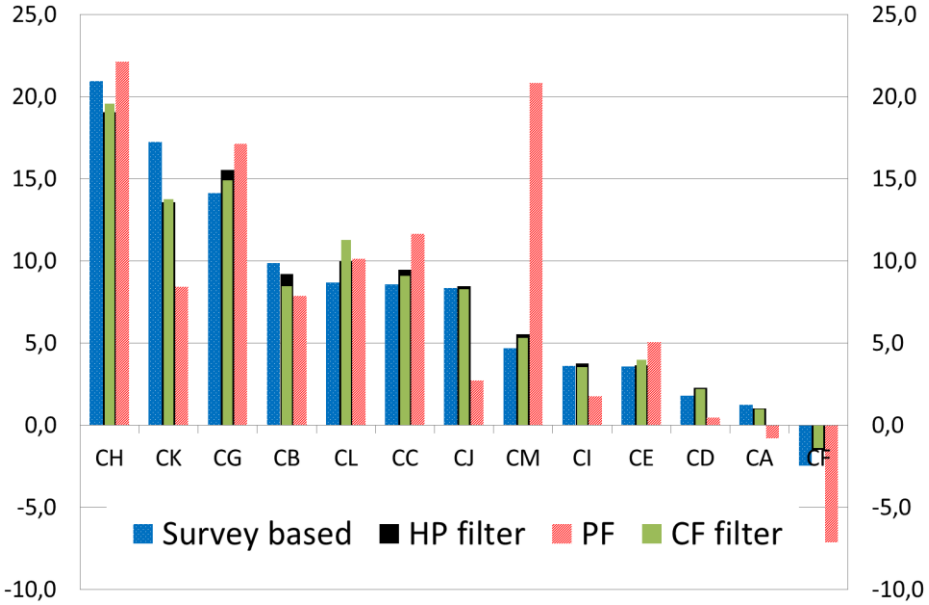
Source: own calculation based on Istat and Terna data. L: contribution of labour; K: contribution of capital; TFP: contribution of the TFP ; Pot: annual rate of change of the potential output.

In terms of factor determinants, about 60% of the cumulated drop of potential output in 2007-13 came from labor, while around 25% is attributable to the TFP (Chart 2). The reason why the contribution of capital is comparatively small is twofold: first, the industrial sector is characterized by a large wage share (close to 70%), therefore the contribution of K in the production function is limited; second, capital is an highly persistent variable and the fall in investments recorded during the two recessions, even if remarkably large, has not (so far) resulted in a dramatic drop of the capital stock.

Chart 3

Baseline contributions to capacity loss by activity sector

(Shares by sector of activity; percentage points)



Source: own calculation based on Istat data; sectoral shares in percentage points; negative numbers indicate that the sector shows an increase in potential. The sum of the sectoral shares is equal to 100 for each method. For PF method, National accounts value added weights. Sectors are described in Appendix A.

Two sensitivity analyses were carried out to quantify the possible differences in the estimates of potential production due to (A) using gross capital stock figures instead of net one, and (B) assuming faster capital goods depreciation, as implied by recent findings in Tartaglia Polcini (2013). In both cases the changes with respect to the baseline estimates are negligible, partly because of the relatively limited weight of capital in the production function and partly because the two variants above do not imply markedly different capital series.

In the baseline PF-based estimates, a large drop of potential output is estimated for firms producing rubber and plastics products (-19.4%) and transport equipment (-18.4%), similarly to the results found with the other approaches (Table 1); a major plunge is also estimated for other manufacturing (-23.7%) and the wood, furniture, paper and printing sector (-19.6%). Potential was broadly stable for producers of food, beverages and tobacco and increased sharply in the pharmaceuticals (22.4%).

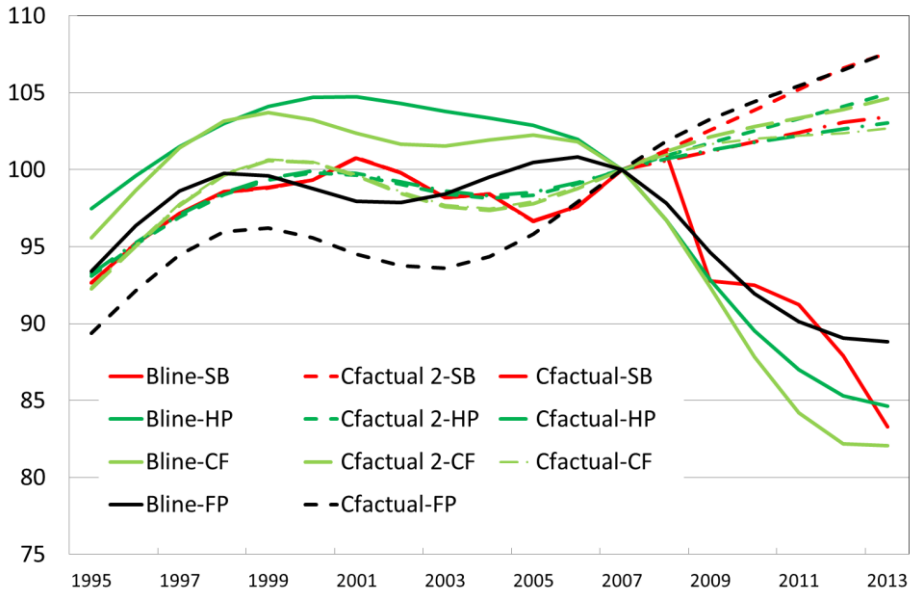
Chart 3 maps the actual contributions of each sector to aggregate manufacturing capacity loss, according to the three methods. There are large differences only for the manufacture of pharmaceutical products (CF) and the other manufacturing sector (CM);

sizeable discrepancies are also found for the Manufacture of machinery and equipment n.e.c (CK) and in the electrical equipment production (CJ).[9]

Chart 4

Potential output in the manufacturing sector: actual and counterfactual values according to all methods

(Index 2007=100)



Source: own calculation based on Istat data.
Notes: Bline: baseline computation for survey-based method (SB), Hodrick-Prescott filter (HP), Christiano-Fitzgerald filter (CF) and production function method (FP); Cfactual: counterfactual computation on 1999-2007 period; Cfactual 2: counterfactual computation on 1992-2007 period.

Chart 4 and Table B1 show the potential output estimates for the manufacturing industry obtained with a counterfactual approach, as in Sections 2 and 3. In the counterfactual scenario, potential output would have been 7.6% higher in 2013 than in 2007, thanks to the larger increase of TFP (explaining more than half of the increase) and capital (accounting for about 40%). The large contribution of capital owes to its average 1.7% increase before 2008, against a slight actual decline during the crisis. In the counterfactual exercise, the TFP keeps growing by slightly less than 1% each year.

In 2013 the baseline level of potential output in the manufacturing sector was lower than the level in the counterfactual scenario by 17.6%. This estimate is smaller but not far from those computed with the survey based and filtering approaches. More than one third of the difference with respect to the counterfactual is due to the labor input and to the TFP.

9 Some of the discrepancies are due to the different sectoral weights on total manufacturing production and on total manufacturing value added.

Table B1 shows the fall of potential output between 2007 and 2013 in the actual and counterfactual scenarios: in line with the analysis of Sections 2 and 3, the sectors most affected by the crisis are the ones producing metals, rubber and plastic and machinery and equipment.

5. Conclusions

In this work we assess the loss of capacity in the Italian manufacturing industry in the years 2008-20013, when Italy was hit by two unprecedented recessions. We use an array of different approaches, based on surveys, statistical filters and a production function approach. All methods point to a sizeable fall in the level of the production capacity: about 11% with the production function approach and around 17% with the other two. This is a large shock in historical terms; it implies that potential output fell back to the levels of the first half of the nineties.

In comparing the results obtained with the different approaches one should consider that survey based methods and the statistical approaches are relatively more affected by the current changes of activity; the production function method is the less affected by the actual evolution of production, as potential output is a function of the equilibrium level of the factors.

In order to disentangle the effect of the crisis from that due to previously ongoing sectoral trends, the loss of potential was also assessed with respect to a counterfactual scenario, in which the data replicate the pre-crisis dynamics; the loss so estimated amounts to almost 20%, with a large heterogeneity across sectors. Firms producing basic metals, fabricated metal products and machinery and equipment are found to be the ones that were most penalized by the crisis of the last six years; by contrasts, sectors that were already shrinking before 2008, such as the manufacture of textiles, appear not to have performed significantly worse during the double-dip recessions than they had in the early 2000's.

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Appendix A: data

In this section we list and briefly describe the data sources we employed for the estimation of production capacity at both the aggregate and the sectoral level:

Survey based methods: IP series (monthly) are NWDA and NSA; CU series (quarterly) are NWDA and NSA. In charts and computations we used Mave4 of quarterly series, to control for seasonality in capacity utilization.

Statistical filters methods: IP series (monthly) are WDSA. Series, originally 1990.1 to 2013.12 are made quarterly and projected forward (up to 2017Q4) with an AR4 process. Series are then filtered with HP (lambda = 1600).

Production function analysis: we use National Accounts annual data which are available since 1970. Y is the value added at factor cost; LF is derived from the National Accounts measure of employment, rescaled for the inverse of the employment rate; the NAIRU is estimated as in Bassanetti et al. (2006), using an unobserved component method; for K we use the stock of net capital as baseline but also the stock of gross capital and a third measure that simulates the faster depreciation recently estimated in Tartaglia Polcini (2013). When we apply the U_k correction we use our electricity consumption based measure described in section 2.1, this in order to avoid using the same information as in section 2.

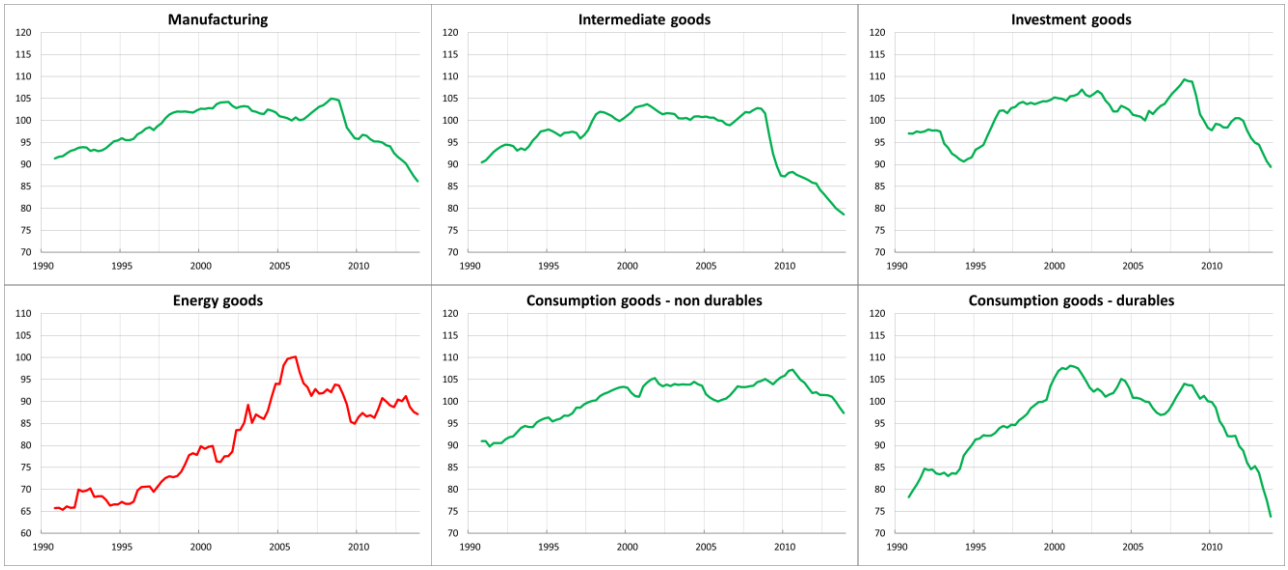
Sectors (NACE rev.2)

C MANUFACTURING
CA Manufacture of food, beverages and tobacco products
CB Manufacture of textiles, wearing apparel and leather
CC Manufacture of wood, paper products and printing
CD Manufacture of coke and refined petroleum products
CE Manufacture of chemicals
CF Manufacture of pharmaceutical products
CG Manufacture of rubber, plastic and non-metallic mineral products
CH Manufacture of basic metals and fabricated metal products
CI Manufacture of computer, electronic and optical products
CJ Manufacture of electrical equipment
CK Manufacture of machinery and equipment n.e.c.
CL Manufacture of transport vehicles
CM Other manufacturing

Appendix B: additional charts and tables

Chart B1

Potential production for Manufacturing and Main Industrial Groupings (MIGs)
(2005 = 100)

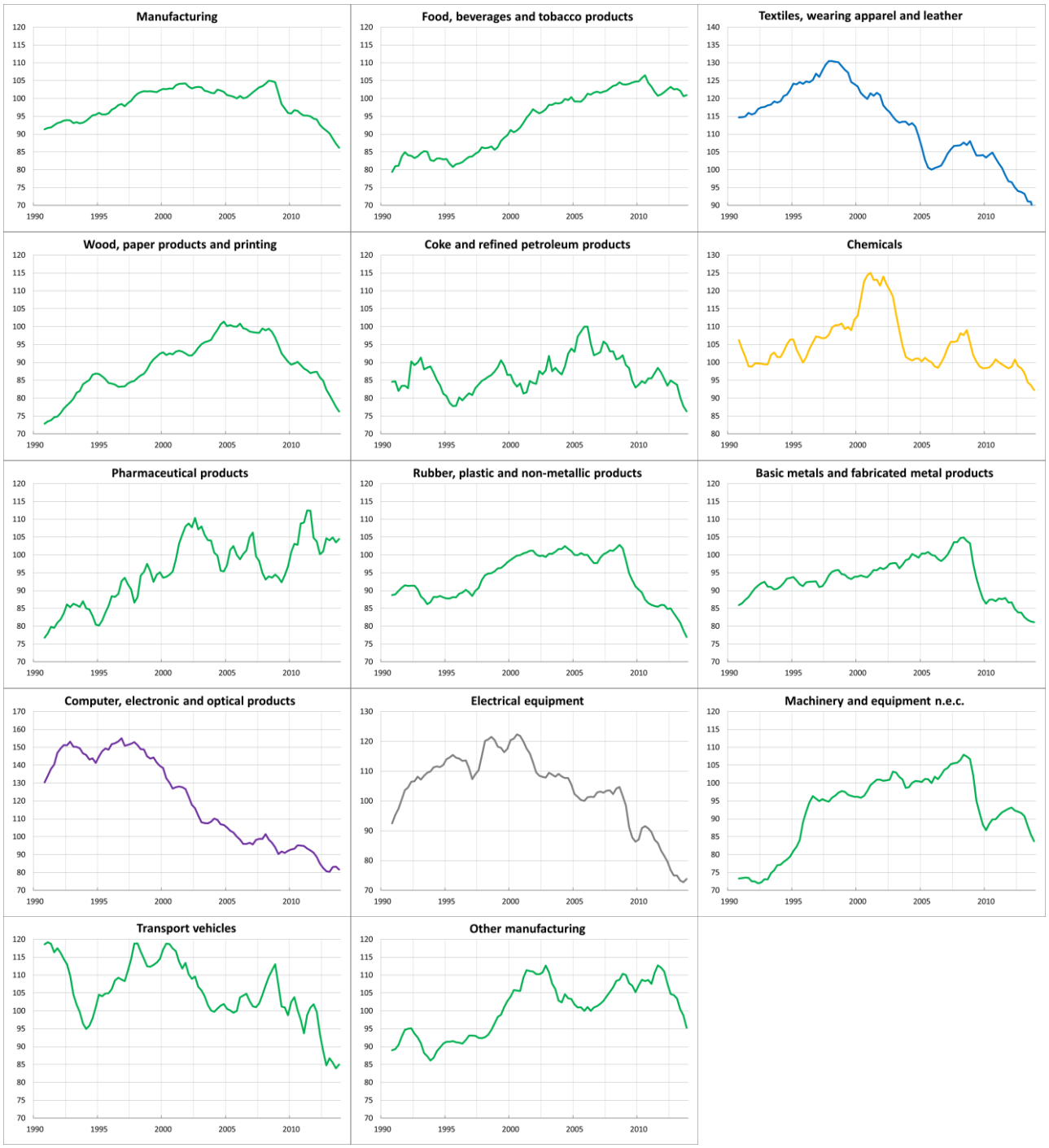


Source: own calculation based on Istat data. Green line for 70-120 scale; different colors are associated with other scales.

Chart B2

Potential production for Manufacturing and Sectors of activity

(2010 = 100)

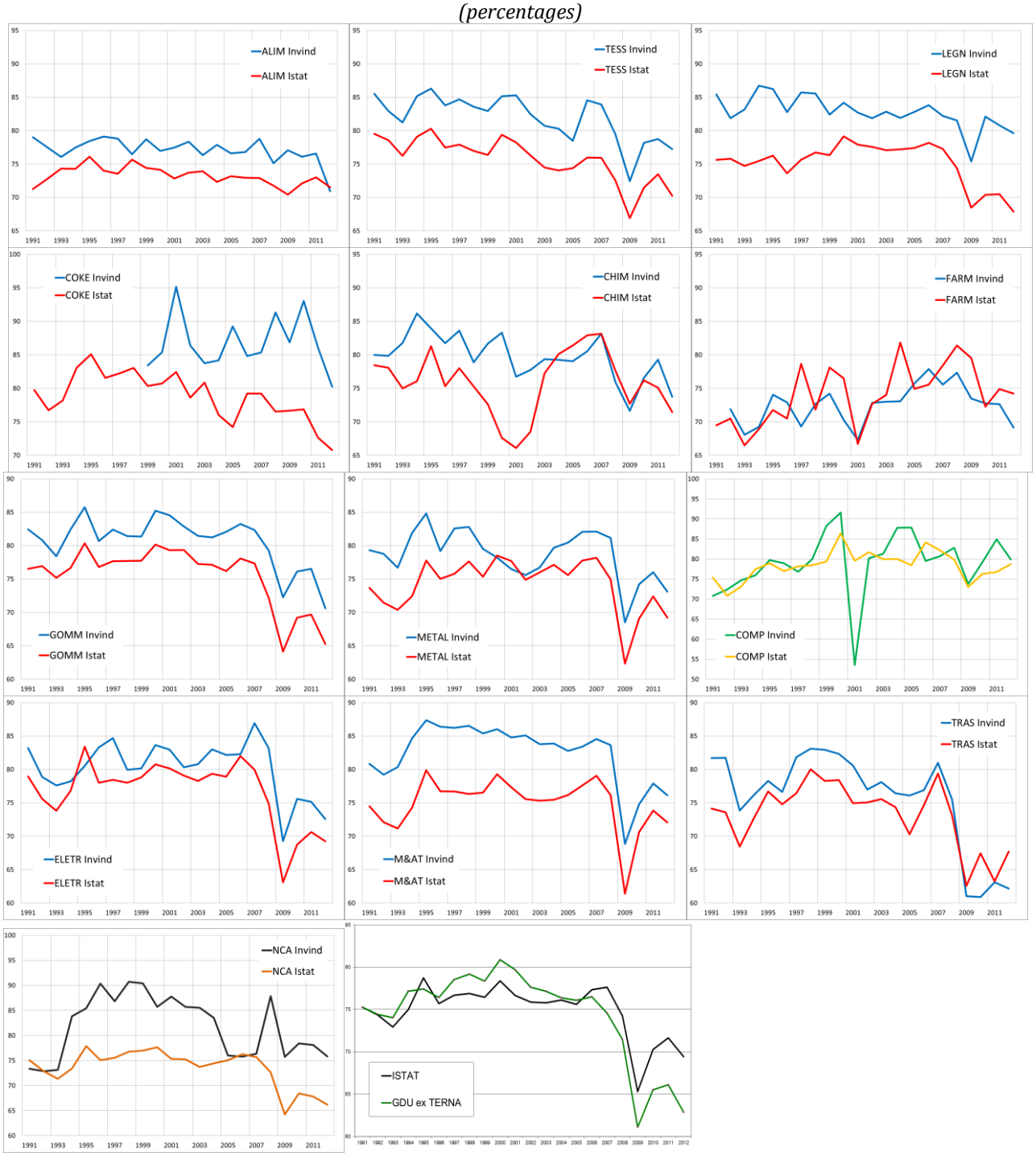


Source: own calculation based on Istat data. Green line for 70-120 scale; different colors are associated with other scales.

Chart B3

Rate of capacity utilization, by activity sector, according to Istat, to the Bank of Italy *Survey on industrial and service firms* and to Terna

(percentages)

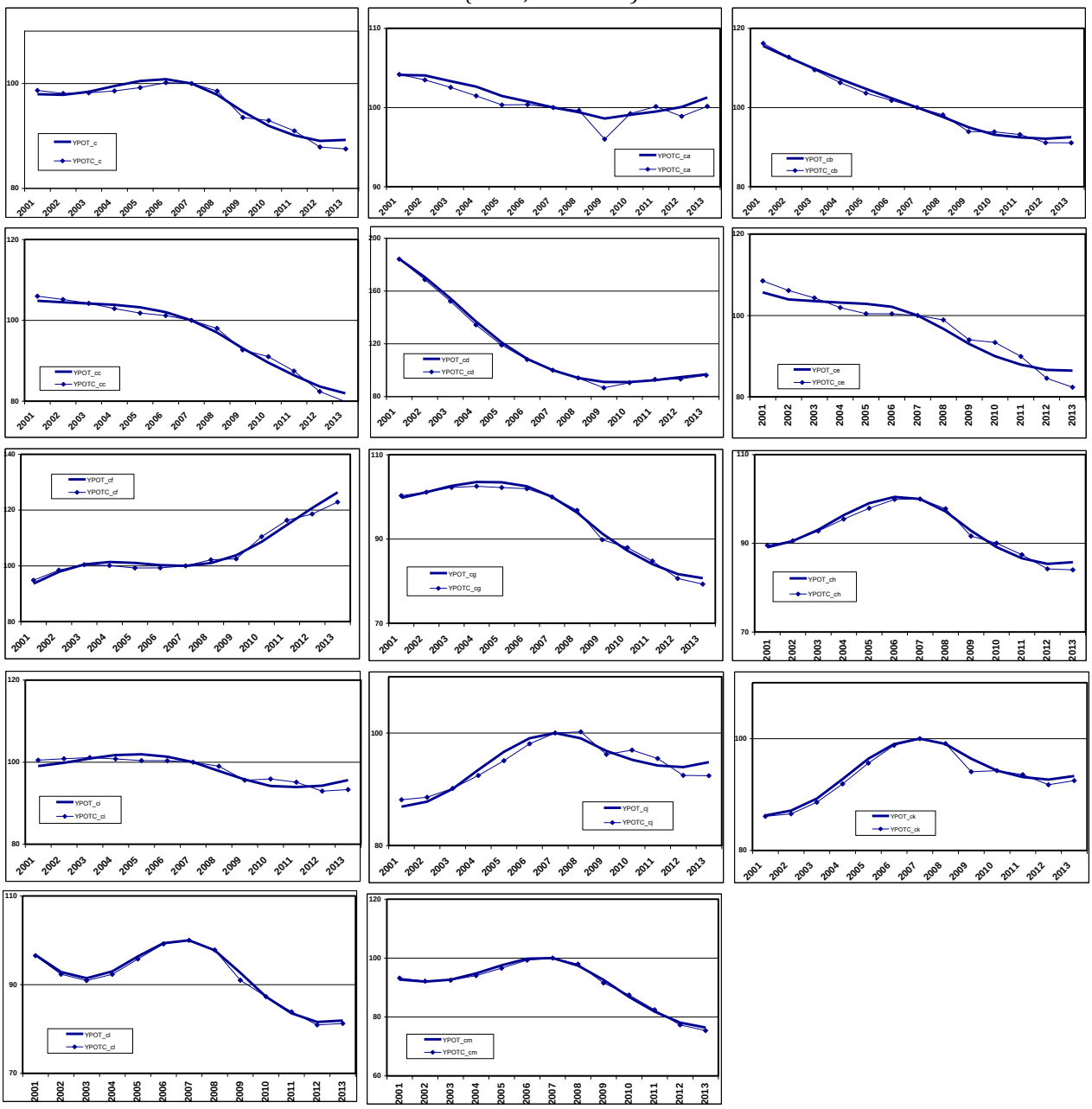


Source: own calculation based on Istat, BoI *Survey on industrial and service firms* and Terna data. Blue and red line are associated with 30pp scales; different colors are associated with larger or smaller scales.

Chart B4

Potential output estimates, Production Function approach

(index, 2007=100)



Source: own calculation based on Istat and Terna data. YPOT_XX:estimates of potential output; YPOTC_XX: estimates of potential output with correction for the capacity utilization; suffix _XX stands for the ATECO 2007 NACE rev. 2 sectors (see Appendix A)

Table B1

Capacity changes by activity sector
(percentages)

Capacity changes by activity sector and MIGs (2007-13)	*Production Function*	
	Actual	Counterfactual
CA Manufacture of food, beverages and tobacco products	0,7	-2,4
CB Manufacture of textiles, wearing apparel and leather	-8,0	-0,9
CC Manufacture of wood, paper products and printing	-19,6	-22,5
CD Manufacture of coke and refined petroleum products	-24,2	4,4
CE Manufacture of chemicals	-15,3	-12,2
CF Manufacture of pharmaceutical products	22,4	2,8
CG Manufacture of rubber, plastic and non-metallic mineral products	-19,4	-25,1
CH Manufacture of basic metals and fabricated metal products	-16,0	-27,8
CI Manufacture of computer, electronic and optical products	-5,1	-16,2
CJ Manufacture of electrical equipment	-6,2	-17,9
CK Manufacture of machinery and equipment n.e.c.	-6,6	-22,4
CL Manufacture of transport vehicles	-18,4	-23,5
CM Other manufacturing	-23,7	-32,3
TOTAL MANUFACTURING (1)	**-11,3**	**-17,6**

Source: own calculation based on Istat and Terna data; percentage points.
Notes: (1) direct estimates.

Table B2

Contributions to capacity changes by activity sector

(percentage changes of the potential =100)

% Contributions to capacity loss by activity sector (2007-13)	***Survey based method***		***HP Filter***		***CF Filter***		***Production function****	
	Baseline	Cfactual	Baseline	Cfactual	Baseline	Cfactual	Baseline	Cfactual
CA Manufacture of food, beverages and tobacco products	1,2	5,5	1,0	6,9	1,0	2,5	-0,6	1,4
CB Manufacture of textiles, wearing apparel and leather	9,8	3,7	9,2	4,2	8,5	4,3	7,4	0,5
CC Manufacture of wood, paper products and printing	8,5	8,7	9,5	9,0	9,1	9,3	11,7	8,5
CD Manufacture of coke and refined petroleum products	1,8	1,8	2,3	1,6	2,2	1,6	2,8	-0,3
CE Manufacture of chemicals	3,5	6,0	3,6	4,4	4,0	4,7	5,2	2,7
CF Manufacture of pharmaceutical products	-2,5	-1,2	-1,5	-0,4	-1,4	-0,4	-5,9	-0,5
CG Manufacture of rubber, plastic and non-metallic mineral products	14,1	12,5	15,5	13,7	14,9	14,3	15,9	13,2
CH Manufacture of basic metals and fabricated metal products	20,9	25,3	19,1	21,3	19,6	22,3	22,8	25,2
CI Manufacture of computer, electronic and optical products	3,6	-0,6	3,8	0,0	3,5	0,0	1,7	3,5
CJ Manufacture of electrical equipment	8,3	5,6	8,4	5,9	8,3	6,4	2,8	5,2
CK Manufacture of machinery and equipment n.e.c.	17,2	21,3	13,6	16,5	13,8	16,8	7,4	15,9
CL Manufacture of transport vehicles	8,7	7,1	10,0	10,1	11,3	11,2	9,4	7,7
CM Other manufacturing	4,7	4,2	5,5	6,7	5,3	7,0	19,4	16,9
TOTAL MANUFACTURING (= sum of the sectoral shares)	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**
Capacity loss for total manufacturing 2007-13	***-16,7***	***-19,4***	***-15,4***	***-17,9***	***-17,9***	***-20,1***	***-11,3***	***-17,6***

Source: own calculation based on Istat data; sectoral shares in percentage points; negative numbers indicate that the sector shows an increase in potential. The sum of the sectoral shares is equal to 100 for each method. (*) National accounts value added weights.

How Financial and Sovereign Risk Shocks shape Potential Output in Italy

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December 18, 2014

Abstract

This paper evaluates the effects of financial and sovereign debt shocks on potential output dynamics in Italy. To this aim, we estimate a Bayesian VAR model on quarterly data covering the period 1999–2013 and identify technology, financial and sovereign risk shocks. By performing a multivariate Blanchard–Quah decomposition we are able to recover the cyclical and long–run components of GDP. We find that financial shocks strongly contributed to the deviations of Italian output from long–term path potential during the global financial crisis and sovereign risk shocks played a prominent role in the most recent period. In particular, the estimated slack in economic activity turns out to be deeper then analogous values obtained by means of production function approach because of the incorporation of financial factors.

JEL Classification: E41, E52, C32.
Keywords: potential output; Bayesian VAR; financial shocks; sovereign shocks.

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The views here expressed are those of the authors and do not necessarily reflect those of the Bank of Italy.

1 Introduction

The double–dip recession that hit the euro area economy starting at the end of 2007 has been severely affecting the dynamics of economic activity, fostering interest in the likely long–lasting effects of the contraction. Great emphasis has been given to the concept of potential output, defined as a measure of the medium–to–long term level of sustainable real output in the economy, which is a crucial (unobservable) variable to guide the implementation of both fiscal and monetary policy. According to all available estimates it experimented a non–negligible fall in the euro area in the wake of the financial crisis of 2008–09, mainly in relation to the downsizing of the financial and the constructions sectors, following their excessive growth in the lead–up to the crisis (EuropeanCentralBank, 2011; Borio *et al.*, 2013, 2014). While the long–run effects of the financial crisis on potential output remain uncertain, depending on the degree of flexibility of the euro area economy in absorbing and reacting to that shock, a dramatic hit to the recovery has been imported by the eruption of the sovereign debt crisis in 2011, firstly visible in the increase of the spread between Greek long–term rates and German Bunds, and then transmitted to other peripheral countries, before extending to Italy, one of the three major economies of the eurozone. As a result, a marked increase in heterogeneity has been observed in economic developments among core and peripheral countries.

The aim of this paper is to evaluate the dynamics of potential output in the euro area and in the three major countries (France, Germany and Italy), and to appraise the effects of financial shocks in inducing deviations of actual from potential output. In this version, full results are available for Italy only. Our empirical analysis focuses on the period after the launch of the euro (1999:Q1 to 2013:Q2). The curse of dimensionality problem, due to the lack of depth in the time series of interest is handled by estimating a Structural Bayesian VAR model for each country / area. The approach can be summarized as follows. We estimate the BVAR model and then identify different types of structural shocks using a mix of short and long-run restrictions: technology, monetary policy and financial innovations. An estimate of potential output is obtained as the cumulated effects of technology. We then recover the cyclical component of output by shutting down the effects of technology shocks, hence deriving the output–gap (Blanchard and Quah, 1989; Benati, 2012).

Our main results are as follows. First, the identified shocks display reasonable effects on the variables employed in our system. Second, we find that Italian potential output fell by about 2.0% between the peak observed in 2007:Q3 and the trough of 2009:Q3, before starting to recover until 2011:Q2, when the sovereign crisis extended to Italy. Since then, we estimate a small decline before the trend inversion took place around the end of 2012. Third, we also derive a measure of cyclical slack, which turns out to be deeper than analogous values achieved by means of production functions methods. We attribute this result to the inclusion

of financial shocks in the system. Indeed, when omitting the latter from the system, estimates of economic slack are more similar to those achieved by production function.

The remainder of the paper is organized as follows. In Section 2 we present the data employed in the empirical analysis. In Section 3 we sketch the methodology adopted. Section 4 reports the results of the empirical analysis. Finally, in Section 5 we draw some conclusions and illustrate the further steps planned in our research agenda.

2 Data and Stylized Facts

In this Section we present the data employed in the empirical analysis and briefly comment on some stylized facts. We employ the following variables: log–differences of real GDP and stock market prices appropriately deflated; the log–differences of harmonized consumer prices (HICP); the level of primary deficit–to–GDP ratio; the Euribor at 3 months; the spread between 10year yields on Italian and German bonds. This choice of variables, despite being parsimonious, provides an adequately rich description of the economy and allows us to carry out the multivariate Blanchard and Quah (1989) decomposition using a wider information set than in the original one (see also Benati, 2012). Stock prices and Euribor provide information on the stance of the business cycle, hence playing the role of demand–side variables. The inclusion of the spread between Italian and German long term yields is crucial in properly identifying the second recession, the one originated by the eruption of the sovereign debt crisis. Finally, accounting for a measure of fiscal stance helps in identifying possible channels of transmission of sovereign risk impact on output (Corsetti *et al.*, 2014).

Figures 1–2 present the data in levels and in first differences for Italy. Some comments are in order. Our sample is evidently characterized by strong turbulences:

- real GDP shows a double dip (and deep) recession decreasing trend in the most recent period;
- a rapid fiscal adjustment was carried out;
- two different shocks took place, clearly visible in the large falls in stock markets and abrupt changes in the sovereign risk
- extraordinary measures of monetary policy were undertaken, as suggested by the Euribor dynamics.[1]

Finally, it is worthwhile noting that real GDP indeed followed markedly different paths in the three major countries. Table 1 reports the cumulated growth rates of output in three

[1] We do not deal here with *unconventional* monetary policy measures.

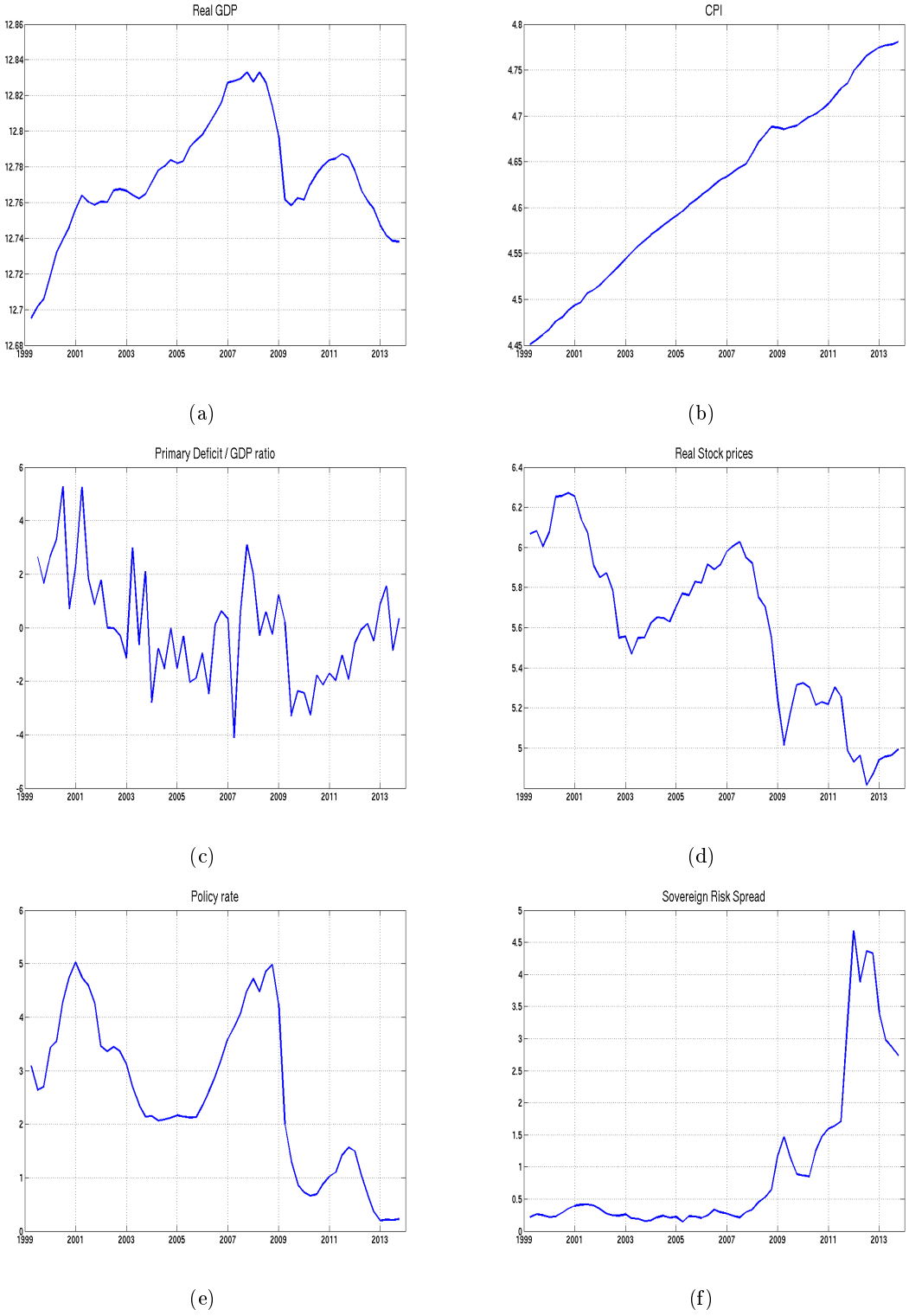
different periods: 1999–2007, corresponding to "normal times", 2008–09 coincident with the global financial crisis, and 2010–13, which includes both the recovery after the first crisis and the sovereign debt crisis period.

Two features clearly emerge: first, after the expansion observed in the first period, more pronounced in France than in Germany and Italy, all countries experimented a deep contraction during the global financial crisis, with Italy having the worst performance. Second, the heterogeneity in economic activity in the final period has been indeed striking: while France cumulated an increase in real GDP by 3.1%, Germany showed a much faster growth, amounting to about 7.1%; by contrast, and not surprisingly Italian output fell by about 3.2%.

Table 1: Cumulated real output growth in different periods covered in our sample

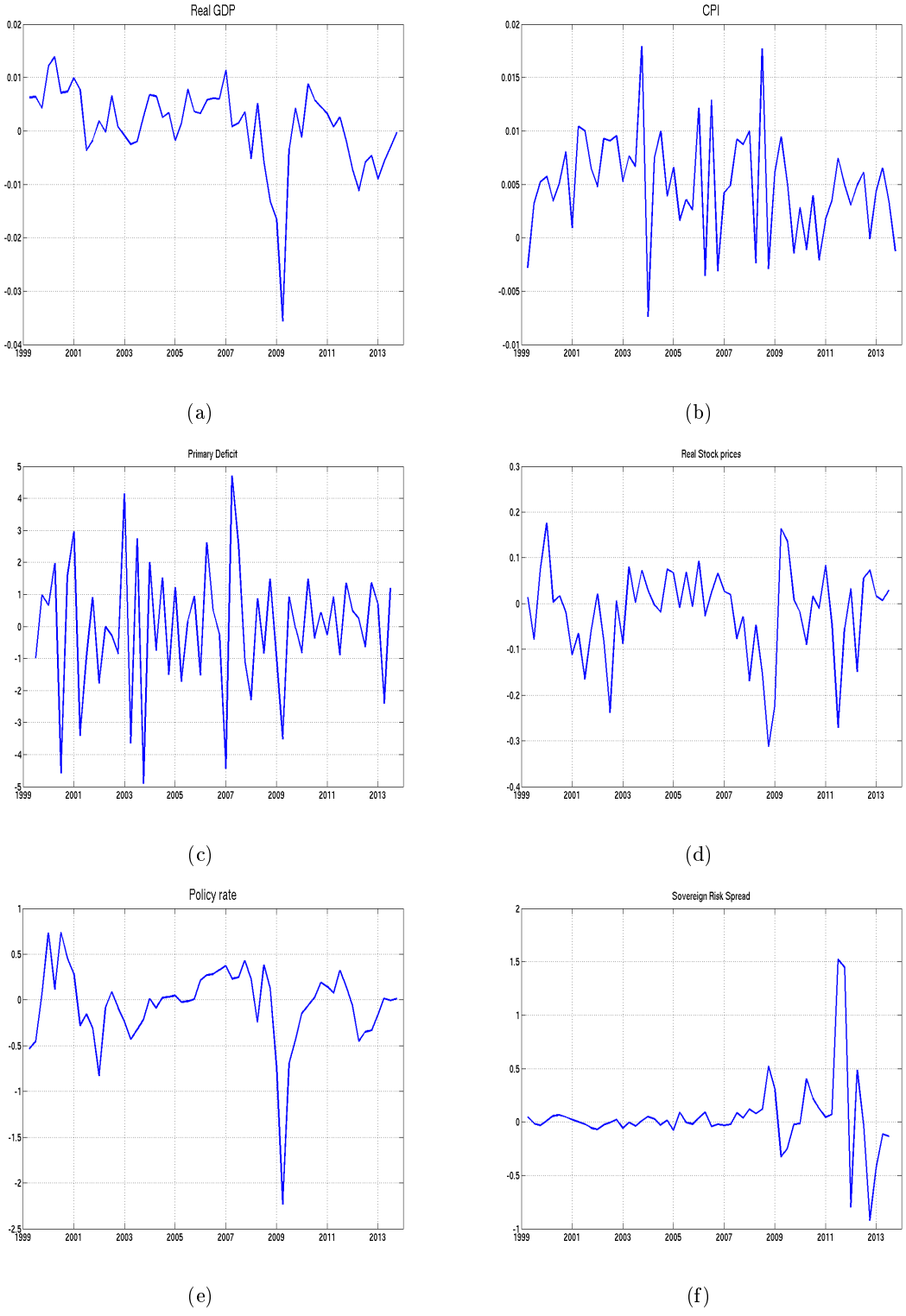
	1999–2007	2008–2009	2010–2013
Euro Area	19.5 %	-5.1 %	1.2%
France	18.4 %	-3.7 %	3.1 %
Germany	14.9 %	-5.0 %	7.1 %
Italy	13.3%	-7.2 %	-3.2%

Figure 1: Data used in the empirical analysis, (log)levels.



Notes: Seasonally adjusted data. Data are from ECB Statistical Data Warehouse except those on sovereign (DataStream). GDP, CPI, stock prices are taken in logarithms, while deficit–to–GDP ratio, the Euribor rate and the sovereign spread are in levels.

Figure 2: Data used in the empirical analysis, (log)differences.



(a) (b) (c) (d) (e) (f)

Notes: Seasonally adjusted data. Data are from ECB Statistical Data Warehouse except those on sovereign (DataStream). GDP, CPI, stock prices are taken in log–differences, while deficit–to–GDP ratio, the Euribor rate and the sovereign spread are in differences.

3 The Model

3.1 Bayesian VAR

Let Y_t be a vector of random variables. We consider the following VAR(p) model

$$Y_t = c + A_1 Y_{t-1} + ... + A_p Y_{t-p} + u_t \tag{1}$$

where u_t is an n–dimensional Gaussian white noise with covariance matrix $\mathbb{E}\ u_t u_t^{'} = \Psi$, $c = (c_1, ..., c_n)'$ is an n–dimensional vector of constants and A_1, ..., A_p are $n \times n$ autoregressive matrices. In order to overcome the curse of dimensionality related in particular to the short time span of our time series of interest we follow a Bayesian approach, in which sample information will be combined to some a-prioris. Let us rewrite the VAR model (1) as a system of multivariate regressions (see, for example, Kadiyala and Karlsson, 1997; Banbura *et al.*, 2010) such that the model si of order[2] $P = 2$ and dimension n:

$$\mathbf{Y} = \mathbf{XA} + \mathbf{E} \tag{2}$$

with $\mathbf{X} = (X_1^{'}, \ldots, X_t^{'}, \ldots, X_T^{'})^{'}$ the $T \times k$-matrix of regressors, where $X_t = (Y_{t-1}^{'}, \ldots, Y_{t-p}^{'}, \ldots, Y_{t-P}^{'})$ and $K = nP + 1$, estimated with Bayesian techniques: sample information is combined to some a-prioris. Specifically, we assume the (standard) Minnesota priors

$$E[B_{p,ij}] = \begin{cases} \delta_i,\ i = j, p = 1 \\ 0,\ \text{otherwise} \end{cases} \qquad V[B_{p,ij}] = \begin{cases} \frac{\lambda^2}{k^2},\ i = j \\ \frac{\lambda^2}{k^2} \frac{\sigma_i^2}{\sigma_j^2},\ \text{otherwise} \end{cases} \tag{3}$$

where $\delta_i = 1$ denotes variables that are characterized by high persistence, while $\delta_i = 0$ is set for variables that are considered as mean–reverting, hence modeled as white noise processes. We assume a-priori that less recent information becomes less important for the forecasts. The covariance of the residuals is assumed to be known and fixed: $\Sigma = diag(\sigma_1, \ldots, \sigma_i, \ldots, \sigma_n)$, where σ_i is the variance of the residuals from a univariate autoregressive model estimated for each i-th variable. The parameter λ represents the contribution of the a-priori information to the estimates.

The coefficients $B_{p,ij}$ are assumed to be Gaussian, while the covariance matrix of the residuals, Ψ, is distributed as an inverted-Wishart:

$$vec(\mathbf{B})|\Sigma \sim \mathcal{N}(vec(\mathbf{B}_0), \Sigma \otimes \Omega_0) \quad \Sigma \sim \mathcal{IW}(S_0, \alpha_0) \tag{4}$$

where $\mathbf{B}_0$, Ω_0, S_0 and α_0 are chosen to replicate the prior moments set in (3). The (4) is an *informative prior* which is combined with the likelihood $\mathcal{L}(\mathbf{Y}|\mathbf{X}, \mathbf{B}, \Sigma)$ to get the posterior distributions

[2]The order of the VAR is chosen according to Bayesian information criteria.

$$
\begin{aligned}
vec(\mathbf{B})|\Sigma, \mathbf{Y}, \mathbf{X} &\sim \mathcal{N}(vec(\hat{\mathbf{B}}), \Sigma \otimes \hat{\Omega}) \\
\Sigma|\mathbf{Y} &\sim \mathcal{IW}(\hat{\Sigma}, T_d + T - k)
\end{aligned}
\tag{5}
$$

As in Banbura *et al.* (2010), we implement the (3) by augmenting the base model (2) with dummies Y_d and X_d such that

$$
\begin{aligned}
B_0 &= \left(\mathbf{X}_d'\mathbf{X}_d\right)^{-1}\mathbf{X}_d'\mathbf{Y}_d \\
\Omega_0 &= \left(\mathbf{X}_d'\mathbf{X}_d\right)^{-1} \\
S_0 &= (\mathbf{Y}_d - \mathbf{X}_d\mathbf{B}_0)'(\mathbf{Y}_d - \mathbf{X}_d\mathbf{B}_0) \\
\alpha_0 &= T_d - k
\end{aligned}
$$

i.e.

$$
\mathbf{Y}_d = \begin{bmatrix} diag(\delta_1\sigma_1, \ldots, \delta_N\sigma_N)/\lambda \\ 0_{N(p-1)\times N} \\ diag(\sigma_1, \ldots, \sigma_N) \\ 0_{1\times N} \end{bmatrix} \quad \mathbf{X}_d = \begin{bmatrix} \mathbf{J} \otimes diag(\sigma_1, \ldots, \sigma_N)/\lambda & 0_{Np\times N_s} \\ 0_{N\times Np} & 0_{N\times N_s} \\ 0_{1\times Np} & \epsilon_{1\times N_s} \end{bmatrix}
$$

where $\mathbf{J} = diag(1, p)$, ϵ is the shrinkage on the seasonal dummies and λ is the shrinkage parameter on the n explicative variables.

Then, (2) becomes

$$
\mathbf{Y}_* = \mathbf{X}_*\mathbf{B} + \mathbf{E}_* \tag{6}
$$

where $\mathbf{Y}_* = (\mathbf{Y}', \mathbf{Y}_d')'$, $\mathbf{X}_* = (\mathbf{X}', \mathbf{X}_d')'$ and $\mathbf{E}_* = (\mathbf{E}', \mathbf{E}_d')'$.

It follows

$$\hat{\mathbf{B}} = \mathbf{X}_*^{'}\mathbf{X}_*^{-1}\mathbf{X}_*^{'}\mathbf{Y}_*$$
$$\hat{\Sigma} = (\mathbf{Y}_* - \mathbf{X}_*\hat{\mathbf{B}})^{'}(\mathbf{Y}_* - \mathbf{X}_*\hat{\mathbf{B}})$$

3.2 Structural Analysis

3.2.1 Identification

From Wold theorem, we know that if $\mathbf{Y}_t$ is stationary then (2) has a moving average representation

$$\mathbf{Y}_t = \sum_{i=0}^{\infty} \Psi_i \mathbf{e}_{t-i} \tag{7}$$

The forecasting errors $e_{jt} \sim WN(0, \sigma_j)$, $j = 1, \ldots, n$ and $\mathbb{E}\left(e_{jt}e_{it}\right) \neq 0$ for each $j \neq i$, can be given an economic meaning by identifying them as structural shocks u_{jt}, uncorrelated with each other and with variance normalized to one. Indeed, assuming that the reduced form errors are linear combinations of the structural shocks

$$\mathbf{e}_t = \mathbf{C}_0\mathbf{u}_t \tag{8}$$

it follows that

$$\hat{\Sigma} = \mathbf{C}_0\mathbf{C}_0^{'} \tag{9}$$

and, hence

$$\mathbf{C}_j = \Psi_j\mathbf{C}_0 \tag{10}$$

One may then write and compute the impulse response functions of the structural model

$$\mathbf{Y}_t = \sum_{i=0}^{\infty} \mathbf{C}_i \mathbf{u}_{t-i} \tag{11}$$

We use a Cholesky identification scheme to disentangle shocks coming from the demand–side: in line with economic theory, prices, financial and monetary policy shocks are assumed not to affect real GDP contemporaneously; stock markets do not react to monetary policy shock instantaneously while we allow the bond spread, a measure of sovereign risk, to be affected by all the other shocks but monetary policy on impact. In practice, we are assuming that the ECB may react contemporaneously to an exogenous rise in sovereign tensions, as

a countercyclical policy (see also Neri and Ropele, 2014). Therefore, we rank variables as follows: $\mathbf{Y}_t = \Big(gdp_t, hicp_t, Deficit_t, sp_t, sr_t, mpr_t\Big)$.[3] Finally, we rotate $\mathbf{C}_0$ until we also identify the technology shock as the only one giving a boost to output in the long-run. More precisely, we construct a rotation matrix $\mathbf{R}$ such that $\mathbf{C}_0^* = \mathbf{C}_0\mathbf{R}$ matches both the short and the long-run identifying conditions, i.e. the rotation matrix is such that technology shocks are the only one influencing output in the long–run, while satisfying at the same time the other constraints coming from the Cholesky. In this sense, one may think that we are adopting a similar approach to the one used in the sign restrictions methodology (Uhlig, 2005).

3.2.2 Effects of long and short run shocks on output fluctuations

Once we have identified the structural shocks, we follow Blanchard and Quah (1989) and estimate the output gap, as the component of real GDP driven by demand disturbances, and the potential output, i.e. the long-term trend of GDP, as the component of GDP driven solely by supply shocks. As in Benati (2012), we extract the short-run signal from the output by reconstructing log real GDP only as a function of *non–technology* shocks, $\mathbf{u}_{P+1+j}^{dem}$:

$$y_{P+1+j}^{gdp} = \mathbf{a}_{1,1}\mathbf{Y}_{P+j} + \mathbf{a}_{2,1}\mathbf{Y}_{P+j-1} + \cdots + \mathbf{a}_{P,1}\mathbf{Y}_{j+1} + \vec{1}\mathbf{u}_{P+1+j}^{dem} \tag{12}$$

for $j = 0, \ldots, T-(P+1)$. By subtracting this cyclical component from log real GDP, we obtain an estimate of the potential output.

4 Results for Italy

Here we present the main findings of the structural analysis for Italy; the analysis for euro area, France and Germany is in progress. In subsection 4.1 we focus on the impulse response functions to the identified shocks; in subsection 4.2 we estimate potential output and output gap.

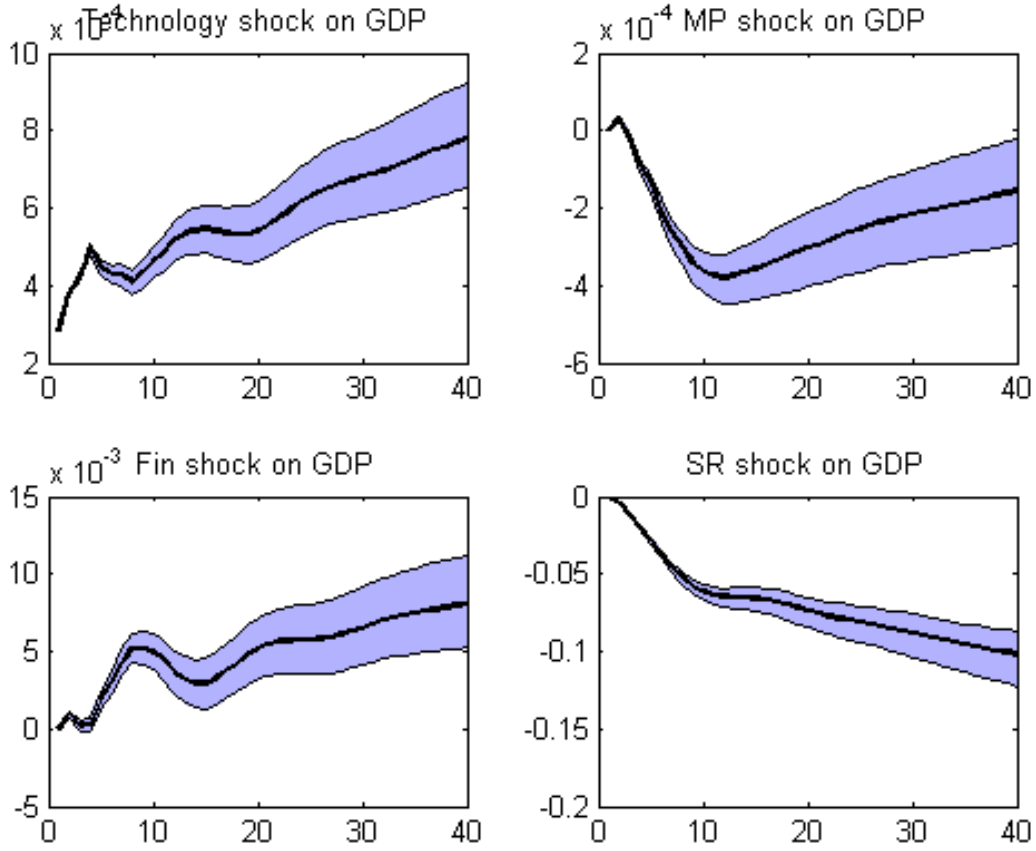
4.1 Impulse response functions

Figure 3 shows the reaction of GDP to technology, monetary, financial and sovereign risk shock, together with the corrispondent 95% confidence interval. Each shock is modeled as a positive innovation in the variable of interest, i.e. an increase in the shocked variable. We therefore are commenting the dynamic effects of an expansionary shock in technology and financial markets, and, by contrast, of a contractionary innovation in the policy rate and in

[3] Switching sp_t and mpr_t, in order to allow for a reaction of monetary policy to financial disturbances, produces qualitatively similar results. We experimented as well with ordering the policy rate before the sovereign risk.

the spread between Italian and German long–term bond rates.[4]

Figure 3: Impulse response functions of GDP to structural shocks.



As expected, technology shock rises output permanently in line with theoretical predictions of macroeconomic models and with empirical evidence (Blanchard and Quah, 1989; Dedola and Neri, 2007; Berg, 2012).[5]

Stock prices shocks display the expected positive impact on GDP, whereas a rise in sovereign risk depresses economic activity. Remarkably, a monetary tightening of the policy rate lowers economic activity in a very persistent way: real GDP reverts back to its pre–shock level only in the long run as well. One may think that this can be due to a lack of information in our VAR (see Forni and Gambetti, 2010, for illustrating this issue by a comparison between SVAR and Structural Factor models), but a similar reaction is found for Italy by Barigozzi

[4]Results are robust to the adoption of the spread between the 10 years Greek long–term interest rate and the Bund as a measure of the sovereign risk.

[5]A remarkable exception to this finding is given by Galí (2004), who provides evidence of a dampened response of GDP to technology shocks in the euro area. However, preliminary evidence by the forecast error variance decomposition shows that technology shocks, despite having a significant impact on output dynamics, are not the main source of economic fluctuations neither in the eurozone or in Italy on the considered sample.

et al. (2014), who use a Structural Dynamic Factor Model, covering a large number of real and monetary time series. This result could be probably related to the negative trend of GDP in the last six years (see 1), during which the economic turmoil has been inducing great instability of the macroeconomic variables. This may have determined a structural change in the monetary transmission mechanism. A further possibility is given by the strong credit crunch observed in both the crises, the latter more severe. Indeed, the deep contraction in the volume of loans accorded to households and non–financial corporations could have fueled an amplification of monetary transmission, consistently with the credit channel of monetary policy and the financial accelerator mechanism (Bernanke and Gertler, 1995; Bernanke *et al.*, 1996). We are going to develop further these issues in the next version of this project, by including credit aggregates and measures of the external finance premium, in order to identify an adverse credit shock and compare the results to those achieved by identifying a shock to stock prices.[6]

Overall, we should note that the results of our impulses response functions (i) look sensible and plausible and (ii) seem to suggest a non–trivial role for both financial and sovereign shocks in affecting the evolution of economic activity.

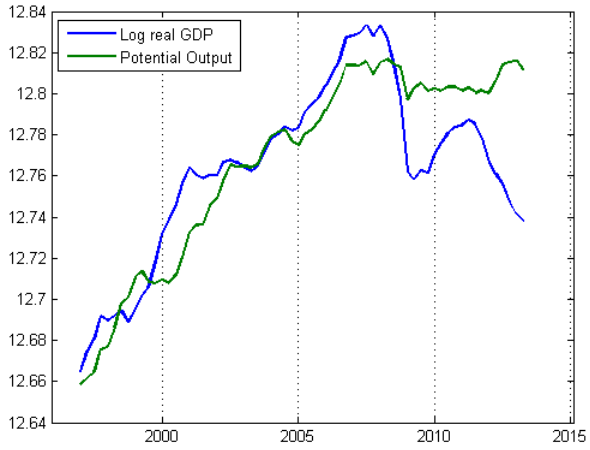
4.2 Potential output and output gap

Figure 4 displays the estimated potential output compared to the log-levels of real GDP (panel a) and the jointly estimated output–gap for the Italian economy, defined as the sum of non–technology shocks (panel b). We start commenting about our findings on potential output dynamics. Consistently with other studies on Italy (Ball, 2014; Gerali *et al.*, 2014), Italian potential output contracted by about 2% with respect to the peak reached before 2008, then stagnating during the sovereign debt crisis, before starting to recover in the first half of 2013. It this worth noting that in our methodology the loss of potential output is measured with respect to the *actual* series of real GDP and not with respect to the long–run growth trend which the economy was recording before the Global Financial Crisis, as in Ball (2014, for example). Should we follow the latter methodology, the loss would be substantially higher, around 10%.

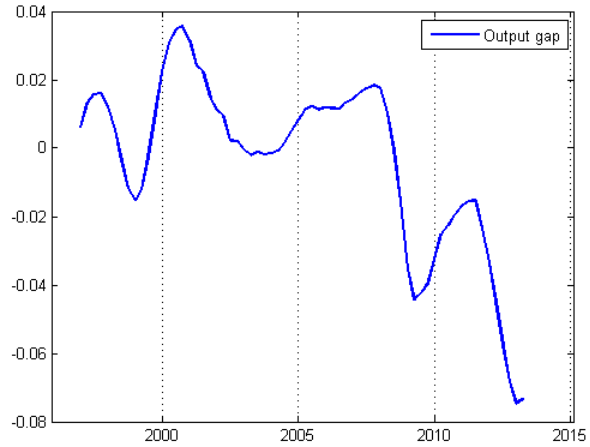
Accordingly, after reaching a positive peak equal to around 2% the estimated output–gap displays the well known contraction during the Global Financial Crisis, before reverting the trend up to 2011, when the sovereign debt crisis started to take its toll on the Italian economy. The point estimates for the output –gap in teh last period available in our analysis is around -7%, well below values obtained with statistical filters such as Hodrick–Prescott or production

[6]We may also exploit different identification schemes, such as the one proposed by Bjørnland and Leitemo (2009), to constrain to zero the response of output to monetary policy. However, it turns out very difficult to find rotations that jointly provide consistent impulse responses of other variables and a less persistent reaction of GDP to monetary policy.

function methods, which range around −4.5%. This effect could be due to the incorporation of shocks stemming from the financial sector. Indeed, a simple bivariate VAR model including real GDP and unemployment rate only provides an estimate of the output–gap around 3.5%.



(a) Potential output



(b) Output gap

Figure 4: Trend and cyclical components of GDP.

5 Concluding remarks

This paper addresses the impact of the global financial crisis and the sovereign-debt crisis on potential output in Italy; future developments will be devoted to extend the empirical analysis to the euro area and its major countries.

We adopted the approach proposed by Blanchard and Quah (1989) and more recently by

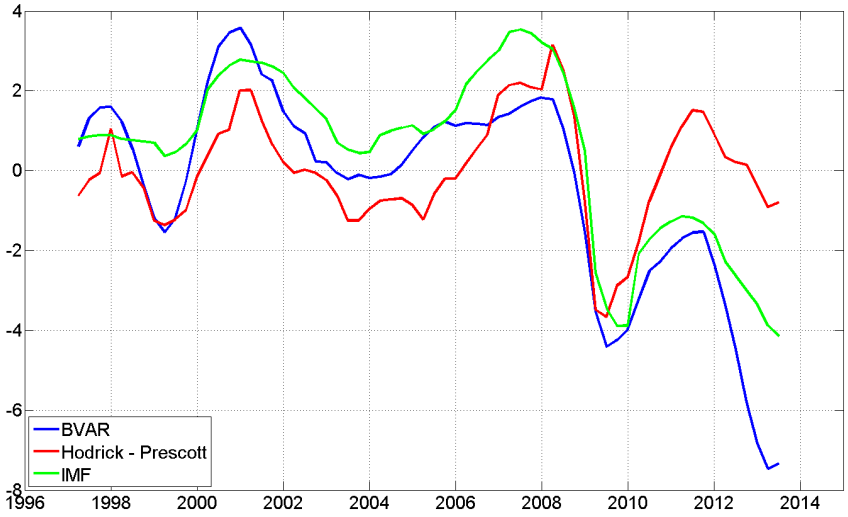


Figure 5: Cyclical components of GDP: different methodologies.

Benati (2012) to estimate potential output (driven by technology shocks), and the output gap (affected by financial shocks and derived as the difference between actual and potential output). A Bayesian VAR has been estimated to cope with the relatively lack of depth in the data; the structural shocks have been identified by a mix of short and long-run restrictions.

Our main findings are the following. First, our estimates suggest that the global financial crisis determined a fall in Italian potential output by about 2.0% and that the size of the decline was smaller during the sovereign debt crisis. Second, financial shocks – especially to sovereign risk – are the main responsible for the negative output–gap observed in the last six years. Third, the size of the cyclical economic slack turns to be very strong, deeper than analogous values obtained by production function methods or statistical filters.

As further developments of the analysis, beyond extending the analysis to France and Germany, our aim is to include business survey indicators to account for agents' expectations, which may have triggered a belief channel, especially during the sovereign debt crisis (Corsetti *et al.*, 2014). Some robustness checks on priors' setting and on the identification scheme will be tested as well.

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Every Cloud has a Silver Lining.
The Sovereign Crisis and Italian Potential Output

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Abstract

The paper provides an assessment of the direct and indirect effects on Italian potential output of the sovereign debt crisis: the former are captured by the increase in the cost of borrowing for Italian debtors that occured in the second half of 2011, when fears of a euro-area break-up soared; the latter by the policy responses that followed the outbreak of the crisis (fiscal consolidation and structural reforms). The evaluation, which goes as far as 2030, is made with respect to a no-crisis scenario reflecting the pre-2011 potential output projections and government's budget rules. A new-Keynesian dynamic general equilibrium model calibrated to Italy is used to simulate the response of real GDP to financial and fiscal shocks and to estimate the macroeconomic effects of reforms aimed at reducing monopoly rents. Potential output is estimated in a "model-consistent" way and coincides with the level of equilibrium GDP prevailing in an environment of flexible prices and no real rigidities. The main findings of the paper are the following. The crisis and the fiscal tightening that it set off are estimated to have subtracted nearly 2pp, cumulatively, to potential output in 2011-2013: the largest contribution (about 2/3 of the total) is attributed to the increase in the cost of borrowing, while fiscal consolidation efforts played a relatively minor role. The growth-enhancing impact of structural reforms, implemented in 2013, would be about 3pp over 2013-2030 period, less than what estimated by international organisations, IMF and OECD in particular. In 2020-2030, reductions in tax rates, made possible by lower interest payment on public debt, would boost potential output growth by some 0.1-0.3pp per year.

JEL classification: C51; E31; E52.
Keywords: Sovereign risk, fiscal policy, potential output.

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1 Introduction

The euro area sovereign debt crisis has left a burdensome legacy to the Italian economy, in the form of a higher cost of borrowing (for both private and public debtors) and higher taxation.[1]

During the summer of 2011 international investors liquidated large positions in Spanish and Italian debt, causing a sharp rise in the cost of borrowing for both sovereigns. The yield spread between 10-year Italian and German bonds peaked from below 140 basis points (bp) to above 550 in November 2011; it then declined to below 300bp after the enactment, at the end of that year, of a hefty fiscal consolidation package, but quickly returned to historically high levels starting from April 2012. A firm downward trend in the sovereign risk premium started only in July 2012, when the President of the European Central Bank Draghi announced (and then launched) the Outright Monetary Transactions (OMT) program, which dissipated the fears of a euro-area break-up and eased financial market tensions.

All in all, to restore market confidence on the sustainability of Italian public finances, the Italian Parliament had to pass by March 2012 three consolidation packages, amounting to some 5 percentage points (pp) of GDP, mainly based on tax increases. It also enacted two reform laws, addressing the malfunctions of the labour market and the services sector, and inscribed in the Constitution a commitment to stabilize public finances (the European Union "fiscal compact").

The 2011 sovereign debt crisis and the related policy responses will have a long-lasting impact on the Italian economy. For the remaining part of the decade (and possibly for longer) the higher cost of borrowing, the record-level tax pressure and the gradual shift to the reformed setting in the labour market and services sector will be key drivers of economic activity. While structural reforms will give a permanent boost to the level of potential output, drags from taxes and financing costs are likely to be long-lasting but transitory. Risk premia and taxes are expected to return to normal (lower) levels as soon as public finances are in order and the debt-to-GDP ratio follows a decreasing path towards the 60 percent target. The change in the three mentioned factors is large and persistent and is likely to affect not only aggregate demand, but also the supply side of the Italian economy, through their effects on the accumulation of productive factors.

[1] The outbreak of the global financial crisis in 2007-2008 affected Italy only indirectly, as neither the construction nor the financial sector, which were the epicenter of the crisis in the United States and elsewhere, had undergone an abnormal growth in the previous years. GDP plummeted as never before in the post WWII period, but the fall in economic activity was mostly due to the plunge in world trade.

This paper evaluates the impact on Italian potential output over the 2011-2030 period of the sovereign debt crisis and its aftermath, making use of a calibrated new-Keynesian dynamic general equilibrium model. The model is large and structural; it features nominal price and wage rigidities and real frictions, such as adjustment costs on investment and habits in consumption. Private sector spending decisions are affected by fiscal measures, sovereign spreads and structural reforms. Different from purely statistical methods, these features allow to account for the implications on potential output of the changes in the economic environment spurred by the sovereign-debt crisis.

We initially assess, over the 2011-2013 period, the impact on Italian potential output of (i) the observed increase in sovereign risk, measured by the yield spread of Italian Treasury bonds with respect to the German ones (henceforth just spread); (ii) the implemented fiscal consolidation measures and (iii) structural (competition-friendly) reform packages. We then evaluate, for the period 2014-2019, the additional impact of planned fiscal measures "needed to comply with the fiscal compact" that will bring indebtedness of the General Government to zero, so triggering the progressive reduction of the debt-to-GDP ratio and hence of the spread. Finally, we assume, for the 2020-2030 period, a permanently balanced public-sector budget and assess the contribution to potential output growth of the joint decrease of financing costs and taxation (either on labor or on capital), made possible by apportioning the resources made available by the lower debt burden to reducing distortionary taxation.

For the sovereign risk premium, we track the observed increase over the 2011-2013 period, starting from an initial (before crisis) level of 100bp. The spread on 10-year Italian Treasury bonds reaches 450bp by the end of 2011 and 250bp eight quarters later. From 2014 onwards, we model the dynamics of the Italian sovereign risk premium by means of the empirical rule estimated by Corsetti *et al.* (2012), which relates non-linearly the spread to the debt-to-GDP ratio. The spread gradually declines to 100bp by 2020. Consistent with empirical evidence, it is assumed that the improvement in the cost of borrowing for the sovereign is quickly and fully passed-through to the private sector (sovereign risk channel):[2] a higher (lower) spread on government bonds implies a higher (lower) cost of borrowing for Italian households and firms and, hence exerts expansionary (contractionary) effects on aggregate demand and potential output.

Fiscal policy evolves over time, going through three different regimes. The initial one approximates historical developments, while the others implement the EU fiscal framework: (1) for 2012-2013 we assume policies that replicate the main features of

[2]See Albertazzi *et al.* (2012).

the actual consolidation package (amounting to almost 5pp of GDP), which was made for about 3/4 of increased taxation on consumption, labor and capital income and for 1/4 of reductions in public spending;[3] (2) for 2014-2019 we posit that the Government adopts policies - mainly based on (mild) public spending cuts - ensuring a 0.5pp yearly reduction of (structural) indebtedness, leading to a balanced budget in 2020, from the 2013 value of 3% of GDP; (3) for 2020-2030, the budget is kept balanced and the savings due to the progressive fall in the cost of servicing the debt are allocated to labour (or, alternative, capital) income tax allowances.[4]

Concerning structural reforms, we simulate the effects of the pro-competition measures decided in 2012. We do not consider labour market reforms, as the lack of reliable quantitative data does not allow for a complete characterization of the legal changes in terms of model variables and parameters. We concentrate instead on liberalization measures in the service sector (e.g. liberalizations in some professions, unbundling measures for energy supply and pro-competition measures in the retail sector), which represent the lion share of the 2012 reform packages. On the basis of panel-regression estimates using the (change in the) OECD indicators, we posit that the overall magnitude of the reforms is such to bring about a 10pp reduction in the average gross markup of the Italian service sector, from 1.29 to 1.19. The reform is gradually implemented over a 10-year horizon, starting from 2013.

We estimate Italian potential output in a "model-consistent" way: following common practice, potential output is defined as the level of GDP obtained from the model under the assumptions that (1) prices and wages are fully flexible (i.e. nominal rigidities are absent) and (2) there are neither adjustment costs on investment nor habits in consumption (i.e. real frictions do not play any role).

Such concept resembles the definition of *efficient* output: it captures the dynamics of output under the assumption that the Italian economy is "efficient", i.e. its response to external shocks is not constrained ("distorted") by nominal and real frictions. We include only one distortion by assuming that steady-state markups are different from zero, thus implicitly accounting for a suboptimal level of production. Such assumption is motivated by the necessity to design a simulation scenario where the degree of monopolistic competition in the service sector is exogenously changed, to capture the effects of pro-competition reforms. However, the assumption that markups are constant at their (positive) steady-state level and do not fluctuate at cyclical frequencies allows

[3]See Ministero dell'Economia e delle Finanze (2012). For a structural model-based evaluation of Italian fiscal multipliers, see Locarno et al. (2013).

[4]The cumulative tax allowance reaches about 4pp in 10 years.

us to compute a measure of the output gap (defined as the difference between actual and potential GDP, divided by the latter) which is a summary statistics of movements of the economy away from its efficient frontier.[5]

In order to estimate the impact on actual and potential GDP of the 2011-13 events, it is necessary to define a counterfactual no-crisis scenario. While it is safe to assume that no consolidation or reform package would have been adopted had the sovereign debt crisis not occurred, no obvious alternatives are available for budget policies and the cost of borrowing. Concerning the former, we make the harmful assumption that the changes in the EU fiscal governance (the six-pack and the fiscal compact in particular) would not have happened; concerning the latter, we maintain that the Corsetti *et al.* rule operates in the no-crisis environment as well. In addition, we assume that, once the public budget is on balance (in 2020), financial resources that become available are entirely used to decrease tax rates on labor or capital income.

The main findings of the paper are the following. The fiscal and sovereign-risk shocks, responsible for the 2011-2013 recession, subtract about 2pp to potential output in 2011-2030. The largest negative contribution (about 2/3 of the total) may be attributed to the impact of the sovereign-debt crisis, while fiscal consolidation efforts play a relatively minor role. Taking into account the positive impact of structural reforms implemented in 2013, the reduction in supply capacity falls to about 1.5pp in 2011-2013 and, from end-2020 onwards, it switches sign and becomes an expansion. The growth-enhancing impact of structural reforms, around 3pp, is less than what estimated by international organisations, IMF and OECD in particular. In 2020-2030, the reductions in either labor or capital income taxes would boost potential output growth by nearly 0.2pp per year.

The original contribution of the paper is to provide long-run forecasts - up to 15-year-ahead - of potential output that are based on economic theory and shy away from unreliable, ad-hoc assumptions, which are instead common among practitioners:[6] future developments of labour, capital and TFP depend only on fundamentals, namely relative factor prices, taxes and market structure.

The paper is organized as follows. Section 2 presents the model used in the simulations and elaborates on model calibration. Section 3 illustrates the simulation exercises. Section 4 shows the evolution of Italian potential output in the counterfactual scenar-

[5] As shown in Justiniano, Primiceri and Tambalotti (2013), this measure of potential output displays very similar (log-linear) dynamics to those obtained with zero steady-state markups.

[6] As a comparison, for medium-term projections of potential output (i) the IMF assumes that the TFP gradually converges to past growth rates; (ii) the EC uses projections of the NAIRU and TFP obtained by means of auto-regressive models; (iii) the OECD estimates on a judgemental basis the contribution to potential of labour and productivity.

ios. Section 5 compares the model-based and HP-filtered potential output. Section 6 concludes.

2 The model

The model represents a world economy composed by three regions: Italy, rest of the euro area (REA) and rest of the world (RW). In each region there is a continuum of symmetric households and symmetric firms. Italian households are indexed by $j \in [0; s]$, households in the REA by $j^* \in (s; S]$, households in the RW by $j^{**} \in (S; 1]$.[7]

Italy and the REA share the currency and the monetary authority, that sets the nominal interest rate according to euro area-wide variables. The presence of the RW outside the euro area (EA) allows to assess the role of the nominal exchange rate and extra-EA trade in transmitting the shocks. In each region there are households and firms. Households consume a final good, which is a composite of intermediate nontradable and tradable goods. The latter are domestically produced or imported. Households trade a one-period nominal bond, denominated in euro. They also own domestic firms and use another final good (different from the final consumption good) to invest in physical capital. The latter is rented to domestic firms in a perfectly competitive market. All households supply differentiated labor services to domestic firms and act as wage setters in monopolistically competitive labor markets by charging a markup over their marginal rate of substitution between consumption and leisure.

On the production side, there are perfectly competitive firms that produce the two final goods (consumption and investment goods) and monopolistic firms that produce the intermediate goods. The two final goods are sold domestically and are produced combining all available intermediate goods using a constant-elasticity-of-substitution (CES) production function. The two resulting bundles can have different composition. Intermediate tradable and nontradable goods are produced combining domestic capital and labor, that are assumed to be mobile across sectors. Intermediate tradable goods can be sold domestically and abroad. Because intermediate goods are differentiated, firms have market power and restrict output to create excess profits. We also assume that markets for tradable goods are segmented, so that firms can set three different prices, one for each market. Similarly to other DSGE models of the EA (see, among the others, Christoffel *et al.* 2008 and Gomes *et al.* 2010), we include adjustment costs on real and

[7]The parameter s is the size of the Italian population, which is also equal to the number of firms in each Italian sector (final nontradable, intermediate tradable and intermediate nontradable). Similar assumptions holds for REA and RW.

nominal variables, ensuring that, in response to a shock, consumption, production and prices react in a gradual way. On the real side, habit preferences and quadratic costs prolong the adjustment of households consumption and investment, respectively. On the nominal side, quadratic costs make wages and prices sticky.[8]

We try and gauge the impact of the crisis on actual and potential output by shocking financial and fiscal variables. Potential output is defined as the level of GDP obtained from the model under the assumption that prices and wages are fully flexible and that investment and consumption are not constrained by adjustment costs or habits.

In the following sections we describe, for the case of Italy, the sovereign spread, the fiscal policy setup and the monopolistic competition regime in the intermediate service sector. Similar equations, not reported to save on space, hold for other regions. The only exception is the equation of the spread, that holds for Italy only.[9]

2.1 Sovereign spread and interest rate

The interest rate paid by the Italian government and Italian households when borrowing is determined as a spread over the EA risk-free nominal interest rate. In the spirit of Corsetti *et al.* (2012), the spread is proportional to the increase in public debt (as a ratio to GDP) b^g:

$$spread_t^H \equiv f_{b_{t_0}^g}\left(b_t^g / b_{t-1}^g\right) \tag{1}$$

where the response of the spread to the given change positively depends on the initial level of public debt $b_{t_0}^g$.

The presumption that changes in the fiscal stance, even temporary ones, affect the sovereign risk premium can be justified on the grounds that any deterioration (improvement) in government net borrowing pushes the economy closer to (further away from) the fiscal limit, i.e. the point at which taxes and spending can no longer adjust to stabilize debt and the government has no choice but to default on its outstanding debt obligations: the closer the fiscal limit, the more likely any recessionary shock to engender a run on the sovereign debt.[10] The higher probability of default calls for an increase in the sovereign risk premium.

The sovereign risk channel does affect the choices of the Italian households through

[8] See Rotemberg (1982).
[9] In the Appendix we lay down the rest of the model.
[10] See for instance Leeper (2013).

the (gross) nominal interest rate R_H in the Euler equation (obtained by maximizing utility subject to the budget constraint with respect to the one-period nominal bond holdings B_t):

$$\left(C_t\left(j\right)-hC_{t-1}\right)^{-\sigma}=\beta E_t\left(R_t^H\Pi_{t+1}^{-1}\left(C_{t+1}\left(j\right)-hC_t\right)^{-\sigma}\right) \tag{2}$$

where:

$$R_t^H\equiv R_t*spread_t^H \tag{3}$$

where R_t is the (gross) risk-free nominal interest rate (which is set by the central bank of the EA) and Π is the Italian CPI inflation rate. Similarly, the higher spread increases the user cost of capital. The higher the spread, the higher the interest rate R_t^H and the larger the incentive for Italian households to postpone consumption and investment.

The monetary authority sets the (short-term) policy rate R_t according to a Taylor rule of the form:

$$\left(\frac{R_t}{\bar{R}}\right)=\left(\frac{R_{t-1}}{\bar{R}}\right)^{\rho_R}\left(\Pi_{EA,t}\right)^{(1-\rho_R)\rho_\pi}\left(\frac{GDP_{EA,t}}{GDP_{EA,t-1}}\right)^{(1-\rho_R)\rho_{GDP}} \tag{4}$$

The parameter ρ_R $(0<\rho_R<1)$ captures inertia in interest rate setting, while the term $\bar{R}$ represents the steady state gross nominal policy rate. The parameters ρ_π and ρ_{GDP} are respectively the weights of EA CPI inflation rate ($\Pi_{EA,t}$) and GDP ($GDP_{EA,t}$). The CPI inflation rate is a geometric average of CPI inflation rates in Italy and the REA (respectively Π_t and Π_t^*) with weights equal to the correspondent country size (as a share of the EA):

$$\Pi_{EA,t}\equiv\left(\Pi_t\right)^{\frac{s}{s+S}}\left(\Pi_t^*\right)^{\frac{S}{s+S}} \tag{5}$$

The EA GDP, $GDP_{EA,t}$, is the sum of the Italian and REA GDPs (respectively GDP_t and GDP_t^*):

$$GDP_{EA,t}\equiv GDP_t+rer_t*GDP_t^* \tag{6}$$

where rer_t is the Italian-to-REA bilateral real exchange rate, defined as the ratio of REA to Italian consumer prices.

2.2 Fiscal authority

Fiscal policy is set at the regional level. The government budget constraint is:

$$\left[\frac{B_{t+1}^g}{R_t^H} - B_t^g\right] = (1+\tau_t^c)P_{N,t}C_t^g + Tr_t - T_t$$

where $B_t^g \geq 0$ is nominal public debt. It is a one-period nominal bond issued in the EA wide market that pays the gross nominal interest rate R_t^H. The variable C_t^g represents government purchases of goods and services, $Tr_t > 0$ (< 0) are lump-sum transfers (lump-sum taxes) to households. Consistent with the empirical evidence, C_t^g is fully biased towards the intermediate nontradable good. Hence it is multiplied by the corresponding price index $P_{N,t}$.[11] We assume that the same tax rates apply to every household. Total government revenues T_t from distortionary taxation are given by the following identity:

$$T_t \equiv \int_0^s \left(\tau_t^\ell W_t(j) L_t(j) + \tau_t^k \left(R_t^k K_{t-1}(j) + \frac{\Pi_t^P}{s}\right) + \tau_t^c P_t C_t(j)\right) dj - \tau_t^c P_{N,t} C_t^g \quad (7)$$

where τ_t^ℓ is the tax rate on individual labor income $W_t(j) L_t(j)$, τ_t^k on capital income $R_t^k K_{t-1}(j) + \Pi_t^P/s$ and τ_t^c on consumption $C_t(j)$. The variable $W_t(j)$ represents the individual nominal wage, $L_t(j)$ is individual amount of hours worked, R_t^k is the rental rate of existing physical capital stock $K_{t-1}(j)$, Π_t^P stands for dividends from ownership of domestic monopolistic firms (they are equally shared across households) and P_t is the price of the consumption bundle.

The government follows a fiscal rule defined on a single fiscal instrument to bring the public debt as a percent of domestic GDP, $b^g > 0$, in line with its target $\bar{b}^g$ and to limit the increase in public deficit as ratio to GDP (b_t^g/b_{t-1}^g):[12]

$$\frac{i_t}{i_{t-1}} = \left(\frac{b_t^g}{\bar{b}^g}\right)^{\phi_1} \left(\frac{b_t^g}{b_{t-1}^g}\right)^{\phi_2} \quad (9)$$

where i_t is one of the three tax rates ($\tau_t^\ell, \tau_t^k, \tau_t^c$) and the two expenditure items (C_t^g, Tr_t). Parameters ϕ_1 , ϕ_2 are lower than zero when the rule is defined on an expenditure item calling for a reduction in expenditures whenever the debt level is above target

[11] See Corsetti and Mueller (2006, 2008).

[12] The definition of nominal GDP is:

$$GDP_t = P_t C_t + P_t^I I_t + P_{N,t} C_t^g + P_t^{EXP} EXP_t - P_t^{IMP} IMP_t \quad (8)$$

where P_t, P_t^I, P_t^{EXP}, P_t^{IMP} are prices of consumption, investment, exports and imports, respectively.

and/or there is a positive change in the debt. To the contrary, they are greater than zero when the rule is on tax rates. The parameters are appropriately adjusted to capture the different fiscal regimes considered in the simulations: the 2011-2013 consolidation packages, the pursuit of a balanced budget (2014-2019) and, in both no crisis and crisis scenarios, the reduction of tax rates (2020-2030).

2.3 Monopolistic competition and structural reforms in the service sector

In the simulations we permanently increase the elasticity of substitution among intermediate nontradable goods (our proxy for services) to augment the degree of competition in that sector. Imperfect competition is introduced as follows. There is a large number of firms offering a continuum of different services that are imperfect substitutes. Each product is made by one monopolistic firm, which sets prices to maximize profits. The elasticity of substitution between products of different firms determines the market power of each firm. In the long-run (flexible-price) steady state, in each sector a first order condition for price setting like the following one holds:

$$\frac{P_Y}{P} = \frac{\theta_Y}{\theta_Y - 1}\frac{MC}{P} \tag{10}$$

where P_Y/P is the relative price of the generic intermediate good Y and MC/P is the real marginal cost of producing Y. The markup is $\theta_Y/(\theta_Y - 1)$ and depends negatively on the elasticity of substitution between different varieties, θ_Y ($\theta_Y > 1$). The higher the degree of substitutability, the lower the implied markup and prices, the higher the production level. As such, the markup reflects imperfect competition. Note that the above relation (10) holds in the long run, when prices are flexible and fully adjust to the given shock. In the short run the markup between marginal costs and prices does depend not only on the elasticity of substitution, but also on nominal rigidities (that depend on quadratic costs that firms have to pay for adjusting their prices).[13]

2.4 Households

Households' preferences are additively separable in consumption and labor effort. The generic Italian household j receives utility from consumption C and disutility from labor

[13] See the Appendix for more details.

L. The expected value of the lifetime utility is:

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[\frac{\left(C_t\left(j\right) - hC_{t-1}\right)^{1-\sigma}}{\left(1-\sigma\right)} - \frac{L_t\left(j\right)^{1+\tau}}{1+\tau} \right] \right\} \tag{11}$$

where E_0 denotes the expectation conditional on information set at date 0, β is the discount factor ($0 < \beta < 1$), $1/\sigma$ is the elasticity of intertemporal substitution ($\sigma > 0$) and $1/\tau$ is the labor Frisch elasticity ($\tau > 0$). The parameter h ($0 < h < 1$) represents external habit formation in consumption.

The budget constraint of household j is:

$$\begin{aligned} \frac{B_t\left(j\right)}{\left(1+R_t^H\right)} - B_{t-1}\left(j\right) \quad \leq \quad & \left(1-\tau_t^k\right)\left(\Pi_t^P\left(j\right) + R_t^K K_{t-1}\left(j\right)\right) + \\ & + (1-\tau_t^\ell) W_t\left(j\right) L_t\left(j\right) - (1+\tau_t^c) P_t C_t\left(j\right) - P_t^I I_t\left(j\right) \\ & + Tr_t\left(j\right) - AC_t^W\left(j\right) \end{aligned}$$

As commonly assumed in the literature, Italian households hold a one-period nominal bond, B_t, denominated in euro ($B_t > 0$ is a lending position). The short-term nominal rate R_t^H is paid at the beginning of period t and is known at time t.[14]

We assume that government and private bonds are traded in the same international market. Households own all domestic firms and there is no international trade in claims on firms' profits. The variable Π_t^P includes profits accruing to the Italian households. The variable I_t is the investment bundle in physical capital and P_t^I the related price index, which is different from the price index of consumption because the two bundles have different composition.[15] Italian households accumulate physical capital K_t and rent it to domestic firms at the nominal rate R_t^k. The law of motion of capital accumulation is:

$$K_t\left(j\right) = \left(1-\delta\right) K_{t-1}\left(j\right) + \left(1 - AC_t^I\left(j\right)\right) I_t\left(j\right) \tag{12}$$

where δ is the depreciation rate. Adjustment cost on investment AC_t^I is:

$$AC_t^I\left(j\right) \equiv \frac{\phi_I}{2}\left(\frac{I_t\left(j\right)}{I_{t-1}\left(j\right)} - 1\right)^2, \ \phi_I > 0 \tag{13}$$

Finally, Italian households act as wage setters in a monopolistic competitive labor mar-

[14] A financial friction μ_t is introduced to guarantee that net asset positions follow a stationary process and the economy converge to a steady state. Revenues from financial intermediation are rebated in a lump-sum way to households in the REA. See Benigno (2009).

[15] See the Appendix for more details.

ket. Each household j sets its nominal wage taking into account labor demand and adjustment costs AC_t^W on the nominal wage $W_t(j)$:

$$AC_t^W(j) \equiv \frac{\kappa_W}{2}\left(\frac{W_t(j)}{W_{t-1}(j)} - 1\right)^2 W_t L_t,\ \kappa_W > 0 \tag{14}$$

The costs are proportional to the per-capita wage bill of the overall economy, $W_t L_t$.

Similar relations hold in the REA and in the RW. The only exceptions are two, as we make two simplifying assumptions. First, the spread paid by Italian households and government are rebated in a lump-sum way to households in the REA. Second, neither the public sectors nor the private sectors in the REA and RW pay the spread when borrowing. So it is the riskless interest rate to appear in the corresponding Euler equations.

Finally, it is assumed that the bond traded by households and governments is in worldwide zero net supply. The implied market clearing condition is:

$$-B_t^g + \int_0^s B_t(j)\,dj - B_t^{g*} + \int_s^S B_t(j^*)\,dj^* - B_t^{g**} + \int_S^1 B_t(j^{**})\,dj^{**} = 0 \tag{15}$$

where B_t^{g*}, $B_t^{g**} > 0$ are respectively the amounts of borrowing of the REA and RW public sectors, while $B_t(j^*)$ and $B_t^{**}(j^{**})$ are respectively the per-capita bond positions of households in REA and in RW.

2.5 Calibration

The model is calibrated at quarterly frequency. We set some parameter values so that steady-state ratios are consistent with 2012 national account data, which are the most recent and complete available data. For remaining parameters we resort to previous studies and estimates available in the literature.[16]

Table 1 contains parameters that regulate preferences and technology. Parameters with "$*$" and "$**$" are related to the REA and the RW, respectively. Throughout we assume perfect symmetry between the REA and the RW, unless differently specified. We assume that discount rates and elasticities of substitution have the same value across the three regions. The discount factor β is set to 0.9927, so that the steady state real interest rate is equal to 3.0 per cent on an annual basis. The value for the intertemporal elasticity of substitution, $1/\sigma$, is 1. The Frisch labor elasticity is set to 0.5. The depreciation rate

[16] Among others, see Forni *et al.* (2010a, 2010b).

of capital δ is set to 0.025. Habit is set to 0.6.

In the production functions of tradables and nontradables, the elasticity of substitution between labor and capital is set to 0.93. To match investment-to-GDP ratios, the bias towards capital in the production function of tradables is set to 0.56 in Italy and, in the REA and in the RW, to 0.46. The corresponding value in the production function of nontradables is set to 0.53 in Italy and 0.43 in the REA and RW. In the final consumption and investment goods the elasticity of substitution between domestic and imported tradable is set to 1.5, while the elasticity of substitution between tradables and nontradables to 0.5, as empirical evidence suggests that it is harder to substitute tradables for nontradables than to substitute across tradables. The biases towards the domestically produced good and composite tradable good are chosen to match the Italy and REA import-to-GDP ratios. In the consumption bundle the bias towards the domestic tradeable is 0.68 in Italy, 0.59 in the REA and 0.90 in the RW. The bias towards the composite tradeable is set to 0.68 in Italy, to 0.5 in the REA and the RW. For the investment basket, the bias towards the domestic tradeable is 0.50 in Italy, 0.49 in the REA and 0.90 in the RW. The bias towards the composite tradable is 0.78 in Italy, 0.70 in the REA and in the RW.

Table 2 reports gross markup values, that represent updated estimates of those reported in Forni *et al.* (2010a). In the Italian tradable and nontradable sectors and in the Italian labor market the markup is set to 1.08, 1.29 and 1.60, respectively (the corresponding elasticities of substitution across varieties are set to 13.32, 4.44 and 2.65). In the REA tradable and nontradable sectors and in the REA labor market the gross markups are respectively set to 1.11, 1.24 and 1.33 (the corresponding elasticities are set to 10.15, 5.19 and 4.00). Similar values are chosen for the corresponding parameters in the RW.

Table 3 contains parameters that regulate the dynamics. The parameters are calibrated to generate dynamic adjustments for the EA similar to those obtained with the New Area Wide Model (NAWM, see Christoffel *et al.* 2008) and Euro Area and Global Economy Model (EAGLE, see Gomes *et al.* 2010, 2013). Adjustment costs on investment change are set to 6. Nominal wage quadratic adjustment costs are set to 200. In the tradable sector, we set the nominal adjustment cost parameter to 300 for Italian tradable goods sold domestically and in the REA; for Italian goods sold in the RW, the corresponding parameter is set to 50. The same parameterization is adopted for the REA, while for the rest of the world we set the adjustment cost on goods exported to Italy and the REA to 50. Nominal price adjustment costs are set to 500 in the non-

tradable sector. The two parameters regulating the adjustment cost paid by the private agents on their net financial position are set to 0.00055 so that they do not greatly affect the model dynamics.

The central bank of the EA (see Table 4) targets the contemporaneous EA wide consumer price inflation (the corresponding parameter is set to 1.7) and the output growth (the parameter is set to 0.1). Interest rate is set in an inertial way and hence its previous-period value enters the rule with a weight equal to 0.87. Same values hold for the corresponding parameters of the Taylor rule in the RW.

Table 5 reports the actual great ratios which are matched in the model steady state under our baseline calibration. We assume a zero steady state net foreign asset position of each region. This implies that for each region - in steady state - the net financial position of the private sector is equal to the public debt. The size of Italian and REA GDPs, as a share of world GDP, are set to 3 percent and to 17 percent, respectively.

As for fiscal policy variables, the public consumption-to-GDP ratio is set to 0.20. The tax rate on wage income τ^{ℓ} is set to 42.6 per cent in Italy and to 34.6 in the REA. The tax rate on physical capital income τ^{k} is set to 34.9 in Italy and 25.9 in the REA, while the tax rate on consumption τ^{c} is equal to 16.8 in Italy and to 20.3 in the REA. The public debt-to-yearly GDP ratio is calibrated to 129 percent for Italy and to 0.79 for the REA. Variables of the RW are set to values equal to those of corresponding REA variables.

We calibrate the spread through a sequence of exogenous shocks over the period 2011-2013 to match the observed path. We follow common practice and focus on the excess return on 10-year Italian over German government bonds. In every quarter from 2011 to 2013 households and firms are surprised by a new shock to the spread. They expect each shock to last four quarters. The two assumptions allow to capture the high degree of financial turbulence and uncertainty that has a characterized the deepest phase of the crisis. From 2014 to 2020, period of "normal" financial conditions, it is assumed a gradual decrease of the spread, associated with the persistent reduction in public debt. The reduction is fully anticipated by investors and, hence, fully credible. The elasticity of the spread with respect to the public debt is calibrated in line with estimates by Corsetti et al. (2012). Consistent with empirical evidence, it is assumed that the increase in spread is quickly and fully passed-through to the financing conditions of the private sector ("sovereign risk channel").[17]

[17] See Albertazzi et al. (2012).

3 The simulated scenarios

The overall simulation period is 2011-2030. The baseline scenario is the one in which the sovereign debt crisis did not take place ("no crisis" scenario, where the spread is set at 100bp, in line with its before-crisis average value). For 2011-2013, GDP is assumed to be consistent with the projections presented in the July 2011 Economic Bulletin of the Bank of Italy; for the following years, (effective) economic activity is assumed to gradually converge to a steady growth path, set at 3.0% per year.

We conveniently split the overall simulation period in three well distinct subperiods. In 2011-2013 the spread is exogenously set to approximately match its historical path. A series of upward shocks increases its level relative to the baseline. The BTP-Bund spread, equal to approximately 100bp before the crisis, increases to: (i) 200bp in 2011Q1; (ii) 300bp in 2011Q3; (iii) 450bp in 2011Q4; (iv) 400bp during the first three quarters of 2012; (v) 300bp from 2012Q4 to 2013Q3 and, finally, (vi) 250bp in 2013Q4. The reversal of the upward trend occurs after the announcement of the ECB President Draghi of the launch of the Outright Monetary Transactions (OMT) program, which dissipated the fears of a euro-area break-up. The shocks to the risk premium on Italian sovereign bonds are assumed to come as surprises for agents, who then expect them to last for 2 quarters once they materialise. This assumption seems plausible for a crisis period, characterized by high uncertainty, and helps portraying households and firms as rational agents, gradually adjusting their expectations as new information arises.

Over the 2014-2019 period the spread steadily decreases, reflecting the improvement in public finance conditions: it falls by 50bp in 2014-2105 and keeps declining afterwards to 100bp, and remains constant at that level afterwards.

Turning to fiscal policy variables, up to 2013 they replicate historical developments: for 2011-2012 we implement the Berlusconi and Monti packages, amounting to almost 5pp of GDP and consisting of higher taxes (mostly on consumption and real estates, the latter proxied by taxes on consumption, labour and capital incomes) for about 3/4 and public spending cuts for the remaining part.[18]

The evolution of fiscal variables from 2014 to 2020 is assumed to be consistent with the EU fiscal framework and with budget policies already passed into law or under discussion. It ensures a 0.5pp yearly improvement in the Italian (structural) deficit from the current value of 3% of GDP up to 0% percent in 2020. The measures that are implemented consist mainly of (mild) public spending cuts.

[18] See Ministero dell'Economia e delle Finanze (2012).

Finally, from 2020 to 2030, public-sector net indebtedness is kept constant and equal to zero in every year. The budget savings allowed by the decrease in interest payments are exploited to gradually reduce the labor income tax rate or, alternatively, the capital income tax rate (by approximately 4pp in 10 years).

For structural reforms, we simulate the effects of the pro-competition measures decided in 2012 for the services sector (such as liberalisations in some professions, unbundling measures for energy supply and pro-competition measures in the retail sector). We assume that the reforms achieve a 10pp reduction in the average gross markup of the Italian services sector, which accordingly falls from 1.29 to 1.19. The reforms are gradually implemented over a 10-year horizon, starting from 2013.

The "no-crisis" scenario, with respect to which we try and assess the impact on potential output of the financial and fiscal shocks, is characterised by two elements.

The first element is that the unconditional growth rate of potential output over the 2007-2013 period is obtained by simulating the model to fit data and forecasts of the Italian (actual) GDP formulated in mid 2011, before the outbreak of the sovereign crisis. We maintain the presumption that for Italy the 2008-2009 recession, which was unprecedented in its harshness, was mainly due to foreign demand shocks and, hence, did not substantially affect the supply capacity of the economy. From 2014 onwards, Italian potential output gradually returns to its long-run path. The latter is assumed to be 1.5%, in line with estimates recently provided by Ball (2014).

The second element is the mix of expenditure and tax rules driving government budget developments. Specifically, the maintained assumption is that the EU fiscal governance would have been left unchanged had the sovereign debt crisis not occurred. With the Six-pack, Fiscal compact and Two-pack entering into force, fiscal rules in the euro area have become stricter and easier to enforce. Three changes in particular are worth mentioning.

First, the Six-pack operationalises the debt criterion, so that an Excessive Deficit Procedure may also be launched on the basis of a debt ratio above 60% of GDP which would not diminish towards the Treaty reference value at a satisfactory pace (and not only on the basis of a deficit above 3% of GDP, which was the case up to 2011).

Second, the Six-pack ensures stricter application of the fiscal rules by defining quantitatively what a "significant deviation" from the Medium-Term budgetary Objective (MTO) or the adjustment path towards it means in the context of the preventive arm of the Stability and Growth Pact (SGP). In addition, by introducing reverse qualified majority voting for most sanctions, it increases their likelihood for euro-area Member

States.[19] The combination of these two prescriptions makes much more difficult for Member States not to comply with the rule demanding a 0.5% improvement in the structural budget deficit when it is too high.

Third, the Six-pack imposes the compliance with an expenditure benchmark, aimed at keeping expenditure on a stable sustainable path over the cycle: government spending (net of interest payments, outlays on EU programmes fully matched by EU funds revenue, and non-discretionary changes in unemployment benefit expenditure) is to grow in line with medium-term potential GDP. Member States that have not yet reached their MTO should take steps to achieve it over the cycle; the adjustment efforts should attach a pivotal role to spending cuts, as the growth rate of expenditure in relation to that of medium-term potential GDP should be expected to yield an annual improvement in the government balance in cyclically adjusted terms net of one-offs and other temporary measures of 0.5% of GDP.

Removing the changes in the EU fiscal governance has the following implications for the "no-crisis" scenario: (1) government spending is projected to increase in line with the pre-2007 period, namely outpacing nominal GDP growth by 0.5% per year; (2) no discretionary measure is assumed to be taken if the (structural) budget balance does not improve annually by half percent of GDP. Once the deficit vanishes, in 2025, it is assumed, as in the crisis scenario, that the financial resources that become available are entirely used to reduce taxes on labour or capital.

4 Results

We try and gauge the impact of the crisis on actual and potential output by shocking financial and fiscal variables in the way described in the previous section. Potential output is defined as the level of GDP obtained from the model under the assumption that prices and wages are fully flexible and that investment and consumption are not constrained by adjustment costs or habits. As such, the dynamics of output is "efficient", as its response to external shocks is not "distorted" by nominal and real frictions. We include only one distorsion by assuming that steady-state markups are different from zero, thus implicitly accounting for a suboptimal level of production. Such assumption is motivated by the necessity to design an exogenous reduction in the degree of monopolistic competition in the service sector, to capture the effects of pro-competition reforms.

[19] Reverse qualified majority voting implies that a recommendation or a proposal of the Commission is considered adopted in the Council unless a qualified majority of Member States votes against it.

However, markups are assumed to remain constant at their (positive) steady-state level and do not fluctuate at cyclical frequencies.

For the sake of convenience, we comment the results of our analysis distinguishing among the following periods: 1. the peak of the crisis (2011–2013); 2. the interim period (2014–15); 3. the pursuit of a balanced budget (2016–2019); 4. the steady state (2020–2030).

4.1 The peak of the crisis (2011–2013)

In 2011–2013 the Italian economy was hit by a severe financial shock, that triggered a fiscal policy response – aimed at reassuring markets about the sustainability of public debt – and accelerated the process of repairing the working of the Italian economy. Table 6 reports the estimated impact of those three factors on potential GDP: in the first two columns, it shows potential output in the no-crisis and crisis scenarios; in the following three, it shows separately the contribution of each of them. For fiscal policy, results reported in Table 6 refer to the case in which the savings allowed by the reduction in the cost of servicing the debt (from 2020 onwards) are used to cut the labor income tax rate (the case where capital income tax are reduced instead is illustrated later). The last column reports the evolution of the output gap, computed as the difference between actual and potential GDP in the "crisis" scenario, divided by potential GDP (the ratio is expressed in percentage points). Figure 1 reports a graphical representation of the three contributions (spread, fiscal policy and reforms).

The impact of the spread on potential output growth is reported in the column labelled "Spread". As expected, the shocks to borrowing costs for domestic borrowers turn out to have a negative influence. Although each shock is viewed as temporary, agents are surprised every period by new ones, which produce sizeable and long-lasting contractionary effects on aggregate demand, in particular consumption and investment: firms reduce employment and investment in response to lower demand; the implied deceleration in the accumulation of labour and capital curbs the supply capacity of the economy and, hence, negatively affects potential output.

In the period under consideration the Italian economy was also affected by fiscal shocks, as policymakers faced the challenges posed by the sovereign-debt crisis by trying and putting public finances in order. The adopted measures – mostly revenue-based – estimated to reduce ex-ante the budget deficit by some 5pp of GDP in three years. The column labelled "Fiscal policy" shows the effects of the budget tightening on Italian potential output. As for the case of spread shocks, fiscal policy is estimated to exert

a negative impulse on the supply side of the economy, decreasing potential output in 2011-2013 by about 0.6pp on aggregate.

At the peak of the crisis, the Italian government also decided to pass laws promoting competition in the services sectors. The reform, which will permanently reduce oligopoly rents for incumbent firms, is assumed to be gradually implemented over a 10-year horizon, starting from 2013Q1. The column "Structural reforms" reports the results. The increase in competition induces firms to permanently reduce the prices of the services they provide. Lower prices have a positive income effect on households, which increases their demand not only for services, but also for manufacturing goods, as the two types of goods are complements rather than substitutes (the elasticity of substitution between manufacturing goods and services is calibrated to 0.5, a relatively low value). The permanent increase in aggregate demand for services and goods induce firms to gradually increase production and hence the demand for labour and capital.

All in all, the Italian potential output is estimated to decrease by about 1.5pp relative to the "No crisis" scenario over the period 2011-2013. The largest negative contribution is attributable to the impact of the sovereign-debt crisis.

4.2 The interim period (2014–2015)

This period is characterised by non-negligible improvements in financial conditions, modest progresses in rebalancing public finances and steps ahead in the implementation of structural reforms. As the most severe phase of the sovereign-debt crisis is over, households and firms start reaping the benefits from financial stabilization.

The 10-year BTP-Bund spread is assumed to decrease by 70bp, gradually reaching 180bp in 2015. Concerning budget policies, differently from the 2011–2012 episode, the measures adopted in 2014–2015 mainly consist of permanent reductions in public spending, which amount to 0.4pp of GDP per year and whose impact on potential output is limited, as public spending, especially if wasteful, does not directly affect supply capacity. The more favourable financial conditions allow households and firms to borrow, fostering private-sector spending; firms increase production to match the acceleration of aggregate demand; the ensued increase in employment and capital accumulation benefits potential output, that resume growing at positive rates starting from 2015.

Compared with the no-crisis scenario, potential output increases by 0.2 in 2015. The negative effect of financial shocks is more than compensated for by the positive effect of reforms.

4.3 The pursuit of a balanced budget (2016–2019)

The evolution of fiscal policy in the second half of the current decade is modelled consistently with the EU fiscal framework, which dictates a 0.5pp annual improvement in the (structural) deficit. From the 2013 value of 3% of GDP, indebtedness gradually falls to 0% in six years. Such pattern reflects the downward trend of the public-sector debt-to-GDP ratio due to (i) the positive effects of previous fiscal consolidation efforts and (ii) the return of the economy to more sustained growth performances.[20] The reduction is assumed to be fully credible and perfectly anticipated by investors. The elasticity of the spread with respect to the public debt is calibrated in line with Corsetti *et al.* (2012).

During this period, potential output grows on average at about 1.5% per year, about three decimal points more than in the no-crisis scenario. Structural reforms provide a substantial support to actual and potential growth in this period.

4.4 The steady state (2020–2030)

With zero indebtedness maintained for the whole decade, the savings generated by the lower cost of servicing the debt are used to reduce distortionary taxes. Two alternative scenarios are considered: in the first, taxes on labour income are reduced; in the second, the tax pressure on capital is mitigated. Table 6 reports results referring to the case of a reduction in labor income taxes. Reforms and tax reduction exert a positive impact on supply capacity. Table 7 compares the impact on potential output growth of both strategies of tax cuts. If labor income taxes and capital income taxes are reduced, potential output respectively grows on average about 0.1 and 0.3pp more than in the no-crisis scenario, in which the taxes are reduced from 2025.

5 Comparing model- and HP-based potential output

[Section to be finished]

We now compare the model-consistent potential output with the potential output estimated with the more traditional HP filtering method. As done for the model-based potential output, we decompose the HP-based in the contribution of the three shocks ("Spread", "Fiscal policy", "Structural reforms"). Results are reported in Table 8. Table 9 compares the impact on potential output growth of strategies of tax cuts from 2020.

[20] The simulated growth rate of Italian GDP in the average of this period is in line with that projected by the International Monetary Fund. See IMF (2013).

Qualitatively, the impact of the shocks on the HP-based output is not different from that observed in the case of model-consistent output. The growth rate of the HP-based financial output is initially negative, reflecting the contractionary effect of spread and, to a lower extent, fiscal policy measures. The growth rate is positively affected by the reforms (Figure 2 reports a graphical representation of the three contributions).

Differences arise in timing and in the magnitude of the effects. They are due to differences in the two methodologies. The HP-based potential output reflects the bilateral smoothing of the filter. The sizable and persistent effects of the shocks on actual GDP are captured by the filter as a change in the permanent component of output. As such, the change in potential output is more prolonged and persistent. The model-based potential output reflects the transmission mechanism implicit in the model. In particular, the absence of nominal and real rigidities. Given the shocks, this implies a short-lived adjustment of potential output.

Overall, the HP-based potential output is affected by the crisis to a larger extent than the model-based.

6 Conclusions

This paper provides an assessment of the effects on Italian potential output of both the sovereign debt crisis and the policy responses that it triggered, i.e. the fiscal consolidation effort undertaken in order to dissipate investors' fears on the sustainability of Italian public debt and the acceleration of the program of reforming the economy. The main findings of the paper are the following. The fiscal and sovereign-risk shocks, responsible for the 2011-2013 recession, would have subtracted nearly 1.7pp to potential output in 2011-2014; taking into account the positive impact of structural reforms implemented in 2013, the reduction in supply capacity would fall to about 1.2pp. For the period 2011-2013, the largest negative contribution (about 2/3 of the total) may be attributed to the impact of the sovereign-debt crisis, while fiscal consolidation efforts would have played a minor role (and most likely no negative role at all, if one considers what would have happened otherwise). The growth-enhancing impact of structural reforms is around 3pp, lower than that estimated by international organisations, IMF and OECD in particular. In 2020-2030, the reductions in either labor or capital income taxes would boost potential output growth by some 0.1-0.3pp on an annual basis.

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Table 1. Parametrization of Italy, REA and RW

Parameter	IT	REA	RW
Discount rate β	0.99	0.99	0.99
Intertemporal elasticity of substitution $1/\sigma$	1.0	1.0	1.0
Inverse of Frisch Elasticity of Labor Supply τ	2.0	2.0	2.0
Habit h	0.6	0.6	0.6
Depreciation rate of (private and public) capital δ	0.025	0.025	0.025
Tradable Intermediate Goods			
Substitution between factors of production $\xi_T, \xi_T^*, \xi_T^{**}$	0.93	0.93	0.93
Bias towards capital $\alpha_T, \alpha_T^*, \alpha_T^{**}$	0.56	0.46	0.46
Nontradable Intermediate Goods			
Substitution between factors of production $\xi_N, \xi_N^*, \xi_N^{**}$	0.93	0.93	0.93
Bias towards capital $\alpha_N, \alpha_N^*, \alpha_N^{**}$	0.53	0.43	0.43
Final consumption goods			
Substitution between domestic and imported goods $\phi_A, \phi_A^*, \phi_A^{**}$	1.50	1.50	1.50
Bias towards domestic tradable goods a_H, a_F^*, a_G^*	0.68	0.59	0.90
Substitution between domestic tradables and nontradables $\rho_A, \rho_A^*, \rho_A^{**}$	0.50	0.50	0.50
Bias towards tradable goods a_T, a_T^*, a_T^{**}	0.68	0.50	0.50
Final investment goods			
Substitution between domestic and imported goods $\phi_E, \phi_E^*, \phi_E^{**}$	1.50	1.50	1.50
Bias towards domestic tradable goods υ_H, υ_F^*	0.50	0.49	0.90
Substitution between domestic tradables and nontradables ρ_E, ρ_E^*	0.50	0.50	0.50
Bias towards tradable goods υ_T, υ_T^*	0.78	0.70	0.70

Note: IT=Italy; REA=Rest of the euro area; RW= Rest of the world.

Table 2. Gross Markups

Markups and Elasticities of Substitution			
	Tradables	Non-tradables	Wages
IT	1.08 ($\theta_T = 13.32$)	1.29 ($\theta_N = 4.44$)	1.60 ($\psi = 2.65$)
REA	1.11 ($\theta_T^* = 10.15$)	1.24 ($\theta_N^* = 5.19$)	1.33 ($\psi^* = 4$)
RW	1.11 ($\theta_T^{**} = 10.15$)	1.24 ($\theta_N^{**} = 5.19$)	1.33 ($\psi^{**} = 4$)

Note: IT=Italy; REA=rest of the euro area; RW= rest of the world; source: OECD (2012).

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Table 3. Real and Nominal Adjustment Costs

Parameter ("*" refers to rest of the Euro area)	IT	REA	RW
Real Adjustment Costs			
Investment ϕ_I, ϕ_I^*, ϕ_I^{**}	6.00	6.00	6.00
Households' financial net position ϕ_{b1}, ϕ_{b2}	0.00055, 0.00055	-	0.00055, 0.00055
Nominal Adjustment Costs			
Wages κ_W, κ_W^*, κ_W^{**}	200	200	200
Italian produced tradables κ_H, k_H^* k_H^{**}	300	300	50
REA produced tradables κ_H, k_H^* k_H^{**}	300	300	50
RW produced tradables κ_H, k_H^* k_H^{**}	50	50	300
Nontradables κ_N, κ_N^*, κ_N^{**}	500	500	500

Note: IT=Italy; REA=rest of the euro area; RW= rest of the world.

Table 4. Monetary Policy Rules

Parameter	IT	REA	EA	RW
	-	-		
Lagged interest rate at t-1 ρ_R, ρ_R^{**}	-	-	0.87	0.87
Inflation ρ_Π, ρ_Π^{**}	-	-	1.70	1.70
GDP growth $\rho_{GDP}, \rho_{GDP}^{**}$	-	-	0.10	0.10

Note: IT=Italy; REA=rest of the euro area; EA= euro area; RW= rest of the world.

Table 5. Main macroeconomic variables (ratio to GDP) and tax rates

	IT	REA	RW
Macroeconomic variables			
Private consumption	61.0	57.1	64.0
Private Investment	18.0	16.0	20.0
Public purchases	20.0	20.0	20.0
Imports	29.0	24.3	4.25
Net Foreign Asset Position	0.0	0.0	0.0
GDP (share of world GDP)	0.03	0.17	0.80

Note: IT= Italy; REA= Rest of the euro area; RW= Rest of the world. Sources: European Commission (2012).

Table 6. Italian potential (model-based) output

	No crisis	Crisis	Spread	Fiscal policy	Structural reforms	Output gap
2008	1.2	1.2	0.0	0.0	0.0	2.0
2009	1.1	1.1	0.0	0.0	0.0	-4.7
2010	1.0	1.0	0.0	0.0	0.0	-4.1
2011	1.0	0.9	-0.1	0.0	0.0	-4.4
2012	1.0	0.1	-0.5	-0.4	0.0	-6.8
2013	0.9	0.4	-0.4	-0.2	0.2	-9.0
2014	0.9	0.9	-0.1	0.0	0.1	-10.1
2015	0.9	1.1	0.0	0.0	0.2	-10.6
2016	1.0	1.2	0.0	0.0	0.2	-10.7
2017	1.1	1.4	0.0	0.0	0.2	-9.9
2018	1.3	1.6	0.0	0.0	0.3	-8.4
2019	1.4	1.7	0.0	0.0	0.3	-7.0
2020	1.5	1.8	0.0	0.0	0.3	-5.7
2021	1.5	1.9	0.0	0.1	0.3	-4.5
2022	1.5	2.0	0.0	0.1	0.3	-3.3
2023	1.5	1.9	0.0	0.1	0.2	-2.0
2024	1.5	1.8	0.0	0.1	0.2	-0.7
2025	1.6	1.8	0.0	0.1	0.1	0.7
2026	1.7	1.8	0.0	0.0	0.1	1.4
2027	1.7	1.8	0.0	0.0	0.1	1.8
2028	1.7	1.8	0.0	0.0	0.0	2.2
2029	1.7	1.8	0.0	0.0	0.0	2.6
2030	1.7	1.7	0.0	0.0	0.0	3.0

Note: annual growth rates (% points). Scenarios "Spread", "Fiscal policy"and "Structural reforms"are expressed as pp deviations from the scenario "No crisis". Output gap: effective GDP/potential output-1, %

Table 7. Italian potential (model-based) output: alternative tax reductions

	No crisis labor	Labor income tax red.	No crisis capital	Capital income tax red.
2020	1.5	0.0	1.5	0.2
2021	1.5	0.1	1.5	0.3
2022	1.5	0.1	1.5	0.3
2023	1.5	0.1	1.5	0.3
2024	1.5	0.1	1.5	0.3
2025	1.6	0.1	1.7	0.3
2026	1.7	0.0	1.8	0.3
2027	1.7	0.0	1.8	0.3
2028	1.7	0.0	1.8	0.3
2029	1.7	0.0	1.8	0.2
2030	1.7	0.0	1.8	0.2
Average		0.1		0.3

Note: annual growth rates (% points). Scenarios "Labor income tax reduction"and "Capital income tax reduction"are expressed as pp deviations from the scenario "No crisis".

Table 8. Italian potential (HP-based) output

	No crisis	Crisis	Spread	Fiscal policy	Structural reforms	Output gap
2008	0.2	-0.3	-0.4	-0.1	0.0	3.1
2009	0.2	-0.5	-0.6	-0.1	0.0	-2.1
2010	0.3	-0.6	-0.7	-0.2	0.0	0.1
2011	0.4	-0.6	-0.8	-0.2	0.0	1.2
2012	0.6	-0.5	-0.9	-0.2	0.1	-1.2
2013	0.8	-0.3	-0.9	-0.3	0.1	-3.2
2014	1.0	0.0	-0.8	-0.3	0.1	-2.9
2015	1.2	0.4	-0.7	-0.3	0.2	-1.8
2016	1.3	0.7	-0.5	-0.2	0.2	-1.0
2017	1.4	1.1	-0.4	-0.2	0.2	-0.4
2018	1.5	1.3	-0.2	-0.1	0.3	-0.1
2019	1.5	1.5	-0.1	-0.1	0.3	0.1
2020	1.5	1.7	-0.1	0.0	0.3	0.4
2021	1.5	1.8	0.0	0.0	0.3	0.5
2022	1.5	1.9	0.0	0.0	0.2	0.5
2023	1.5	1.9	0.0	0.1	0.2	0.4
2024	1.5	1.9	0.0	0.1	0.2	0.4
2025	1.5	1.8	0.0	0.1	0.2	0.3
2026	1.5	1.8	0.0	0.1	0.1	0.2
2027	1.6	1.8	0.0	0.0	0.1	0.1
2028	1.6	1.8	0.0	0.0	0.1	0.1
2029	1.7	1.7	0.0	0.0	0.1	0.0
2030	1.7	1.7	0.0	0.0	0.1	0.0

Note: annual growth rates (% points). Scenarios "Spread", "Fiscal policy"and "Structural reforms"are expressed as pp deviations from the scenario "No crisis". Output gap: effective GDP/potential output-1, %

Table 9. Italian potential (HP-based) output: alternative tax reductions

	No crisis labor	Labor income tax red.	No crisis capital	Capital income tax red.
2020	1.5	-0.0	0.3	0.0
2021	1.5	0.0	0.3	0.1
2022	1.5	0.0	0.2	0.2
2023	1.5	0.1	0.2	0.2
2024	1.5	0.1	0.2	0.3
2025	1.5	0.1	1.6	0.3
2026	1.5	0.1	1.6	0.2
2027	1.6	0.0	1.7	0.1
2028	1.6	0.0	1.8	0.1
2029	1.7	0.0	1.8	0.0
2030	1.7	0.0	1.8	0.0
Average		0.0		0.1

Note: annual growth rates (% points). Scenarios "Labor income tax reduction"and "Capital income tax reduction"are expressed as pp deviations from the scenario "No crisis".

Figure 1. Impact of crisis factors and structural reforms on potential (model-consistent) output growth

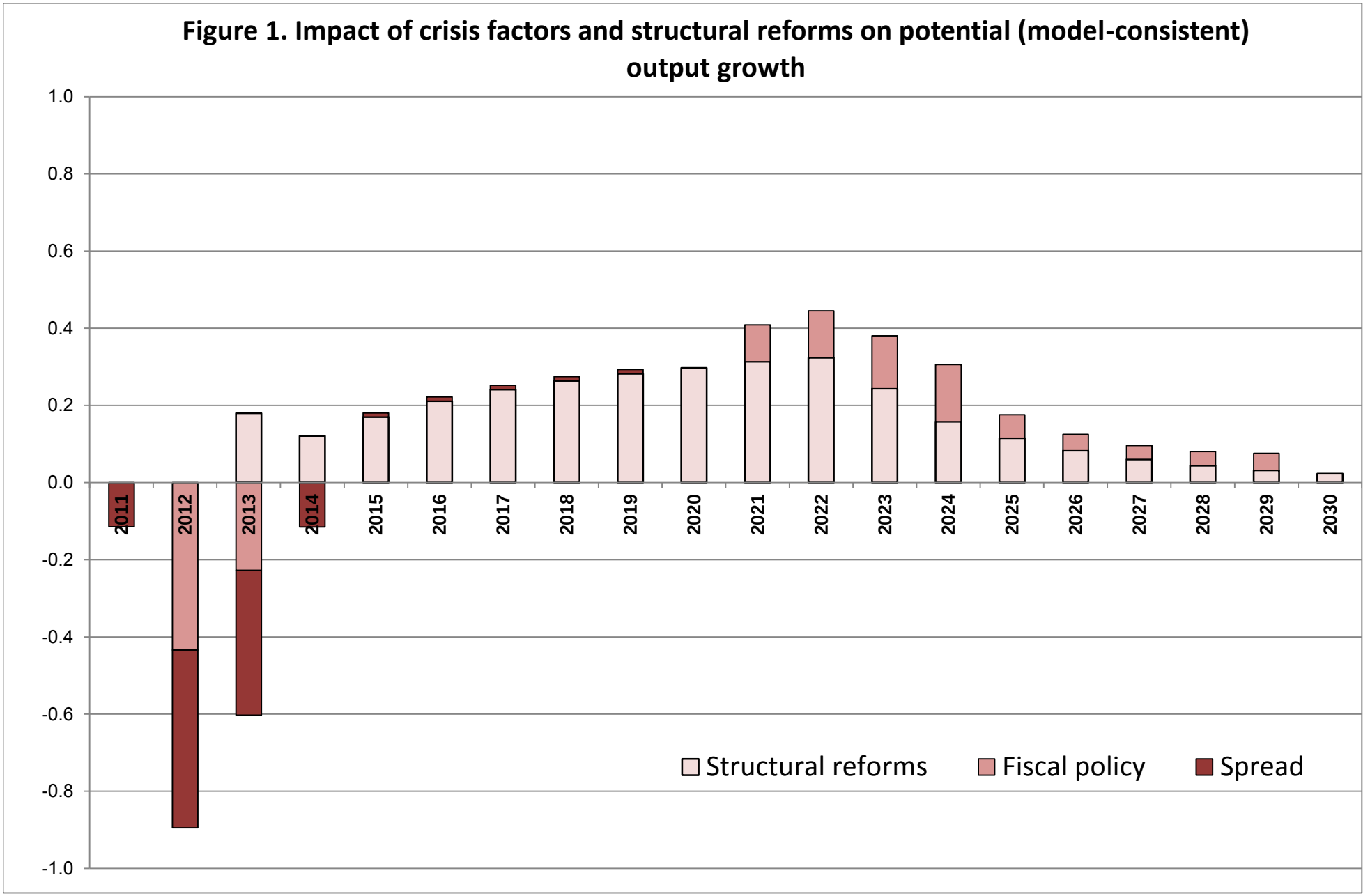
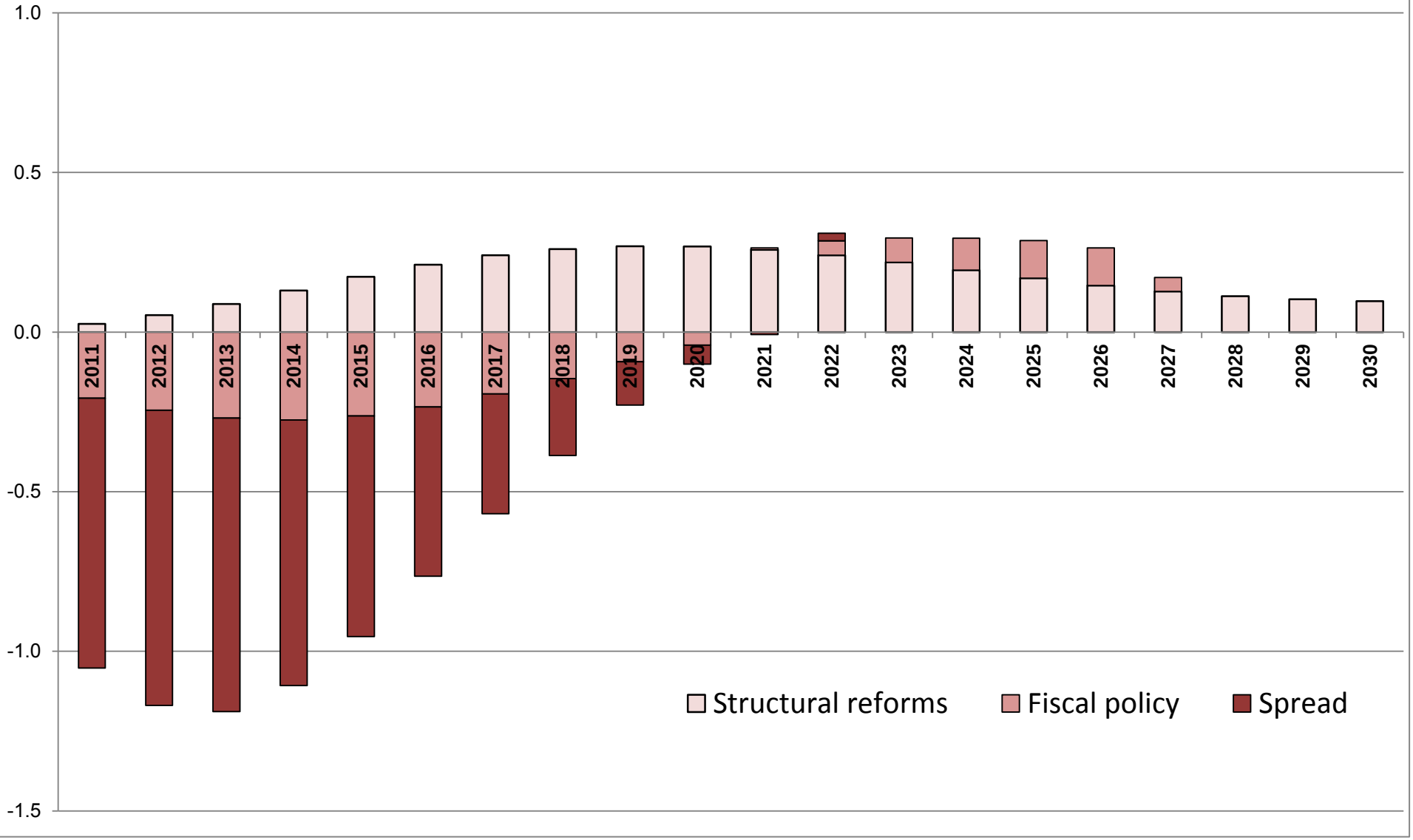


Figure 2. Impact of crisis factors and structural reforms on potential (HP-based) output growth



Appendix

In this Appendix we report a detailed description of the model, excluding the fiscal and monetary policy part and the description of the households optimization problem that are reported in the main text.[21]

There are three countries, Italy, the rest of the euro area (REA) and the rest of the world (RW). They have different sizes. Italy and the REA share the currency and the monetary authority. In each region there are households and firms. Each household consumes a final composite good made of non-tradable, domestic tradable and imported intermediate goods. Households have access to financial markets and smooth consumption by trading a risk-free one-period nominal bond, denominated in euro. They also own domestic firms and capital stock, which is rent to domestic firms in a perfectly competitive market. Households supply differentiated labor services to domestic firms and act as wage setters in monopolistically competitive markets by charging a markup over their marginal rate of substitution.

On the production side, there are perfectly competitive firms that produce the final goods and monopolistic firms that produce the intermediate goods. Two final goods (private consumption and private investment) are produced combining all available intermediate goods according to constant-elasticity-of-substitution bundle. The public consumption good is a bundle of intermediate non-tradable goods.

Tradable and non-tradable intermediate goods are produced combining capital and labor in the same way. Tradable intermediate goods can be sold domestically or abroad. Because intermediate goods are differentiated, firms have market power and restrict output to create excess profits. We assume that goods markets are internationally segmented and the law of one price for tradables does not hold. Hence, each firm producing a tradable good sets three prices, one for the domestic market and the other two for the export market (one for each region). Since the firm faces the same marginal costs regardless of the scale of production in each market, the different price-setting problems are independent of each other.

To capture the empirical persistence of the aggregate data and generate realistic dynamics, we include adjustment costs on real and nominal variables, ensuring that, in response to a shock, consumption and production react in a gradual way. On the real side, quadratic costs and habit prolong the adjustment of the investment and consump-

[21] For a detailed description of the main features of the model see also Bayoumi (2004) and Pesenti (2008).

tion. On the nominal side, quadratic costs make wage and prices sticky.

In what follows we illustrate the Italian economy. The structure of each of the other two regions (REA and the RW) is similar and to save on space we do not report it.

6.1 Final consumption and investment goods

There is a continuum of symmetric Italian firms producing final non-tradable consumption under perfect competition. Each firm producing the consumption good is indexed by $x \in (0, s]$, where the parameter $0 < s < 1$ measures the size of Italy. Firms in the REA and in the RW are indexed by $x^* \in (s, S]$ and $x^{**} \in (S, 1]$, respectively (the size of the world economy is normalized to 1). The CES production technology used by the generic firm x is:

$$A_t(x) \equiv \left(a_T^{\frac{1}{\phi_A}} \left(\begin{array}{c} a_H^{\frac{1}{\rho_A}} Q_{HA,t}(x)^{\frac{\rho_A - 1}{\rho_A}} \\ + a_G^{\frac{1}{\rho_A}} Q_{GA,t}(x)^{\frac{\rho_A - 1}{\rho_A}} (1 - a_H - a_G)^{\frac{1}{\rho_A}} Q_{FA,t}(x)^{\frac{\rho_A - 1}{\rho_A}} \\ + (1 - a_T)^{\frac{1}{\phi_A}} Q_{NA,t}(x)^{\frac{\phi_A - 1}{\phi_A}} \end{array} \right)^{\frac{\rho_A}{\rho_A - 1} \frac{\phi_A - 1}{\phi_A}} \right)^{\frac{\phi_A}{\phi_A - 1}}$$

where Q_{HA}, Q_{GA}, Q_{FA} and Q_{NA} are bundles of respectively intermediate tradables produced in Italy, intermediate tradables produced in the REA, intermediate tradables produced in the RW and intermediate non-tradables produced in Italy. The parameter $\rho_A > 0$ is the elasticity of substitution between tradables and $\phi_A > 0$ is the elasticity of substitution between tradable and non-tradable goods. The parameter a_H $(0 < a_H < 1)$ is the weight of the Italian tradable, the parameter a_G $(0 < a_G < 1)$ the weight of tradables imported from the REA, a_T $(0 < a_T < 1)$ the weight of tradable goods.

The production of investment good is similar. There are symmetric Italian firms under perfect competition indexed by $y \in (0, s]$. Firms in the REA and in the RW are indexed by $y^* \in (s, S]$ and $y^{**} \in (S, 1]$. Output of the generic Italian firm y is:

$$E_t(y) \equiv \left(v_T^{\frac{1}{\phi_E}} \left(\begin{array}{c} v_H^{\frac{1}{\rho_E}} Q_{HE,t}(y)^{\frac{\rho_E - 1}{\rho_E}} + v_G^{\frac{1}{\rho_E}} Q_{GE,t}(y)^{\frac{\rho_E - 1}{\rho_E}} \\ + (1 - v_H - v_G)^{\frac{1}{\rho_E}} Q_{FE,t}(y)^{\frac{\rho_E - 1}{\rho_E}} \\ + (1 - v_T)^{\frac{1}{\phi_E}} Q_{NE,t}(y)^{\frac{\phi_E - 1}{\phi_E}} \end{array} \right)^{\frac{\rho_E}{\rho_E - 1} \frac{\phi_E - 1}{\phi_E}} \right)^{\frac{\phi_E}{\phi_E - 1}}$$

Finally, we assume that public expenditure C^g is composed by intermediate non-tradable goods only.

6.2 Intermediate goods

6.2.1 Demand

Bundles used to produce the final consumption goods are CES indexes of differentiated intermediate goods, each produced by a single firm under conditions of monopolistic competition:

$$Q_{HA}(x) \equiv \left[\left(\frac{1}{s}\right)^{\theta_T} \int_0^s Q(h,x)^{\frac{\theta_T-1}{\theta_T}}\, dh\right]^{\frac{\theta_T}{\theta_T-1}} \tag{16}$$

$$Q_{GA}(x) \equiv \left[\left(\frac{1}{S-s}\right)^{\theta_T} \int_s^S Q(g,x)^{\frac{\theta_T-1}{\theta_T}}\, dg\right]^{\frac{\theta_T}{\theta_T-1}} \tag{17}$$

$$Q_{FA}(x) \equiv \left[\left(\frac{1}{1-S}\right)^{\theta_T} \int_S^1 Q(f,x)^{\frac{\theta_T-1}{\theta_T}}\, df\right]^{\frac{\theta_T}{\theta_T-1}} \tag{18}$$

$$Q_{NA}(x) \equiv \left[\left(\frac{1}{s}\right)^{\theta_N} \int_0^s Q(n,x)^{\frac{\theta_N-1}{\theta_N}}\, dn\right]^{\frac{\theta_N}{\theta_T-1}} \tag{19}$$

where firms in the Italian intermediate tradable and non-tradable sectors are respectively indexed by $h \in (0,s)$ and $n \in (0,s)$, firms in the REA by $g \in (s,S]$ and firms in the RW by $f \in (S,1]$. Parameters θ_T, $\theta_N > 1$ are respectively the elasticity of substitution across brands in the tradable and non-tradable sector. The prices of the intermediate non-tradable goods are denoted $p(n)$. Each firm x takes these prices as given when minimizing production costs of the final good. The resulting demand for intermediate non-tradable input n is:

$$Q_{A,t}(n,x) = \left(\frac{1}{s}\right)\left(\frac{P_t(n)}{P_{N,t}}\right)^{-\theta_N} Q_{NA,t}(x) \tag{20}$$

where $P_{N,t}$ is the cost-minimizing price of one basket of local intermediates:

$$P_{N,t} = \left[\int_0^s P_t(n)^{1-\theta_N}\, dn\right]^{\frac{1}{1-\theta_N}} \tag{21}$$

We can derive $Q_A(h,x)$, $Q_A(f,x)$, $C_A^g(h,x)$, $C_A^g(f,x)$, P_H and P_F in a similar way. Firms y producing the final investment goods have similar demand curves. Aggregating over x and y, it can be shown that total demand for intermediate non-tradable good n

is:

$$\begin{aligned} & \int_0^s Q_{A,t}(n,x)\,dx + \int_0^s Q_{E,t}(n,y)\,dy + \int_0^s C_t^g(n,x)\,dx \\ = & \left(\frac{P_t(n)}{P_{N,t}}\right)^{-\theta_N}\left(Q_{NA,t} + Q_{NE,t} + C_{N,t}^g\right) \end{aligned}$$

where C_N^g is public sector consumption. Italy demands for (intermediate) domestic and imported tradable goods can be derived in a similar way.

6.2.2 Supply

The supply of each Italian intermediate non-tradable good n is denoted by $N^S(n)$:

$$N_t^S(n) = \left((1-\alpha_N)^{\frac{1}{\xi_N}} L_{N,t}(n)^{\frac{\xi_N-1}{\xi_N}} + \alpha^{\frac{1}{\xi_N}} K_{N,t}(n)^{\frac{\xi_N-1}{\xi_N}}\right)^{\frac{\xi_N}{\xi_N-1}} \tag{22}$$

Firm n uses labor $L_{N,t}^p(n)$ and capital $K_{N,t}(n)$ with constant elasticity of input substitution $\xi_N > 0$ and capital weight $0 < \alpha_N < 1$. Firms producing intermediate goods take the prices of labor inputs and capital as given. Denoting W_t the nominal wage index and R_t^K the nominal rental price of capital, cost minimization implies:

$$L_{N,t}(n) = (1-\alpha_N)\left(\frac{W_t}{MC_{N,t}(n)}\right)^{-\xi_N} N_t^S(n) \tag{23}$$

$$K_{N,t}(n) = \alpha\left(\frac{R_t^K}{MC_{N,t}(n)}\right)^{-\xi_N} N_t^S(n)$$

where $MC_{N,t}(n)$ is the nominal marginal cost:

$$MC_{N,t}(n) = \left((1-\alpha)W_t^{1-\xi_N} + \alpha\left(R_t^K\right)^{1-\xi_N}\right)^{\frac{1}{1-\xi_N}} \tag{24}$$

The productions of each Italian tradable good, $T^S(h)$, is similarly characterized.

6.2.3 Price setting in the intermediate sector

Consider now profit maximization in the Italian intermediate non-tradable sector. Each firm n sets the price $p_t(n)$ by maximizing the present discounted value of profits subject

to the demand constraint and the quadratic adjustment costs:

$$AC_{N,t}^{p}(n) \equiv \frac{\kappa_N^p}{2}\left(\frac{P_t(n)}{P_{t-1}(n)}-1\right)^2 Q_{N,t} \quad \kappa_N^p \geq 0$$

paid in unit of sectorial product $Q_{N,t}$ and where κ_N^p measures the degree of price stickiness. The resulting first-order condition, expressed in terms of domestic consumption, is:

$$p_t(n) = \frac{\theta_N}{\theta_N - 1} mc_t(n) - \frac{A_t(n)}{\theta_N - 1} \tag{25}$$

where $mc_t(n)$ is the real marginal cost and $A(n)$ contains terms related to the presence of price adjustment costs:

$$\begin{aligned} A_t(n) \quad \approx \quad & \kappa_N^p \frac{P_t(n)}{P_{t-1}(n)}\left(\frac{P_t(n)}{P_{t-1}(n)}-1\right) \\ & -\beta\kappa_N^p \frac{P_{t+1}(n)}{P_t(n)}\left(\frac{P_{t+1}(n)}{P_t(n)}-1\right)\frac{Q_{N,t+1}}{Q_{N,t}} \end{aligned}$$

The above equations clarify the link between imperfect competition and nominal rigidities. As emphasized by Bayoumi et al. (2004), when the elasticity of substitution θ_N is very large and hence the competition in the sector is high, prices closely follow marginal costs, even though adjustment costs are large. To the contrary, it may be optimal to maintain stable prices and accommodate changes in demand through supply adjustments when the average markup over marginal costs is relatively high. If prices were flexible, optimal pricing would collapse to the standard pricing rule of constant markup over marginal costs (expressed in units of domestic consumption):

$$p_t(n) = \frac{\theta_N}{\theta_N - 1} mc_{N,t}(n) \tag{26}$$

Firms operating in the intermediate tradable sector solve a similar problem. We assume that there is market segmentation. Hence the firm producing the brand h chooses $p_t(h)$ in the Italian market,a price $p_t^*(h)$ in the REA and a price $p_t^{**}(h)$ in the RW to maximize the expected flow of profits (in terms of domestic consumption units):

$$E_t \sum_{\tau=t}^{\infty} \Lambda_{t,\tau} \left[\begin{array}{c} p_\tau(h) y_\tau(h) + p_\tau^*(h) y_\tau^*(h) + p_\tau^{**}(h) y_\tau^{**}(h) \\ -mc_{H,\tau}(h)\left(y_\tau(h) + y_\tau^*(h) + y_\tau^{**}(h)\right) \end{array} \right]$$

subject to quadratic price adjustment costs similar to those considered for non-tradables and standard demand constraints. The term E_t denotes the expectation operator condi-

tional on the information set at time t, $\Lambda_{t,\tau}$ is the appropriate discount rate and $mc_{H,t}(h)$ is the real marginal cost. The first order conditions with respect to $p_t(h)$, $p_t^*(h)$ and $p_t^{**}(h)$ are:

$$p_t(h) = \frac{\theta_T}{\theta_T - 1} mc_t(h) - \frac{A_t(h)}{\theta_T - 1} \tag{27}$$

$$p_t^*(h) = \frac{\theta_T}{\theta_T - 1} mc_t(h) - \frac{A_t^*(h)}{\theta_T - 1} \tag{28}$$

$$p_t^{**}(h) = \frac{\theta_T}{\theta_T - 1} mc_t(h) - \frac{A_t^{**}(h)}{\theta_T - 1} \tag{29}$$

where θ_T is the elasticity of substitution of intermediate tradable goods, while $A(h)$ and $A^*(h)$ involve terms related to the presence of price adjustment costs:

$$\begin{aligned}
A_t(h) &\approx \kappa_H^p \frac{P_t(h)}{P_{t-1}(h)} \left(\frac{P_t(h)}{P_{t-1}(h)} - 1 \right) \\
&\quad -\beta \kappa_H^p \frac{P_{t+1}(h)}{P_t(h)} \left(\frac{P_{t+1}(h)}{P_t(h)} - 1 \right) \frac{Q_{H,t+1}}{Q_{H,t}} \\
A_t^*(h) &\approx \theta_T - 1 + \kappa_H^p \frac{P_t^*(h)}{P_{t-1}^*(h)} \left(\frac{P_t^*(h)}{P_{t-1}^*(h)} - 1 \right) \\
&\quad -\beta \kappa_H^p \frac{P_{t+1}^*(h)}{P_t^*(h)} \left(\frac{P_{t+1}^*(h)}{P_t^*(h)} - 1 \right) \frac{Q_{H,t+1}^*}{Q_{H,t}^*} \\
A_t^{**}(h) &\approx \theta_T - 1 + \kappa_H^p \frac{P_t^{**}(h)}{P_{t-1}^{**}(h)} \left(\frac{P_t^{**}(h)}{P_{t-1}^{**}(h)} - 1 \right) \\
&\quad -\beta \kappa_H^p \frac{P_{t+1}^{**}(h)}{P_t^{**}(h)} \left(\frac{P_{t+1}^{**}(h)}{P_t^{**}(h)} - 1 \right) \frac{Q_{H,t+1}^{**}}{Q_{H,t}^{**}}
\end{aligned}$$

where κ_H^p,$\kappa_H^{p\,*}$,$\kappa_H^{p\,**} > 0$ respectively measure the degree of nominal rigidity in Italy, in the REA and in the RW. If nominal rigidities in the (domestic) export market are highly relevant (that is, if is relatively large), the degree of inertia of Italian goods prices in the foreign markets will be high. If prices were flexible ($\kappa_H^p = \kappa_H^{p*} = \kappa_H^{p**} = 0$) then optimal price setting would be consistent with the cross-border law of one price (prices of the same tradable goods would be equal when denominated in the same currency).

6.3 Labor Market

In the case of firms in the intermediate non-tradable sector, the labor input $L_N(n)$ is a CES combination of differentiated labor inputs supplied by domestic agents and defined

over a continuum of mass equal to the country size ($j \in [0, s]$):

$$L_{N,t}(n) \equiv \left(\frac{1}{s}\right)^{\frac{1}{\psi}} \left[\int_0^s L_t(n,j)^{\frac{\psi-1}{\psi}} dj\right]^{\frac{\psi}{\psi-1}} \tag{30}$$

where $L(n,j)$ is the demand of the labor input of type j by the producer of good n and $\psi > 1$ is the elasticity of substitution among labor inputs. Cost minimization implies:

$$L_t(n,j) = \left(\frac{1}{s}\right) \left(\frac{W_t(j)}{W_t}\right)^{-\psi} L_{N,t}(j), \tag{31}$$

where $W(j)$ is the nominal wage of labor input j and the wage index W is:

$$W_t = \left[\left(\frac{1}{s}\right) \int_0^s W_t(h)^{1-\psi} dj\right]^{\frac{1}{1-\psi}}. \tag{32}$$

Similar equations hold for firms producing intermediate tradable goods. Each household is the monopolistic supplier of a labor input j and sets the nominal wage facing a downward-sloping demand, obtained by aggregating demand across Italian firms. The wage adjustment is sluggish because of quadratic costs paid in terms of the total wage bill:

$$AC_t^W = \frac{\kappa_W}{2} \left(\frac{W_t}{W_{t-1}} - 1\right)^2 W_t L_t \tag{33}$$

where the parameter $\kappa_W > 0$ measures the degree of nominal wage rigidity and L is the total amount of labor in the Italian economy.

6.4 The equilibrium

We find a symmetric equilibrium of the model. In each country there is a representative agent and four representative sectorial firms (in the intermediate tradable sector, intermediate non-tradable sector, consumption production sector and investment production sector). The equilibrium is a sequence of allocations and prices such that, given initial conditions and the sequence of exogenous shocks, each private agent and firm satisfy the correspondent first order conditions, the private and public sector budget constraints and market clearing conditions for goods, labor, capital and bond hold.

On the structure of Italian households' consumption patterns during the recent crises

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Abstract

This paper reviews the evolution of the Italian household consumption during the recent crises. We first provide a comparison between macro data, recovered from the National Accounts, and micro data, from the Household Budget Survey, and show that the main aggregates from the two sources behave in a similar way over time. We then inspect the typologies of households that most suffered from the recent economic crises and provide evidence of sizeable re-composition effects in their consumption patterns. Specifically, younger households faced an increase in the share of housing and food expenses, by compressing the expenditure share of non-basic items; the proportion of housing related consumption increased for working age household heads too, while it decreased for retired.

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1 Introduction

The fall in real consumption of Italian households observed over the recent economic crises has been particularly severe, amounting to 4.5% in 2012-2008 according to annual National Accounts data; in the same period GDP contracted by 5.8% and real disposable income by 8.3%. The unprecedented drop in household expenditure reflected the effects of the fall in disposable income, arising from the public finance measures, as well as heightened uncertainty and lower confidence levels (Busetti and Cova, 2013). Differently from the Global Financial crisis (2008-2009), the Sovereign Debt crisis was mainly due to factors affecting domestic demand, which jointly account for about two third of the downturn in GDP recorded between mid 2011 and end 2013. Given that household consumption represents over 60% of GDP, a sound understanding of its evolution during the recent recessions is useful to correctly appraise its path in the course of the future recovery.

Two consecutive recessions in five years may have induced Italian households not only to reduce their expenditure levels, but also to adjust its composition. These adjustments stem from several mechanism: a) the shift in the budget constrain determined by the fall in real disposable income; b) variations in the slope of the budget constraint due to changes in relative prices; c) changes in preferences. The severe contraction in income experienced over the recent years is likely to have induced a re-composition in consumption: in order to minimize the impact of the fall of income on basic, not-easy-to compress expenses (such as rents, health that are inelastic to income), households reshaped their consumption for "leisure" items, such as clothing and footwear, recreation and culture, accommodation and restaurants.

The crises may have also induced a change in households' preferences, with a reduction in the quality of purchased goods and a more widespread recourse to discounts. Pozzolo (2011), for example, finds that during the Global financial crisis Italian families consumed more chicken, reducing the quantity of veal and preferred cheaper outlet types, such as discounts.

In this paper we ask whether the reduction in consumption that occurred in the last recessions (i) indeed affected budget shares, and if so, whether (ii) the impact was differentiated

across households types. We preliminary provide a comparison between National Accounts data (macro-data) and the aggregation of the Household Budget Survey (micro-data). It is a widely held view that macro and micro consumption statistics differ markedly (Maki and Garner, 2010; Maki and Nishiyama, 1993), given the underreporting in micro Surveys. We find that in Italy the main consumption aggregates show differences in levels but similar dynamics, once we properly harmonize the definition of households and the classification of services and goods in the two datasets. According to both datasets, the budget shares of "leisure" expenditures (such as clothing and footwear, furniture and household services) declined, while the share of housing expenditures rose; the share for food remained roughly unchanged.

We then turn to analysing whether the effects differed across the population, examining the evolution of the budget shares for households with different socio-demographics characteristics in the pre-crisis (2003-2007) and post-crisis (2008-2012) period. Households in the lowest deciles of the consumption distribution lowered the budget shares allocated to clothing and footwear, transport, furniture and accommodation and restaurants; by contrast, the share of food and housing, which are non-negligible needs, increased. Households in the upper tail of the consumption distribution reduced all the expenses for furniture and other household services, clothing and footwear and slightly rose the one for accommodation and restaurants. We also observe a regularity across age groups: although on average the budget share for food did not change, during the Sovereign Debt crisis younger households increased the share for food and housing, compressing all the others.

The reminder of the paper is organized as follows. In Section 2 we provide a comparison between macro and micro consumption data available for Italy and describe the evolution of the main expenditure aggregates in the recent recessions. Section 3 presents the heterogeneous attitudes adopted by Italian families vis-à-vis the double recessions and identifies the typologies of households that most suffered from the recessions. Section 4 concludes and discusses issues for future research.

2 A comparison between Macro and Micro consumption data

In this Section we provide a comparison between macro data (Annual National Accounts, NA), and micro data, retrieved from the Istat Household Budget Survey (HBS). Given that micro data are obtained from interviews with households, it is worth analysing whether or not the aggregation of individual data diverges from the macro data. To the extent that the comparison between the two datasets shows similar dynamics for the variables of interest, the results obtained from studying the heterogeneous evolution of expenditure patterns on the basis of the micro data may be viewed as consistent with the evolution of macro data.

National Accounts are based a the concept of household consumption (introduced with the ESA95) which distinguishes between the time of purchase of goods and services and that of the satisfaction of needs. Moreover, expenditure refers to resident citizens, thus

$$HC = (EX_{H,int} + EX_{res,abr} - EX_{for,int}) \tag{1}$$

where household consumption HC is given by the sum of (i) resident and non-resident households' expenditure in the national economic territory ($EX_{H,int}$), (ii) expenditure made abroad by resident households ($EX_{res,abr}$) and (iii) expenditure made by foreign households on the national economic territory ($EX_{for,int}$).

The Household Budget Survey (HBS) is an annual Survey conducted by the National Institute of Statistics (ISTAT). It provides information on the patterns and the level of consumption of Italian resident households according to various demographic and social characteristics. It is a continuous Survey, involving approximately 28,000 households each year, sampled at random from the residence records of the municipalities involved in the Survey. The data is collected for 278 elementary consumption items, providing a very detailed picture of consumption patterns. Sampling weights allow to expand the sample to the whole population.[1] Real consumption measures are obtained by deflating elementary nominal

[1]The survey is based on three questionnaires: (1) ***the book of purchases*** that records daily expenses, such as the amount spent for food (bread, pasta , meat, etc...) and current goods and services (newspapers, tobacco, bus tickets, etc...). (2) ***Self-consumption***, that records self-produced and auto-consumed goods,

consumption items with the corresponding price indices from the Consumer Price Index (CPI).

2.1 Total household consumption in the NA and the HBS

There have been several discussion about the quality of survey data and their ability to reproduce the movements in aggregate consumption (see Seslnick 1992 and Paulin 1990 for USA data; Banks and Johnson 1997 for UK). These studies stress that aggregate individual data and National Accounts are expected to diverge given the different definition of goods and services, the reference population and measurement errors. To the best of our knowledge, there are no studies providing such a comparison for the Italian case.

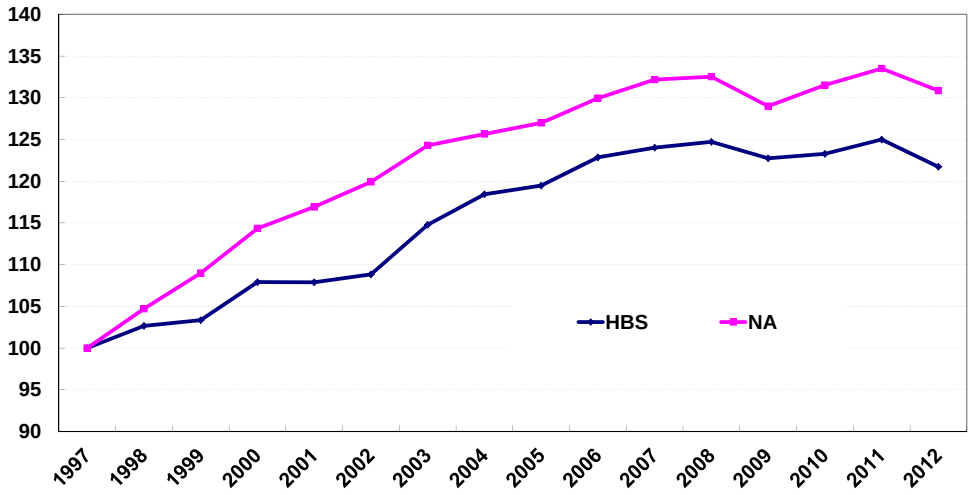
The Household Budget Survey (Istat, 1995) is one of the main data sources used to estimate Gross Domestic Product (GDP) on the demand side, but it is not the only one. About 30% of the National Accounts consumption is recovered from HBS, 30% from the ISTAT Surveys on business and foreign trade statistics, 10% from the Multi-Purpose Survey (MPS) and the remaining 30% is obtained from administrative data (energy consumption, Siae, etc...) and other data sources. Additionally, the HBS and NA differ along three dimensions: 1. the reference population, 2. the concept and definitions of goods and 3. the reference market. The Survey samples the resident population and refers to households only, whereas the NA consider the population on the national territory and covers the expenditure for both households and cohabitations (i.e., the expenses by those who live in communes Institutions such as convents, boarding schools, prisons, etc.). As far as the concept and definition of goods is concerned: (a) the same item may be treated in a different way in the two datasets; this is the case, for instance, of imputed rents that are based on a self-evaluation of the owner in the HBS, while in NA they are estimated classifying apartments into 42 standard types (see also Section 2.2); (b) some types of expenditure are provided

during the reference period (one week); (3) ***summary of expenditure***, compiled by the interviewer at the beginning of the month following the period of reference. On this occasion the interviewer also records the socio-demographic characteristics of the households, expenses for housing, the cost of furniture and equipments, clothing and footwear, health, transport and communications, leisure, entertainment and education, other goods and services.

by the Survey but not by the NA, such as the buying and selling of cars by one family to another[2]; (c) in-kind income in NA (such as luncheon vouchers, not detected by the Survey) are estimated using other independent data sources.

In 2012 nominal household consumption on the economic territory amounted to 962,721 million of € according to National Accounts; the average monthly expenses of Italian households recovered from the Household Budget Survey was 2,504€. Even correcting for the reference market in the two datasets, a discrepancy emerges, with a clear underestimation of total consumption by the Survey; the Survey underestimation is a common feature of that series (see Figure 1). The ratio between nominal consumption level from HBS and NA has however remained broadly stable, averaging 80% since 2000. Following Maki and Garner (2010), underreporting in microeconomic statistics is expected to play an important role.

Figure 1: Nominal household consumption on the domestic territory (1997=100)



Notes: Our calculation from HBS and NA.

[2]NA, by definition, consolidates transaction within the same Institution.

2.2 Household consumption disaggregated by COICOP in the NA and the HBS

We now turn to analyse whether households' consumption patterns in the NA and HBS evolve in the same way considering not only total consumption, but also the main sub-items. To analyze consumption patterns, we use the COICOP (Classification of Individual Consumption by Purpose) classification developed by the United Nations Statistics Division to classify and analyze individual consumption expenditures incurred by households according to their purpose.[3]

Starting from the NA we computed household consumption excluding some of the services that are not sampled in the Survey (such as social protections and financial services); in order to make the comparison feasible we divided total consumption by the number of households on the economic territory and recovered a monthly indicator of consumption. We analyse the evolution of consumption patterns from 1997, the first year the HBS was conducted according to a new methodology, to 2012, the last wave available. For each households i in years $t = 1997, .., 2012$, we calculate the 12 COICOP consumption chapters ($j = 1, ..., 12$), aggregating the single items included in that chapter (i.e., COICOP1 is obtained summing up pasta, rice, meat, fish, etc...). The total budget share w_{jt} for each COICOP is obtained as the ratio between consumption for good j and total expenditure, i.e.

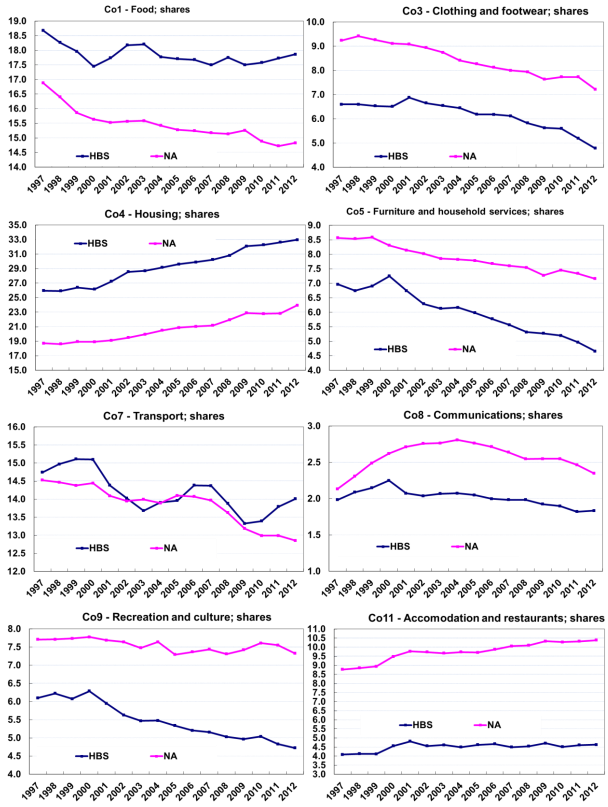
$$w_{jt} = \frac{\sum_i C_{ijt}}{\sum_i C_{it}}$$

A detailed description of the evolution of the budget shares is provided in Appendix A, where we show that the main aggregates exhibit differences in levels, but similar trends. In Figure 2 we report the budget shares for some relevant COICOP in the NA and HBS.

COICOP1. *Food and non-alcoholic beverages.* The budget share decreased by 0.8 percentage points from 1997 to 2012 in HBS, with a more pronounced drop (-2.1 percentage points) in NA; both data sets show that the share remained roughly unchanged during the

[3]The 12 COICOP chapters are (1) food and non-alcoholic beverages; (2) alcoholic beverages and tobacco; (3) clothing and footwear; (4) housing, water, electricity and fuel; (5) furniture and household services; (6) health; (7) transport; (8) communications; (9) recreation, entertainment and culture; (10) education; (11) accommodation services and restaurants; (12) other goods and services.

Figure 2: Comparison between the NA and HBS budget shares



Notes: Our calculation from HBS and NA

recent crises. The fact that the evolution of the budget shares is comparable across datasets may also be due to the fact that most items in NA (such as butter, oil and fats; sugar, jam and confectionery; meat) are estimated from HBS.

COICOP3. *Clothing and footwear.* The dynamic of the budged share for clothing and footwear is broadly comparable in the two datasets. NA and HBS both show a decreasing pattern, with a difference of 2 percentage points from 1997 to 2012 (1 p.p. during the recent crises). The total budget share devoted by households to buy clothing and footwear went down from 6.6 in 1997 to 4.8% in 2012 (from 9.2 to 7.2% according to the NA).

COICOP4. *Housing, water, electricity and fuel.* This is a wide sub-component, that includes most of the expenses related to housing. Based on HBS, the budget share increased from 26 to 33% (from 18.7 to 23.9% according to the NA). However, the evolution showed a

similar dynamic. Actual rents and imputed rents are the two main sub-components of this COICOP. Actual rents are taken from sampled households in HBS and they represent also the main source used to estimate the same component in the NA. In the HBS imputed rents refer to an estimation subjectively given by the households, while in the NA they are estimated classifying apartments into 42 standard types, defined from the house characteristics available in the HBS. From 2008 to 2012, imputed rent shares increased by about 1.3 percentage point in NA and 0.4 p.p in HBS, while actual rent shares rose by about 2 percentage points in both datasets.

COICOP5. *Furniture and household services.* This sub-component includes leisure items like furniture and repairs, linen and other items for the home, appliances and repair, glassware and tableware, tools and equipment for house and garden, goods and services for home maintenance. The budget shares (4.7 in HBS and 7.2% in NA in 2012, respectively) differ considerably across the two datasets; however their evolution shows a decreasing pattern, more pronounced in HBS. In particular, according to the households evaluations the budget share allocated to furniture and other household services decreased by about 0.7 percentage points in the period 2008-2012, NA reports a fall of 0.4 p.p.

COICOP7. *Transport.* The relative expenditure for transport on total consumption in 2012 was about 14% in HBS (13% in NA). Over the period 1997-2012 the budget share decreased by 0.7 percentage points in HBS, almost double in the NA; the difference is mainly due to the last four years when the Survey points to an increase and the National Accounts to a decrease.

COICOP8. *Communications.* Communication is the COICOP item that shows the highest divergence between HBS and NA both in levels and budget shares.

COICOP9. *Recreation, entertainment and culture.* According to the subjective evaluation of the households, the relative weight of recreation, entertainment and culture over total consumption decreased over the period 1997-2012 by 1.4 percentage points (0.4 p.p. considering NA); one out of forth of this fall was registered during the last recession.

COICOP11. *Accommodation services and restaurants.* The budget share for this COICOP

was 5% over total consumption for HBS and double for NA in 2012; its evolution shows an upward increase in both datasets.

In summary, over the recent crises Italian households have indeed modified their consumption patterns. In particular, the decrease of the budget share related to "leisure" (like clothing and footwear, furniture and household services) has been associated with an increase in the share devoted to housing expenditure, while the one for food has remained roughly unchanged. Similar evidence is provided by the budget shares in real terms reported in Table 1.

Table 1: **Real expenditure disaggregated by COICOP.**

	Expenditure:							
	1	3	4	5	7	8	11	Total
1997	509	176	781	183	422	28	121	2710
1998	506	176	784	179	434	30	122	2728
1999	496	172	792	182	432	31	119	2702
2000	496	175	774	196	433	35	134	2751
2001	484	180	782	178	406	33	136	2676
2002	483	170	824	165	392	34	124	2635
2003	494	172	845	166	393	37	127	2706
2004	487	171	869	169	399	40	124	2732
2005	490	162	849	162	387	42	126	2703
2006	494	165	834	159	398	44	128	2722
2007	480	162	830	151	393	48	121	2698
2008	465	153	799	140	363	50	120	2626
2009	443	144	820	135	350	48	121	2564
2010	446	142	818	132	340	48	114	2537
2011	445	131	798	126	334	47	116	2503
2012	426	115	734	112	310	47	112	2365
2003-2007	-2.8	-5.3	-1.8	-9.0	0.1	31.2	-5.1	-0.3
2012-2008	-8.4	-24.8	-8.2	-20.0	-14.5	-6.1	-6.6	-9.9
	Budget shares:							
2003-2007	-0.5	-0.3	-0.5	-0.5	0.1	0.4	-0.2	
2012-2008	0.3	-1.0	0.6	-0.6	-0.7	0.1	0.2	

Source: Auhtor's calculation from the HBS. Selected COICOP chapters are (1) food and non-alcoholic beverages; (3) clothing and footwear; (4) housing, water, electricity and fuel; (5) furniture, and household services; (7) transport; (8) communications; (11) accommodation services and restaurants. % change for expenditure; percentage points for budget shares.

In what follows we will use the consumption expenditure and budget shares recovered from the Household Budget Survey, to account for the heterogeneity of attitudes implemented by household types.

3 Budget shares and socio-economic characteristics in the recent crises

In this Section we check whether the evolution of the budget shares show regularities across socio-demographic characteristics of the households. The analysis is based on the HBS micro data. We will focus on food and non-alcoholic beverages, clothing and footwear, housing, furniture and housing services, transport, communications and accommodation services and restaurants, representing more than 80% of total consumption expenditure. We refer to the socio-economic characteristics across the consumption distribution, as income data are not available in HBS since 2002. The observed regularities are in line with Crossley at al. (2012) for UK.

Table 2: **Quartile distribution across socio-demographic characteristics.**

	2012				2002			
Quartile	**0-44**	**45-64**	**65 +**		**0-44**	**45-64**	**65 +**	
1	6.5	9.7	8.8		6.9	7.9	10.2	
2	6.1	9.6	9.4		6.7	9.1	9.2	
3	5.8	9.4	9.8		7.4	9.8	7.8	
4	6.6	10.4	8.0		7.9	10.5	6.6	
	Primary	**Secondary**	**High**	**University**	**Primary**	**Secondary**	**High**	**University**
1	8.7	9.2	6.0	1.1	12.9	7.8	3.8	0.6
2	7.3	7.7	8.0	2.0	10.2	7.6	6.0	1.3
3	6.2	7.2	8.6	3.0	8.1	7.5	7.4	1.9
4	3.8	5.2	10.1	5.9	5.4	6.6	9.3	3.7
	North	**Center**	**South**		**North**	**Center**	**South**	
1	7.1	3.7	14.3		7.0	3.6	14.4	
2	10.6	5.3	9.1		11.4	5.0	8.6	
3	13.8	5.7	5.6		14.2	5.3	5.5	
4	16.9	5.2	2.9		15.5	5.5	4.0	
	Employee	**Self-employed**	**Not employed**		**Employee**	**Self-employed**	**Not employed**	
1	9.5	2.4	13.1		8.3	2.5	14.2	
2	10.1	2.8	12.1		9.1	2.9	13.0	
3	9.7	2.8	12.5		9.4	3.9	11.7	
4	10.7	3.6	10.7		10.5	4.5	10.0	
	Owners	**Renters**	**Usufruct**	**Other**	**Owners**	**Renters**	**Usufruct**	**Other**
1	14.9	7.2	0.7	2.2	15.9	6.8	0.6	1.7
2	18.0	4.0	0.9	2.2	18.0	4.7	0.7	1.7
3	19.1	3.4	0.7	1.8	18.8	4.2	0.6	1.4
4	20.4	2.3	0.6	1.7	19.9	3.0	0.6	1.5

Source: Auhtor's calculation from the HBS. Sample weights included. Quartiles are defined according to the equivalised consumption distribution.

The recent recession was accompanied by a change in the composition of the Italian population. By applying the equivalence scale used in official statistics, expenditure levels

are made comparable, in welfare terms, across households of different size, taking a two-member household as the reference.[4] As to *demographic characteristics*, compared to 2002, in 2012 the share of young households in the richest quartile of the equivalised consumption distribution declined (from 7.9% to 6.6), while the proportion of 65 and over increased (from 6.6% to 8.0); in the poorest quartile, the share of retired households fell (from 10.2% to 8.8), while the one of households of ages between 45 and 64 increased (from 7.9% to 9.7). In terms of *geographical areas*, Northern households in the highest tail of the distribution increased. As to the *occupation* of the head of the household, the share of employees increased in the first quartile, while the one for self-employed fell in the forth. Renters became poorer: the share in the lowest quartile increased (from 6.8% to 7.2) while the one in the highest reduced by 7 percentage point (to 2.3%).

The recent recession induced a re-composition of consumption expenditure.

Food. The *budget share* of food remained roughly unchanged during the recent recessions; however the aggregate outcomes masks heterogeneity across households types. The share allocated to food and non-alcoholic beverages increased for younger households, by about 1 percentage point, while it decreased for retired household heads and was unchanged for middle aged ones (Figure 3). The percentage change in food *expenditure*, which recorded a negative variation also in the period 2003-2007, was markedly negative especially for middle aged households. In terms of deciles of the equivalised consumption distribution, we observe a rapid drop for the highest and lowest deciles.

Clothing and footwear. The drop observed for the *budget share* of clothing and footwear over the period 2008-2012 (1 percentage point) is in line with the trend in the pre-crisis period. The contraction has been more pronounced for households whose head is in working age (less than 64) and was widespread across all deciles of the equivalised consumption distribution, especially for the highest ones (Figure 4). Considering clothing *expenditure*, it is interesting to see that it increased for the poorest decile in the period 2007-2003 (by about 5%), while it fell by about 25% in the recent crises. This seems to

[4]The equivalence scale assigns weight 1 to a household of two persons and then weights 0.6 to a single person, 1.33 to three persons, 1.63 to four persons, 1.9 to five or more persons.

confirm the fact that in the recent recessions households reduced by non-negligible amount their expenditure for non-basic goods and services. The compression was more moderate for household heads aged 65 and over: this could reflect the end of their working life and the subsequent less need to buy new clothes. Miniaci et al. (2003) call "retirement consumption puzzle" the fact that consumption of work-related goods falls around retirement age while home production of food and other goods increases (see also Battistin et al. 2009).

Housing. During the recent crises housing *expenditure* in real terms decreased by 8%; the fall has been particularly relevant for youngest and middle aged households and for the highest deciles the equivalised consumption distribution (Figure 5). By contrast, the *budget share* devoted to housing expenses rose for household heads aged less than 64, for the poorest and richest households, for renters and self-employed. On average oldest households devoted 40% of the budget share to housing expenses; this could reflect the fact that this COICOP item includes not only actual rents, but also imputed rents.

Furniture. The reduction in furniture and other household services *expenditure* was particularly severe for the lowest and highest deciles of the consumption distribution and youngest households (Figure 6). The *budget share* allocated to furniture decreased by about 1 percentage point between 2008 and 2012 for household in working age and by about 2 p.p. for the highest decile, continuing a trend started during the pre-crisis period.

Transport. Transport *expenditure* in real terms fell by 15% during the recession, against a stagnation during pre-crisis period; in particular, the fall reflected a sizeable drop for households less than 44 and affected all deciles of the equivalent consumption distribution (Figure 7). The relative *budget shares* tell a similar story.

Communications. Real communication *expenditure*, which on average had risen by about 30% in the period 2007-2003, declined by 6% during the recession, reflecting a fall for youngest households. The reduction, particularly relevant for the highest deciles of the equivalised consumption distribution, affected all deciles, with the exception of the 3rd and 4th. The *budget share* for communication has increased from 1.3% in 2003 to 2.0% in 2012, without any particular pattern across households types (Figure 8).

Accommodation. Over the years 2003-2012 real *expenditure* for accommodation and restaurant has decreased by about 5% both before and during the crises. The increase observed for the first decile in the pre-crisis period (25%, the largest among deciles) was compensated by the rapid drop in the recession (-32%). In the years 2008 and 2012, youngest households reduced their expenditure for these items. The *budget share* for accommodation and restaurant remained stable over the period 2003-2012, reflecting a pre-recessions decrease (-0.2 p.p.) and an increase in the recessions (0.2 p.p). The rise was concentrated in the highest deciles of the equivalised consumption distribution and for retired household heads (see Figure 9).

4 Conclusions and possible extensions

The paper reviews the evolution of the structure of household consumption over the recent crises in Italy. Households types reacted differently to the economic shocks of 2008-2012, reducing the level of their expenditure and modifying their structure. In particular, on average the decrease in the budget shares related to "leisure" expenditure (e.g., clothing and footwear, furniture and household services) has been associated with an increase in the share of housing expenditure, while the share for food has remained roughly unchanged.

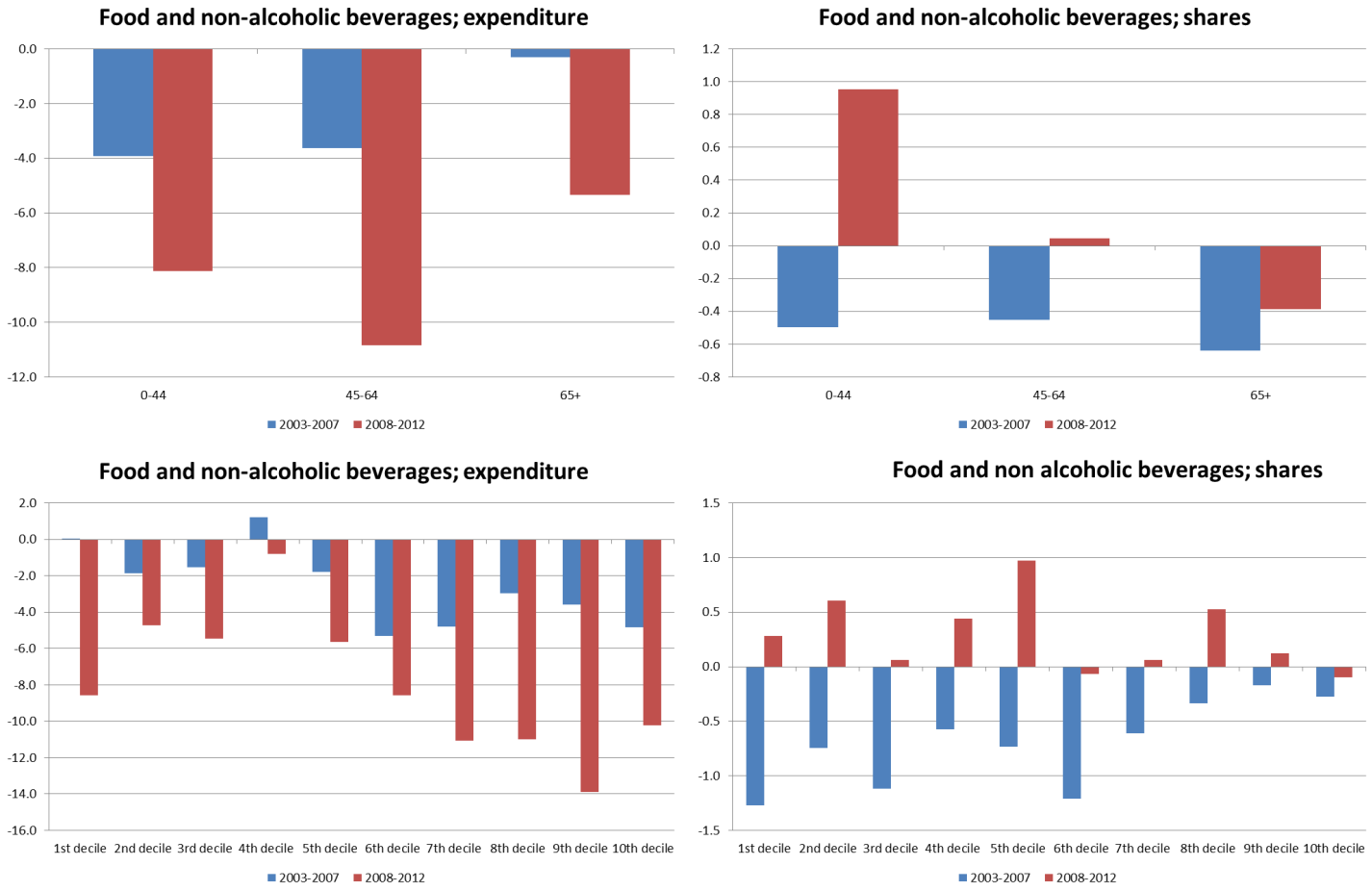
Heterogenous attitudes were observed across deciles of the consumption distribution: households in the lowest deciles increased the share of housing expenditure by decreasing the budget share allocated to clothing and footwear, transport, furniture and household services and accommodation and restaurants; at the same time, they increased the share for food, which is a basic item, not easy to reduce below a certain threshold. By contrast, households in the upper tail of the consumption distribution reduced all the expenses for furniture and other household services, clothing and footwear, while they slightly raised the share for recreation, accommodation and restaurant.

Turning to consumption patterns by age groups, although the budget share for food remained roughly unchanged in the aggregate, its share went up for younger households and reduced for old ones. The share of housing expenses increased for household heads in working ages and decreased for retired.

To understand whether the evolution of the budget shares reflected an income effect or a change in the relative prices, an Almost Ideal Demand System (AIDS) model proposed by Deaton and Muellbauer (1980a, 1980b) and/or its quadratic version (QUAIDS) introduced by Banks et al. (1997) will be estimated in a follow-up to this work. QUAIDS is very demanding in terms of computation (Pollak and Wales, 1981; Poi 2002, 2008, 2012) and data, as information on price levels for all different items included in the analysis is required.

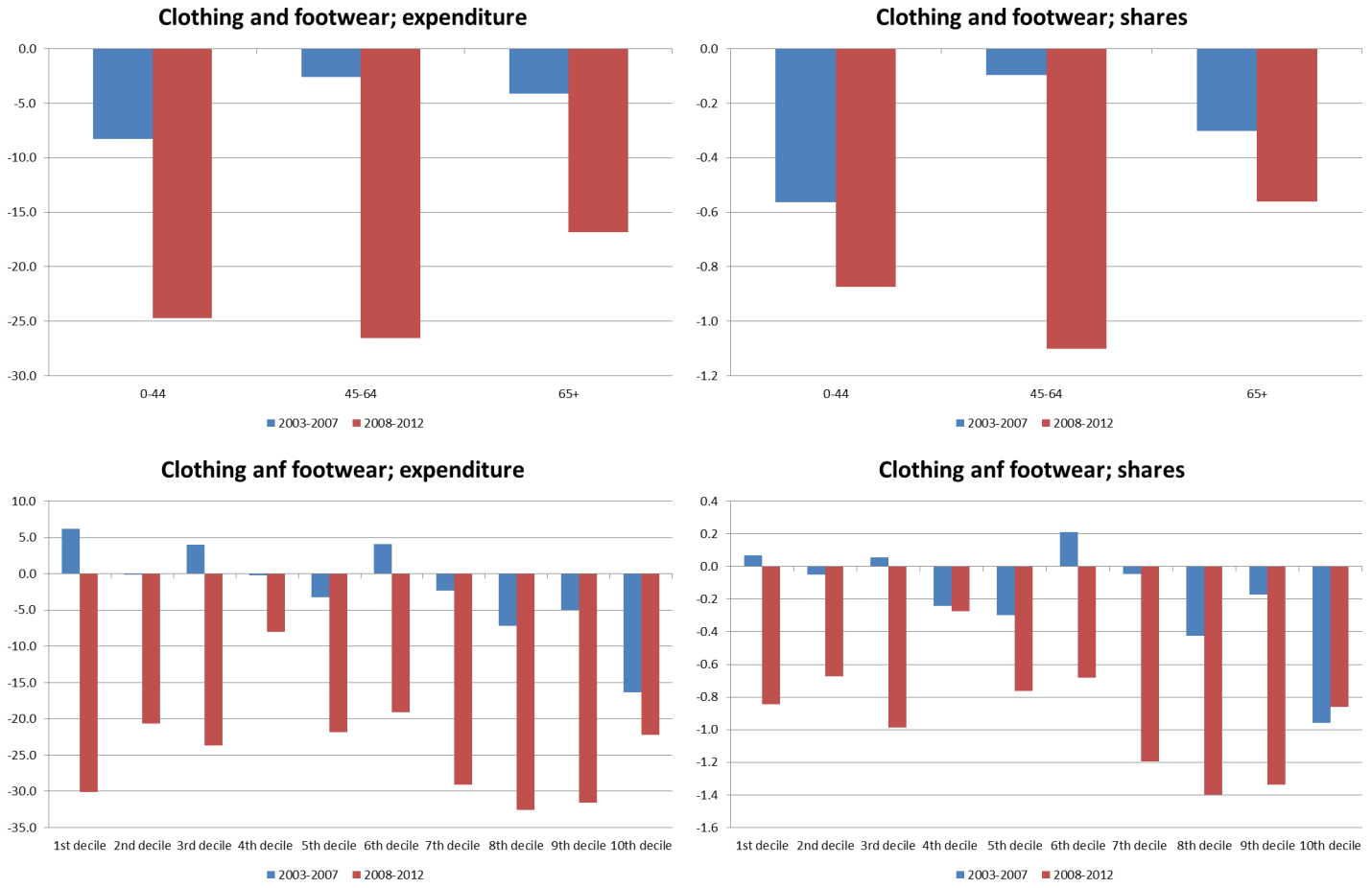
Those estimates may also help to cast light on the issue of the possible impact of the recent crises on consumer preferences.

Figure 3: Change in real COICOP1 expenditure and shares by age and deciles



Notes: Our calculation from HBS. Sample weights included. Deciles are defined according to the equivalised consumption distribution. % change for expenditure; percentage points for shares. Total consumer price index used as deflator for total consumption; consumer price index for COICOP1 used as deflator for food.

Figure 4: Change in real COICOP3 expenditure and shares by age and deciles

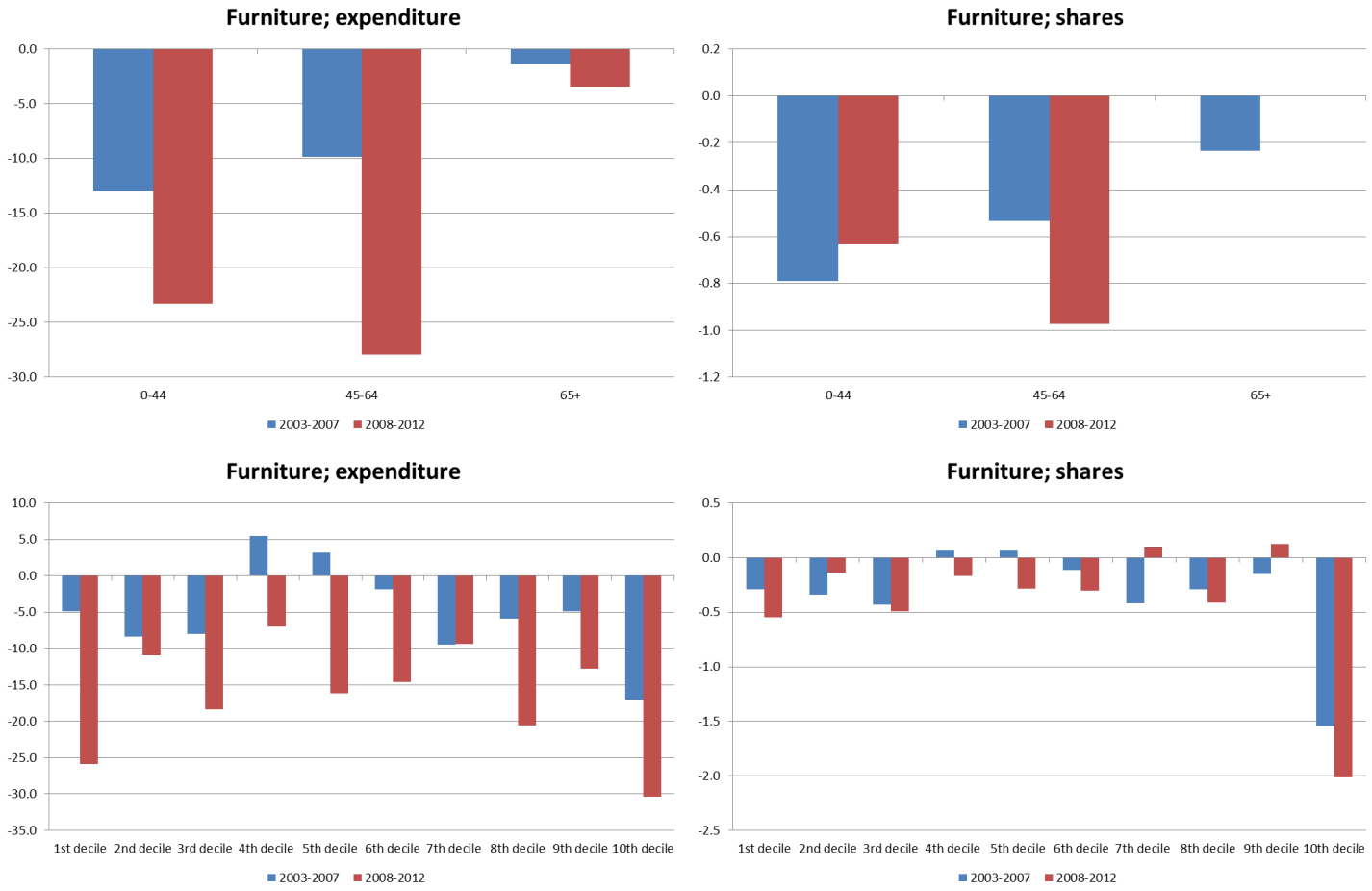


Notes:Our calculation from HBS. Sample weights included. Deciles are defined according to the equivalised consumption distribution. % change for expenditure; percentage points for shares. Total consumer price index used as deflator for total consumption; consumer price index for COICOP3 used as deflator for clothing.

Figure 5: Change in real COICOP4 expenditure and shares by age and deciles

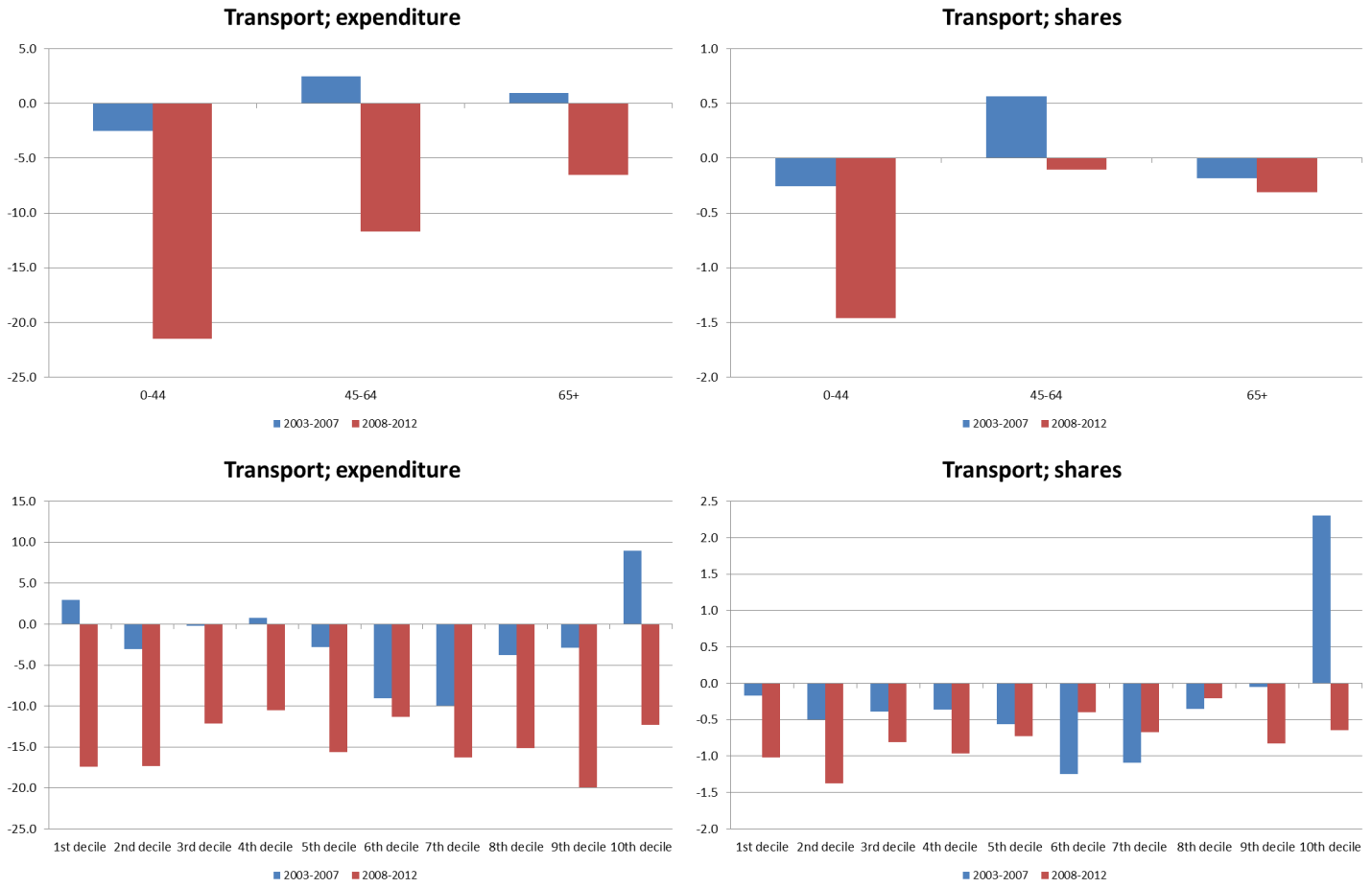
Notes: Our calculation from HBS. Sample weights included. Deciles are defined according to the equivalised consumption distribution. % change for expenditure; percentage points for shares. Total consumer price index used as deflator for total consumption; consumer price index for COICOP4 used as deflator for housing.

Figure 6: Change in real COICOP5 expenditure and shares by age and deciles



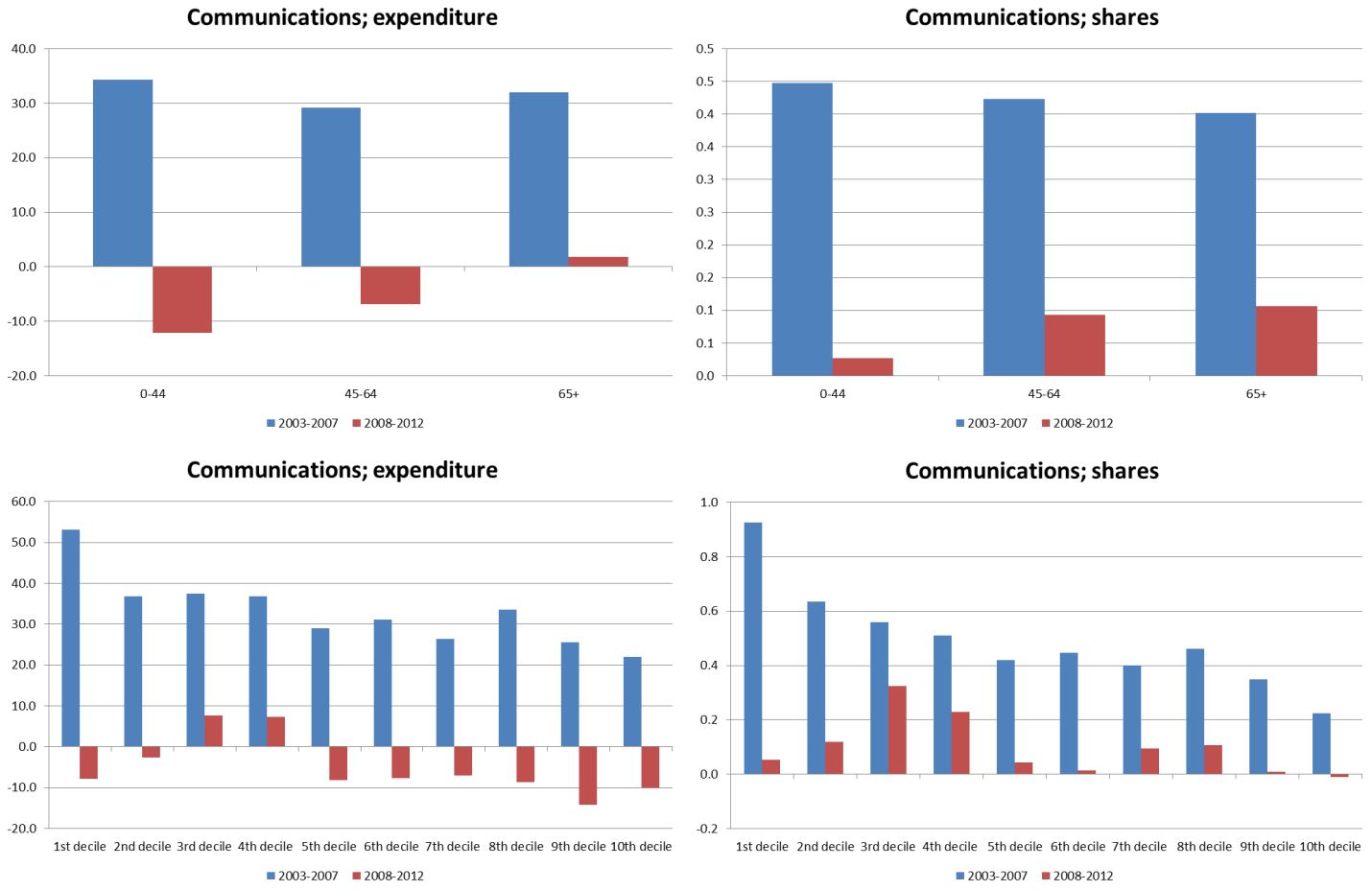
Notes: Our calculation from HBS. Sample weights included. Deciles are defined according to the equivalised consumption distribution. % change for expenditure; percentage points for shares. Total consumer price index used as deflator for total consumption; consumer price index for COICOP5 used as deflator for furniture.

Figure 7: Change in real COICOP7 expenditure and shares by age and deciles



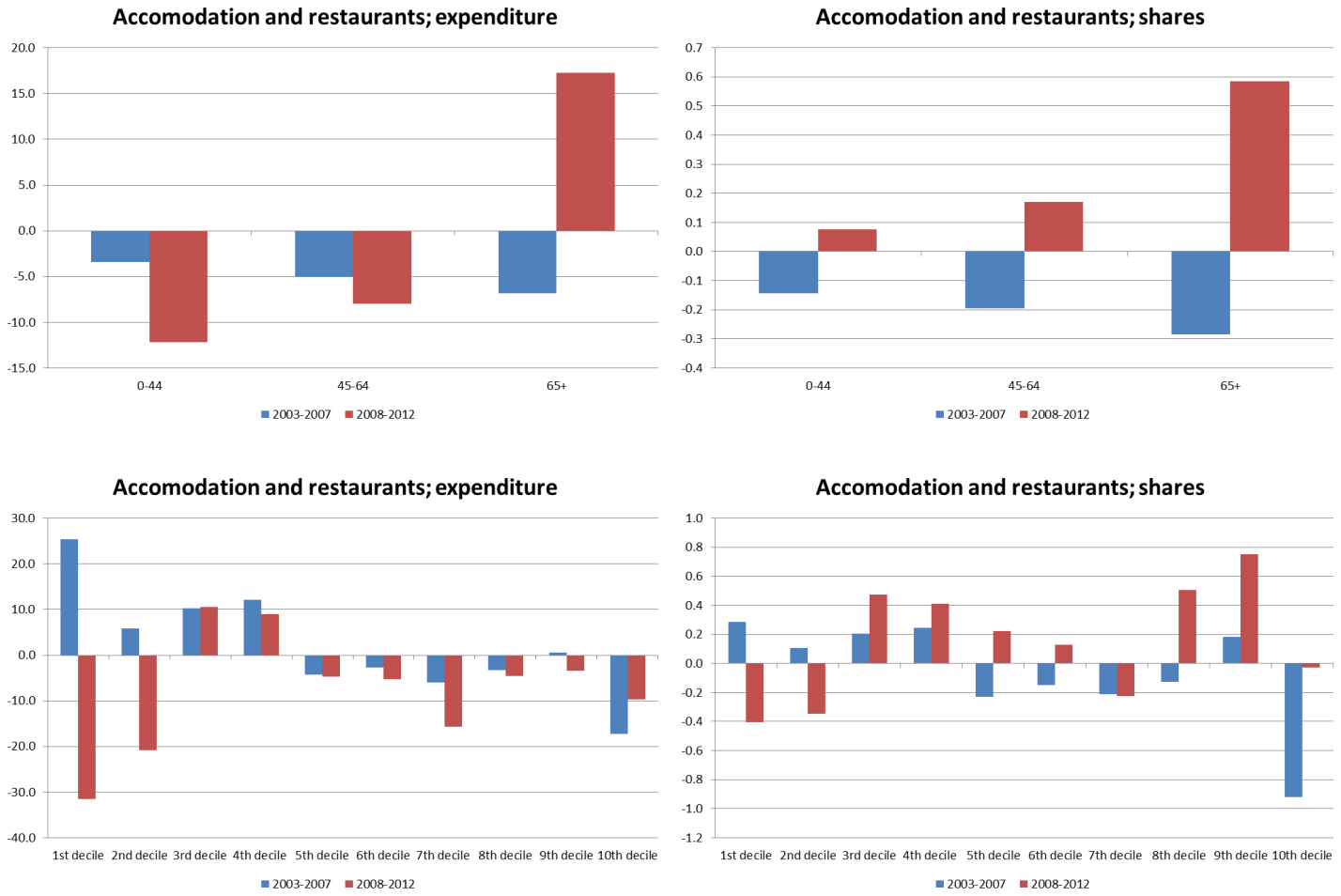
Notes: Our calculation from HBS. Sample weights included. Deciles are defined according to the equivalised consumption distribution. % change for expenditure; percentage points for shares. Total consumer price index used as deflator for total consumption; consumer price index for COICOP7 used as deflator for transport.

Figure 8: Change in real COICOP8 expenditure and shares by age and deciles



Notes: Our calculation from HBS. Sample weights included. Deciles are defined according to the equivalised consumption distribution. % change for expenditure; percentage points for shares. Total consumer price index used as deflator for total consumption; consumer price index for COICOP8 used as deflator for communications.

Figure 9: Change in real COICOP11 expenditure and shares by age and deciles



Notes: Our calculation from HBS. Sample weights included. Deciles are defined according to the equivalised consumption distribution. % change for expenditure; percentage points for shares. Total consumer price index used as deflator for total consumption; consumer price index for COICOP11 used as deflator for accommodation services and restaurants.

A The evolution of consumption in the NA and HBS (1997-2012)

1. *Food and non-alcoholic beverages.* According to HBS, in 2012 Italian households devoted in nominal terms 447€ to food and non alcoholic beverages, compared to 384 in 1997 (see Table 3). Taking into account the increase of total nominal expenditure (to 2,504€ from 2,057), the budget share decreased by 0.8 percentage points, remaining almost stable during the recent crises. A similar pattern is observed from the NA, with a more pronounced drop (-2.1 p.p.). Estimated levels in NA are recovered mainly from the HBS (butter, oil and fats; sugar, jam and confectionery; meat) while other goods are obtained with the Availability Method (AM - "metodo della disponibilità").[5] In particular flour, rice, bouillon cubes, yeast, homogenized foods are obtained with the AM as they require a transformation of industrial products. Overall the dynamic of this component was in line between the two datasets (see Figure 10).

2. *Alcoholic beverages and tobacco.* The estimation of this sub-component in the National Accounts is not based on the HBS; this explains the differences in levels and dynamics. Over the years 1997-2012 however, the total budget share remained roughly unchanged in the two data sources, at 2.8% in NA and 1.7 in HBS. More precisely, as alcoholic beverages (such as beer, wine, whiskey) are industrial products, they are obtained with the Availability Method in the NA. Tobacco is an example of the discrepancy between the amount of smoking declared by the households (in HBS) and the one recovered from administrative sources (the State Monopoly) integrated with smuggling tobacco based on the seizures made by the Financial

[5]The AM calculates the amount of goods and services potentially available for end uses. In case of domestic consumption, these are computed as follows:

$$C = P + (I - E) + (G1 - G2) - U$$

where C = domestic consumption; P = national production; I = imports, E = exports; $G1$ = inventories at the beginning of the year, $G2$ = inventories at the end of the year; U = resources for investment and intermediate consumption. Consumption functions estimated with this method concern only goods resulting from transformation of industrial products.

Table 3: **Nominal expenditure disaggregated by COICOP.**

	1	2	3	4	5	6	7	8	9	10	11	12	Total
1997	384	37	136	534	143	88	303	41	125	31	84	151	2057
1998	386	38	139	547	142	92	316	44	131	27	87	161	2112
1999	382	37	139	561	147	89	321	46	129	27	88	161	2126
2000	387	37	145	581	161	86	335	50	140	29	101	169	2220
2001	394	36	153	604	150	80	319	46	132	27	107	172	2219
2002	407	36	149	639	141	83	314	46	126	24	102	172	2239
2003	430	39	155	677	145	87	323	49	129	27	109	191	2361
2004	433	40	157	710	150	90	339	51	133	29	110	194	2436
2005	435	41	152	728	147	92	343	50	131	25	114	200	2458
2006	447	41	156	755	146	85	364	51	132	27	118	207	2528
2007	446	41	156	771	142	100	367	51	132	25	115	205	2551
2008	455	42	150	790	136	96	356	51	129	25	117	219	2566
2009	442	40	142	810	133	88	337	49	125	24	119	216	2525
2010	446	42	142	818	132	91	340	48	128	27	114	209	2536
2011	456	42	134	839	128	92	355	47	124	28	119	209	2571
2012	447	41	120	826	117	88	351	46	118	29	116	205	2504
2003-2007	3.8	6.6	1.0	13.9	-1.8	14.1	13.5	3.7	1.9	-7.1	5.3	7.4	8.1
2012-2008	-1.8	-1.0	-19.9	4.5	-14.4	-7.8	-1.5	-9.8	-8.4	16.5	-0.5	-6.3	-2.4
						Budget shares							
2003-2007	-0.7	0.0	-0.4	1.5	-0.6	0.2	0.7	-0.1	-0.3	-0.2	-0.1	-0.1	
2012-2008	0.1	0.0	-1.0	2.2	-0.7	-0.2	0.1	-0.2	-0.3	0.2	0.1	-0.3	

Source: Auhtor's calculation from the HBS. The 12 COICOP chapters are (1) food and non-alcoholic beverages; (2)alcoholic beverages and tobacco; (3) clothing and footwear; (4) housing, water, electricity and fuel; (5) furniture, and household services; (6) health services and health expenditures; (7)transport; (8) communications; (9) recreation, entertainment and culture; (10) education; (11) accommodation services and restaurants; (12) other goods and services. % change for expenditure; percentage points for budget shares.

Police (in NA).

3. *Clothing and footwear.* Although based on the Availability Methods in NA, the dynamic of the budged share for clothing and footwear is broadly comparable between the two datasets.The NA and the HBS both show a decreasing pattern, with a difference of 2 percentage points from 1997 to 2012 (1 p.p. during the recent crises). The total budget share devoted by households to buy clothing and footwear went down from 6.6 in 1997 to 4.8% in 2012 (from 9.2 to 7.2% according to the NA; Figure 10); in absolute terms households spent 120€ per month in 2012 (from 136€ in 1997).

4. *Housing, water, electricity and fuel.* This is a wide sub-component, that includes most of the expenses related to housing. Based on HBS, the nominal expenditure of Italian households increased from 534€ in 1997 to 826€ in 2012; the corresponding budget share also increased from 26 to 33% (from 18.7 to 23.9% according to the NA). However, the

Table 4: **% change in expenditure disaggregated by COICOP.**

COICOP	Item	nominal		real		deflator	
		2003-2007	2008-2012	2003-2007	2008-2012	2003-2007	2008-2012
1	Food and non-alcoholic beverages	11.1	1.2	4.2	-5.8	6.9	7.0
2	Alcoholic beverages and tobacco	14.9	6.2	-6.3	-8.9	21.2	15.1
3	Clothing and footwear	4.5	-6.0	-2.0	-11.9	6.5	5.9
4	Housing, water, electricity and fuel	21.1	12.7	1.9	1.4	19.2	11.4
4.1	Actual rents	21.4	14.0	0.2	3.1	21.2	10.9
4.2	Imputed rents	23.9	13.4	4.6	3.3	19.3	10.1
5	Furniture and household services	10.5	-1.9	3.3	-8.6	7.2	6.7
6	Health	10.0	3.3	10.8	3.2	-0.9	0.1
7	Transport	13.9	-2.5	0.5	-16.1	13.4	13.6
7.1	Vehicles' purchases	16.4	-32.2	11.4	-36.1	5.0	3.9
8	Communications	9.0	-4.8	42.3	1.8	-33.3	-6.6
9	Recreation, entertainment and culture	13.6	3.5	12.3	2.3	1.3	1.3
10	Education	12.5	9.4	-1.8	-1.8	14.4	11.3
11	Accommodation services and restaurants	18.7	6.2	7.1	-0.3	11.6	6.5
11.1	Accommodation	18.2	7.0	6.0	-1.9	12.2	8.9
11.2	Restaurants	20.3	3.9	10.5	4.8	9.8	-0.9
12	Other goods and services	22.3	-6.5	6.3	-1.7	16.0	-4.7

Source: Auhtor's calculation from NA.

pattern showed a similar trend. Actual rents and imputed rents are the two items of this sub-component whose budget shares behave in a comparable way across sources (Figure 13), although based on a different methodology. Indeed, actual rents are taken from sampled households in HBS and they represent also the main source used to estimate the same component in the NA. In the HBS imputed rents refer to an estimation subjectively given by the households, while in the NA they are estimated classifying apartments into 42 standard types, defined from the house characteristics available in the HBS (for a broad comparison between rents measured in different datasets, see also Rondinelli and Veronese, 2011). Rents expenditure in NA (actual and imputed) increased by 14% in nominal terms and 3% in real ones, as shown in Table 4.

5. *Furniture and household services.* This sub-component includes leisure items like furniture and repairs, linen and other items for the home, appliances and repair, glassware and tableware, tools and equipment for house and garden, goods and services for home maintenance. Although both the nominal expenditure (117€ in the HBS and 220€ per month in NA in 2012) and the budget shares (4.7 and 7.2%, respectively) differ considerably across the two datasets, the dynamic of the budget share points to a decreasing pattern,

more pronounced in HBS (Figure 11). In particular, according to the households evaluations the budget share allocated to furniture and other household services decreased by about 0.7 percentage points in the period 2008-2012, NA reports a fall of 0.4 p.p. The different methodology used in the two datasets allows for a possible interpretation of the different drop: households self perception of the expenses devoted to these items were more pessimistic than the one registered in the National Accounts that uses the Availability Methods that is, as previously mentioned, based on industrial production.

6. *Health.* Health expenditure, on both services and goods, in HBS and NA are broadly comparable: the monthly nominal expenses attained 88€ and 92€ per month in 2012, respectively; the difference in the budget shares is almost negligible in the studied period and fluctuated around 3% to 4% of the total consumption. The evolution of the budget shares shows a regular divide. In particular, while in NA health goods are estimated with the Availability Method (Istat, 1995), services are mainly recovered from the Multipurpose Survey "Health status and use of health services" led by National Institute of Statistics.[6] Of the three items included in this subcomponent, medical products show a similar pattern in the two datasets, while hospital services an irregular one; medical services occupy an intermediate position (Figure 13).

7. *Transport.* On average households spent 350€ per month in 2012 (395 according to the NA) for transport; the relative expenditure on total consumption was about 14% (13% in NA). Over the period 1997-2012 the budget share decreased by 0.7 percentage points in HBS, almost double in the NA; the difference is mainly due to the last four years when the Survey points to an increase and the National Accounts to a decrease.[7] In the same period, nominal transport expenditure decreased by 2.5% (16.1% in real terms) reflecting the drop occurred in the vehicle purchase (see Table 4).

8. *Communications.* Communication is the COICOP item that shows the highest di-

[6]The Survey measures the quality of life of citizens and the satisfaction of certain public utilities.

[7]For the estimation of the transport expenditure NA uses a variety of sources, from which the HBS is excluded. In particular for car expenditure NA adopt a price times quantity approach: car registrations are obtained from DMW with segment types defined by the National Association of car manufacturers (ANFIA).

vergence between HBS and NA both in levels and budget shares. This discrepancy of an increase of the relative dynamics in the National Accounts and a decrease in the Survey can also be related to the fact that the three sub-items are estimated with different data sources: postal and telephone services using information recovered from the authorities responsible for the provision of the service (like Poste Italiane, Vodafone, Telecom Italia), while telephone goods with the Availability Method.

9. *Recreation, entertainment and culture.* According to the subjective evaluation of the households, the relative weight of recreation, entertainment and culture over total consumption decreased over the period 1997-2012 by 1.4 percentage points (0.4 p.p. considering NA); one out of forth of this fall was registered during the last recession (Figure 12). The proportion of items in the National Accounts that are estimated using the HBS is negligible[8], while the vast majority is recovered with the Availability Method (especially for goods), the Multipurpose Survey (sports), and administrative survey (like SIAE for theater, movie).

10. *Education.* In 2012 Italian households devoted about 30€ per month to cover education expenditure, in line with the amount registered by NA; the budget share has remained around 1% from 1997-2012 in the two datasets. If we consider the evolution of the budget share we see a more regular pattern estimated under National Accounts [9] compared to HBS.

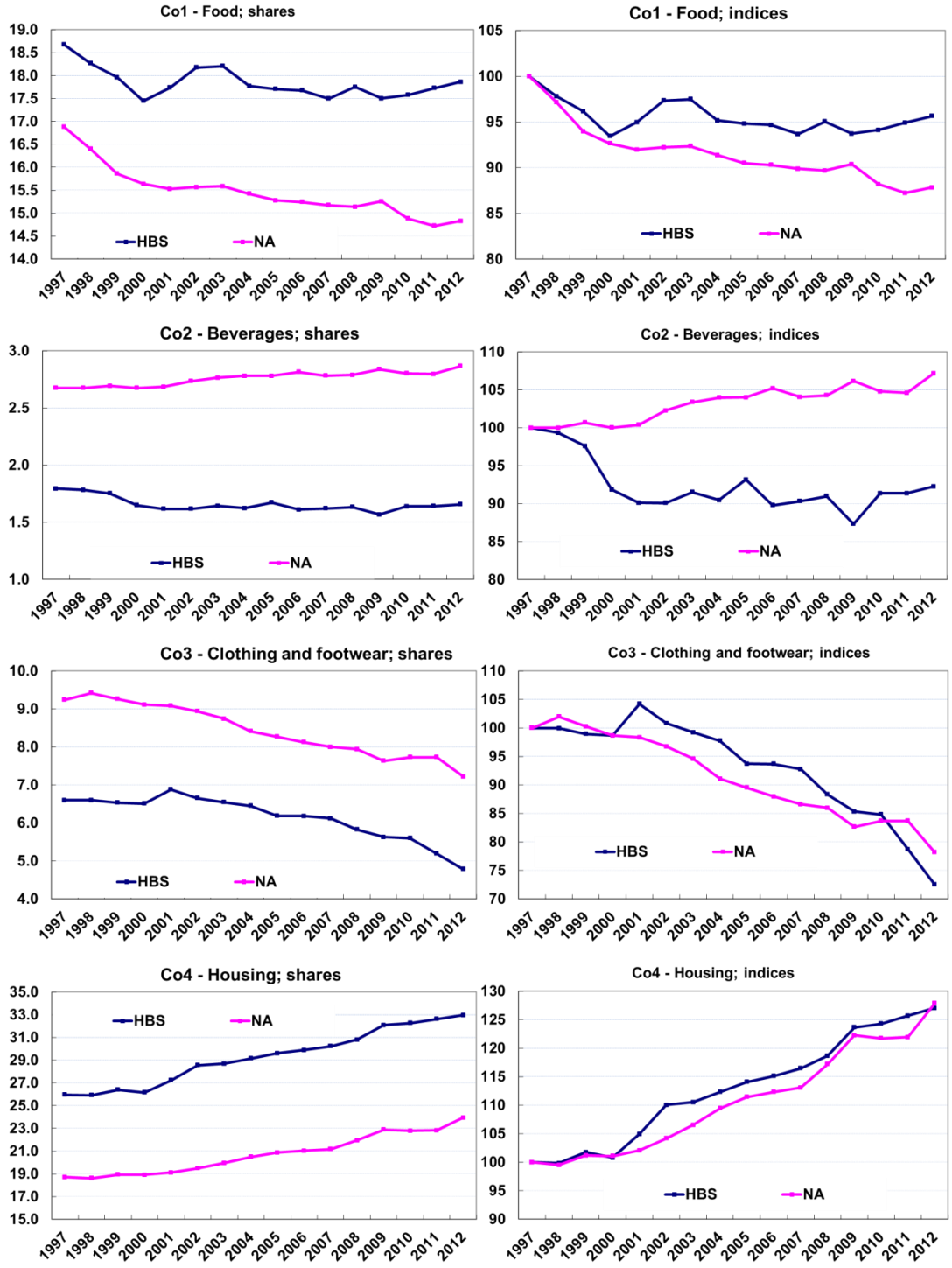
11. *Accommodation services and restaurants.* Taken in nominal terms, the expenditure of Italian households for accommodation services and restaurant was 151€ per month in 1997 and attained 205€ in 2012. The relative budget share was 5% over total consumption for HBS and double for NA; its evolution shows an upward increase in both datasets. NA (Istat, 1995) uses a price times quantity approach to estimate accommodation from the Tourism Statistics and this could explain the spike profile of the item in the Survey compared to National Accounts (see Figure 13). As far as restaurant is concerned the pattern looks more similar across datasets and it is estimated from the Multipurpose Survey and other surveys on vacations.

[8]For COICOP 8 and 9, only the repairing (of telephone, TV, etc...) is recovered from HBS.

[9]NA consumption data for education are obtained from the Multipurpose Survey, HBS, Ministry of Education and Istat data on education.

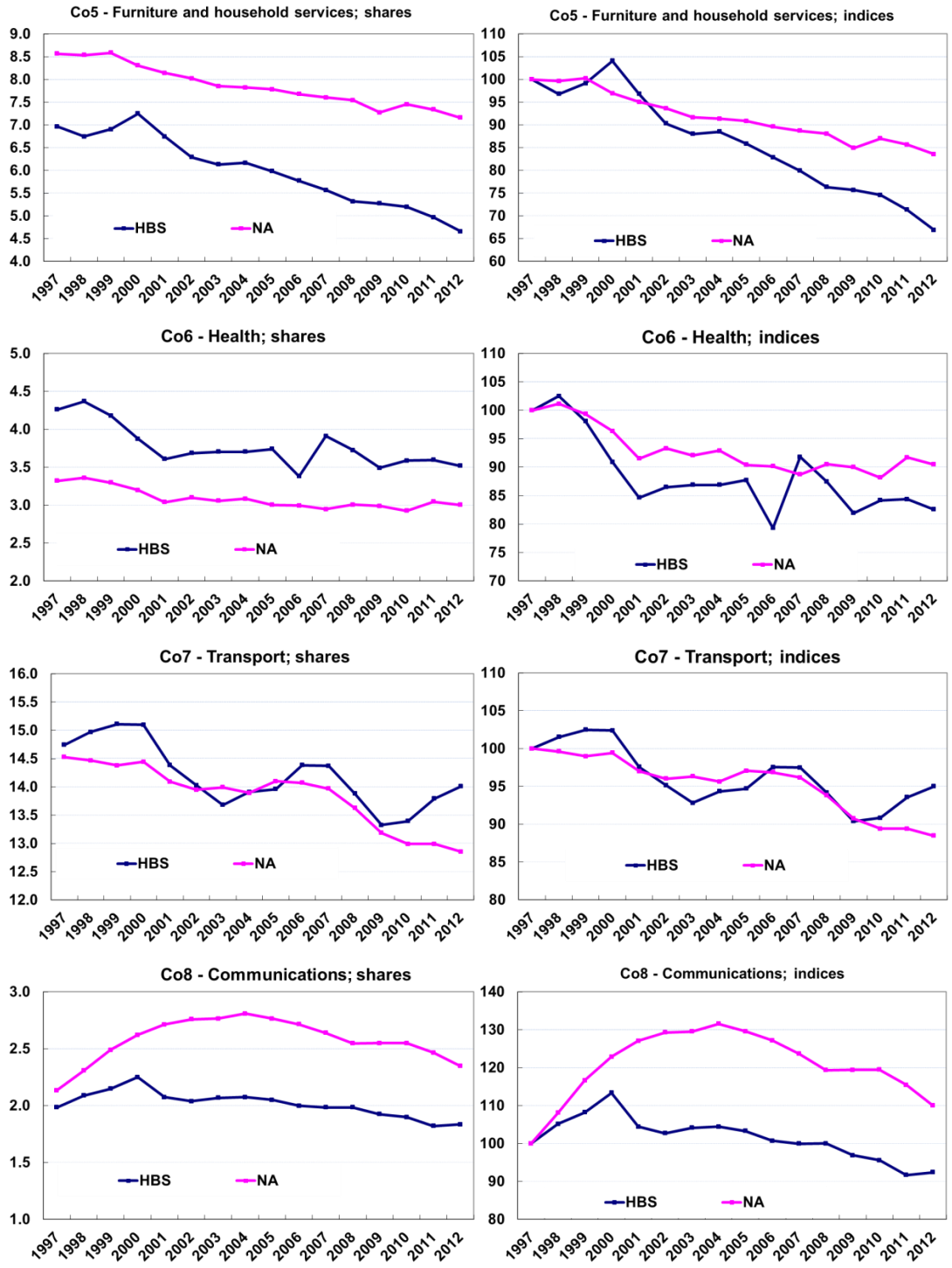
12. *Other goods and services.* As previously emphasized, to make the comparison between the two datasets feasible, we exclude from the NA both social protections and financial services. The evolution of the budget shares points to an increase in the NA and HBS.

Figure 10: A comparison between NA and HBS(COICOP1-COICOP4)



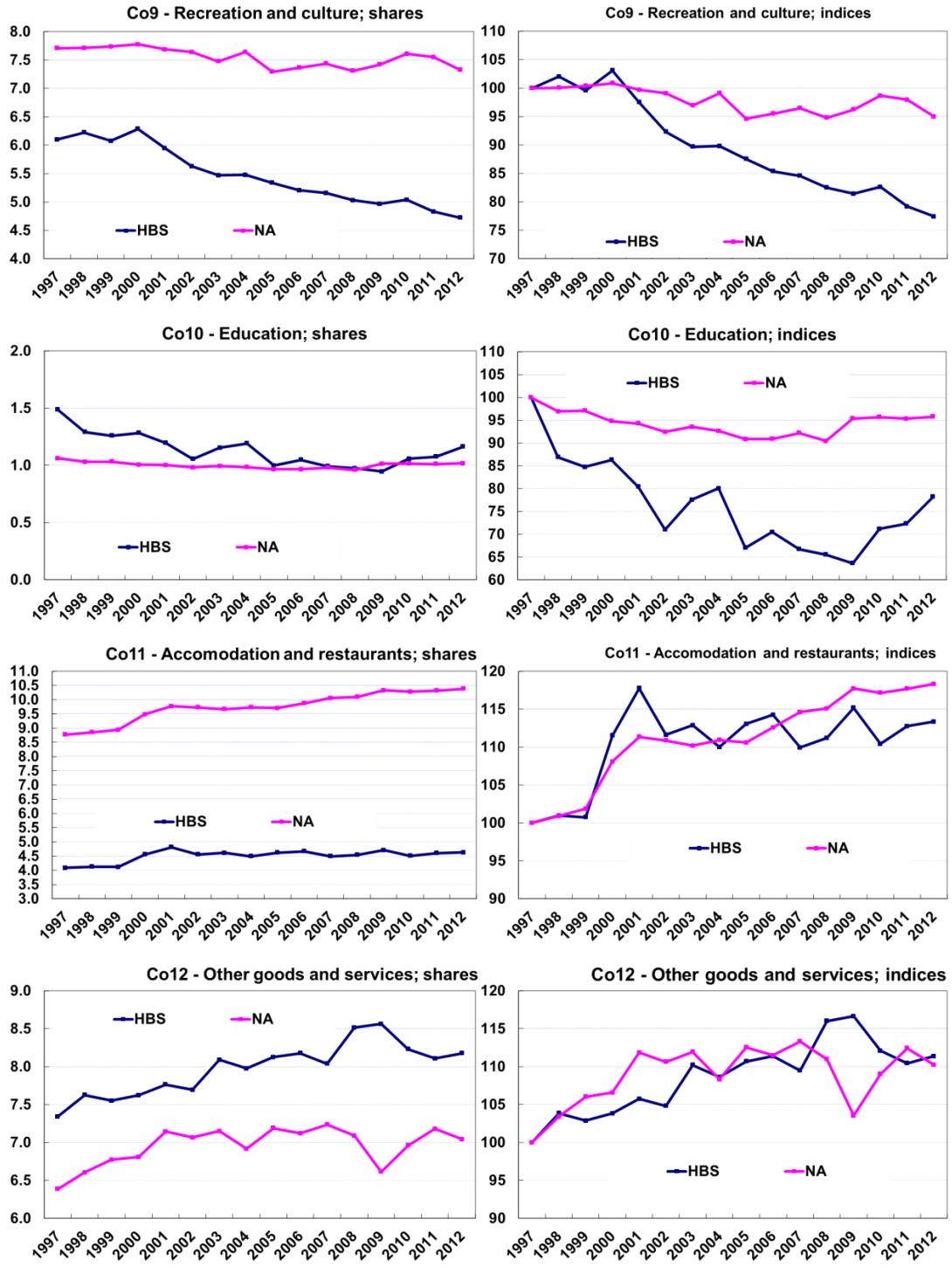
Notes: Our calculation from HBS and NA. Shares: evolution (left panel); indices 1997=100 (right panel).

Figure 11: A comparison between NA and HBS(COICOP5-COICOP8)



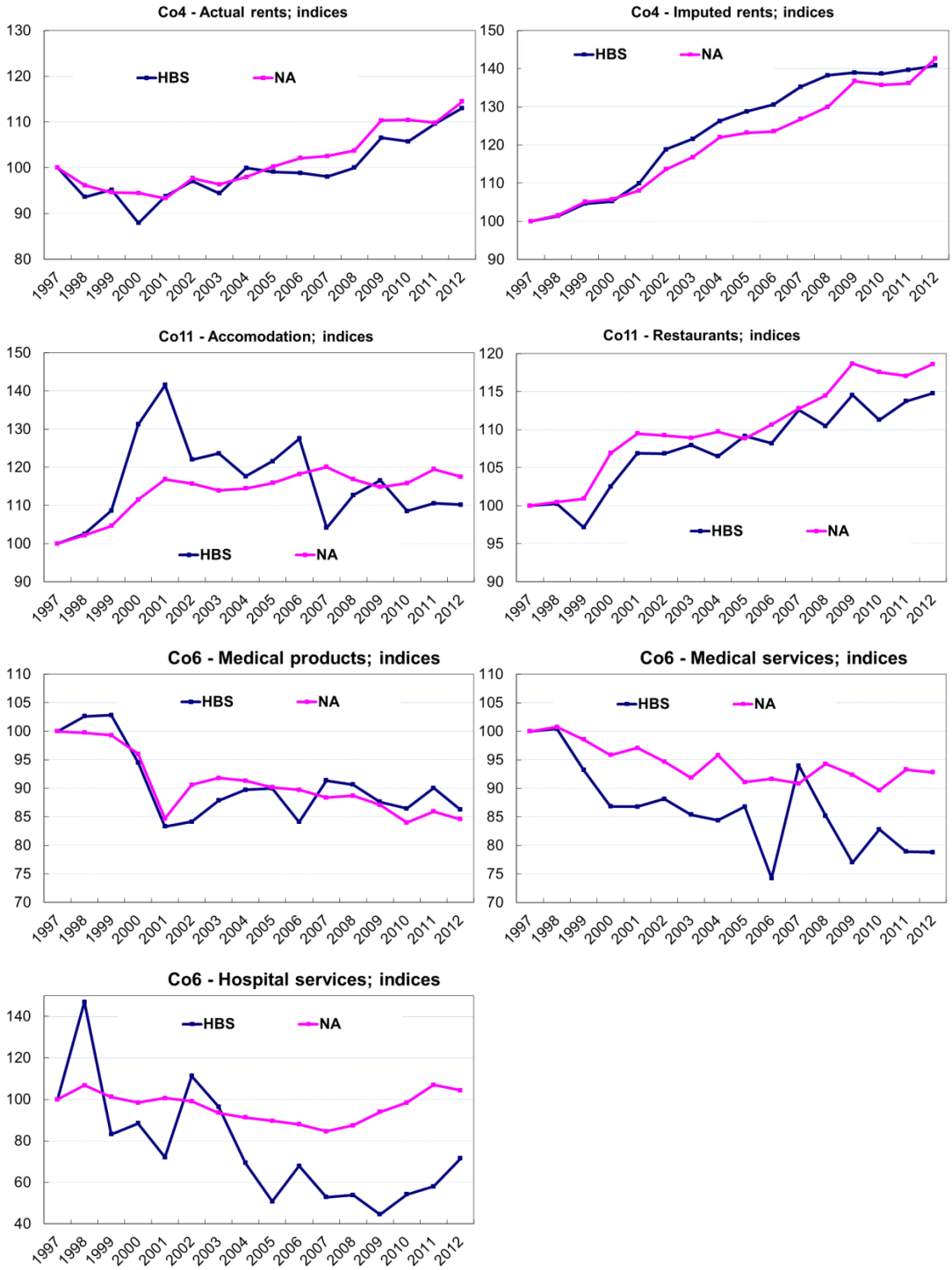
Notes: Our calculation from HBS and NA. Shares: evolution (left panel); indices 1997=100 (right panel).

Figure 12: A comparison between NA and HBS(COICOP9-COICOP12)



Notes: Our calculation from HBS and NA. Shares: evolution (left panel); indices 1997=100 (right panel).

Figure 13: A comparison between nominal NA and HBS (selected items)



Notes: Our calculation from HBS and NA for rents, health and accommodation and restaurants. Indices 1997=100

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The Italian household consumption: a comparison among recessions.

Lisa Rodano[*] and Concetta Rondinelli[**] [†]

Abstract

We compare households' behavior during recessions. We observe that households' consumption during the Sovereign debt crisis fell more than real disposable income; to disentangle among alternate explanations, we make use of two different approaches: the first takes advantage of the consumption equations of the Bank of Italy Quarterly Model. We find that, differently from past episodes, the reduction in wealth, partly due to capital losses, is relevant to explain consumption contraction during the last recession; the length of the double recession and the intense consumption smoothing during the Global financial crisis may have played a non-negligible role as well. The second approach benefits from the microeconomic information contained in the Survey of Households Income and Wealth. We find that a large share of the fall in aggregate consumption stems from the choices of younger households, whose income and wealth decreased more significantly than those of their elder peers; a downward risk for the evolution of domestic demand may be related to the persistence of negative labour market conditions and a lower level of real wealth. Moreover, the perception of future income perspectives appears uncertain across all households types. Taking into account the subjective probability that the loss experienced in 2012 will extend into the future, we estimate that the perception of permanent denting of Italian households income did play a relevant role in driving the extraordinary fall of private consumption in the last few years.

Outline

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1. Introduction and stylized facts

During the last thirteen quarters, Italian GDP has been shrinking; domestic demand contributed negatively to growth, reflecting a further drag stemming from the decline in gross fixed capital formation; on the other hand, by the second half of 2013, after almost two years of relentless reduction, household spending started to stabilize. The strength of household consumption however is highly uncertain. In this work we focus on households behavior and compare consumption dynamics across recessions, with the twofold objective of explaining current developments and assessing the prospects of the future recovery.

Over the last twenty years Italy has experienced three main episodes of recessions. The first one started in the second quarter of 1992 and lasted one year and a half (the "Early nineties" event from now on). The two most recent recessions followed one another in a rapid succession and covered a period that extends from the end of 2007 until the third quarter of 2014. For exposition purposes we will refer to these last two episodes as the "Global financial crisis" (until the end of 2009) and the "Sovereign debt crisis" (from the second half of 2011).

All in all, the economic downturn ensuing from the Sovereign debt crisis shares some key common features with each of the previous two recessions:

1. Similarly to the Global financial crisis, which originated from the US financial sector, the Sovereign debt crisis was triggered by a financial turmoil in the markets for sovereign bonds. However, the nature of the shocks that hit the Italian economy was very different in the two recessions[1]: the Global financial crisis was prominently an "imported crisis", with the fall in international trade being the main driver of the large and prolonged decline of economic activity. During the Sovereign debt crisis, instead, the fall of GDP was mainly induced by the generalized worsening of financing conditions and the deterioration of business and household confidence, that resulted in an sharp drop in consumption and investment.
2. Similarly to the Early nineties event, the Sovereign debt crisis was characterized by a severe contraction of domestic demand.

More in detail, when comparing the three recessions a number of stylized facts stand out (Table 1):

[1] See Caivano et al., 2010. For a detailed analysis of the main factors behind the two recessions see Busetti and Cova, 2013.

- with respect to the Early nineties event and the Global financial crisis, the Sovereign debt crisis is the longest recession;
- the last episode came after a harsh and long recession, interrupted by a short and incomplete recovery in 2010-11: at the end of the brief upturn, Italian GDP was still around 5 per cent below its pre-crisis level. Despite the different origins, the Global financial crisis and the Sovereign debt crisis jointly caused a prolonged strain on economic activity. The financial crisis alone caused the most severe downturn since WWII;
- the Sovereign debt crisis stands out as the episode with the most dramatic fall in total consumption;
- a distinguishing feature of the Sovereign debt crisis is that the drop in overall households consumption – of both durables and non-durables – is stronger than that of real disposable income;

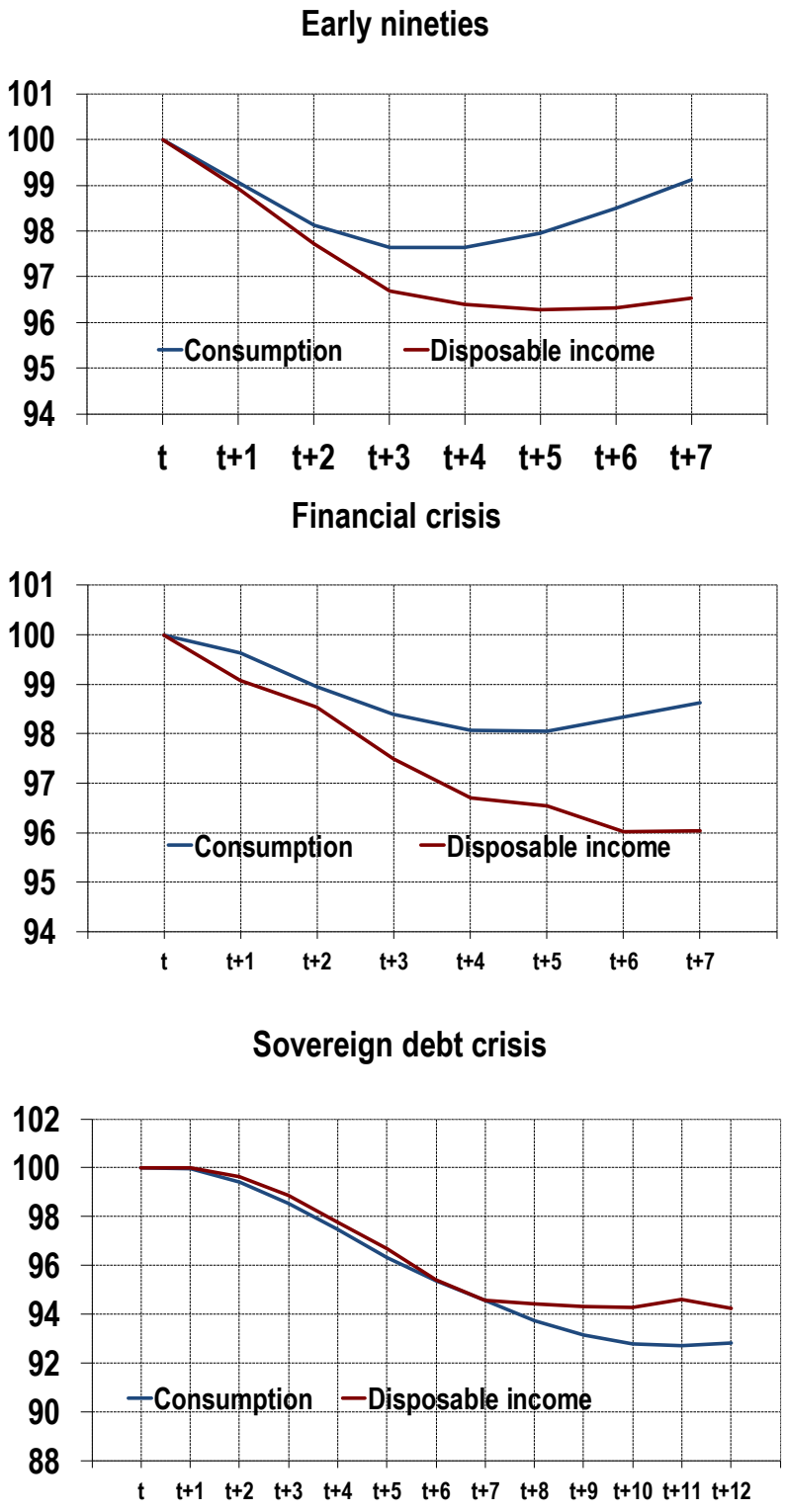
Table 1. Comparing recessions

	N.	GDP	DOMESTIC DEMAND	TOTAL CONSUMPTION	NON DURABLE CONSUMPTION	DURABLE CONSUMPTION	DISPOSABLE INCOME	TOTAL EMPLOYMENT
1992.2-1993.3	**6**	**-1.0**	**-4.0**	**-2.1**	**-1.1**	**-10.3**	**-2.7**	**-2.7**
2007.4-2009.4	**9**	**-3.0**	**-2.5**	**-0.9**	**-1.3**	**-2.4**	**-2.2**	**-1.6**
2011.3-2014.2	**12**	**-1.7**	**-3.0**	**-2.4**	**-2.7**	**-6.0**	**-2.1**	**-1.0**
Memo item: Long run growth								
- 1990-2007		***1.5***	***1.5***	***1.4***	***1.3***	***2.4***	***0.9***	***0.4***
- 1990-2013		***0.7***	***0.5***	***0.7***	***0.5***	***0.1***	***0.1***	***0.0***

Note: Our calculations from National Accounts quarterly data, average growth rates in annual terms (corrected for the length of each episode).

Clear evidence of a different pattern characterizing the evolution of consumption during the Sovereign debt crisis compared with previous recessions is provided by the quarterly dynamics of real household income and consumption (Figure 1): during the Early nineties and the Global financial crisis, households consumption declined less than disposable income (*consumption smoothing*); during the Sovereign debt crisis, instead, the fall in income has been accommodated by a drop in households consumption of just the same magnitude until the third quarter of 2013, while it was lower than the one in household spending from Q4/2013 up to Q2/2014.

Figure 1. Household real disposable income and consumption during recessions



Note: Our calculations from National Accounts quarterly data; indices equal 100 in the first period of contraction of disposable income in annual terms, 4 terms moving averages.

2. Possible explanations

Against this background, we investigate whether the consumption dynamics during the last recession represents an anomaly and, if so, what are the potential drivers of such an unusual occurrence.

A number of possible, not necessarily mutually exclusive, explanations can justify the observed pattern:

(i) the consumption squeeze observed during the Sovereign debt crisis may have resulted from a drop in (perceived) 'permanent income';

(ii) variables relevant for consumption decisions, but different from households disposable income, may have been hit by unusual shocks;

(iii) other things equal, there may be a structural increase, for precautionary reasons, in the desired saving ratio.

Disentangling among alternative explanations may be relevant, as it allows a more educated appraisal of the evolution of domestic demand along the recovery path that we should expect in the near future. In case we are not facing a drop in 'permanent income', we might expect a more buoyant expansion of consumption in the next quarters; the opposite may apply if a downward shift in 'permanent income' occurred.

In the remainder of this paper, we bring these questions to the data. We make use of two different approaches: the first takes advantage of the information contained in the consumption block of the Bank of Italy Quarterly Model (BIQM) and exploits the econometric relationships used for mapping consumption behaviour. The second benefits from the microeconomic information contained in the Survey of Households Income and Wealth (SHIW), which for the first time in 2012 contains a question on households' perceptions about their income dynamics with respect to 'normal times'.

3. The Bank of Italy Quarterly Model as a macro-economic tool to compare recessions

One way to track and compare the evolution of consumption during different recessions involves the use of the macroeconomic relationships estimated in the BIQM. The BIQM is used to achieve four main tasks:

(i) track the actual evolution of households expenditure and test whether the residuals signal a deterioration in the predictive accuracy of the equations. The performance of the model during different recessions is compared in order to assess whether consumption dynamics in the last episode followed a path which is in line with historical trends or rather presents anomalous features;

(ii) run counterfactual experiments aimed at comparing recessions on the basis of the relationships estimated in the model, in order to evaluate whether factors different from disposable income – but playing a role in the theoretical framework underlying the BIQM – did affect consumer spending in a particularly strong way in the last recession;

(iii) test whether the coefficients of the consumption equations are stable or point to a structural break in the long run relationships between consumption and its determinants;

(iv) check whether there may be other relevant economic phenomena that contribute to explain the observed consumption performance, but are omitted from the model.

3.1 A brief description of the consumption block of the BIQM

Overall consumption (TC_t) is the sum of durable (CD_t) and non-durable consumption (CN_t):

$$TC_t = CN_t + CD_t \tag{1}$$

For a better match with theory, economic consumption (C_t) rather than non-durable consumption is modelled in the BIQM. The two components are related by identities:

$$C_t = CN_t + (\delta + \rho)CK_{t-1} \tag{1a}$$

$$CK_t = CK_{t-1}(1-\delta) + CD_t \tag{1b}$$

where CK_t is the stock of durables at the end of period t, δ is the rate of (exponential) depreciation for CK, and ρ is the real interest rate. In the BIQM there are two behavioral equations, one for the economic consumption C_t and one for durable consumption CD_t. The estimated equation for C_t takes the form of an error correction model that describes the adjustment of economic consumption to its long run level:

$$\Delta \ln C_t = \beta_0 + \beta_1 \Delta \ln C_{t-1} + \beta_2 \Delta \ln Y_{t-1} + \beta_3 (C_{t-1} / A_{t-2}) + \beta_4 (Y_{t-1} / A_{t-2}) + \beta_5 \rho + u_t \tag{2}$$

with Y_t and A_t being, respectively, real private-sector disposable income and wealth[2]. Estimation results are reported in Table 2.

[2] The BIQM does not distinguish between households and firms, thus the explanatory variables in the equations modelling consumption refer to the private sector as a whole.

Table 2. Estimated values and statistics for economic consumption

	Estimates	t-ratios
β_0	0.02577	3.166
β_1	0.24826	2.289
β_2	0.04327	2.253
β_3	-2.0062	-4.906
β_4	1.2326	6.183
β_5	-0.0912	-3.715
R-Squared		0.44025
Adjusted R-Squared		0.41285
Durbin-Watson Statistical		2.0881
Sum of Squares of Residuals		0.003
Standard Errors of Regression		0.004
Current sample		1971.2-2008.4

Note: OLS estimates from National Accounts data.

It can be shown that the long run cointegrating relationship of equation (2) takes the form:

$$C_t = c_y Y_t + c_a A_{t-1} \tag{3}$$

where:

$$c_y = \frac{\beta_4}{-\beta_3}; \qquad \text{and} \qquad c_a = \frac{\beta_0}{-\beta_3} + \frac{\beta_1 + \beta_2 - 1}{-\beta_3} g + \frac{\beta_5}{-\beta_3} \rho = c_0 + c_g g + c_r \rho \tag{4}$$

with *g* representing the long-run common growth rate of consumption, real disposable income and real wealth along the balanced growth path.

Consistently with the standard life cycle theory, in the long run economic consumption is driven by 'permanent income' represented in the equation by disposable income Y_t and wealth A_t. The real interest rate ρ captures the inter-temporal substitution between consumption and savings and it also accounts for capital gains and losses on the stock of wealth, which is not measured at market values.

The demand for durables is treated separately in the model. The consumption of durable goods is adjusted to match a desired stock of durables, which depends on the relative price of durables and

non-durables, the long-term interest rate and a set of demographic variables. Last but not least, the demand of durables is conditioned to non-durable consumption, which is also included in the equation among the explanatory variables.

4. Goodness-of-fit of the BIQM during recessions

The aim of this section is to investigate whether the consumption equations of the BIQM succeeded in tracking consumption dynamics during recessions.[3] For each economic downturn, Figure 2 plots the errors of the static (bold line) and dynamic (dotted line) simulations; the latter basically cumulate the one-step ahead errors across time and thus summarize the performance of the model when the values of the endogenous variable are not known (i.e. forecast error).

The equation of economic consumption (right hand column of Figure 2) has relatively small residuals, none of them being statistically different from zero (with a confidence level of 5%). Notice though that in the two previous recessions they tended to compensate with each other, adding up to roughly zero by the end of the relevant horizon. By contrast, during the Sovereign debt crisis, even though remaining small in size in each period, they highlight a systematic overestimation of actual consumption dynamics: all in all, the end-of-period over-prediction of economic consumption amounts to about 1.5%.

Errors for total consumption (left hand column of Figure 2) show that the model performance worsens significantly in the last episode, unlike what had happened in the previous two. They are also much larger than those of economic consumption, due to the sizable forecast errors for durable consumption. In fact large errors in durable consumption may be expected in recessions owing to the earlier and faster reaction of durables than non-durables to economic downturn, as documented by simple OLS estimations.[4] The cumulated prediction error for total consumption during the last unprecedented crisis rises up to more than 4%.

Compared to past episodes, the analysis of residuals reveals that forecast errors increased during the Sovereign debt crisis for both components of consumption, in particular for durables.

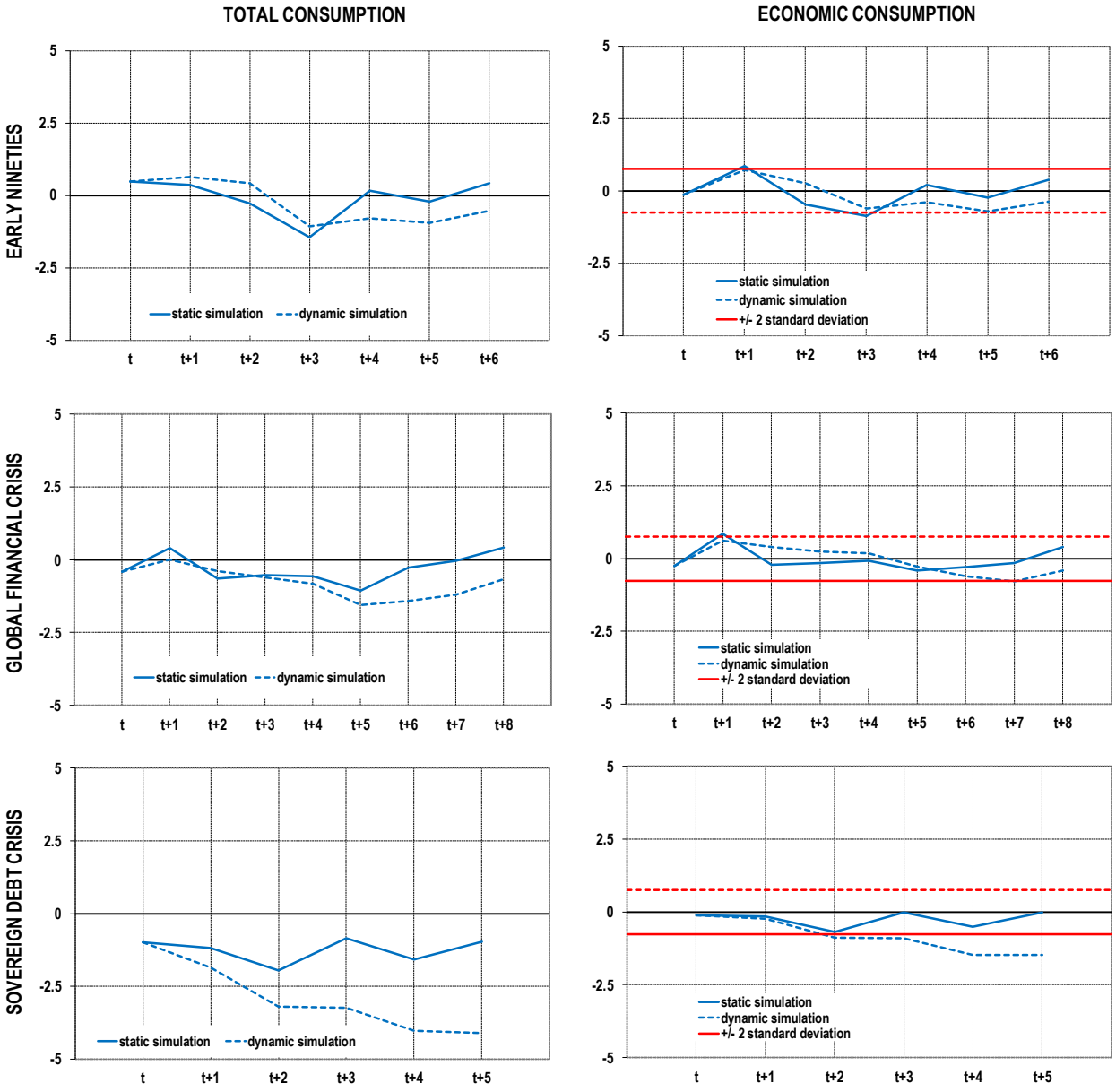
It is worth noting that, while the estimation range excludes almost entirely both the Global financial crisis and the Sovereign debt crisis, the forecast performance worsens significantly only

[3] Data for this Section are updated to the third quarter of 2013.

[4] In order to check for the correlation of durable and non-durable consumption to the economic cycle, percentage variations of each component is regressed over the cycle, allowing coefficients to be different during recession episodes. Results show that correlation to the cycle is higher for durable consumption both in 'normal' times and during recessions.

in the latter. Moreover, residual analysis does not change in any relevant way when the estimation sample is extended to include also the last observations.

Figure 2. Goodness-of-fit during recessions: static and dynamic residuals



Note: Residuals are calculated as percentage points of quarterly changes of the considered variable.

5. A 'permanent' income loss?

The worsening of the model performance in the last recession tentatively suggests that some unusual fact may be characterizing the dynamics of consumption. We investigate whether such errors are likely to result from a drop in permanent income that is not correctly accounted for by the model.

The equations of a macroeconomic model, being aggregate in nature, do not help much to investigate the perceptions of individuals in a direct way; an inspection based on microeconomic data is provided in Section 8. However, following Guiso and Siviero (1994) and Siviero and Terlizzese (1995 and 2007), an indirect method can be used to explore the issue.

The argument put forward by these authors involves the evaluation of the relative size of the estimation errors in the two consumption equations. They claim that 'permanent income' implicitly drives both durable and non-durable consumption. However in the equation for non-durable consumption, 'permanent income' Y^P is measured imprecisely, as current disposable income Y_t is used as a proxy. For exposition purposes, ignoring the role of other variables, we may write:

$$CN_t = c\left(Y_t^P\right) = \hat{c}Y_t + \varepsilon_t \tag{5}$$

In the equation for durable consumption, instead, non-durable consumption is directly taken in as an explanatory variable to proxy permanent income Y^P. Accordingly, if – and only if – *CN* correctly mirrors Y^P, we can write:

$$CD_t = g\left(CN_t\right) = g\left[c\left(Y^P\right)\right] \tag{6}$$

In principle measurement errors in 'permanent income' should enlarge the estimated residuals of the equation for non-durables, where permanent income is replaced by actual income. Following this line of reasoning, had the anomalous drop of consumption in 2012-13 resulted from a fall in 'permanent' income, we should have observed large errors in the non-durable consumption equation. Instead, the residual analysis shows sizeable one-step ahead forecast errors for durables, while they are negligible for non-durables (see previous paragraph).

However, some caveats apply: i) as discussed earlier, since durable consumption is also more responsive to the economic cycle, in particular during recessions, it is more likely that durable consumption more rapidly adjusts to changes in disposable income, thus resulting in worse fitting; ii) the non-durable equation systematically overestimated the actual spending during the Sovereign crisis, thus possibly signalling an increasing gap between current and permanent income.

All in all, the argument based on the residual analysis is hardly conclusive in order to test for a drop in permanent income during the latest years.

6. Are other factors relevant to describe consumption dynamics?

A common way to analyze and compare historical events using a macroeconometric model is by means of counterfactual exercises. In this context counterfactual analysis provides evidence on the role played by the determinants of consumption in different adverse cyclical episodes and allows to appraise the magnitude of the performance failure in the various recessions.

The basic idea behind the counterfactual simulation approach is to assume that the variable of interest, i.e. consumption, evolves according to a no-crisis scenario. To identify such a scenario, assume that the "true" model of consumption is $C = X\beta + e$, according to which consumption can be fully traced down by a set of economic variables X and an error term e. Then consumption in the counterfactual scenario will be $C^* = X^*\beta + e^*$, where each of the relevant X is bound to follow an alternate path, X^*, reflecting the "no crisis" assumption. In this setting, the difference C-C^* can then be decomposed into the contributions of each economic determinant $\beta_i\left(X_i - X_i^*\right)$ and a residual term e-e^*.

6.1 Hypotheses behind the counterfactual scenario

The design of a counterfactual scenario is to some extent an arbitrary exercise, whose robustness largely depends on the plausibility of the assumptions adopted for the counterfactual path of the *Xs*; such assumptions thus need to be as internally consistent as possible. As described earlier, the economic variables X mapping the evolution of economic consumption in the BIQM are real private-sector disposable income (Y_t), wealth (W_t) and interest rate (ρ_t).

The counterfactual values for X have been set according to the following rules:

(1) Disposable income (Y^*) is assumed to expand in the no-crisis scenario at the same average rate of growth prevailing in the ten years before each recession. In annual terms, the average rate of growth of real disposable income in the counterfactual scenario is around 3% in the early nineties and around 2% during the most recent recessions.

(2) No-crisis wealth (W^*) evolves according to the following rule: $W^*_t = W^*_{t-1} + \left(1 - c^*\right)Y^*$, where c^*, the average propensity to consume out of disposable income, is kept constant at the level observed on average in the previous 3 years of each recession.

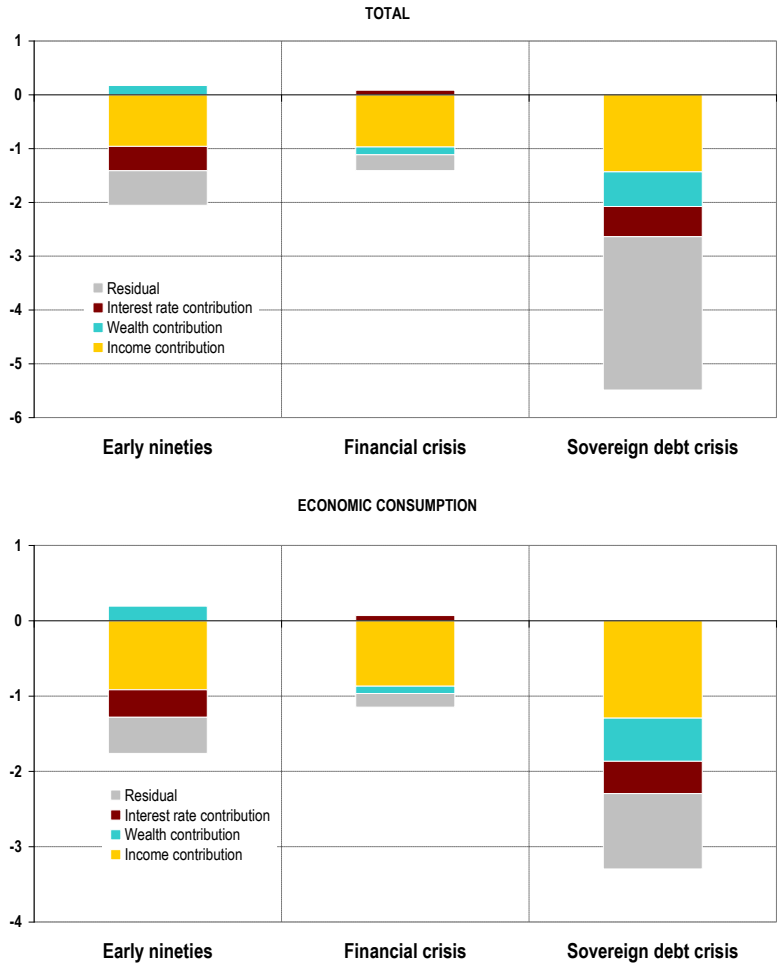
(3) The real interest rate ρ^* is been kept constant at the level recorded before each episode of recession.

(4) Errors e^* are set to zero.

6.2 Results

Figure 3 shows how the decline in consumption according to the counterfactual scenario is decomposed into its main determinants. Each histogram reports average consumption decrease with respect to a no-crisis scenario in annual terms; while the first two recessions were characterized by falls of similar size, the drop in the last episode has been much more intense.

Figure 3. Contributions of the decrease in consumption with respect to counterfactual simulations



Note: Simulations from the BIQM consumption block.

A common characteristic among different episodes is the contribution of real disposable income, which is comparable in magnitude. On the contrary, the contribution of real wealth, which was inexistent during the Early nineties, gains some prominence in explaining the drop in household spending during the Financial crisis and even more so during the last recession. The figure also shows that high interest rates too had a role in explaining the contraction of consumption during the Sovereign debt crisis, presumably reflecting large capital losses. The residual component has nearly tripled during the Sovereign debt crisis, representing almost one third of the overall factors behind economic consumption dynamics and a half of total consumption.

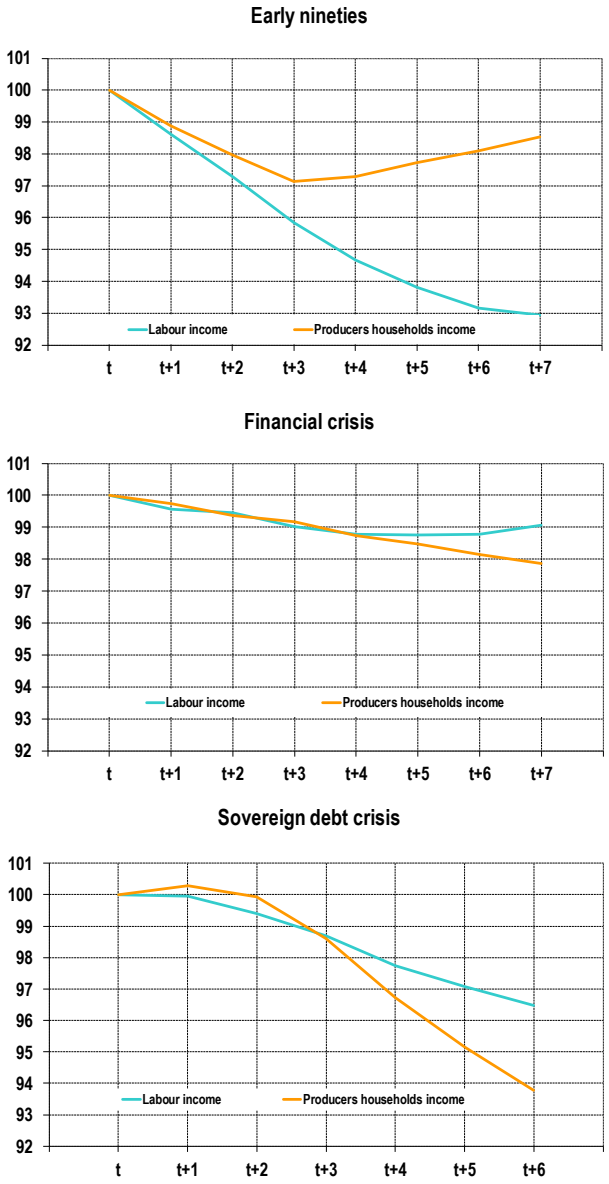
6.3 What is possibly missing?

We ask now whether there is some other relevant variable, which has not been included in the model, that justifies the large forecast errors. Figure 4 reports the evolution of two major sources of household disposable income: labour income (net of social contributions), which accounts for around 40 per cent of total resources available to households, and producers' household income (which represents around 25 per cent of gross income). During the last recession, differently from the past, producers' household income contracted markedly more than labour income. Such developments suggest that a possible cause of consumption reduction may involve liquidity constraints.

Producers' household income in fact is a source of income that derives from enterprise activity and pertains to households inasmuch they own a small-scale enterprise, which in the National Accounts is recorded within the household sector. Since 2011 small enterprises have suffered a major reduction in activity and self-financing. Had those enterprises also been constrained in their access to external financing, then household owners could have been forced to reduce their consumption in order to save resources to finance their enterprise activity.

A first attempt to test this issue involves a re-estimation of the consumption block, including a variable that reflects credit restrictions to the enterprise activity. While future research will be devoted to explore the issue, preliminary results show that the impact of credit rationing may have been significant. The amended model markedly enhances the forecast performance of the durable consumption equation, virtually zeroing the overall prediction error. Though further analysis is needed as the estimated relation could well be spurious, capturing other factor possibly at work during the recession.

Figure 4. Selected components of real disposable income: dynamics during recessions



Note: Our calculations from National Accounts quarterly data; indices equal 100 in the first period of contraction of disposable income in annual terms, 4 terms moving averages.

7. Stability tests on the estimated coefficients

In this paragraph, we explore whether relationships that drive consumption decisions are changing over time. To this aim the coefficients of the equations in the consumption block are tested for the existence of a structural break. We run a recursive regression of the model: the range moves ahead to include all observations up to the third quarter of 2013.

Results show that the long run average propensity to consume, c_y in equation (4), tends to decrease as the estimation range approaches the most recent years (Figure 5a). While the propensity to

consume out of wealth moves in the opposite direction (Figure 5b). Standard stability tests run on these recursive estimates[5] tend not to reject the null hypothesis of no structural break in the average propensity to consume; however a recent test developed by Busetti (2012), which gives more relevance to recent observations, provides some evidence for the existence of a structural break with a confidence level from 5 to 10%.

Figure 5a. Recursive estimation for the average propensity to consume out of income

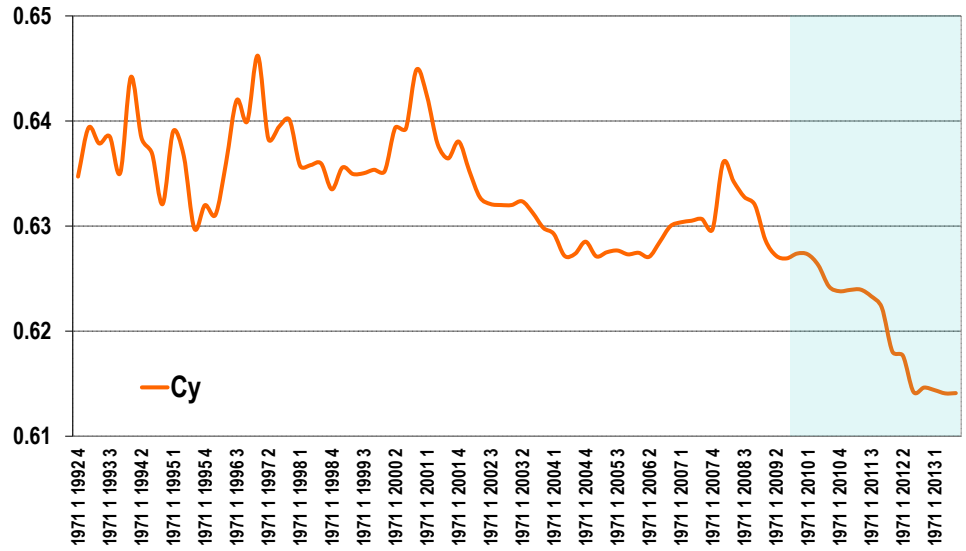
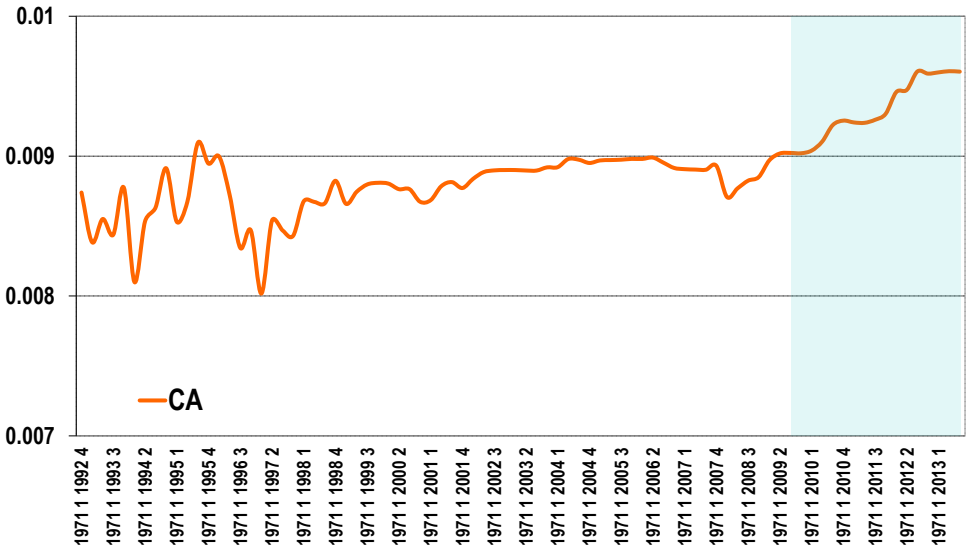


Figure 5b. Recursive estimation for the average propensity to consume out of wealth



[5] Ploberger et al. (1989) propose a set of 'fluctuation tests' as a way to detect parameter instabilities examining the sequence of regression coefficients estimated with an increasingly large data set.

Notice that if we re-estimated the model including the most recent observations and ran the same counterfactual scenario as above with the new coefficients, the contribution of wealth would be larger.

8. The Survey of the Household Income and Wealth as a micro-economic tool to compare recessions

In this Section we use micro data, recovered from the Survey of Household Income and Wealth (SHIW), to analyse the reaction of consumption to income in the last three recessions. In particular, we first verify whether the macro evidence (provided in Section 1) can reasonably be replicated aggregating households responses about their income Y, consumption C and wealth W. We then exploit the heterogeneous response of the Italian population and provide a first descriptive insight about the reasons why the Sovereign debt crisis was different from the two previous recessions.

8.1 The Survey of the Household Income and Wealth

Our main data set is obtained from the Survey of Households Income and Wealth (SHIW), a large-scale household survey run every two years by the Bank of Italy on a random sample of about 8,000 Italian households. The survey is available since 1965 and covers at least three full business cycles with large fluctuations in Gross Domestic Product (GDP); to compare recessions we rely on the 1991, 1993, 1995, 1998, 2000, 2002, 2004, 2006, 2008, 2010 and 2012 waves whose questionnaire contents, survey methodology and variable definitions are broadly homogeneous. The survey has also a rotating panel component, so that every sampled year about half of the observations refer to households which have been interviewed in more than one survey. The rotating component could prove useful in eliminating unobserved heterogeneity when studying the dynamics of consumption in response to wealth and income changes.

The SHIW collects detailed information on Italian household income, consumption and wealth, as well as on households' portfolio allocation across financial instruments and their access to formal and informal credit. It has also detailed information on real estate wealth, including year of asset acquisition, size (in square meters) of the house, whether it is the main residence, property status and location. Also the net income definition is very detailed as it includes not only wages, but also capital gains and pensions. For each household, the Survey also provides information on characteristics of the households' head and each household member, such as education, age, place of birth, and residence. The Survey is provided with sample weights to expand the results to the Italian population as a whole. The 2012 SHIW included new questions asking whether the net

disposable income had been unusually high, low or normal; households were also asked to declare the amount of the reduction/increase of their income and to attribute a probability to the fact that it will stay high/low over the coming 5 years (see Section 8.3).

8.2 A comparison between macro and micro evidence

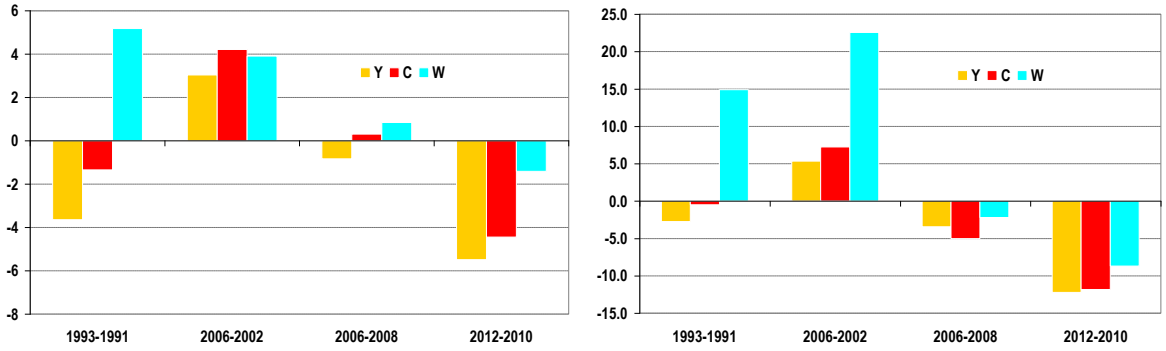
In this Section we compare the change in consumption, income and wealth from the SHIW survey with the one recovered at macro-level from the National Accounts and offer an inspection by decile of the equivalised income distribution and other relevant demographic characteristics.

Micro and macro data in 1993 and 2008 (Figure 6a) show a similar pattern for consumption and income in the three recessions, with a less pronounced drop of consumption in 1993 and 2008 and, by contrast, a fall roughly in line with that of income during the Sovereign debt recession.[6] Also the evolution of wealth looks very similar across datasets, with an increase in 1993 and a sharp decrease in 2012. In real terms, median net wealth[7] dropped by 16%: the fall was mainly driven by the decline in real estate which is the main component of the real assets. The different magnitude between datasets can be attributed to the evaluation of house prices: these are based on the dynamics of house prices recovered from Agenzia del Territorio in the NA and on the subjective assessment provided by households in the SHIW. The appraisal expressed by households may have reflected the worsening of the housing market observed in the first 6 month of 2013, when the interviews were conducted. For 2008, instead, National Accounts point to a slight increase in wealth, while micro data suggest that wealth started to fall during the Financial Crisis.

We now analyse the changes in equivalised real income, consumption and wealth by decile.[8] During the Sovereign debt crisis, the largest drop in median income was observed in the first decile of the income distribution (-23%), while for wealth it occurred in the highest decile. In the 10th decile, also the compression of consumption (-9.3%) was more pronounced than the average (-4.8%; Figure 6b).

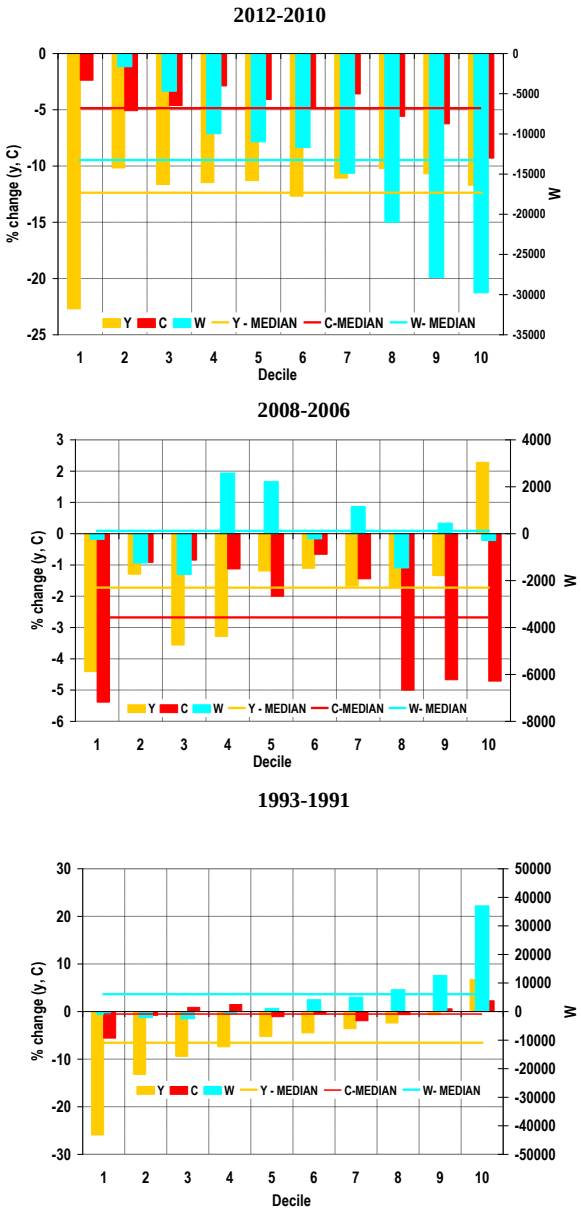
[6] Aggregate percentage changes of SHIW and NA figures are not strictly comparable (see Banca d'Italia, 2014, 2012).
[7] Net wealth is the sum of real assets (real estate, companies, valuables) and financial assets (deposits, bonds, shares, etc…) net of financial liabilities (mortgages and other debts).
[8] Notice that Y, C and W in Figures 6a and 6b are not directly comparable, due to the different definitions of income, consumption and wealth (total versus equivalised).

Fig. 6a macro and micro evidence



Notes: our calculations from National Accounts (left panel) and SHIW (right panel; median percentage change)

Fig. 6b Changes of Y, C, W by decile

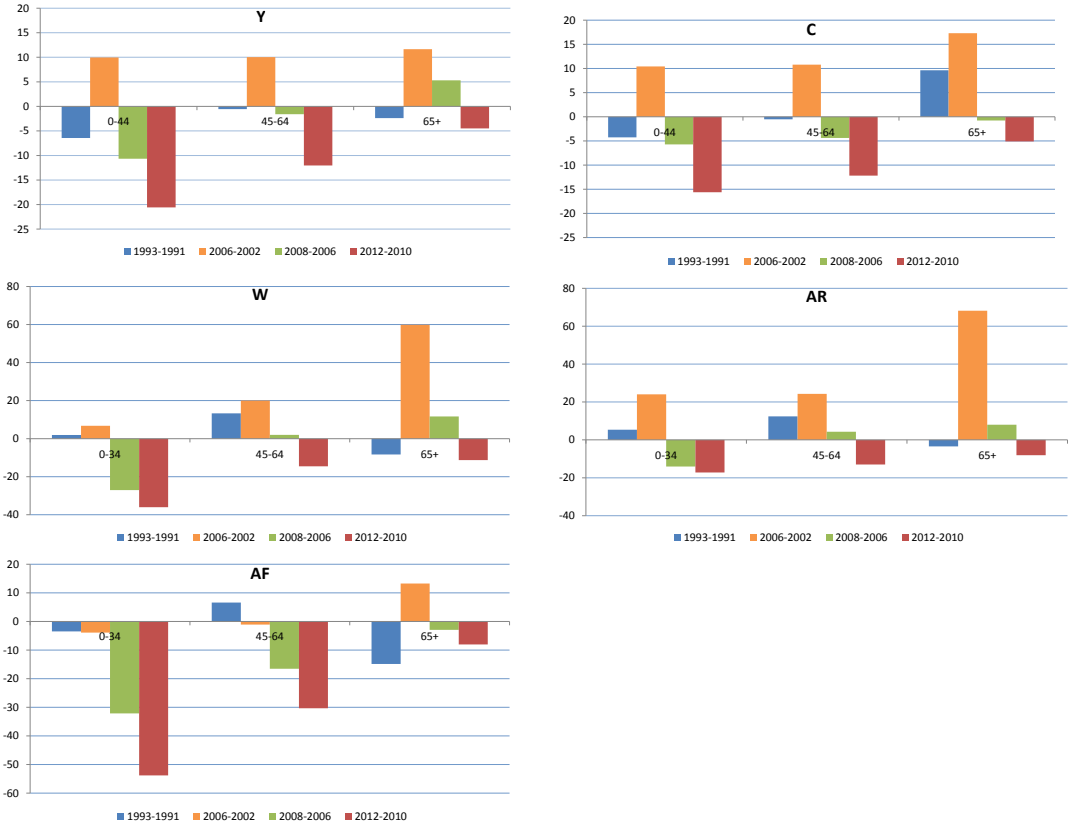


Notes: our calculations from SHIW by decile of the real equivalised income, consumption and net wealth distribution. Net wealth on the right scale.

During the Global financial recession, instead, the median fall in consumption had been about 5% for the first, 8th, 9th and 10th decile of the consumption equivalised distribution. The drop in median income was particularly severe for the lowest decile, while income increased for the highest. Wealth experienced a fall, though limited in size, due mainly to the reduction suffered from the poorest 30 per cent of the population.

A more regular pattern emerges from the recession of the Early nineties, when the drop in median income was more pronounced for the lowest decile and turned progressively positive along the income distribution. The fall in consumption has been less severe than the one in income for the first decile, but no clear pattern emerges along the distribution. Wealth registered an upward increase in the highest deciles.

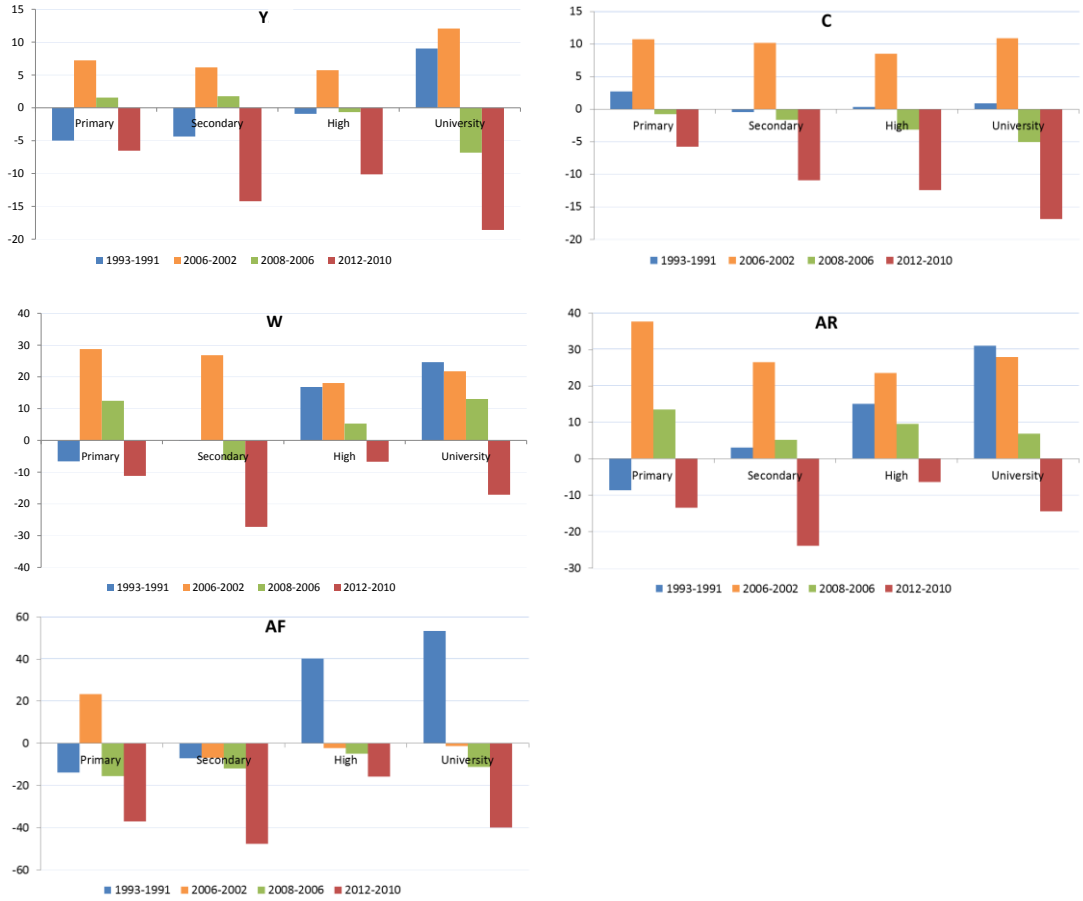
Figure 7. Y, C and W by age



Notes: Our calculation from SHIW. Mean percentage change for Y and C; median percentage change for W, AR (real assets) and AF (financial assets).

We now consider the evolution of equivalised real consumption, income and wealth according to the main socio-demographic characteristics of the Italian population[9]. During the Sovereign debt crisis, at all ages, the reduction of income has been accommodated by an equal reduction of consumption. However younger households (less than 44, accounting for one third of total Italian households) suffered the largest reductions in income (21%), consumption (16%) and wealth (36%; Figure 7); this tendency had already started during the Financial Crisis and got exacerbated in 2012. The drop in wealth reflected mainly a contraction of real assets (representing about 90% of net wealth) and to a less extent a reduction of financial assets. During the crisis of the Early nineties household heads aged less than 44 reduced consumption by 4% vis-à-vis a negative shock in income of 6.5%. Notice, though, that the change in consumption, income and wealth turned negative, during the last episode, also for elders, while they had remained positive during the Global financial crisis.

Figure 8. Y, C and W by educational level



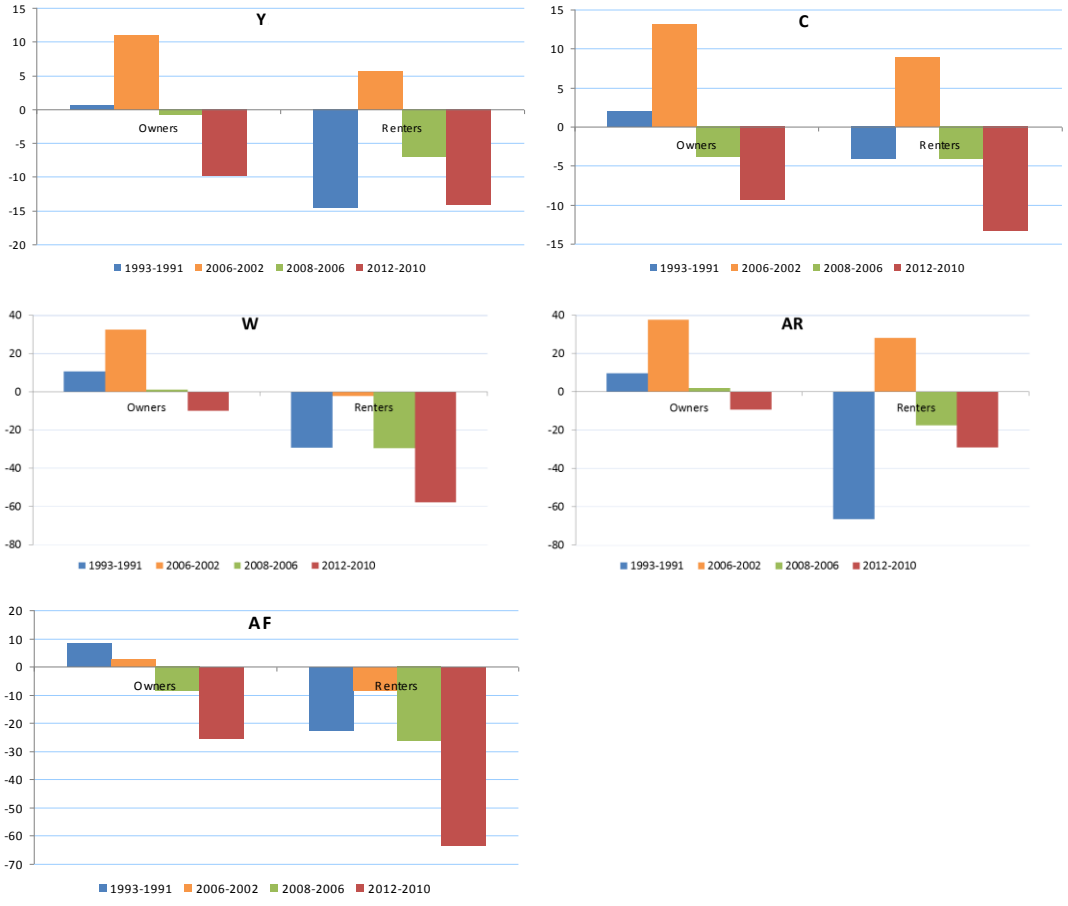
Notes: Our calculation from SHIW. Mean percentage change for Y and C; median percentage change for W, AR (real assets) and AF (financial assets). Household heads with no education are included within the primary class; those with a post graduate degree in the University class.

[9] The analysis by Crossley et al. (2012) for UK reaches similar conclusions.

Highly educated households were also affected by the two consecutive recent recessions: Figure 8 shows that the drop in mean real equivalised income and consumption was particularly severe for households owning a university degree or a post graduate qualification. During the Sovereign debt crisis they experienced a severe drop in income (19% compared to 2010) and consumption (17%), following a trend started during the Financial crisis when Y fell by 7% and C by 5. A very different pattern emerged at the beginning of the nineties when real mean equivalised income dropped for all educational levels, but not for the high educated households. In 2012 also net wealth recorded a negative change, compared to 2010, for all educational levels, with a severe drop for households owning on average a relatively lower educational attainment, with respect to those with high school diploma or a university degree.

During the Sovereign debt crisis home owners and renters households (Figure 9) both were subject to a negative shock in income and adjusted their consumption by the same amount (10% and 14%, respectively); net median equivalised real wealth dropped for both, differently from past events. The recession of the Early nineties affected mainly renters.

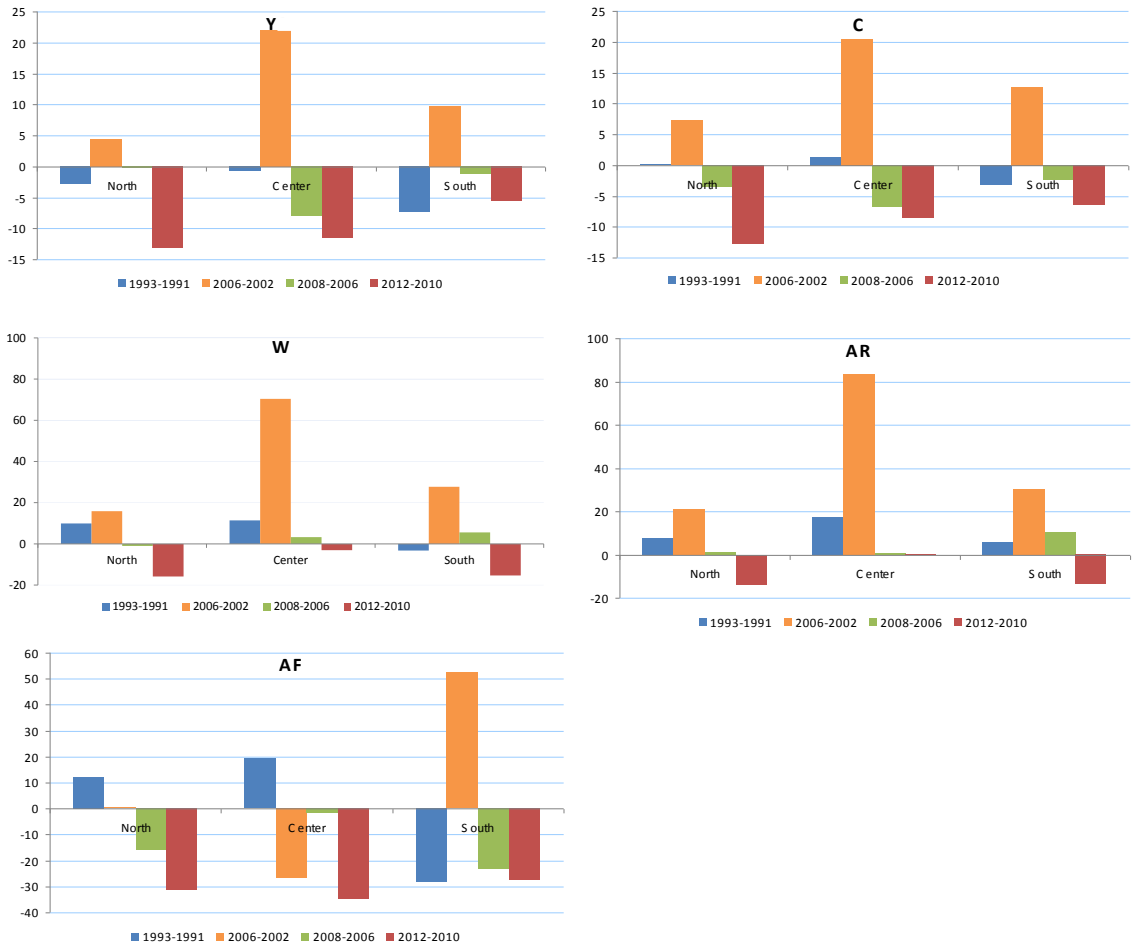
Figure 9. Y, C and W for home owners and renters



Notes: Our calculation from SHIW. Mean percentage change for Y and C; median percentage change for W, AR (real assets) and AF (financial assets).

As far as the geographical dimension is concerned (Figure 10), during the Sovereign debt crisis income and consumption reduced more markedly for Northern and Central households, while net wealth decreased in the South and North.

Figure 10. Y, C and W by geographical region



Notes: Our calculation from SHIW. Mean percentage change for Y and C; median percentage change for W, AR (real assets) and AF (financial assets).

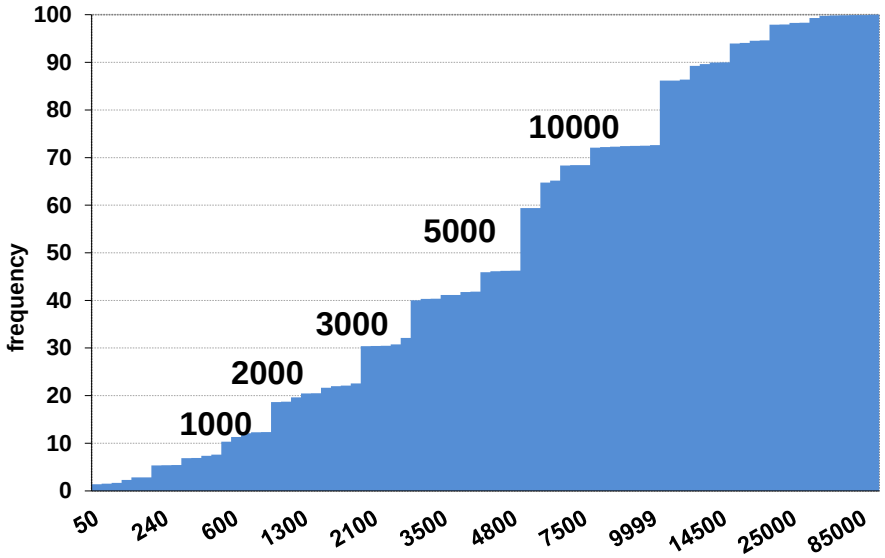
8.3 The Sovereign debt crisis in the households perceptions

In the 2012 wave, 8,151 Italian households were sampled and asked to provide an assessment of their income compared to a "normal" year.[10] About 1% of the households reported that income had been unusually high, while 17.5% declared that it had lowered and the vast majority (78.5%)

[10] The question was: "Considering all of your household's sources of income together, would you say that the total was unusually high in 2012, unusually low, or normal with respect to the yearly income your household generally makes in a normal year?" Possible answers were unusually high, normal, unusually low, don't know, no answer. If "Unusually high/low", "About how many euros more than in a normal year?" and "In your opinion, what is the probability that it will stay so much above normal for five years? Please answer on a scale from 0 to 100, giving a low number if there is little chance of this happening and a high one if there is a good chance".

judged it "normal".[11] Looking closer at the 17.5% of households that reported unusually low incomes, they are predominantly found to be 45 and over (80%), living in the North and South (40% and 38%, respectively), employee (44%) and self-employed (20%), homeowners (62%), concentrated in the two lowest (37%) and highest (15%) decile of the equivalised income distribution. Of the 240 households (representing 3% of total population) that contacted a bank or a financial company with a view to obtaining a loan or mortgage, 72 reported a low income compared to a normal year; around two thirds of these households declared that their request was granted in part or refused.

Figure 11. Cumulative density function for the perceived loss in income in 2012



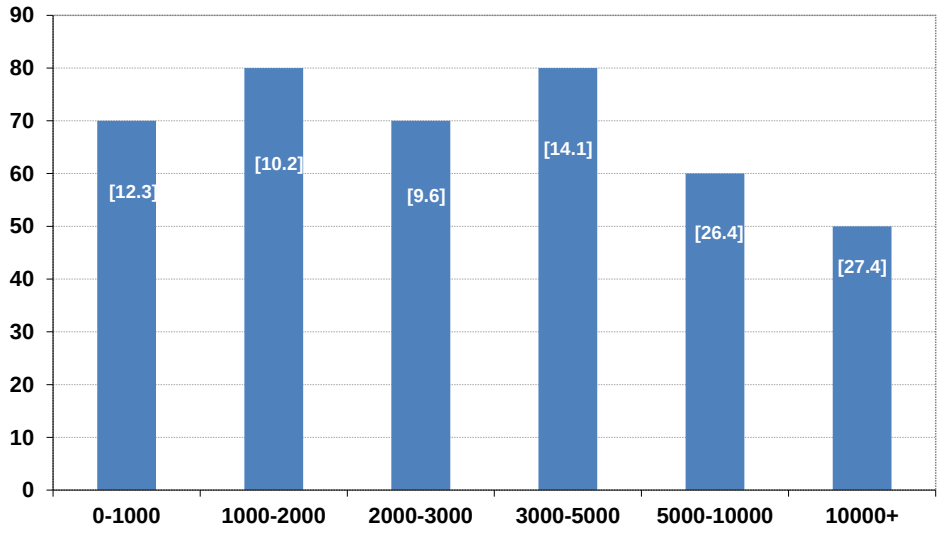
Notes: Our calculation from SHIW (2012).

Households were also asked to provide an estimate of the amount of reduction/increase and to assign a probability to the fact that the fall/rise will last over the coming five years. In Figure 11 we reported the cumulative density function for the decrease in income observed in 2012. The distribution peaks at the values of 1,000, 2,000, 3,000€, etc.; as it is common in these questions households round their values to the highest thousand. The median value of the distribution is 5,000€, the first quartile is 2000€; 27% of the population declare having experienced a drastic fall in their income (more than 10,000€). Households reporting a drop lower than 5,000€ believe that the cut is very likely to stay in the future (about 70%); in the 55% of the cases in which the reduction was more severe, 5,000€ and over, the loss is believed to persist (see Figure 12). This suggests that for relatively low losses, the majority of households tend to consider them

[11] The remaining 3% did not answer the question.

permanent, while the subjective probability that the fall be permanent is somewhat lower (but still sizeable) for larger losses.

Figure 12. Probability that the loss will last over the coming 5 years



Notes: Our calculation from SHIW (2012). Values in brackets indicate the percentage of households with the loss reported in the x axis.

Looking at the main socio-demographics traits in Table 3, pensioners and those aged 65 and over recorded a drop of 3,000€; the loss has been particularly severe for households in the 10th decile of the equivalised income distribution, self-employed and unemployed household heads. Considering the 4,611 households belonging to the panel in two consecutive waves (2010-2012), the drop in income (10,000€ and over) is associated with a change in the employment status from occupied in 2010 to unemployed in 2012 for about 40% of households.

The loss is more likely to be perceived as permanent by household heads aged 55 and over, pensioners, home owners; unemployed people are uncertain and assign a 50 per cent probability to the fact that the fall will persist in the coming five years. All in all, uncertainty is high across all household types.

For the households in the panel (4,611)[12] it is interesting to compare the actual loss in income, calculated as the difference between net disposable income in 2012 and 2010, and the perceived one, as recovered from the new questions about the "normal" income in the 2012 wave. In Figure 13 we report the actual and perceived loss for the 457 households in the panel (representing 4% of total population) who both recorded a negative change in income and perceived a loss; it is clear that for low losses, households perception is correct; for higher amounts, instead perceptions tend

[12] Over 8,151 households in 2012, 4,611 were also interviewed in 2010; 2,314 of these reported a negative change in actual income between 2012 and 2010 (2,297 registered an increase). 457 households (out of 2,314) also perceived a loss in income compared to a normal year.

to underestimate actual loss; in the mid-range (2,000-10,000€) the opposite tends to happen.[13] On average, for this 4% of total population the mean perceived income loss is roughly lower than the actual change in income.

Table 3. Median fall and percentage probability the fall will last in 5 years.

	AGE				
	0-34	35-44	45-54	55-64	65+
median loss	5000	5000	5000	5000	3000
median probability of a permanent loss	50	60	50	70	80

	EDUCATION			
	None and primary school	Lower secondary school	High School diploma	University degree
median loss	3000	5000	5000	5000
median probability of a permanent loss	70	50	70	70

	GEOGRAPHICAL AREA		
	North	Center	South
median loss	5000	5000	5000
median probability of a permanent loss	60	70	60

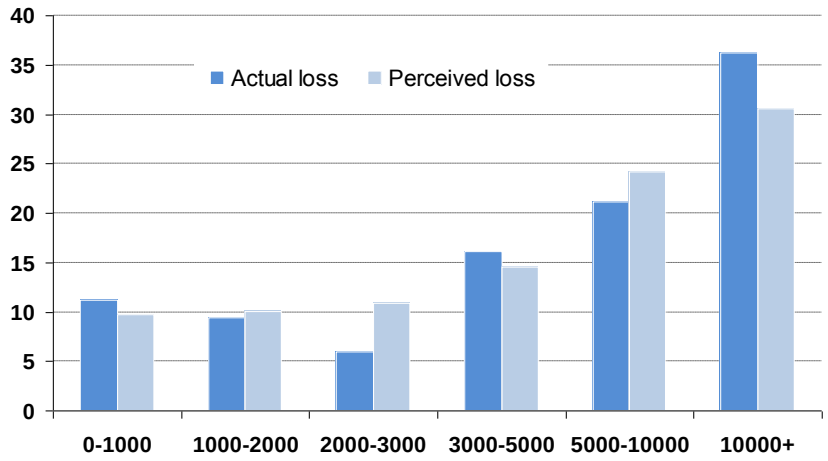
	OCCUPATION				
	Employee	Self-employed	Not employed	Unemployed	Pensioner
median loss	4000	8000	5000	7000	3000
median probability of a permanent loss	70	50	50	50	80

	HOUSE			
	Homeowner	Renter	Under redemption agreement	Occupied in usufruct
median loss	5000	5000	1000	5000
median probability of a permanent loss	70	60	90	50

	DECILE									
	1	2	3	4	5	6	7	8	9	10
median fall	5000	5000	3000	5000	5000	3500	5000	3000	6500	10000
median probability of a permanent loss	50	70	50	80	70	60	60	70	80	50

Notes: Our calculation from SHIW (2012).

Figure 13. Actual and perceived loss in 2012



Notes: Our calculation from SHIW (2012 and 2010). Panel component.

[13] Although the number of households decreases when considering households in the panel from 2008 to 2012 (3,596) and from 2006 to 2008 (2,790), this evidence is broadly confirmed also for the period 2012-2008 and 2012-2006.

Income in a "normal" year may be computed by summing (subtracting) from the actual income observed in 2012 the loss (gain) with respect to "normal" as recorded in the 2012 wave. For the overall Italian population, actual income in 2012 (30,884€) is non-negligibly lower than the "normal" one, computed as described above (31,912€).[14] If we weight observations according to the subjective probabilities that the loss/gain recorded in 2012 will persist in the next 5 years, "normal" income is found to have declined by 20% for the 17.5% of households who experienced a loss and increased by 40% for the 1% who recorded a gain. Therefore, during the Sovereign debt crisis aggregate "normal" income may be estimated to have permanently declined by 3%.

Between 2010 and 2012, average household income fell by 7.3% (Bank of Italy, 2014). Assuming that actual income in 2010 was roughly in line with "normal" income[15] and that the latter has remained by and large unchanged between 2010 and 2012, the findings above suggest that almost half of the loss of income in 2010-2012 is not expected to be recovered in the next five years, i.e. it is deemed a permanent loss.

All in all, micro evidence tentatively suggests that the perception of permanent denting of Italian households income did play a relevant role in driving the extraordinary fall of private consumption in the last few years.

9. Concluding remarks

In this paper we study how the last recession affected households' consumption behaviour, in order to gain a deeper understanding of the likely evolution of domestic demand in future recovery. In particular, we try and answer the question whether the fall in consumption and income observed during the Sovereign debt crisis is the result of an anomalous behaviour of households with respect to past events.

Interpreting macroeconomic data through the lenses of the BIQM, we reach the following conclusions:

(i) Forecast errors during the Sovereign debt crisis are large and systematic, especially for durable consumption, but forecast performance worsens also for non-durables; no firm conclusion can be reached as to whether the consumption pattern is consistent with a fall in perceived permanent income. Large errors might be signalling the existence of other relevant factors, that are not captured by the specification of the consumption equations of the BIQM; in particular, part of the fall in consumption might be related to the plunge of gross operating surplus of small

[14] We exclude those who did not answer the question.

[15] Indeed this is supported by the data: for households in the panel that also replied to the new questions, the actual income in 2010 and "normal" one are comparable (33,221 and 33,439€, respectively).

enterprises, whose financing conditions were affected by credit restrictions during the last crisis, requiring additional resources to be channelled by the owner households;

(ii) Wealth seems to have played a major role. During the Global financial crisis, households had reduced their consumption less than income (*consumption smoothing*), which had contributed to erode savings and wealth. The occurrence of a new recession, soon after the previous one, caused a further contraction of disposable income, exacerbated by substantial capital losses induced by severe financial shocks. The decline in both income and the perceived value of wealth may have prompted households to increase their savings in order to preserve their future purchasing power amid the prolonged tensions on the credit market, the difficult conditions on the labour market and substantial fiscal adjustments.

Microeconomic evidence based on the SHIW replicates the main macroeconomic developments, confirming that in the last recession income and consumption declined by the same amount; additionally, households were hit by a severe shock on wealth that mainly reflected that of real estates, which accounts for the lion's share of real assets.

Looking at heterogeneity within the population, we find that during the Sovereign debt crisis a large share of consumption reduction comes from the choices of younger households (0-44), whose income and wealth fell much more significantly than their elder peers'. This might have reflected weak conditions prevailing at the moment they were entering the labour market. In this perspective, the main evidence coming from the micro data points to a key role of the younger households to explain the reduction in consumption. Accordingly, a downward risk for the evolution of domestic demand is related to the persistence of negative labour market conditions and a reduced level of real wealth, which affect young people to a more pronounced extent.

Moreover, the perception of future income perspectives appears uncertain across all households types. Aggregating micro economic data and taking into account the subjective probability that the loss/gain experienced in 2012 will extend into the future, we estimate that during the Sovereign debt crisis "normal" income permanently reduced by 3% for the total Italian population. Given that average household income fell by 7.3% between 2010 and 2012, these findings suggest that almost half of the loss of income in 2010-2012 is not expected to be recovered in the next five years, i.e. it is deemed a permanent loss.

All in all, micro evidence tentatively suggests that the perception of permanent denting of Italian households income did play a relevant role in driving the extraordinary fall of private consumption in the last few years.

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The Italian labor market after the Great crisis

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Abstract

I explore whether the sharp deterioration of the Italian labor market since 2008 has a structural nature or reflects a substantial demand slack exploring whether the empirical implications of a simple search and matching model in the face of a structural shock are supported by the data. Specifically, I explore whether measures of aggregate matching efficiency have deteriorated, whether the likelihood of long run unemployment has increased relatively more for professional profiles in excess supply and, similarly, whether hiring wages have deteriorated more for those professional profiles. I do not find support for these predictions and conclude that the higher unemployment is mostly a reflection of cyclical weakness.

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1 Introduction

The Italian economy reached a peak at the end of 2007, after a decade that coupled unprecedented employment creation rates and the poorest post-war economic growth record[1]; employment began to fall shortly afterwards. Between the peak and the second quarter of 2014 the number of persons employed fell by about 1.2 millions, roughly 5 percent, largely in industry and construction; total hours declined by 7.5 percent. Unemployment rose from the 2007 historically low 6 percent to an unprecedented 13 percent at the beginning of 2014; the share of jobless unemployed for longer than a year rose from around 40 percent to more than 60 percent.

In this paper I explore whether such deep deterioration of the labor market, in particular the high levels of unemployment, has a structural nature or reflects a substantial demand slack. Specifically, I look at unemployment developments through the lense of a standard search and matching model. In such models *structural* unemployment stems from search frictions. At the current juncture, there are concerns that a fundamental mismatch between labour demand and supply may have determined a worsening of such frictions and thus raised steady state unemployment. Consequently, policy advice puts a lot of weight on measures to improve the skills of the workforce and the matching process. Obviously, although helpful, such measures may

[1] Between 1997 and 2007 total employment grew by over 14 percent while real value added only slightly above 16 percent. The striking employment performance, amidst weak TFP growth and increased competition on the world markets, was favoured both by the significant wage moderation ensuing the income policy agreements of the early '90s and the widening margins of labour adjustment deriving from a number of legislative interventions which broadened the scope for temporary work and other flexible work arrangements (see Brandolini, Casadio, Cipollone, Magnani, Rosolia and Torrini (2007) and Brandolini and Bugamelli (2009)). The income policy agreements resulted in a decline of nearly 10 percentage points of the labour share, a fall of consumer-price deflated hourly compensations and overall stagnation of real household disposable income; increased competitive pressures, however, pushed up valued added-deflated compensations. Labour flexibility was achieved at the margin, leading to marked segmentation, especially along the age dimension which, in addition to wider margins of labour flexibility, introduced a further element of moderation in labour costs as wages of new entrants in real terms fell throughout the period (Rosolia and Torrini (2007)), Rosolia and Torrini (2013))

be misplaced at least in the short run if higher unemployment does not reflect a deterioration of the matching process. Within the search and matching framework mismatch carries well identified consequences. I explore three specific ones. First, I check whether at the macro level the matching process has become less efficient by comparing the developments of job finding rates with those of aggregate labor market tightness. Second, I check whether wage differentials across professional profiles have increased as a consequence of diverging market strengths of job seekers in short and excess supply. Third, by the same token, I check whether unemployment durations have become more heterogeneous across professional profiles.

My analyisis is seriously limited by lack of suitable data. Most of the information required for a stock-flow analyisis of the Italian labour market is available since no earlier than the mid 2000s thus mostly falling in the crisis period. With this caveat in mind, the three exercises I perform do point to the same conclusion, namely that currently high unemployment levels mostly reflect a sizeable demand slack. In this sense, structural reforms, while still necessary to address long lasting weaknesses of the Italian economy, could result in a weak support to the recovery in the short run.

2 Labour market developments and economic activity

Figure (1) displays the cumulated change in unemployment and employment since the end of 2007. The two stages of the long crisis are easily spotted. In the early stages, characterized by the global demand slump, the rise in unemployment strictly mirrored the fall in employment and labour supply stagnated. The weak recovery in early 2011 was soon halted by the sovereign crisis: for some time employment lingered on the low levels recorded so far while unemployment

quickly rose, at first pushed by increasing supply and then also by falling employment. A quantitative sense of the role played by labour supply in shaping unemployment can be obtained holding the labour force constant at its pre-crisis level and letting unemployment simply mirror employment changes[2]. Figure (2) shows that, unsurprisingly, the unemployment rate would have mimicked the actual one until the sovereign crisis burst; afterwards, it would have risen about 2 points less than actually recorded and, by mid-2013, it would have stopped increasing any further.

Beyond accounting for up to one third of the increase in the unemployment rate, labour supply developments also led to significant changes in the pool of job seekers and employed. Panel A of figure (3) displays the cumulated change in employment and unemployment by sex and two age classes (15-34 and 35+). Youth labour supply kept shrinking along a pre-crisis trend of declining participation but the number of unemployed youths rose, especially in the second stage of the crisis; overall, youths cut about 1.4 million persons to labor supply and added about 0.7 million unemployed. The older group displayed opposite developments: total labor supply rose for both men and women, although among the former unemployment outpaced employment; overall, the age class added 2.1 million persons to labour supply 0.9 million of which were additional unemployed. These absolute changes reflect also demographic trends; panel B reports changes in unemployment-to population and employment-to-population ratios. Core age male employment suffered from the contraction of construction and industry: as a share of the underlying population its fall was accompanied by an equal increase of unemployment and participation rates remained unchanged; core age women employment kept rising throughout,

[2]Formally, $ur = U/(E+U) = (U/P)/((E+U)/P)$ so that absolute changes in the unemployment rate can be rewritten as $\Delta ur = \frac{1}{a_0}(\Delta u - \Delta a \frac{u_1}{a_1})$ where u and a are unemployment-to population and labor force-to-population ratios.

benefitting from the ongoing expansion of services; also unemployment increased reflecting their higher participation. Franceschi (2014) shows that such a behaviour of female labor supply can be traced to a large extent to an *added worker effect*, whereby otherwise inactive women enter the labour market to make up for the job loss of their spouse; specifically, he shows that such effect accounts for as much as 8 percent of the higher labour supply of married women over the sovereign crisis.

Figure (4) decomposes the 1.6 million additional unemployed created by the crisis along their previous labor market status. The additional unemployed were primarily previously employed workers; this was particularly true in the early stages of the crisis until 2010-11. Afterwards, as the sovereign crisis set in, flows towards unemployment from out of the labor market intensified. They initially involved experienced inactive workers and later on also unexperienced ones: these included both young new entrants whose hiring became significantly delayed by weak demand and older experienceless individuals.

The major compositional shifts in unemployment and labour force caused by the long recession begun in 2007 raise concerns that higher unemployment rates may be or become ingrained in the labour market, due to the potential mismatch between the skills supplied by the unemployed and those demanded by employers, possibly burdened by the skill decay of long-term unemployed.

3 Is unemployment structural?

Discussions on the nature of unemployment typically focus on the empirical negative relationship between vacancies and unemployment, the Beveridge curve: changes in vacancies and unemployment *along* such curve are generally associated with cyclical effects, whereby unem-

ployment is high because (labor) demand is low; shifts of the curve are generally associated with structural effects, whereby unemployment is higher than in the past for comparable levels of labour demand.

In search and matching models of the labour market, that rationalize the coexistence of unsatisfied labour demand and unemployment with search frictions, the Beveridge curve is the steady state locus of vacancies and unemployment. Letting $m(u, v)$ be the function that governs the frictions in the labour market and allows vacancies (v) and job seekers (u) to meet and create occupations, unemployment evolves according to $u_{t+1} = u_t - m(u_t, v_t) + s(1 - u_t)$, where s is the inflow into unemployment caused by job separations; the Beveridge curve thus yields from the necessary steady state condition $m(u, v) = s(1 - u)$. Shifts of the curve stem from permanent (or long lasting) changes of the separation rate or of the matching function, that is changes in the matching efficiency[3].

Within this framework mismatch and the ensuing higher structural unemployment should be associated with at least three facts. First, measures of matching efficiency should display a long-lasting to permanent drop; second, the dispersion of hiring wages should increase as a result of stronger bargaining positions of workers in short supply as opposed to the weaker one of profiles in excess supply; third, and by the same token, unemployment durations should be more heterogeneous[4]. Next, I address these implications in turn.

[3] This is an admittedly sketchy representation: search and matching models yield out-of-steady state dynamics which imply (short-lived) movements off the Beverdige curve. See, for example, Blanchard and Diamond (1989), Pissarides (1990).

[4] Sahin, Song, Topa and Violante (2014) develop a measurement framework based on a dynamic version of the standard search and matching model to quantify the contribution of mismatch to the rise of US unemployment. They conclude that sectoral and occupational mismatch can explain at most one third of the increase while geographical mismatch played no role. For EU countries, Arpaia, Kiss and Turrini (2014) follow a different approach and find a great deal of heterogeneity in the evolution of efficiency across countries over the crisis.

3.1 Aggregate matching efficiency

The matching funtion returns the number of matches the labor market is able to yield with a given level of job seekers and open vacancies, $m = Am(u, v)$; A measures the matching efficiency. The associated Beveridge curve is therefore given by $Am(u, v) = s(1 - u)$.

The first panel of figure (5) displays the pairs vacancy-unemployment since 2004:1, that is the Italian Beveridge curve[5]; official quarterly data on open vacancies are available since 2004:1[6]. The curve shows that the first stage of the crisis is characterised by a rapid and deep slump in vacancies; afterwards there was some recovery until mid-2011 when demand dropped again; the last quarters have witnessed again somewhat of a recovery. Meanwhile, unemployment increased almost continuously and somewhat accellerated since mid 2011. Therefore worries that unemployment may be turning structural are based on the observation that, for example, against vacancy rates currently similar to those ongoing in 2009 unemployment rates are still much higher. However, permanent shifts of the Beveridge curve are not easily identified. For example, Blanchard and Diamond (1989) show that business cycle models imply loops around a stable U-V locus. Thus, the empirical stability of the curve also depends on the depth of recessionary episodes and on the speed of adjustment of the labour market; moreover, we have seen above that, especially in the second stage of the crisis, developments of the unemployment rate reflected to a large extent labour supply developments. A plot of the vacancy rate against the unemployment-to-population ratio, displayed in the second panel of figure (5), reveals that such shifts are smaller and less clearcut.

[5] I seasonally adjust official unemployment and vacancies by filtering out stochastic cycles with periods up to to 5 quarters, consistently with a definition of business cycle as cycles with periods between 6 and 32 quarters. I use the Stata implementation of the Christiano-Fitzgelard method.

[6] Early studies on the Italian matching efficiency made use of help-wanted indexes. See, for example, Sestito (1988) and Brandolini and Cipollone (2001); Peracchi and Viviano (2004) propose a method to back out vacancy rates from individual transitions in and out of employment.

Within a search and matching framework, a large contribution of separation rates to the increase in unemployment would suggest, all else equal, a structural shift of the Beveridge curve. To assess whether this is the case I follow Shimer (2012) and estimate quarterly job finding and separation probabilities combining macro data on stocks with micro data on unemployment durations[7]. Figure (6) displays seasonally adjusted job finding and separation probabilities since the mid '70s. Since the mid '90s both probabilities have increased substantially; separation rates spike early on in recessions, but then appear to quickly return to their long run trend. During the current recession such spikes are evident at the onset of the global financial crisis and at the beginning of the sovereign crisis; job finding rates, instead, appear to have sunk mostly with the latter crisis. A large literature that tries to assess the relative weight of separation and hiring rates in shaping cyclical developments of unemployment generally finds a larger role for hiring rates: cyclical unemployment thus reflects more increased difficulties to find a job than the higher likelihood of losing one[8]. I use the estimated separation and hiring rates shown above to decompose the absolute change in unemployment over the two stages of the crisis. Results presented in figure (7) show that increased separations played a role only in the very early stage of the financial crisis, when job finding rates had not yet reacted in a sizeble way. As the financial crisis progressed and the sovereign one kicked in, the drop in job finding rates started to weigh in; over the sovereign crisis it appears to be the main driver of the increase in

[7]Shimer (2012) addresses explicitly the issue of time aggregation starting from a continuous time representation of the law of motion of intra-period employment and unemployment and shows how to back out the transition rates between the two states under the assumption of constant labour force within the period. He also explore a three-state version of the method addressing explicitly the issue of transitions in and out of the labour force. Here I stick to the two-states representation and focus on the population 25-54 which displays a higher attachment to the labour market and less cyclical variation of the labour participation margin.

[8]See, for example, Shimer (2012), Elsby, Michaels and Solon (2009), Fujita and Ramey (2009), Hall (2005). These authors disagree on the exact quantification of the contribution of the two transition probabilities to cyclical unemployment fluctuations, although all seem to recognize that job finding rates play a sizeably larger role.

unemployment.

This evidence seems to rule out shifts of the Beveridge curve driven by permanent changes in separation rates. However, it does not rule out the possibility that the deterioration of job finding rates reflects that of matching efficiency rather than weak demand. In fact, in the above framework the job finding probability is given by $p(\theta) = Am(u, v)/u = Am(1, \theta)$, where I have made the standard assumption that $m(.,.)$ is CRS and defined $\theta = v/u$ as the labour market tightness. This expression however suggests that a measure of matching efficiency can be recovered by focusing on the relationship between hiring rates and labor market tightness; therefore data on vacancies, unemployment and hiring rates allow to back out a time series for A. I use the above Istat vacancy and unemployment rates to obtain a measure for labour market tightness in conjunction with the estimates for job finding rates introduced above. Figure (8) plots the relationship between the (log of) job finding probability and the (log of) labor market tightness along with a regression line estimated for the period 2004:1-2006:4[9]. Differences from the regression line are thus differences in matching efficiency with respect to pre-crisis levels. The figure shows that except for a short-lived divergence in 2007, slightly earlier than the crisis fully burst, between 2008 and 2010 the relationship between labour market tightness and job finding rates has largely conformed with historical experience. Since early 2011 measured efficiency has dropped significantly and then slowly recovered; since late 2013, however, the labour market appears to be working as usual given ongoing low levels of tightness.

[9]The regression projects the log of the job finding rate on a constant and the log of labour market tightness. The estimated coefficient is 0.501 with a standard error of 0.06; the adjusted R2 of the regression is 0.84. Estimating on the whole period 2004:1-2014:2 returns a coefficient within the 10% CI of that estimated on the shorter pre-crisis sample.

3.2 Dispersion of hiring wages

The previous section has explored whether economy wide indicators are consistent with the mismatch hypothesis, finding only temporary deviations from the historical relationship between job finding rates and market tightness.

At a more micro level, mismatch implies that some professional profiles are in short supply relative to demand while others are in relative excess supply. Therefore market-specific degrees of tightness should be increasingly different[10].

Figure (9), displaying sector-specific indexes of labor market tightness, does not suggest this to be the case; it rather shows a generalised decline in labor market tightness. However, such indexes, though customarily used in the literature, are likely to be imprecise: they are obtained as the ratio of sector-specific vacancy rates to job seekers with past experience in the same sector implicitly limiting to the latter the pool of relevant job seekers for a given sector. Clearly this is not the case: certain workers have skills that are more easily transferable across sectors while certain jobs do not require specific skills at all.

A better assessment can be made on the basis of wage developments. In search and matching models the fact that some markets are tighter than other implies that the workers in tighter markets are able to command relatively higher wages than those in less tight markets. Thus, dispersion of hiring wages should increase when mismatch becomes more relevant. To explore whether this is the case, I exploit a large sample of administrative data on new hires providing detailed information on job and personal characteristics as well as entry wages to measure

[10]More precisely, this result requires that mismatch arises because it is costly for job seekers to move across labour markets, for example because of mobility or training costs; therefore, as for example in the model of Sahin et al. (2014), job seekers are inefficiently allocated to specific labor markets. Mismatch can also arise because, within a single market, there are more heterogeneous skills so that opening a vacancy implies the risk of meeting the wrong worker; in such a case, both suitable and unsuitable workers pay a cost due to the lower number of vacancies opened (for example, Albrecht and Vroman (2002) and Gautier (2002)).

the evolution of wage dispersion across professional profiles; I define a professional profile as the intersection of industry, job title and macroregion of work (for example, a manufacturing unskilled manual job in the north-east). Figure (10) plots the (log) average hiring wage and its coefficient of variation across professional profiles[11]; along with the actual indexes I report a constant composition version with weights given by the share of hires into the professional profile in 2009. The average real hiring wage has fallen throughout the period nearly unaffected by changing composition; during 2012 it appears to have stabilised at levels about 10 percent lower than those prevailing in 2009. On the contrary, its dispersion across professional profiles appears to have been shaped significantly by the evolution of composition. Observed hiring wage dispersion was stable until mid 2011 then, after a short-lived drop, rose ever since 2012; however, net of changes in composition, such increase begun earlier but halted by the end of 2012. Figure (11), which displays the 1st, 5th and 9th decile of the real hiring wage distribution (2009:1=1), shows that the patterns of dispersion are led by the top end of the distribution, against similar downward trends at the bottom and at the median. Importantly, the evolution of actual dispersion reflects mostly changing composition at the top end rather than diverging trends in profile-specific entry wages, suggesting that wage pressures stemming from mismatch are at best very weak.

3.3 The evolution of unemployment duration

A final piece of evidence on mismatch comes from the distribution of unemployment durations across professional profiles. Mirroring the argument above, if mismatch stems from a shortage of

[11] As before, I seasonally adjust the time series by filtering out cycles with period less than 6 quarters using the Christiano-Fitzgerald filter.

suitable job seekers given the composition of job openings, then unemployment durations of job seekers with the right skills should be shorter than those of workers lacking them: the incidence of long-term unemployment should be *relatively* higher among mismatched job seekers. On the other hand, if longer unemployment spells reflects a generalised weakness of labour demand, the incidence of long spells should increase rather uniformly across the skill distribution.

To summarize the evidence about the evolution of the incidence of long term unemployment (LTU) across professional profiles I estimate a linear probability model for being a LTU, that is unemployed for at least 12 months, separately for the pre-crisis period 2004-2007, for the first and the second stages of the crisis (2008-2010 and 2011-2013, respectively) as function of a broad set of personal and professional characteristics of the most recent work experience[12]. Figure (12) displays, for each characteristic reported on the x-axis, the 95 percent confidence interval of the corresponding dummy's point estimate on the pre-crisis sample 2004-2007 and the 2 point estimates obtained on the 2008-2010 and 2011-2013 samples; the reference category for each characteristic is reported in the figure. There are three main facts to be noticed. First, for many of the characteristics considered the point estimates in 2008-10 and 2011-13 fall within the 2004-2007 corresponding confidence interval, so that the differential probability of LTU associated with the specific feature has not changed significantly during the recessionary phase. Second, when the crisis period differential LTU probabilities are statistically different from the corresponding 2004-07 ones, they are smaller in absolute value implying more similarity of the probability of LTU across professional profiles. Third, the differences between point estimates for the two stages of the crisis are definitively small. If anything, they signal a tendency towards

[12]Labour force survey micro data collect information on whether currently non-employed persons have some work experience and when it took place; whenever it took place within the past three years, also information of sector, job title, type of employment is collected.

more similar (but higher) LTU probabilities across professional profiles except for workers with past recent experience in industry, construction and trade for whom the probability appears to have increased although in a non statistically significant way.

Additional evidence comes from profession-specific transition probabilities to employment. The results above are based on cross-sectional evidence on the (differential) incidence of LTU for specific professional profiles which may hide different transitions rates at shorter durations which only slowly pass through to cross-sectional differences in the incidence of LTU. Figure (13) thus replicates the same exercise as above using labour force quarterly panels that allow to track individual transitions between consecutive quarters; the dependent variable is now a dummy signalling that an unemployed at quarter t reports to be employed at quarter $t+1$; the explanatory variables are the same as before augmented with a dummy for being an LTU at quarter t. Resutls confirm the basic message: differences across characteristics in the quarterly probability of reemployment have not changed much during the crisis and, if anything, have become smaller.

Overall, this evidence does not point to increasing differences in the probability of LTU across professional profiles, as instead implied by growing mismatch between labour demand and supply.

4 Conclusions

Since 2007 the Italian labour market has significantly deteriorated. In this paper I have presented evidence on the nature of such deterioration. Specifically, I have explored three factual implications of the presence of mismatch in search and matching models: that measures of

matching efficiency decline, that the dispersion across professional profiles of hiring wages and unemployment durations increase as a result of the coexistence of shortages and excess supply of specific profiles. While the analysis is seriously limited by the scant availability of historical data that would allow to construct appropriate and reliable counterfactuals, the evidence discussed here does not point to the presence of mismatch and thus increased structural unemployment. Rather, it suggests that currently high unemployment is mostly a consequence of weak demand. As a consequence, policies aiming at improving the matching process or the skills of the unemployed are likely to have little effect in the short run; measures to support final demand would be more effective in sustaining the recovery.

Clearly, such assessments have a relevant time dimension. Today's unemployment has mostly a cyclical nature; however, an excessive prolongation of the current weakness of the labour market and the consequent lengthening of unemployment durations might eventually lead to a fundamental mismatch between demand and supply through deteriorated human capital, turning today's cyclical unemployed into structural ones.

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Figure 1: Unemployment and employment 2007-2014 absolute changes ('000 persons)

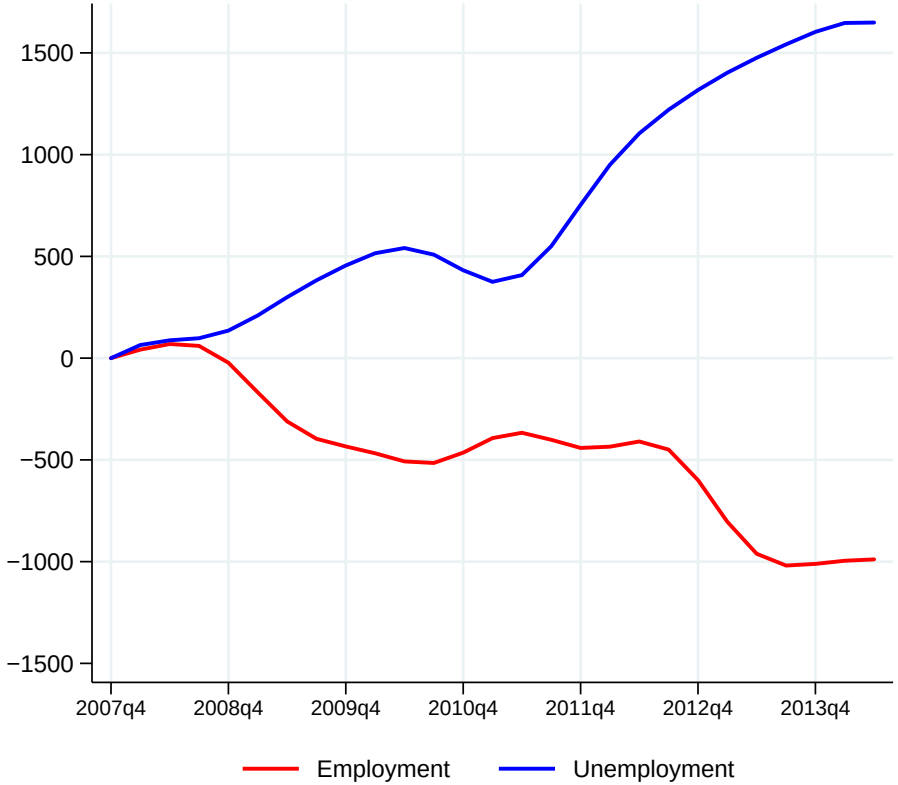
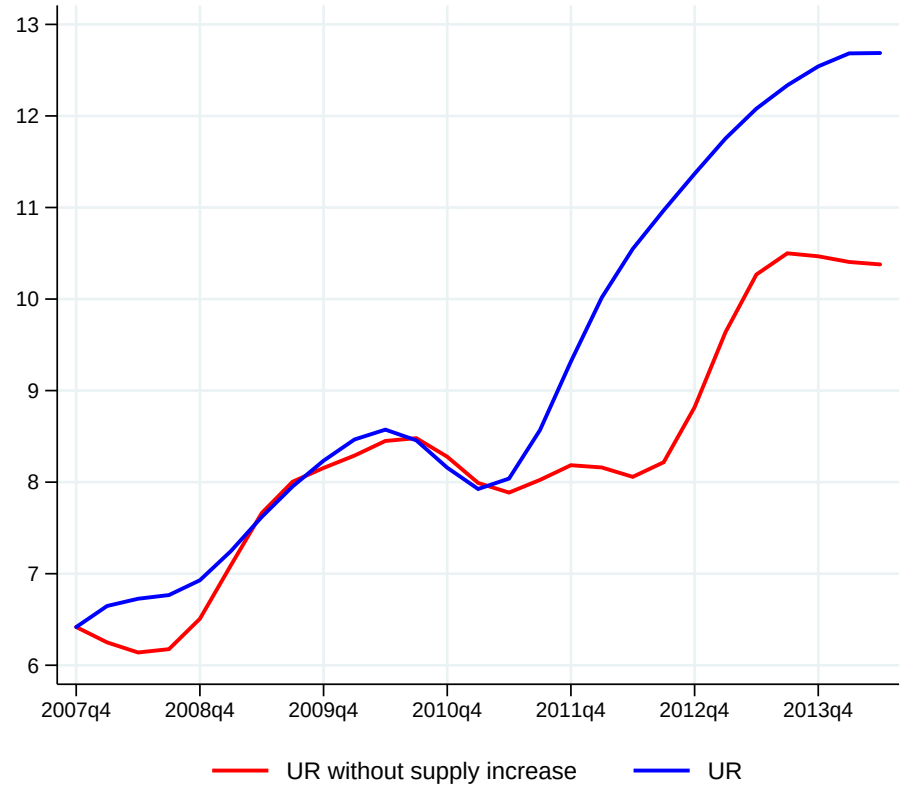


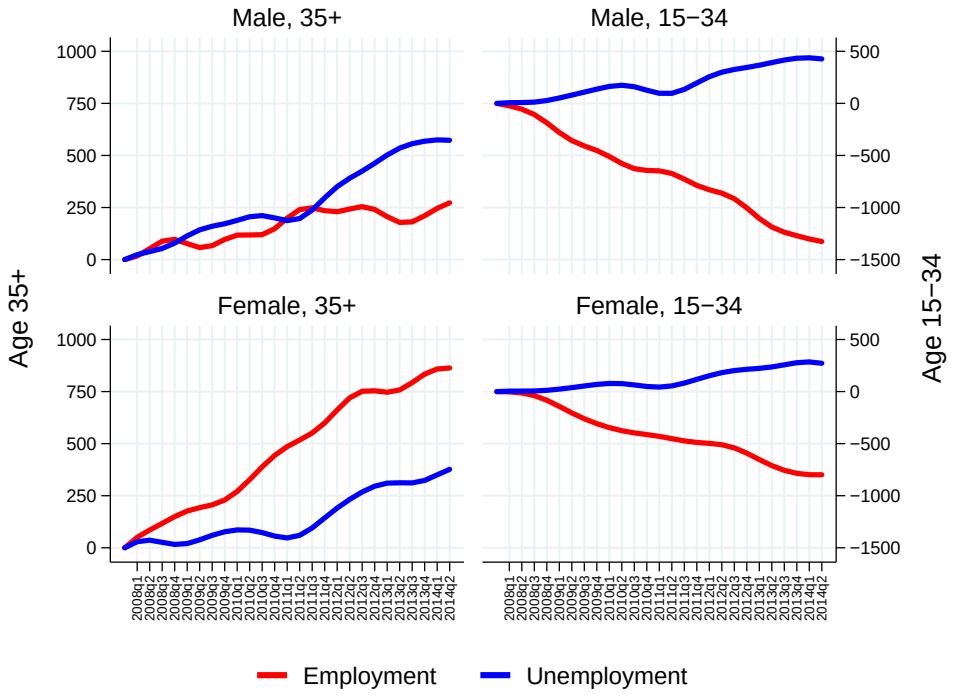
Figure 2: Actual and counterfactual unemployment rate, 2007-2014



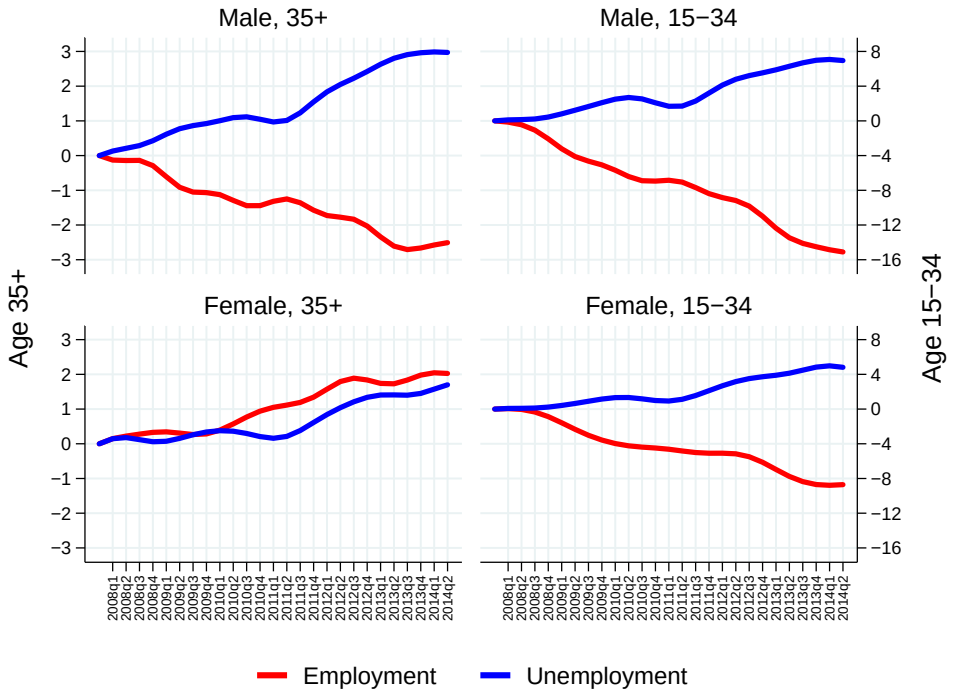
The counterfactual unemployment rate is computed holding the labor force constant at the 2007:4 level and letting unemployment mirror employment changes ($\Delta U_t = -\Delta E_t$).

Figure 3: Unemployment and employment 2007-2014 changes by sex and age

A. Absolute changes ('000 persons)

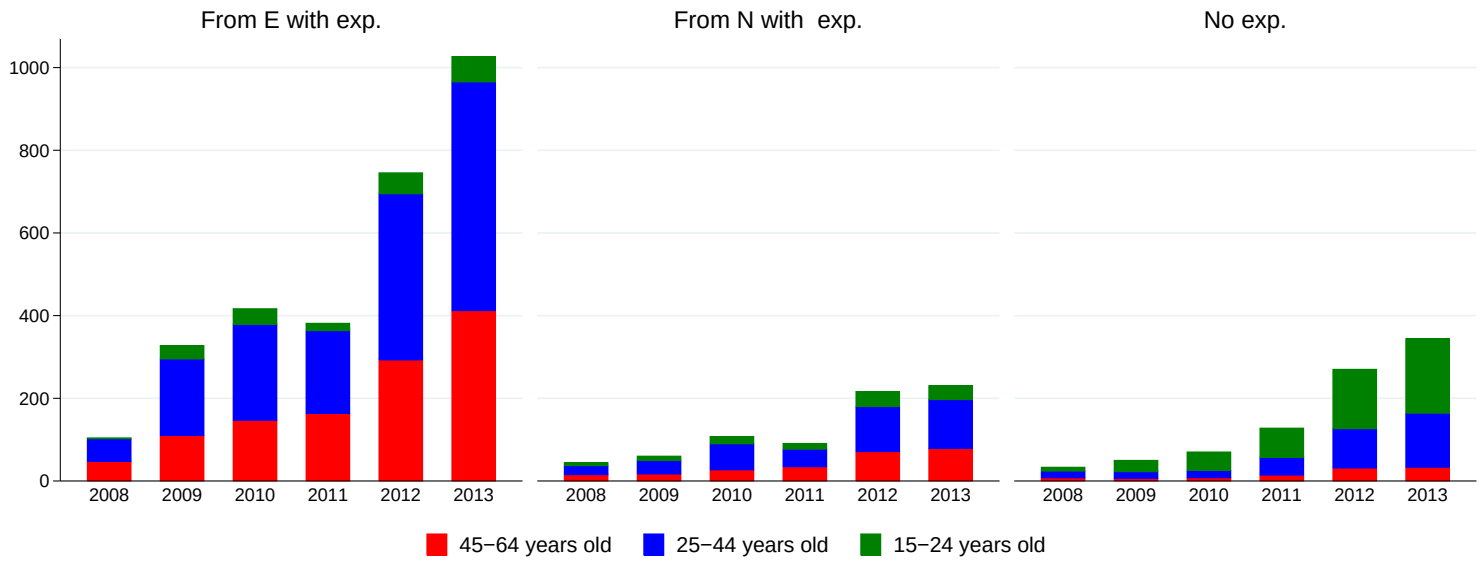


B. Changes of ratios to population (%)



Panel A reports absolute changes in employment and unemployment by age-sex groups; panel B reports changes in employment-to-population and unemployment-to-population ratios for the same groups.

Figure 4: Decomposition of cumulated 2007-2014 changes in unemployment by previous condition ('000 persons)



Bars represent the absolute cumulated change in the number of unemployed persons in each group since 2007.

Figure 5: The Beveridge curve

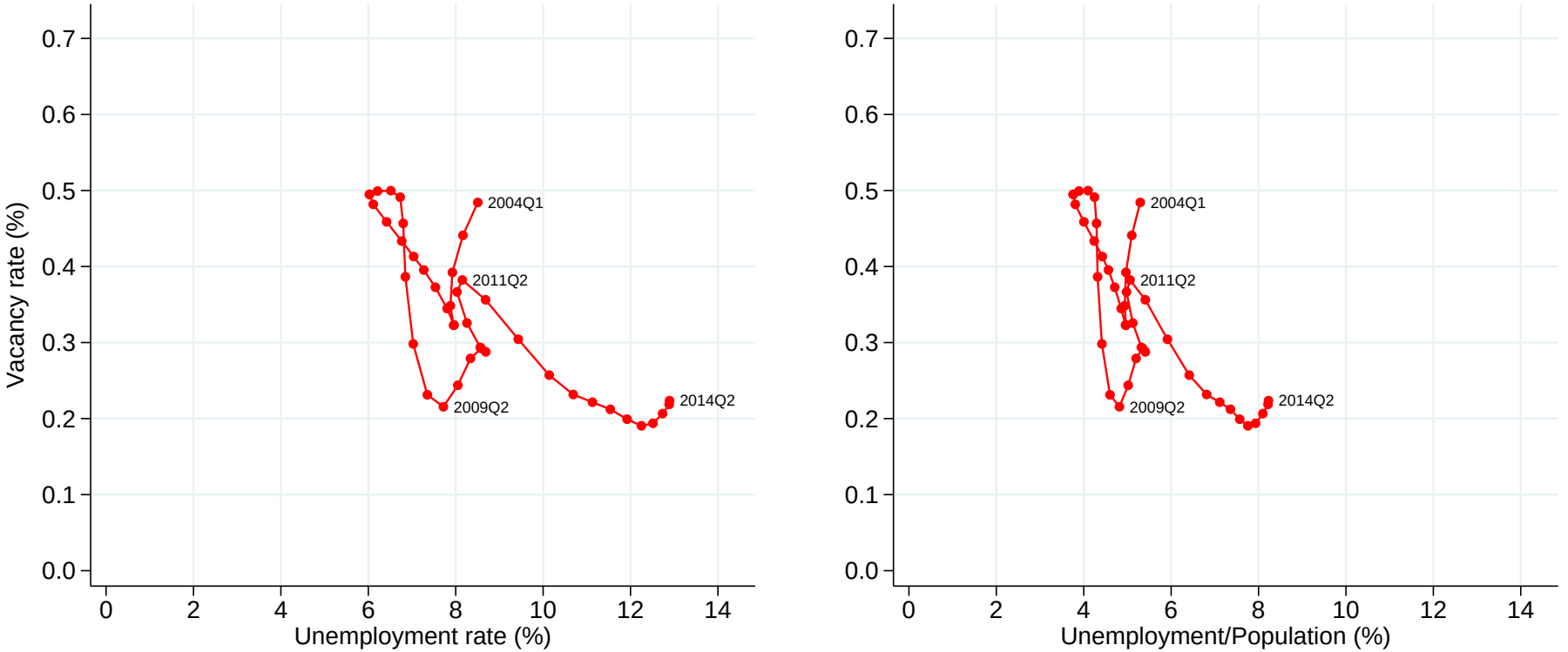


Figure 6: Workers flows

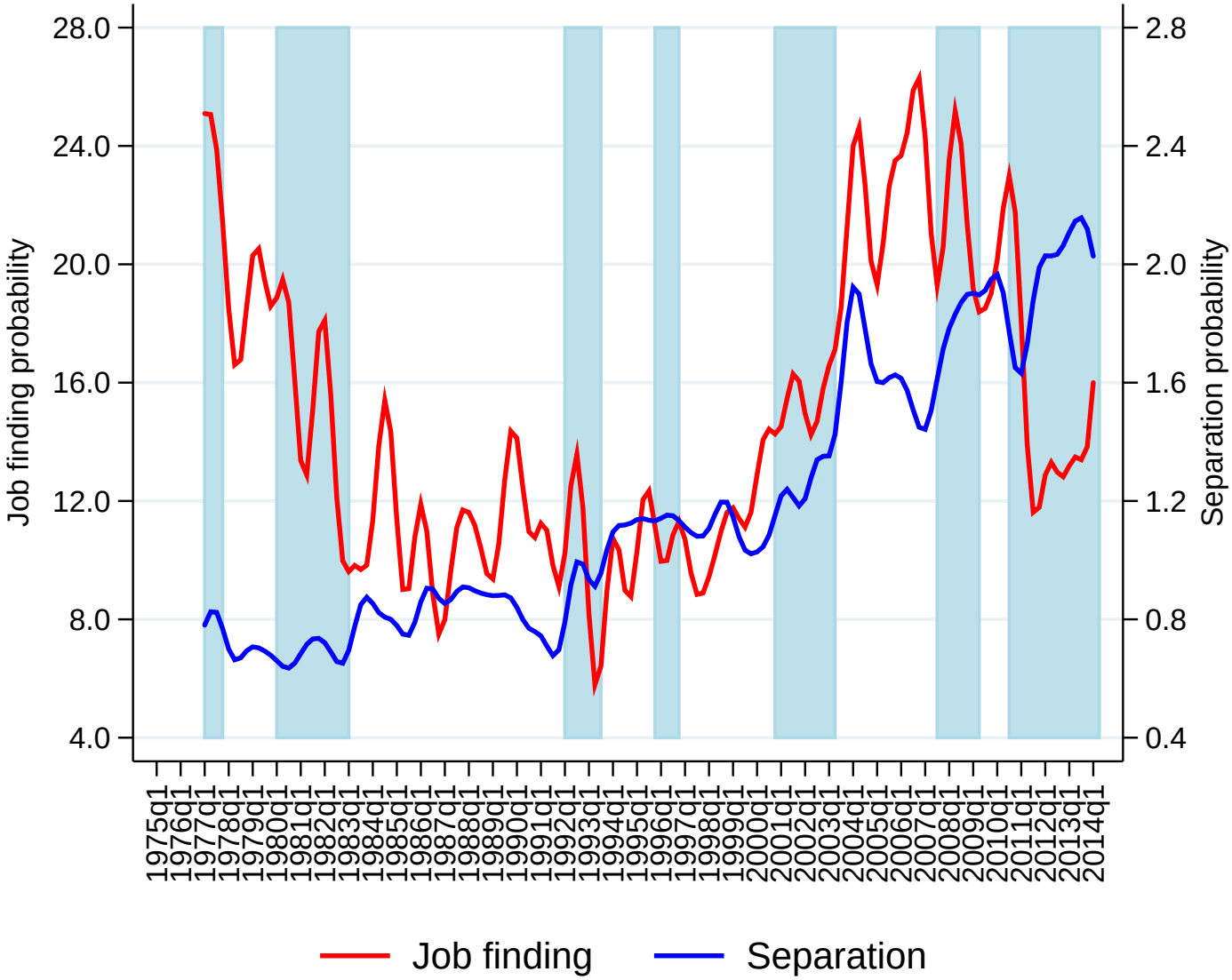


Figure 7: Contributions of job finding and separation rates to 2007-2014 unemployment change

Figure 8: Matching efficiency

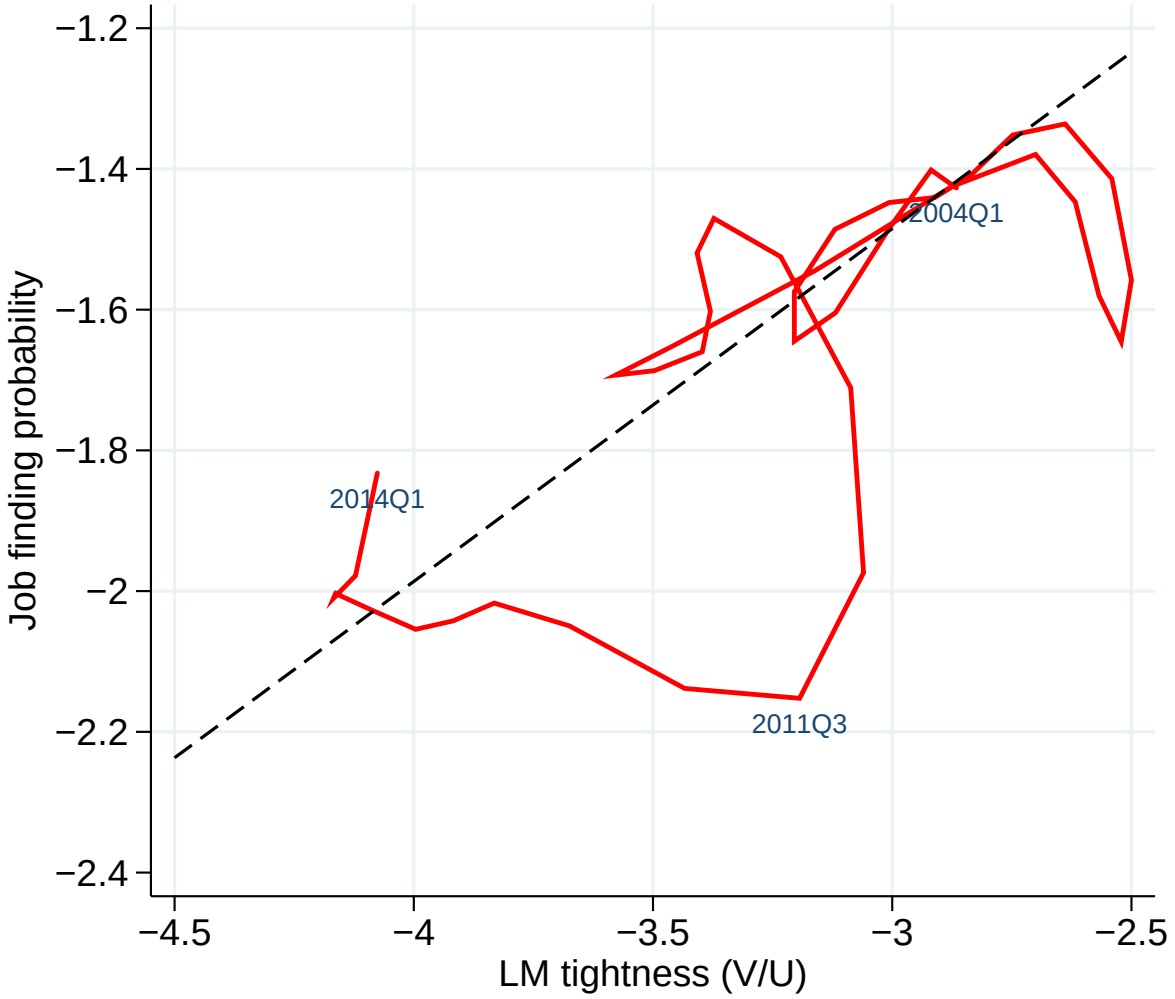
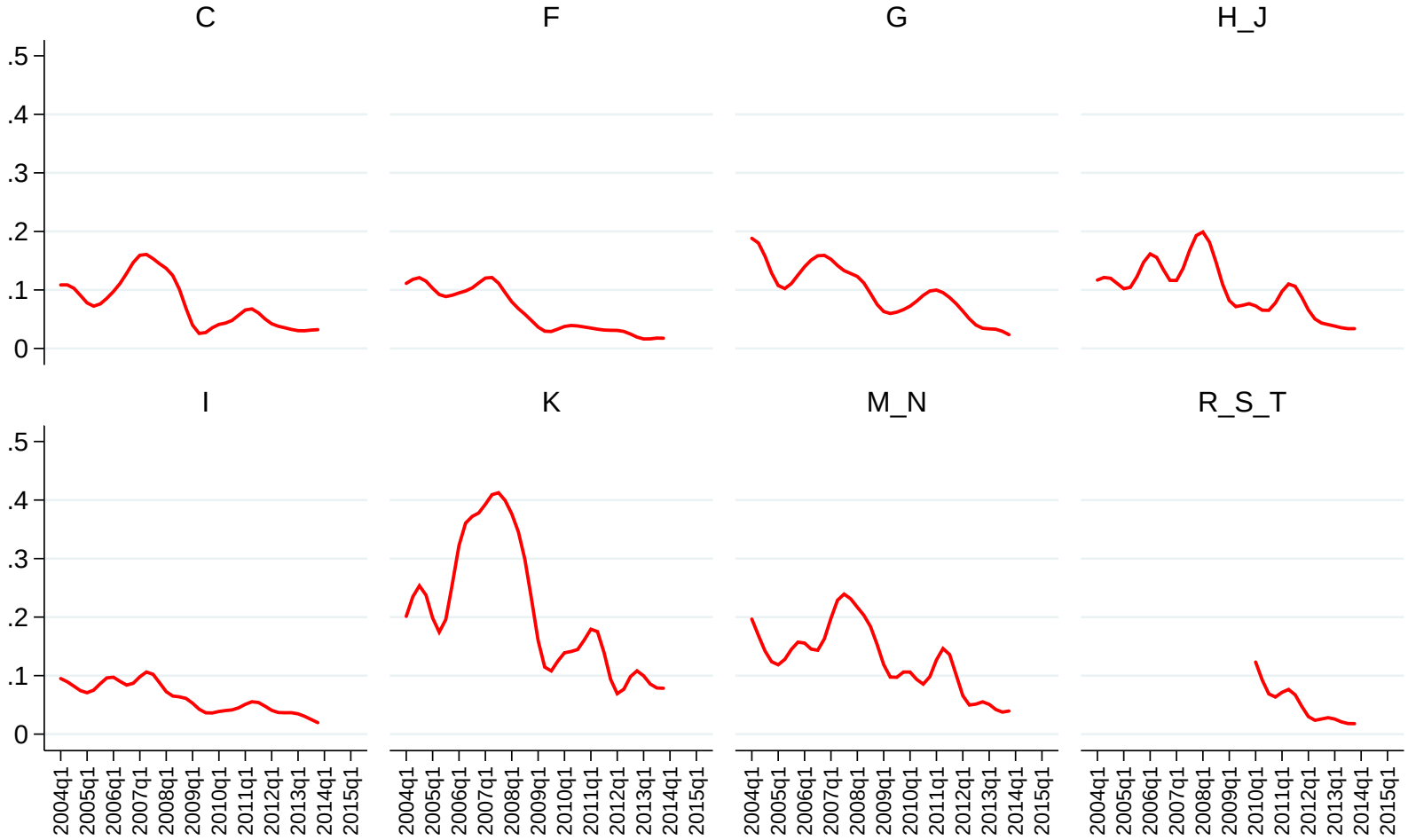
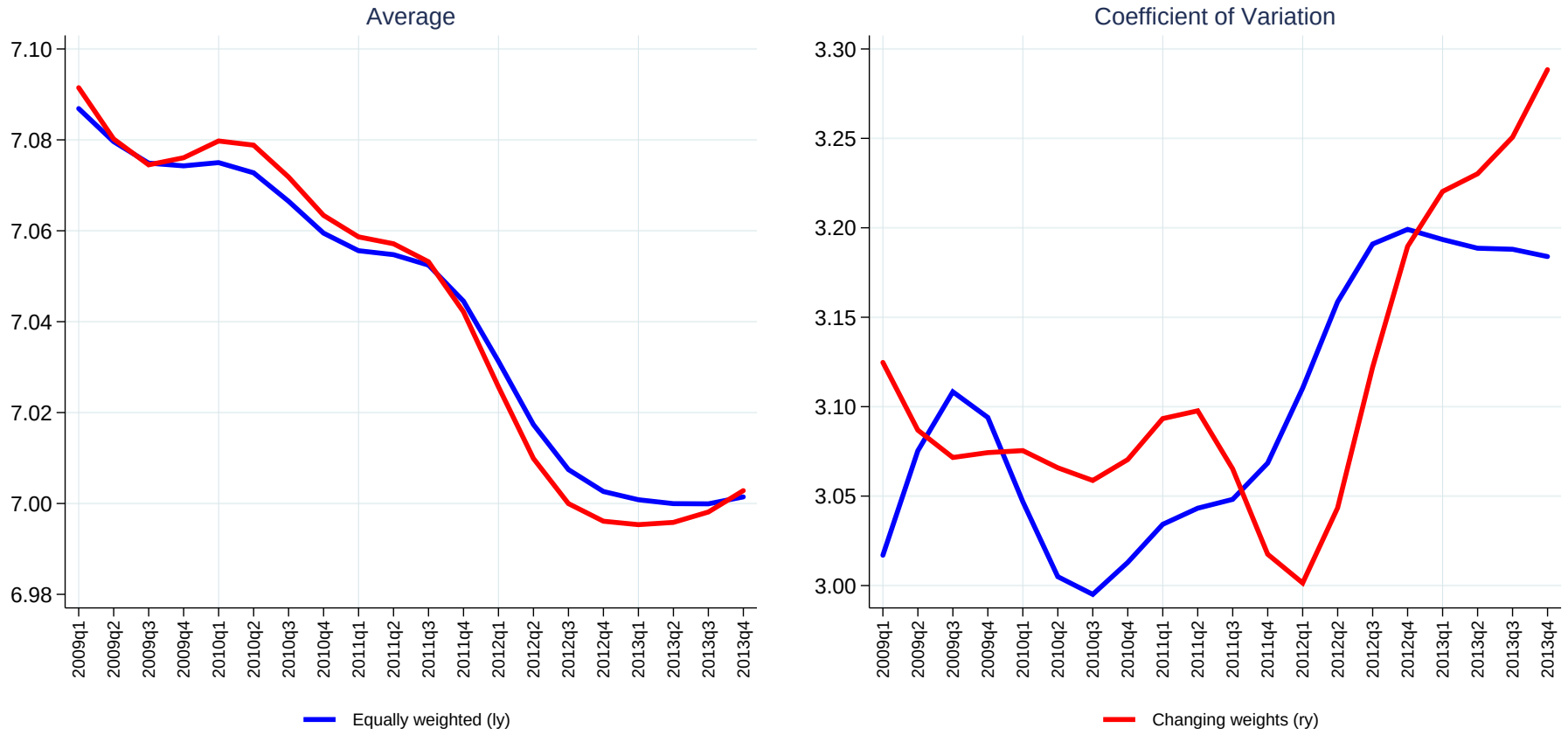


Figure 9: Sectoral labor market tightness



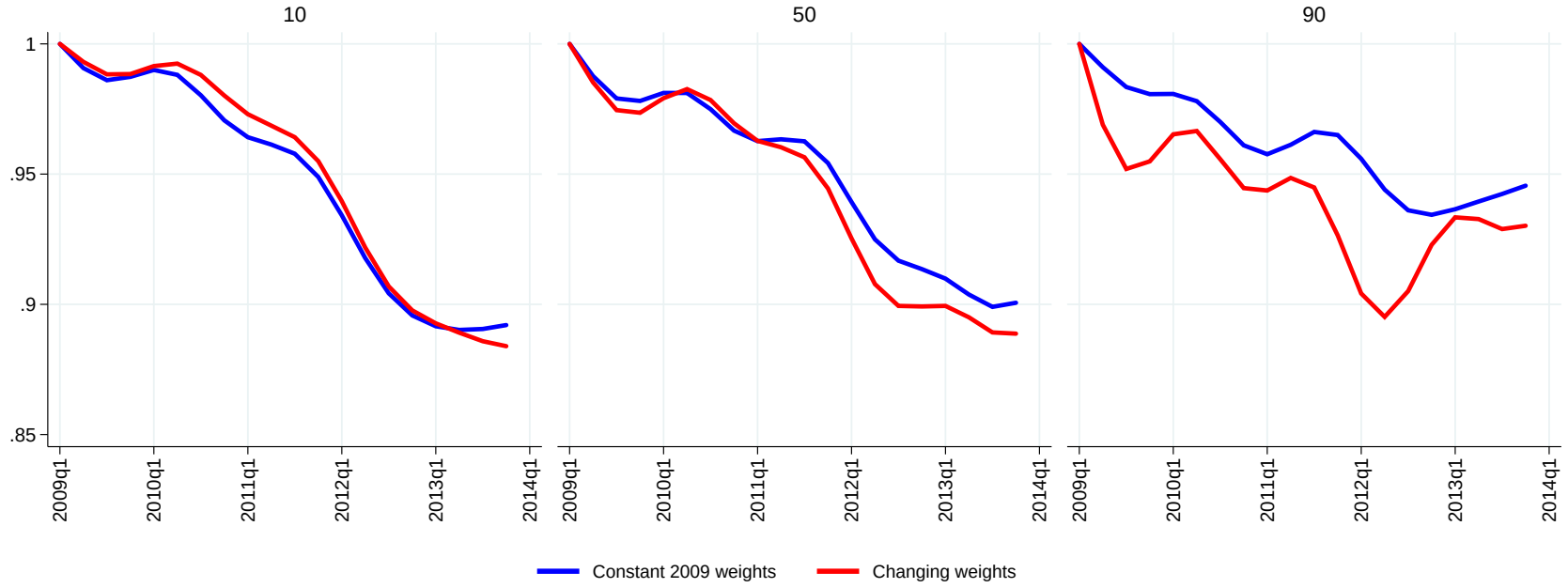
Sectoral labor market tightness is the ratio between sectoral vacancies and jobseekers with past experience in the sector. Sector classification is NACE Rev. 2. C - Manufacturing; F - Construction; G - Trade and repair of motorvehicles; H-J - Transportation, storage, Information and communication; I - Accomodation and food service activities; K - Financial and insurance activities; M-N - Professional, scientific, technical administrative and support service activities; R-S-T - Arts, entertainement and recreation, other service activities. Some sectoral aggreation is required as vacancy data and labor force survey micro data have slightly different classifications.

Figure 10: Real hiring wages



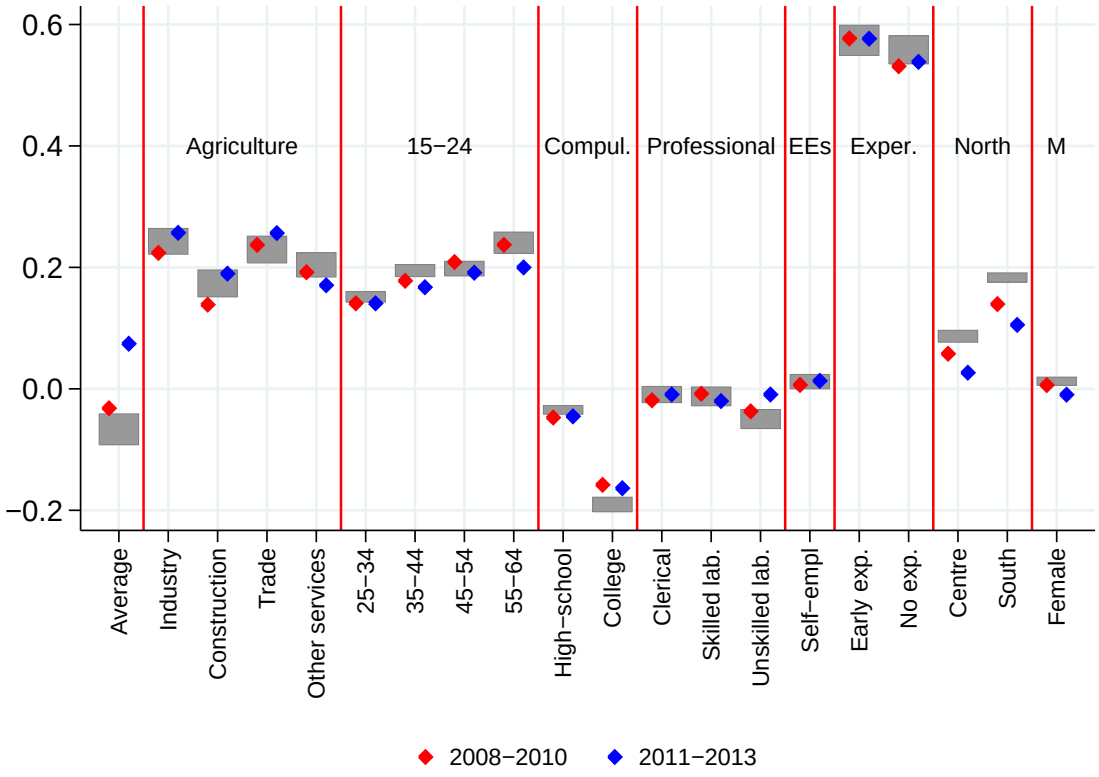
Elaborations on data from the Italian Ministry of Labour, CICO, 2009-2013.

Figure 11: Deciles of real hiring wages



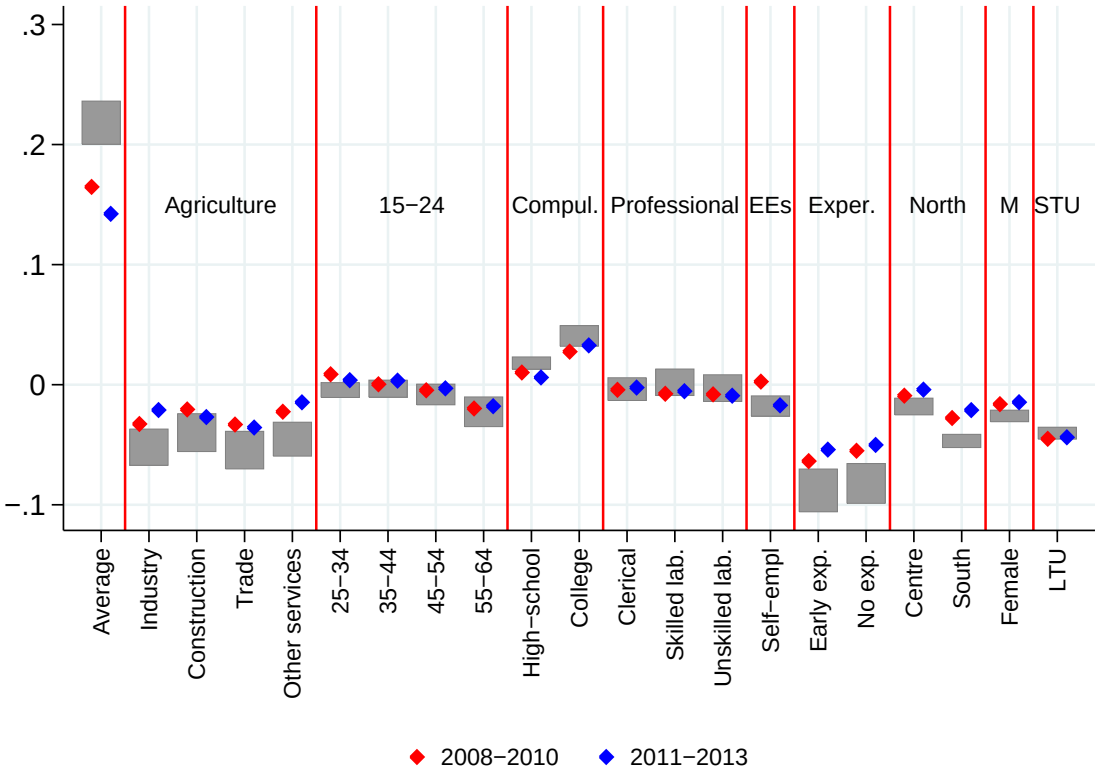
Elaborations on data from the Italian Ministry of Labour, CICO, 2009-2013.

Figure 12: Probability of LTU by professional profiles



Grey bars are 95% confidence intervals for the corresponding coefficient estimated on the pre-crisis sample of quarterly tranistions 2004:1-2007:1; red diamonds are the corresponding point estimates obtained on the post-crisi sample of quarterly transitions 2008:1-2013:2. Reference categories are reported in the figure whenever not obvious.

Figure 13: Probability of re-employment by professional profiles



Grey bars are 95% confidence intervals for the corresponding coefficient estimated on the pre-crisis sample of quarterly tranistions 2004:1-2007:1; red diamonds are the corresponding point estimates obtained on the post-crisi sample of quarterly transitions 2008:1-2013:2. Reference categories are reported in the figure whenever not obvious.

The Added Worker Effect for Married Women in Italy

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(July 2014)

Abstract

In this paper we provide evidence about the existence of a significant Added Worker Effect (AWE) in Italy. By AWE we mean the increase in the labour supply of married women due to their husband's job loss. Since 2009 Italy shows several conditions that should lead to a significant AWE: increasing number of unemployed men, longer unemployment spells, and tight borrowing constraints preventing an easy smoothing of consumption. The Italian labour force survey provides information on the reason for the husband's job loss, therefore we can disentangle transitions associated with low or high income losses without explicit income data. We find that the wife's (yearly) transition probability toward employment increases by 2.1 percentage points when her husband is laid-off; the probability of joining the labour force for an inactive wife increases by 3.5 percentage points. The magnitude of the estimated AWE becomes larger after 2008: this may reflect the larger expected income loss due to the husband's unemployment and it may also suggest that during the crisis the group of men losing their job is more random than in normal time, therefore the group of "treated" women is more skilled and employable (through positive assortative mating). Our estimates suggest that about 8 percent of the increase in the labour force participation of married women observed between 2011 and 2013 may have been caused by the AWE.

1. Introduction

Since the second quarter of 2008 the Italian economy has performed poorly: between 2008 and 2013 the country lost more than 8 percent of its real GDP (Figure 1). The consequences of this prolonged crisis on the labour market have been severe, with a significant worsening since the third quarter of 2011. In particular, 2012 and 2013 were characterized by a significant surge of the unemployment rate: in these two years it has increased by 3.9 percentage points over 2011 and at the end of 2013 it was twice as large as in 2007. The increase in unemployment was associated with a sharp increase in female labour

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force participation: between 2007 and 2013 it went from 50.7 to 53.6 percent. The increase in female labour force participation may be a manifestation of the Added Worker Effect (AWE, henceforth). By AWE we refer to the increase in labour supply of married women due to their husband's job loss. In this paper we estimate the magnitude of the AWE for years 2004-2013, and we also show that it became larger after the crisis started in 2009. Our estimates suggest that about 8 percent of the increase in the labour force participation of married women observed in 2012 and 2013 is due to the AWE. We also provide evidence suggesting that the opposite husband's transition (from unemployment to employment) does not produce symmetric effect on a wife's behaviour. When a husband finds a job the effect on the wife's probability of leaving the labour force is small and statistically insignificant.

Among the OECD countries, Italy shows one of the lowest female labour force participation rates. In 2013 only 53.6 percent of women between 15 and 64 year participated in the labour force. Italy is also characterized by wide regional disparities: in the North the female participation rate is about 62.6 percent, 23.6 percentage points higher than in the South. The participation rate of married women in 2013 was 52.2 percent, a 3 percentage point increase over 2007. This increase is mostly due to the change in participation rates after year 2011. The economic crisis hit married men: in 2013 their unemployment rate was 7.0 percent,[2] against only 2.4 percent in 2007, and the probability of transition from employment to unemployment more than doubled in a few years (Figure 2). In 2007 the probability of an employed married man becoming unemployed within 12 months was 1.5 percent; the same probability between 2012 and 2013 reached 3.8 percent. These factors, the low female participation rate and the large increase in married men unemployment rate, together with the tight borrowing constraints faced by a significant fraction of Italian households, provide indeed conditions for finding a significant AWE. The literature shows mixed results, with some studies finding almost no AWE and other studies finding some AWE. Italy seems to provide a sound setting for the identification of the AWE: if there exists a country where to test the empirical validity of this theoretical implication, this country is Italy.

In this paper we address whether the AWE is a relevant phenomenon for the Italian economy by exploiting retrospective questions provided by the Italian labour force survey. Retrospective questions allow the identification of transitions between labour market states. In particular we study how the wife's probability of joining the labour force and that of becoming employed are influenced by her husband's job loss. We also estimate whether the reverse husband's transition, from unemployment to employment, increases the wife's probability of leaving the labor force. Finally, unlike previous studies on the AWE, we

[2] Married men of age 15-64.

estimate how the full transition matrix between labour market states is affected by the husband's job loss.

The dataset provides information on the reason for the husband's job loss. This information allows us to identify the fully expected job losses and those associated with small income losses. This information is crucial for estimating the AWE for two reasons. The first one is that when the husband's job loss is anticipated, we should not observe significant changes in his wife's behaviour after the husband's transition occurs. That is because she may have acted before the occurrence of the husband's transition. The second reason is that the AWE depends on the magnitude of the income loss. Transitions associated with a small income loss should also not produce significant response by the wife. For instance, when the husband retires the income loss is usually relatively small, whereas when he quits his job for a health reason the income loss is likely to be large.

Unlike most empirical papers dealing with the relevance of the AWE, we exploit a severe recession to make the identification easier. The recession comes handy for essentially for two reasons. The first one relates to the higher number of husband's transitions from employment to unemployment. The second one is related to the fact that the occurrence of the husband's job loss during recessions is more random than in normal times, when the job loss is more likely to hit very selected workers with low productivity. If that's true, it should result in the reduction of the possible downward bias due to the unobserved heterogeneity between the group of women whose husbands experience a job loss and that of those not experiencing a job loss. However, the lack of control for savings may induce an upward bias in our estimates. In fact, if low skilled individuals are less wealthy and have lower savings, their response to their partner's job loss should be larger.

Our results show that the husband's job loss significantly affects both the wife's probability of becoming employed and that of entering the labour force. In particular, the wife's probability of finding a job within a year increases by 2.1 percentage points when the husband is laid off. The probability of joining the labour force, which is less affected by changes in labour demand, significantly increases by 3.5 percentage points. Evidence of significant responses are also found when the husband quits his job for health reasons, even though the relatively small number of occurrences makes difficult to produce precise estimates in all specifications. Even in this case the husband's transition is usually not fully anticipated and it implies a significant income loss as in the case of dismissal. Transitions due to retirement or due to family reasons do not produce a significant change in the wife's behaviour. The estimated AWE before the crisis (years 2004-08) is 1.8 percentage points in terms of transitions toward employment and 2.5 percentage points in terms of labour force participation. During the crisis (years 2009-2013) the AWE increases for both definitions: 2.4

for transitions toward employment, 4.2 for transitions toward labour force participation. Comparing the different areas of the country, we find some differences in the wife's response when we study transition toward employment. The estimated effect in such case is larger in the North, where the labour market is more efficient than in the South. When the family comprises at least one child the wife's probability of transition toward employment (or labour force participation) is significantly lower, witnessing the crucial role of family arrangements for labour market behavior of women in Italy. Finally we show that when a husband finds a job there is not a significant reduction in his wife's attachment to the labour force. Together, the evidence of a significant AWE and that of no symmetric effects when a husband finds a job may imply a permanent increase in female labour force participation in Italy.

Looking at the estimated full transition matrices between labour market states, clear signs of positive assortative mating between spouses emerge. High skilled men with low risk of being laid off are more likely to marry high skilled easily employable women. However, the transition matrices also show that the AWE is particularly relevant for participation in the labour force: the transition probability from unemployment to inactivity is significantly lower when the husband loses his job. More in general, the transition matrices show that, conditional on being laid-off, the transition toward inactivity is much less likely for a wife whose husband lost his job in the same period.

In section 2 we present the relevant related literature. Section 3 contains information on the data used for the analysis and descriptive statistics of the selected sample. In section 4 we discuss the identification strategy. Section 5 shows the results for the AWE and transition matrices between labour market states. Section 6 concludes.

2. Literature

The theoretical framework for studying the increase in a married woman's labour supply in response to her husband's job is provided by an extension of the standard life-cycle model of labour supply with uncertainty (Stephens, 2002). The relevance of the AWE in a life-cycle model crucially depends on the magnitude of the income loss due to the husband's unemployment spell, on the family wealth and on the magnitude of income elasticity of labour supply in the short-run. When the labour market is efficient and unemployment spells are short, a significant response of the wife's labour supply is unlikely to be found since the household can smooth the income loss over the life-cycle. However, in the literature at least two possible mechanisms preventing the smoothing of the income loss have been pointed out. The first and more traditional mechanism is due to inefficiency of the financial market (Lundberg, 1985). If households face tight borrowing constraints, in particular when the

main income recipient loses his labour income, the welfare cost of even short unemployment spells can be high, leading to a significant labour supply response of other household members. The second and more recently highlighted mechanism points out the role of consumption commitments, which magnifies the effect of even small inefficiencies in the financial market (Chetty and Szeidl, 2007). In fact, when a relevant fraction of total household expenditure cannot easily be reduced in the short term (consumption commitments) the welfare cost associated with unemployment is high, leading to larger income elasticity of labour supply than usually found in the literature (Blundell and MaCurdy 1999). The impact of credit constraints and consumption commitments are, however, mitigated by the generosity of unemployment benefits (Cullen and Gruber, 2000). Yet, unemployment benefits are temporary. Hence, even in the presence of rich unemployment benefits, the wife's response may be significant if she expects her husband's unemployment spell to be long. The role of credit constraints on the wife's labour supply have also been studied in a similar context under the "family investment hypothesis" (Cobb-Clark and Crossley, 2004). According to this hypothesis, a wife may join (temporarily) the labour force to allow her husband to invest in human capital. This hypothesis seems to be particularly relevant for immigrants, whose skills are not perfectly transferrable across countries (Baker and Benjamin, 1997).

Formal unemployment benefits in Italy are not very generous: the replacement rate is 40 per cent for a period up to seven months. Moreover, only workers who have been employed for at least 52 weeks in the 2 years before the unemployment spell are eligible for receiving the benefit. However, formal unemployment benefit is not the most common form of assistance to individuals with temporary difficulties. The redundancy fund (*Cassa Integrazione Guadagni*) is currently the main program. It covers workers who are suspended from work (partially or completely) for temporary difficulties of the firm. This program became the main way to support "workless" workers during the economic crisis started in 2008. We use the expression "workless workers" because individuals benefiting from the redundancy fund are actually still formally employed with their last employer, even though they often do not work at all (sometimes the redundancy fund is used to reduce temporarily the hours of work). For a lot of these workers the probability of returning to their job is very low, and their situation is very similar to that of unemployed individuals. The redundancy fund can however last for much longer than the regular unemployment benefit (in special cases even up to five years).

The empirical literature on the AWE presents mixed evidence. On the one hand, some of the studies find negligible impacts of the husband's job loss (Mincer, 1962; Heckman and MaCurdy, 1980 and 1982). However, these studies do not distinguish between

partners who recently experienced job losses and those who are long-term unemployed. Without this distinction it is hard to estimate a pure AWE. More recent work, which uses the husband's actual transitions from employment to unemployment, finds a significant AWE in different countries: USA (Stephens, 2002), Canada (Morissette and Ostrovsky, 2009), Australia (Xiaodong, 2011).

Congregado et al. (2011) study the AWE after the big slump of the Spanish economy, which started in the third quarter of 2009. They exploit aggregate data to find that the AWE dominates the discouraged-worker effect when the unemployment rate is not too high. We try to exploit the recession that hit Italy almost at the same time as Spain. The deep and long recession has increased the incidence of job loss among husbands, which helps us identifying the AWE. Unlike Congregado et al. (2011), we use micro-data, which allows us to account for the other relevant socio-demographic factors affecting a wife's labour supply.

3. Data

The Italian Labour Force Survey (LFS henceforth) is conducted by the National Statistics Office (Istat). Interviews are continuously carried out in every week of the year. The population of interest is household members above age 15. About 70,000 households are interviewed for a total of 125,000 individuals each quarter. The Italian LFS was radically changed at the beginning of the last decade, and the new series started on January 2004. We use 40 quarters of this survey, from January 2004 to December 2013.

According to the rotation scheme of the Italian LFS, individuals stay in the survey for two quarters, skip for one quarter and return for the fourth quarter of their survey year. Therefore the structure of the data permits the study of quarterly and yearly transitions. However, only the full file provides the identifier that allows tracking people through time. With the standard file available to us we can study only yearly transitions by means of retrospective questions. These questions focus mainly on labour force status. This is the main source of information we use, and it allows the analysis of a wife's labour supply response to her husband's job loss. Unfortunately, we can study only responses in terms of the extensive margin and within the one year time window provided by the data. This means that we cannot study responses on the intensive margin, such as the increase of number of hours worked by a wife when her husband is laid off.

Since our interest is the labour supply of married women, the dataset is restricted to married individuals. Pooling together all quarters from 2004 to 2013, we obtain 1,050,000 married couples. Table 1 reports the descriptive statistics for women conditional on

husband's work status. As expected, strong evidence of positive assortative mating emerges (people do not get married randomly). When the husband is employed, 55 percent of women are employed as well, against only 39 percent when the husband is unemployed. The husband's and wife's probability of being unemployed are also positively correlated. Another sign of positive assortative mating emerge looking at wife's education: only 36 percent of women with unemployed husband have more than primary education, against 57 percent for women with employed husbands. The regional distribution of couples with unemployed husband is uneven, with about sixty percent of them living in Southern regions.

The data confirm well-known facts about Italian economy, which is characterized by wide regional differences in terms of income, employment rate, female labour force participation and education.

4. Identification

4.1 Added worker effect

The literature defines the AWE in two ways. The first one defines AWE as the increase in the transition probability from "non-employment" to employment for married women whose husband experienced a recent job loss. By "non-employment" we mean both unemployed and inactive individuals. The second one defines AWE as the increase in the probability of participating in the labour force for inactive women in case of husband's job loss. Joining the labour force means moving from being inactive to employed or unemployed.

In this work we estimate the AWE for both definitions. The first measure of AWE, which studies transitions into employment, is however directly affected by labour demand as well. During recessions, not only are husbands at higher risk of being laid off, but work opportunities for wives are also reduced. Transition from inactivity to activity is on the other hand less affected by labour demand, even though discouragement could also attenuate wife's labour supply response during recessions. However, it should be remarked that to limit the effect of discouragement on our estimates we do not follow the formal definition of unemployment. According to the ILO definition of unemployment adopted in Italy, an individual is statistically considered unemployed if the following conditions hold: i) he is job-less, ii) he states that he wants to work iii) he did active job search in the 4 weeks before the interview, iv) he is willing to start working within two weeks from a job offer. The literature has shown that these conditions tend to underestimate significantly the number of actually unemployed people, since in terms of transitions between labour market states some of the officially inactive people behave very similarly with those counted as unemployed

(Jones and Riddell, 1999; Brandolini et al, 2006). We therefore require only the first two conditions to be met for considering an individual as unemployed. This choice solves a problem that is often discussed in the AWE literature: the discouraged worker effect tends to act in the opposite direction of the AWE and it can lead to significant attenuation of its estimates. Discouraged people are individuals who would like to work, but they are not officially counted in the pool of unemployed since they do not actively search for a job. The Italian LFS permits the identification of both officially unemployed individuals and those who would like to work but who have not performed any active job search in the four weeks before the interview. The main challenge in estimating the impact of the husband's job loss on the wife's labour supply is the construction of a credible counterfactual, namely what would have happened if the husband had not lost his job. If both the factual and counterfactual situations were observable, the AWE would simply be:

$$\gamma = Pr\left(E_i{}^t = 1 \middle| L^t{}_i = 1, E_i^{t-1} = 0\right) - Pr(E_i^t = 1 | L^t{}_i = 0, E_i^{t-1} = 0) \quad [1]$$

Where $E_i{}^t$ is an indicator dummy equal to one when wife *i* works at time *t*, and equal 0 otherwise. $L^t{}_i$ indicates whether her husband experienced a job-loss between *t-1* and *t*. Therefore, γ provides a measure of the AWE, since it captures the difference between the transition probabilities from "non-employment" to employment in case the husband loses his job and in case he does not.

However, we cannot observe both the factual and the counterfactual situation; therefore some identifying assumptions are required. Since the same individual cannot be observed in both states, we adopt the sample of women whose husband did not lose his job to construct the counterfactual needed for estimating the AWE. The validity of this approach relies on the assumption that the conditioning vector *X* of observable characteristics removes systematic differences between the two groups. In effect, we assume that estimates for the AWE are not biased by unobservable characteristics:

$$\gamma = Pr\left(E_i{}^t = 1 \middle| L^t{}_i = 1, E_i^{t-1} = 0, X_i\right) - Pr\left(E_j^t = 1 \middle| L^t{}_j = 0, E_j^{t-1} = 0, X_j\right) \quad [2]$$

where $i \in T$ represents the sample of treated women and $j \in C$ represents the control group (no husband's job loss).

Assuming that [2] holds and provides unbiased estimates of γ, we estimate the wife's transition probability by a *logit* specification. The model can therefore be written as:

$$\Pr(E_i^t = 1) = \frac{e^{z_i^t}}{1+e^{z_i^t}} \quad [3]$$

and

$$Z_i^t = \alpha + L_i^t\beta + X_i^w\theta^w + X_i^h\theta^h + \mu_i + \varepsilon_i$$

where X_i^w and X_i^h represent respectively wife's and husband's characteristics, and μ_i represents region specific year fixed effects.[3] The vector β captures the AWE for each of the reasons for the husband's job loss (retirement, family reasons, dismissal, and health problems). We allow the standard errors to be correlated at the regional level (clustered standard errors).

What are the possible consequences on the estimated AWE of using the group of women whose husband did not lose his job as a control group? Our interpretation is that if unobserved heterogeneity between the two groups is biasing the estimates, it is working toward a downward bias. This is because, through positive assortative mating, the group of women whose husband did not experience a job loss is on average more skilled and more employable than the group of women whose husband did experience a job loss. Therefore, if we were assigning the job loss at random among husbands we would observe a larger average response by wives. However, the lack of controls for household's savings may induce a downward bias in our estimates. In fact, if low skilled individuals have lower savings, according to the theory, their response should be larger, everything else equal.

According to the theory, the AWE is increasing in the size of income loss and on how unexpected the husband's job loss was. In particular, fully anticipated husband's transitions from employment to "non-employment" may produce very little posterior responses, since the action may well take place before the husband loses his job. In order to account for this implication of the theory and for the fact that some transitions are associated with small (if any) income losses, the vector β provides an estimate of the AWE for each reason for the husband's job loss. The Italian LFS provides detailed information on the reason why a working individual at time *t-1* is "non-working" at *t*, when the interview in carried on. The first element of β caputres the effect of husband's retirement between *t-1* and *t*. Retirement is usually a fully anticipated transition. The second element of β captures the effect of the husband's job losses due to family reasons. These also are likely to be quite anticipated, since we can imagine a joint decision between the spouses. Finally, the third and fourth elements of β capture the effect of two types of job losses that usually are less anticipated: dismissal and health problems. Our main focus will be on cases when the husband is dismissed by the employer.

3 For lack of convergence, when we estimate the model on reverse transitions, we keep separate year and region fixed effects.

To estimate what happens to the wife's behavior when her husband finds a job, we follow a similar approach. Adopting a *logit* specification as before, we now estimate how the wife's transition probability from the state active to the state inactive is affected by the occurrence of husband's transition from the state unemployed to the state employed. We also estimate the effect of the husband's transition from "non-employment" (i.e. any state other than employment) to employment, but the results do not change substantially and the wife's response remains insignificant.

4.2 Full transition matrix

The standard approach to the AWE relies on the estimation of the effect of the husband's job-loss on the two transition probabilities discussed above. However, we can imagine that the probability of transition between any two labour market states is affected by the husband's job loss. In this section we estimate the full transition matrix between labour market states for women experiencing, or not, husband's job loss.

The empirical methodology adopted in this section follows previous work that estimated transitions between types of jobs and labour market states for immigrants (Skuterud and Su, 2012) or self-employment dynamics (Kuhn and Schuetze, 2001). In particular, we estimate the effect of husband's job loss on the wife's full transition matrix between labour market states assuming that such dynamics are approximated by a first-order Markov process. This assumption implies that all the relevant dynamics can be represented by a 3x3 matrix, where the labour market states are employment, unemployment and inactivity at time *t-1* and at time *t*. Given our data, the lag between *t-1* and *t* is 12 months. This means that our data do not allow us to identify action that is taking place between *t-1* and *t*. For instance, if the husband loses his job between *t-1* but he finds the new job before *t*, this transition is not captured in the data and in our estimation.

Each element of the transition matrix is estimated by a multinomial logit, restricting the sample to individuals in each of the origin states separately. For instance, to estimate the transitions from employment in *t-1* to all other states in *t*, we restrict the sample to individuals who are employed at *t-1*. To estimate transitions from unemployment and from inactivity we similarly restrict the sample to individuals who happened to be respectively in each of the two states at *t-1*.

The specification of the multinomial *logit* includes a dummy indicating whether the husband lost his job between *t-1* and *t*, a vector of spouse's characteristics, region and year fixed effects. Since the group of women whose husband lost his job shows different average observable characteristics from women whose husband did not lose his job and we are

interested in isolating only the AWE, we construct the transition matrices as follows. We first obtain the marginal effects evaluated at the overall sample mean for each initial state. Then we calculate the value of each element of the two transition matrices adopting the sample means of wives with non-laid off husbands for both groups. We sum the estimated marginal effect of β (evaluated at the mean) to each element of the transition matrix referred to women whose husband lost his job. Therefore, the difference between the transition matrices of the two groups of wives is entirely attributable to the estimated AWE.

5. Results

5.1 Added Worker Effect

We begin by discussing the wife's response to the different types of husband's job loss. We first consider transitions from "non-employment" to employment. Individuals that are non-employed are either unemployed or inactive. Table 2 reports estimated coefficients of the *logit* model [3]. The first column of coefficients refers to transitions from "non-employment" to employment. The second refers to transitions from the state inactive to active. The first coefficient provides an estimate of the AWE when the husband is laid off; the second coefficient refers to cases when the husband stops working for health problems; the third and the fourth coefficients report AWE estimates when the husband retires or when he quits his job for family reasons.

One of the main predictions of the theory is borne out in these estimates. In fact, when the husband's transition from employment to non-employment is anticipated and the income loss is small, the estimated AWE is very small and statistically insignificant. In particular, when the husband retires there is no response in terms of wife's labour supply. Similarly, when the husband stops working for family reasons, the estimated AWE is not significant.

On the other hand, when the husband is laid off we find a significant increase in the wife's transition probability from non-employment to employment. The estimated marginal effect at the mean implies that women whose husband was laid off between *t-1* and *t* are 2.1 percentage points more likely to become employed between *t-1* and *t*.

When the husband quits his job for health reasons, the estimated increase in the wife's probability of becoming employed is about 2.3 percentage points, even though the precision of this estimate is quite low.

The other covariates exhibit the expected signs: the higher the education of the wife, the higher her probability of becoming employed between *t-1* and *t*. The probability of transition is also higher in Northern regions, where the labour market is more efficient. The

magnitude of the response is decreasing in both partners' age. Not immediate is however the interpretation of the role of husband's education. In fact, our results show that the higher the husband's education the less likely the wife's probability of transition toward employment. This may be due to at least two factors: the higher the husband's education, the shorter the expected husband's unemployment spell (small income loss), and the lack of control for the wealth of the family (consumption smoothing is easier for household with high savings). The presence of children in the household reduces the wife's probability of finding a job between *t-1* and *t*. This result confirms that family commitments represent one of the main factors keeping Italian women off the labour market. This evidence is quite strong and it is confirmed in all the other specifications in this work.

We now consider whether the probability of participating in the labour force for inactive women is affected by the husband's job loss. Here we consider the AWE in terms of the transition probability from inactivity to either unemployment or employment.

The second column of Table 2 reports coefficients affecting the wife's probability of transition from "inactive" to "active" for the same four cases as before. Even in this case the wife's transition probability is influenced only by the husband's job losses that entail substantial income losses. In fact, when the husband's transition is due to retirement or family reasons there is no significant response by the wife. When we focus on husbands that have been laid off between *t-1* and *t* or husbands that have quitted their job for health problems, a significant AWE is found. In the first of these two cases, the marginal effect at the mean indicates that the probability for married women to enter the labour force increases by 3.5 percentage points. When the husband's withdraw from the labour market is due to health problems the wife's transition probability increases by 5.3 percentage points.

Table 3 and Table 4 report the estimates for the AWE before the crisis (years 2004-08) and during the crisis (2009-2013). For both definitions of AWE, toward employment and toward labour force participation, the estimated effect is larger during the crisis. The probability of finding a job increases from 1.8 to 2.4 percentage points, whereas the wife's transition probability toward participation increases from 2.5 to 4.2 percentage points. This fact may reflect that the income loss is larger during the crisis, since longer unemployment spells are expected. Moreover, this may be a manifestation of the reduction of the bias: during the crisis, more skilled husbands became unemployed, and through positive assortative mating, this results in a bigger wife's response.

Table 5 and Table 6 show the separate estimates for the North, Centre and South of the country. In all three areas the response to husband's dismissal is positive and statistically

significant. The marginal effects at the mean[4] across areas are very similar when we refer to the wife's probability of joining the labour force. When we focus on transition toward employment, the marginal effect in the North is slightly larger than in the South, reflecting the better quality on the labour market in the North.

So far we have shown that when a husband experiences a job-loss that usually is not fully anticipated and implies a substantial income loss, his wife is more likely to join the labour force. We now discuss what happens in the opposite case. We focus on active women with non-working husbands. In our estimate we distinguish between the case when the husband is unemployed and the case when the husband is simply non-working (this group includes inactive men too). Column 1 of table 3 reports the estimates for the first case (unemployed husbands); column 2 refers to the wider classification of non-working husbands. With both specification, the estimated effect on the wife's transition probability from the state inactive to active is insignificant, and its magnitude is small. This implies that, at least in the short run, active wives whose husbands got a job between *t-1* and *t* are not more likely to leave the labour force compared to wives whose husband did not find a job. This evidence, together with previous results showing the existence of a significant AWE may imply that from this crisis Italy may exit with a structurally higher female labour force participation rate.

5.2 Full Transition Matrix

We now discuss the estimated 3x3 matrices describing the transition probability from any labour market states at *t-1* to any states in *t*, where the time window is one year. Table 8 refers to women whose husband did not lose his job, whereas Table 9 reports the estimated transition probabilities when the husband has lost his job. We should remark that calculating these two tables we keep constant the characteristics of the two groups of women, purging therefore the confounding factors such as the higher average education among women whose husband did not lose his job. For both groups we hold the observable characteristics constant at the first group mean values (those whose husband did not lose his job). Doing so we isolate the AWE.

We now discuss the results comparing the transition probabilities of women at the same state at time *t-1* in the two cases (laid-off or non laid-off husband). Looking at employed women at time *t-1*, the probability of still being employed one year later is higher when the husband is not laid off. This might seem a contradiction with the AWE, but probably it is capturing some correlation between spouses' employment shocks (same local labor market, same industry, etc.). However, conditional on having lost their job, women

[4] Available upon request.

whose husband also lost his job are more likely to stay active. In fact, the probability of going toward unemployment is 7 per cent for those women, 3.3 times the probability of going to inactivity. Looking at women whose husband was not laid-off the estimated probability of going to unemployment is 2.5 percent, only 1.6 times as large as the probability of going to inactivity.

Even stronger evidence of the AWE emerge when we focus on women that are unemployed at *t-1*. The probability of going toward inactivity is much lower for those women whose husband did lose his job (5.9 percent against 9.2 percent). Again the AWE seems to act in terms of labor force participation, whereas if we look at transitions to employment the first group displays marginally larger probability. This is probably due to matching between high productivity individuals.

When we consider inactive women at *t-1*, the effect of husband's dismissal positively affects both the probability of moving to employment and to unemployment. In this case, where unobservable differences among the two groups of women are presumably less important, the AWE is found both in terms of transition toward employment and in terms of transition toward unemployment (active participation into the labour market).

Pooling together all years from 2004 to 2012 we are implicitly assuming that the Markov chain is time-homogeneous. This means that each entry of the matrix is time independent. This assumption might appear problematic, since the last four years have been characterized by a prolonged recession. However, between estimates for years before the crisis (2004-2008) and years after (2009-2012), the transition matrix changes only marginally. The main difference is found looking at women that are unemployed at *t-1*. In years 2009-2012 the probability of finding a job for unemployed women whose husband did not lose his job is lower the in the first 5 years under analysis (2004-2008), as expected given the poor performance if the Italian economy performance after the second half of 2008. Nevertheless, the probability of finding a job for unemployed women whose husband lost his job increases after 2008. In bad times the expected unemployment spell of the husband is longer, leading to a larger expected income loss. This can induce a reduction of wife's reservation wage and an increase of her search effort. Together these two responses may explain an increase of the transition probability from unemployment to employment even when labour demand is weak.

6. Conclusion

We study the labour supply response of married women to their husband's job loss. Exploiting retrospective questions of the Italian labour force survey, we identify transitions between labour market states in a 12-month time window both for the husband and for the wife. This explicitly allows the identification of the short-run response of the wife's labour supply to her husband's job loss. The study covers years 2004-2013. Starting from 2008, the performance of the Italian economy was negative, and about 8 percent of national GDP was lost in these 6 years. The labour market reflects the negative performance of the economy, with a sharp increase in unemployment and in the transition probability from employment to unemployment. For married men, this probability more than doubled between 2007 and 2013. This provides sound conditions for estimating the AWE.

Consistent with the theoretical framework for the AWE, we find that only the usually unexpected husband's job losses associated with high income losses produce a significant change in the wife's labour force behaviour. In fact, when the husband retires or quits for family reasons (transitions that are usually expected and implying low income loss), no significant effect is found, either before 2008 or after the economic crisis began. Conversely, when the husband is laid-off or he stops working for health related reasons, the wife's response is positive and significant. We find a positive effect both on the wife's transition probability from non-employment to employment and from the state inactive to active. Comparing the pre-crisis period (2004-08) and the "crisis" (2009-13), it emerges that the estimated AWE in response to the husband's dismissal is significantly larger during the crisis. This may reflect that the income loss due to the husband's dismissal is larger during the crisis, when unemployment spells became longer. Applying our estimates to the observed aggregate data, they suggest that about 8 per cent of the observed changes in the number of active married women between 2011 and 2013 may have been caused by the AWE.

Comparing the North, Centre and South of the country, we find some difference in the magnitude of the response studying only transitions toward employment, whereas transitions in terms of labour force participation are not very different among areas. This seems to reflect the different quality of the labour market and it suggests that there is not clear evidence that the willingness to work is different between North and South. This result also reflects our choice to define as unemployed a larger pool of individuals than just those officially defined as unemployed. The discouraged worker effect is a much more severe problem in the South, where people tend to do less job search than in the North.

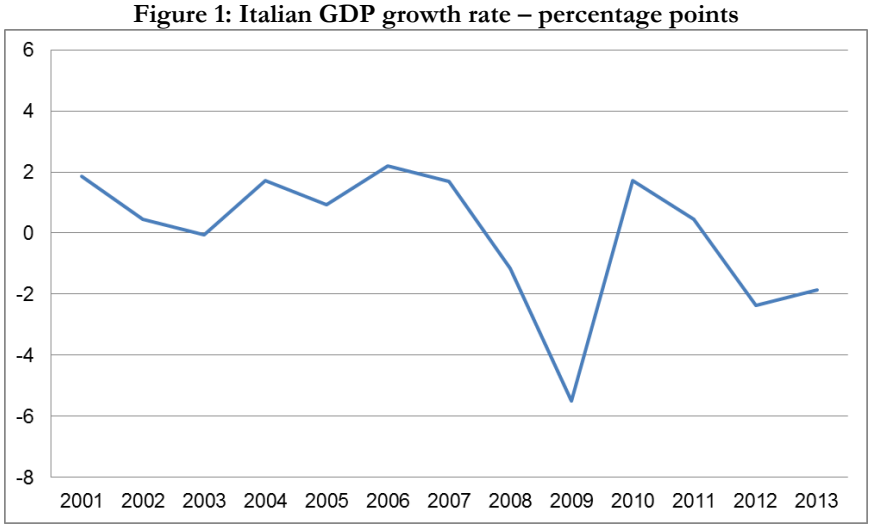
In addition to estimating the AWE in the traditional manner proposed by the literature, we also estimate the effect of the husband's job loss on the full transition matrix between labour market states of the wife. We find that AWE is particularly relevant in terms

of labour force participation, since the husband's job loss clearly reduces the wife's transition probability from unemployment to inactivity. Clear evidence of positive assortative mating emerges as well.

Finally, we test whether active women whose husband finds a job are more likely to leave the labour force. Our estimates show that the effect of such transition by the husband on his wife's behaviour is small in magnitude and statistically insignificant. Therefore, this result together with the evidence of a significant AWE may imply a structurally higher female labour force participation rate after the crisis. Among several negative long lasting effects of the crisis on the Italian economy, our evidence suggests a possible positive gift.

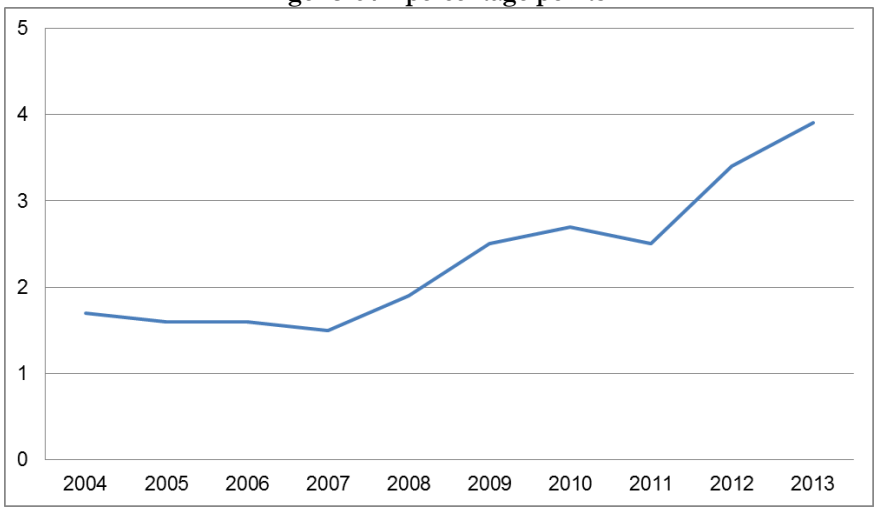
Figures and Tables

Figure 1: Italian GDP growth rate – percentage points



Source: OECD data

Figure 2: Unconditional transition probability from employment to unemployment for married men Age 15-64 – percentage points



Source: Italian labour force survey

Table 1: Descriptive wife's characteristics conditional on husband's employment status

	Employed husband		Unemployed husband		Inactive husband	
Employment status		**St. Err.**		**St. Err.**		**St. Err.**
Employed	0.55	(0.0009)	0.39	(0.0049)	0.29	(0.0015)
Unemployed	0.04	(0.0003)	0.14	(0.0033)	0.01	(0.0004)
Inactive	0.41	(0.0009)	0.48	(0.0049)	0.69	(0.0016)
Education						
Primary	0.43	(0.0009)	0.64	(0.0047)	0.71	(0.0015)
High-school	0.43	(0.0009)	0.30	(0.0045)	0.24	(0.0014)
Univeristy	0.14	(0.0006)	0.06	(0.0024)	0.05	(0.0007)
Household size	3.47	(0.0016)	3.53	(0.0096)	3.10	(0.0032)
Kid 0-5	0.27	(0.0009)	0.28	(0.0045)	0.05	(0.0008)
Kid 6-14	0.37	(0.0009)	0.39	(0.0048)	0.10	(0.0010)
Age						
15-24	0.01	(0.0002)	0.02	(0.0016)	0.00	(0.0002)
25-34	0.21	(0.0008)	0.25	(0.0045)	0.04	(0.0007)
35-44	0.39	(0.0009)	0.37	(0.0048)	0.09	(0.0009)
45-54	0.30	(0.0008)	0.28	(0.0043)	0.31	(0.0016)
55-64	0.08	(0.0004)	0.08	(0.0024)	0.55	(0.0017)
Area						
North	0.46	(0.0009)	0.25	(0.0044)	0.43	(0.0017)
Centre	0.19	(0.0008)	0.14	(0.0040)	0.17	(0.0014)
South	0.34	(0.0008)	0.60	(0.0051)	0.40	(0.0016)

Source: Italian labour force survey – 2004-2012

Table 2: AWE – Wife's transition probabilities.

	Transition from non-employment to employment	Transition from the state inactive to the state active
Reason for the husband's job loss		
Dismissal	0.446***	0.691***
	(0.0533)	(0.0393)
Health problem	0.475	0.936***
	(0.291)	(0.254)
Retirement	-0.0806	0.0348
	(0.118)	(0.134)
Other family reasons	0.533	0.646
	(0.429)	(0.556)
Wife's education		
Less than high school	Omitted	Omitted
High school diploma	0.481***	0.378***
	(0.0427)	(0.0354)
University degree	1.119***	0.971***
	(0.0894)	(0.0754)
Husband's education		
Less than high school	0.0720	0.160***
	(0.0540)	(0.0563)
High school diploma	0.148***	0.219***
	(0.0358)	(0.0490)
University degree	Omitted	Omitted
Couple with children	-0.372***	-0.148***
	(0.0525)	(0.0420)
Wife's age		
15-19	2.204***	2.902***
	(0.632)	(0.389)
20-24	2.049***	2.338***
	(0.314)	(0.261)
25-29	2.451***	2.472***
	(0.240)	(0.205)
30-34	2.571***	2.518***
	(0.215)	(0.199)
35-59	2.605***	2.493***
	(0.193)	(0.192)
40-44	2.456***	2.349***
	(0.200)	(0.193)
45-49	2.256***	2.084***
	(0.169)	(0.175)
50-54	1.875***	1.678***
	(0.154)	(0.158)
55-59	1.107***	0.926***
	(0.208)	(0.192)
60-64	Omitted	Omitted
Husband's age		
20-24	1.256***	0.771***
	(0.326)	(0.288)
25-29	0.770***	0.490***
	(0.233)	(0.175)
30-34	0.679***	0.490***
	(0.206)	(0.164)
35-59	0.532***	0.363***
	(0.179)	(0.131)
40-44	0.412***	0.279**
	(0.142)	(0.130)
45-49	0.281**	0.144
	(0.128)	(0.119)
50-54	0.101	0.0187
	(0.111)	(0.0946)
55-59	0.00928	-0.0862
	(0.0976)	(0.0997)

60-64	Omitted	Omitted
Husband's industry at *t-1*		
Agriculture	0.0906	0.0505
	(0.0881)	(0.0461)
Mining and Oil	-0.192**	-0.174***
	(0.0918)	(0.0532)
Manufacturing	-0.108*	-0.0955**
	(0.0655)	(0.0412)
Construction	-0.221**	-0.142**
	(0.0889)	(0.0580)
Commercial services	-0.0942	-0.0560
	(0.0577)	(0.0536)
Tourism	-0.00946	-0.0318
	(0.0467)	(0.0964)
Transp. and telecomm.	-0.104	-0.0772
	(0.0885)	(0.0747)
Finance	-0.138**	-0.0635
	(0.0636)	(0.0688)
Professional services	-0.0875	-0.0398
	(0.0667)	(0.0723)
PA & defense	-0.219***	-0.0859
	(0.0767)	(0.0595)
Education and health	-0.0443	0.0333
	(0.102)	(0.0844)
Other services	Omitted	Omitted
Region specific year fixed effects	Y	Y
Constant	-5.884***	-5.463***
	(0.232)	(0.209)
Observations	365000	296900

Clustered standard errors in parentheses (by region) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: AWE – Wife's transition toward employment before and during the crisis

	Transition from non-employment to employment 2004-2008	Transition from non-employment to employment 2009-2013
Reason for the husband's job loss		
Dismissal	0.406***	0.491***
	(0.0825)	(0.0698)
Health problem	0.723**	0.00354
	(0.321)	(0.532)
Retirement	-0.237	0.133
	(0.182)	(0.153)
Other family reasons	0.486	0.630
	(0.630)	(0.741)
Wife's education		
Less than high school	Omitted	Omitted
High school diploma	0.473***	0.482***
	(0.0560)	(0.0424)
University degree	1.106***	1.127***
	(0.0936)	(0.0993)
Husband's education		
Less than high school	0.142	0.0119
	(0.0862)	(0.0492)
High school diploma	0.216***	0.0788
	(0.0548)	(0.0511)
University degree	Omitted	Omitted
Couple with children	-0.404***	-0.327***
	(0.0587)	(0.0523)
Wife's age		
15-19	2.389**	2.130***
	(0.974)	(0.781)
20-24	2.585***	1.600***
	(0.396)	(0.413)
25-29	2.943***	2.031***
	(0.387)	(0.380)
30-34	2.953***	2.291***
	(0.409)	(0.325)
35-59	2.957***	2.358***
	(0.414)	(0.296)
40-44	2.761***	2.251***
	(0.412)	(0.312)
45-49	2.570***	2.036***
	(0.423)	(0.274)
50-54	2.089***	1.738***
	(0.375)	(0.284)
55-59	1.008***	1.220***
	(0.385)	(0.295)
60-64	Omitted	Omitted
Husband's age		
20-24	1.356***	1.139**
	(0.272)	(0.490)
25-29	0.597***	0.945***
	(0.189)	(0.308)
30-34	0.615***	0.723***
	(0.177)	(0.260)
35-59	0.481***	0.571**
	(0.159)	(0.237)
40-44	0.331**	0.488**
	(0.137)	(0.206)
45-49	0.204	0.357**
	(0.133)	(0.176)
50-54	-0.0504	0.248
	(0.121)	(0.173)
55-59	-0.0705	0.0974
	(0.114)	(0.162)

60-64	Omitted	Omitted
Husband's industry at *t-1*		
Agriculture	-0.0719	0.272***
	(0.115)	(0.100)
Mining and Oil	-0.388***	-0.0401
	(0.0916)	(0.126)
Manufacturing	-0.180**	-0.0500
	(0.0728)	(0.0947)
Construction	-0.482***	0.0490
	(0.105)	(0.111)
Commercial services	-0.206***	0.0206
	(0.0735)	(0.113)
Tourism	-0.116	0.113
	(0.0916)	(0.103)
Transp. and telecomm.	-0.258***	0.0876
	(0.0888)	(0.134)
Finance	-0.239**	-0.0223
	(0.102)	(0.0799)
Professional services	-0.241**	0.0885
	(0.105)	(0.0980)
PA & defense	-0.331***	-0.0936
	(0.0670)	(0.117)
Education and health	-0.0825	0.0110
	(0.106)	(0.143)
Other services	Omitted	Omitted
Region specific year fixed effects	Y	Y
Constant	-5.871***	-5.827***
	(0.421)	(0.196)
Observations	201448	163552

Clustered standard errors in parentheses (by region) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: AWE – Wife's transition toward activity before and during the crisis

	Transition from the state inactive to active 2004-2008	Transition from the state inactive to active 2009-2013
Reason for the husband's job loss		
Dismissal	0.609***	0.726***
	(0.0934)	(0.0561)
Health problem	1.217***	0.520
	(0.270)	(0.586)
Retirement	-0.403	0.365
	(0.354)	(0.426)
Other family reasons	0.292	1.412
	(0.526)	(0.996)
Wife's education		
Less than high school	Omitted	Omitted
High school diploma	0.440***	0.311***
	(0.0435)	(0.0575)
University degree	1.128***	0.841***
	(0.0856)	(0.0892)
Husband's education		
Less than high school	0.176*	0.135***
	(0.0954)	(0.0504)
High school diploma	0.241***	0.184***
	(0.0887)	(0.0464)
University degree	Omitted	Omitted
Couple with children	-0.231***	-0.0506
	(0.0654)	(0.0437)
Wife's age		
15-19	3.569***	2.375***
	(0.491)	(0.379)
20-24	3.090***	1.756***
	(0.360)	(0.303)
25-29	3.036***	2.094***
	(0.362)	(0.237)
30-34	2.989***	2.228***
	(0.382)	(0.225)
35-59	2.859***	2.312***
	(0.386)	(0.208)
40-44	2.744***	2.135***
	(0.377)	(0.225)
45-49	2.432***	1.905***
	(0.391)	(0.200)
50-54	1.847***	1.607***
	(0.340)	(0.209)
55-59	0.995***	0.931***
	(0.307)	(0.242)
60-64	Omitted	Omitted
Husband's age		
20-24	0.829***	0.619**
	(0.280)	(0.312)
25-29	0.326**	0.662***
	(0.165)	(0.215)
30-34	0.451***	0.535**
	(0.171)	(0.225)
35-59	0.373***	0.374**
	(0.138)	(0.162)
40-44	0.362**	0.221
	(0.150)	(0.163)
45-49	0.171	0.140
	(0.145)	(0.138)
50-54	-0.00998	0.0638
	(0.111)	(0.126)
55-59	-0.0902	-0.0538
	(0.152)	(0.123)

60-64	Omitted	Omitted
Husband's industry at *t-1*		
Agriculture	-0.0553 (0.0806)	0.131* (0.0769)
Mining and Oil	-0.0826 (0.159)	-0.223** (0.0872)
Manufacturing	-0.0381 (0.0712)	-0.153 (0.102)
Construction	-0.166** (0.0787)	-0.115 (0.0969)
Commercial services	0.0201 (0.0567)	-0.154 (0.143)
Tourism	0.121 (0.115)	-0.161 (0.128)
Transp. and telecomm.	0.0339 (0.0951)	-0.225 (0.145)
Finance	0.0581 (0.0794)	-0.219*** (0.0824)
Professional services	-0.122 (0.118)	0.0157 (0.123)
PA & defense	0.0215 (0.0832)	-0.202* (0.111)
Education and health	0.175* (0.0940)	-0.127 (0.124)
Other services	Omitted	Omitted
Region specific year fixed effects	Y	Y
Constant	-6.168*** (0.356)	-5.060*** (0.205)
Observations	165989	130911

Clustered standard errors in parentheses (by region) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: AWE – Wife's transition toward employment across areas

	Transition from non-employment to employment North	Transition from non-employment to employment Center	Transition from non-employment to employment South
Reason for the husband's job loss			
Dismissal	0.419***	0.341***	0.536***
	(0.110)	(0.0735)	(0.0760)
Health problem	0.0913	1.359***	0.0669
	(0.418)	(0.276)	(0.529)
Retirement	-0.170	0.239	-0.0956
	(0.127)	(0.206)	(0.252)
Other family reasons	1.212*	0.409	-0.249
	(0.671)	(0.468)	(0.702)
Wife's education			
Less than high school	Omitted	Omitted	Omitted
High school diploma	0.553***	0.385***	0.477***
	(0.0174)	(0.138)	(0.0728)
University degree	0.957***	0.922***	1.546***
	(0.0591)	(0.0307)	(0.0955)
Husband's education			
Less than high school	0.137***	0.134**	-0.101
	(0.0510)	(0.0681)	(0.0935)
High school diploma	0.152***	0.216***	0.0584
	(0.0302)	(0.0271)	(0.0874)
University degree	Omitted	Omitted	Omitted
Couple with children	-0.439***	-0.302***	-0.315***
	(0.0758)	(0.0832)	(0.0731)
Wife's age			
15-19	1.840**	1.624	3.226***
	(0.851)	(1.440)	(0.589)
20-24	1.719***	1.448***	3.016***
	(0.407)	(0.328)	(0.358)
25-29	2.260***	2.097***	2.968***
	(0.345)	(0.390)	(0.246)
30-34	2.507***	2.070***	2.920***
	(0.299)	(0.395)	(0.230)
35-59	2.583***	2.174***	2.819***
	(0.265)	(0.387)	(0.249)
40-44	2.427***	2.029***	2.662***
	(0.292)	(0.362)	(0.204)
45-49	2.297***	1.872***	2.325***
	(0.234)	(0.321)	(0.207)
50-54	1.719***	1.607***	2.180***
	(0.178)	(0.294)	(0.226)
55-59	0.787***	0.798**	1.755***
	(0.228)	(0.362)	(0.225)
60-64	Omitted	Omitted	Omitted
Husband's age			
20-24	2.037***	-0.0597	-0.125
	(0.222)	(1.228)	(0.493)
25-29	1.098***	1.219**	0.0317
	0.951***	1.161**	0.0757
	(0.219)	(0.454)	(0.175)
30-34	0.664***	1.059*	0.124
	(0.175)	(0.558)	(0.156)
35-59	0.490***	0.850*	0.156
	(0.136)	(0.495)	(0.137)
40-44	0.305*	0.698*	0.136
	(0.156)	(0.412)	(0.122)
45-49	0.0857	0.470	0.0612
	(0.142)	(0.394)	(0.0893)
50-54	0.00239	0.276	-0.00765
	(0.139)	(0.365)	(0.0892)

55-59	-0.208**	-0.111	0.325***
	(0.0881)	(0.185)	(0.0727)
60-64	Omitted	Omitted	Omitted
Husband's industry at *t-1*			
Agriculture	-0.208**	-0.111	0.325***
	(0.0881)	(0.185)	(0.0727)
Mining and Oil	-0.204	-0.0773	-0.280***
	(0.206)	(0.190)	(0.0617)
Manufacturing	-0.120	-0.132	-0.0878
	(0.161)	(0.144)	(0.0705)
Construction	-0.187	-0.356***	-0.216**
	(0.204)	(0.123)	(0.102)
Commercial services	-0.0680	-0.219*	-0.0574
	(0.140)	(0.114)	(0.0513)
Tourism	-0.0114	-0.0321	-0.00367
	(0.124)	(0.0782)	(0.0405)
Transp. and telecomm.	-0.105	-0.0169	-0.233***
	(0.211)	(0.0733)	(0.0829)
Finance	-0.0329	-0.297***	-0.240**
	(0.119)	(0.0888)	(0.107)
Professional services	-0.0446	-0.277***	-0.0583
	(0.155)	(0.0308)	(0.0676)
PA & defense	-0.109	-0.267***	-0.322***
	(0.190)	(0.0190)	(0.0839)
Education and health	-0.0576	-0.0432	-0.110
	(0.262)	(0.118)	(0.107)
Other services	Omitted	Omitted	Omitted
Region specific year fixed effects	Y	Y	Y
Constant	-5.488***	-5.883***	-5.656***
	(0.439)	(0.108)	(0.300)
Observations	130966	49403	184631

Clustered standard errors in parentheses (by region) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: AWE – Wife's transition toward activity across areas

	Transition from the state inactive to active North	Transition from the state inactive to active Center	Transition from the state inactive to active South
Reason for the husband's job loss			
Dismissal	0.566***	0.819***	0.729***
	(0.0989)	(0.0731)	(0.0335)
Health problem	1.057***	1.569**	0.534*
	(0.337)	(0.687)	(0.279)
Retirement	-0.187**	0.390*	0.0803
	(0.0876)	(0.201)	(0.324)
Other family reasons	0.698	-0.356	1.008
	(0.741)	(1.201)	(0.874)
Wife's education			
Less than high school	Omitted	Omitted	Omitted
High school diploma	0.385***	0.293**	0.424***
	(0.0257)	(0.128)	(0.0307)
University degree	0.825***	0.805***	1.338***
	(0.0570)	(0.0209)	(0.0570)
Husband's education			
Less than high school	0.221***	0.0700	0.105*
	(0.0820)	(0.0915)	(0.0574)
High school diploma	0.290***	0.155**	0.144***
	(0.0629)	(0.0728)	(0.0444)
University degree	Omitted	Omitted	Omitted
Couple with children	-0.273***	-0.0636	-0.0255
	(0.0289)	(0.0498)	(0.0422)
Wife's age			
15-19	2.912***	1.147	3.356***
	(0.431)	(1.238)	(0.509)
20-24	2.123***	1.703***	3.012***
	(0.384)	(0.328)	(0.178)
25-29	2.332***	2.258***	2.858***
	(0.340)	(0.319)	(0.211)
30-34	2.434***	2.172***	2.873***
	(0.314)	(0.427)	(0.212)
35-59	2.461***	2.186***	2.770***
	(0.296)	(0.465)	(0.230)
40-44	2.266***	2.054***	2.654***
	(0.311)	(0.427)	(0.184)
45-49	2.097***	1.732***	2.327***
	(0.285)	(0.292)	(0.194)
50-54	1.574***	1.406***	2.003***
	(0.213)	(0.353)	(0.179)
55-59	0.712***	0.629**	1.437***
	(0.262)	(0.248)	(0.193)
60-64	Omitted	Omitted	Omitted
Husband's age			
20-24	1.008**	1.927***	0.0669
	(0.428)	(0.689)	(0.335)
25-29	0.721***	0.713	0.140
	(0.198)	(0.703)	(0.144)
30-34	0.681***	0.922	0.123
	(0.136)	(0.590)	(0.171)
35-59	0.466***	0.653	0.161
	(0.138)	(0.574)	(0.135)
40-44	0.434***	0.463	0.0872
	(0.152)	(0.588)	(0.157)
45-49	0.147	0.465	0.0393
	(0.156)	(0.499)	(0.120)
50-54	0.0758	0.257	-0.0869
	(0.145)	(0.397)	(0.0689)

55-59	0.0294	0.0407	-0.199***
	(0.206)	(0.318)	(0.0268)
60-64	Omitted	Omitted	Omitted
Husband's industry at *t-1*			
Agriculture	-0.0250	0.0942	0.0781
	(0.108)	(0.0614)	(0.0563)
Mining and Oil	-0.173*	-0.146**	-0.135
	(0.105)	(0.0615)	(0.0890)
Manufacturing	-0.0179	-0.108	-0.125**
	(0.0852)	(0.0661)	(0.0559)
Construction	-0.0181	-0.191**	-0.213***
	(0.0960)	(0.0918)	(0.0659)
Commercial services	0.0462	-0.143	-0.0829**
	(0.0711)	(0.198)	(0.0417)
Tourism	0.135	0.00884	-0.190
	(0.136)	(0.115)	(0.170)
Transp. and telecomm.	0.106	-0.151***	-0.209**
	(0.110)	(0.0413)	(0.0891)
Finance	0.116	-0.291***	-0.105
	(0.127)	(0.0236)	(0.0836)
Professional services	0.104	-0.207***	-0.0812
	(0.147)	(0.0310)	(0.0668)
PA & defense	0.114	-0.173***	-0.172**
	(0.102)	(0.0623)	(0.0704)
Education and health	0.167	-0.234***	0.00220
	(0.108)	(0.0830)	(0.127)
Other services	Omitted	Omitted	Omitted
Region specific year fixed effects	Y	Y	Y
Constant	-5.462***	-5.186***	-5.408***
	(0.372)	(0.268)	(0.195)
Observations	109467	39682	147751

Clustered standard errors in parentheses (by region) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: AWE – Wife's transition probabilities from the state active to the state inactive

	Husband's transition from unemployment to employment	Husband's transition from any state other than employment to employment
Occurrence of the husband's transition	0.0137	0.0321
	(0.0406)	(0.0396)
Wife's education		
Less than high school	Omitted	Omitted
High school diploma	-0.678***	-0.777***
	(0.0539)	(0.0478)
University degree	-1.136***	-1.172***
	(0.101)	(0.0943)
Husband's education		
Less than high school	0.161	0.197
	(0.123)	(0.128)
High school diploma	-0.103	-0.0889
	(0.114)	(0.0906)
University degree	Omitted	Omitted
Couple with children	0.0374	-0.0540
	(0.0340)	(0.0401)
Wife's age		
15-19	2.655**	2.187*
	(1.164)	(1.193)
20-24	0.437*	0.0728
	(0.242)	(0.229)
25-29	0.255	-0.101
	(0.227)	(0.213)
30-34	-0.0448	-0.417**
	(0.215)	(0.185)
35-59	-0.309	-0.661***
	(0.210)	(0.169)
40-44	-0.541***	-0.883***
	(0.199)	(0.175)
45-49	-0.738***	-1.199***
	(0.229)	(0.193)
50-54	-0.787***	-1.312***
	(0.228)	(0.163)
55-59	-0.555***	-0.913***
	(0.158)	(0.0766)
60-64	Omitted	Omitted
Husband's age		
20-24	0.412	0.660***
	(0.261)	(0.235)
25-29	-0.182	0.0771
	(0.164)	(0.151)
30-34	-0.176	0.146
	(0.155)	(0.133)
35-59	-0.217*	0.0624
	(0.131)	(0.118)
40-44	-0.176	0.111
	(0.119)	(0.0907)
45-49	-0.114	0.143*
	(0.125)	(0.0813)
50-54	-0.0192	0.197***
	(0.123)	(0.0536)
55-59	0.0647	0.115**
	(0.106)	(0.0460)
60-64	Omitted	Omitted
Region fixed effects	Y	Y
Year fixed effects	Y	Y
Constant	-0.805**	-0.730**
	(0.327)	(0.292)

Observations	36598	91335

Clustered standard errors in parentheses (by region) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Conditional transition probabilities – Non laid off husbands

	Employed (t)	Unemployed (t)	Inactive (t)
Employed (t-1)	0.959	0.025	0.016
	(0.265)	(0.0162)	(0.0116)
Unemployed (t-1)	0.198	0.710	0.092
	(0.0864)	(0.0866)	(0.0391)
Inactive (t-1)	0.024	0.026	0.950
	(0.0191)	(0.0192)	(0.0355)

Transition probabilities are predictions from three separate multinomial logit regressions (one for each origin state). Standard errors in parenthesis

Table 9: Conditional transition probabilities – Laid off husbands

	Employed (t)	Unemployed (t)	Inactive (t)
Employed (t-1)	0.909***	0.070***	0.021***
Unemployed (t-1)	0.182*	0.759**	0.059***
Inactive (t-1)	0.034**	0.060***	0.906***

Transition probabilities are predictions from three separate multinomial logit regressions (one for each origin state). All predictions are made at mean values of the covariates for women whose husband did not lose his job. The transition probabilities of wives whose husband lost his job differ from those referred to wives with non-laid off husbands only by the estimated AWE (marginal effect of the AWE dummy). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ refer to the estimated coefficient of the AWE dummy.

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E' aumentata la flessibilità nominale negli ultimi anni?
Evidenze per l'Italia sui prezzi al consumo

a cura di

Silvia Fabiani e Mario Porqueddu

1 Introduzione e principali conclusioni

Le caratteristiche e l'evoluzione del meccanismo di formazione e aggiustamento dei prezzi hanno importanti implicazioni macroeconomiche, in particolare in relazione agli effetti delle fluttuazioni cicliche, all'andamento dei tassi di cambio reali e la politica monetaria ottimale. Rispetto all'evidenza relativamente scarsa descritta da Taylor circa quindici anni fa (Taylor, 1999) la letteratura empirica sul comportamento dei prezzi a livello micro si è arricchita notevolmente, grazie soprattutto alla disponibilità di ampi dataset di dati elementari di prezzo (quotazioni individuali rilevate per il calcolo degli indici dei prezzi al consumo e alla produzione, scanner data, ecc). Bils e Klenow (2004), Dhyne et al (2006), Nakamura e Steinsson (2008), Berardi, Gautier e Le Bihan (2013) sono solo alcuni dei numerosi studi che negli ultimi anni hanno documentato il grado di rigidità nominale attraverso l'analisi del meccanismo di formazione e aggiustamento dei prezzi. In particolare, Dhyne et al (2006) sintetizzano i risultati ottenuti nel contesto di un ampio progetto di ricerca condotto dall'Eurosistema all'inizio degli anni 2000 (Inflation Persistence Network, IPN). Tali risultati, relativi ai prezzi al consumo in diversi paesi dell'area dell'euro, sono basati sull'analisi di un dataset di rilevazioni mensili di prezzo, dal 1996 al 2001, di un campione armonizzato di beni e servizi che compongono il paniere dell'indice dei prezzi al consumo. Ne emerge un grado di rigidità nominale, misurato da frequenza, dimensione e direzione degli aggiustamenti dei prezzi, ampiamente eterogeneo tra prodotti: nel complesso dell'area, la frequenza media di variazione dei prezzi nel periodo in esame varia dal 5,6 per cento per i servizi al 28,3 per gli alimentari freschi, al 78 per cento per i beni energetici. Anche tra paesi si riscontra una dispersione significativa; l'Italia si colloca sull'estremo superiore: solo il 10 per cento dei prodotti registrano ogni mese una variazione di prezzo, contro il 15 del complesso dell'area dell'euro[1]. L'evidenza sui dati micro dei prezzi al consumo relativa al nostro paese, nell'ambito dell'IPN, deriva dallo studio di Fabiani et al. (2006).[2]

Vi sono stati cambiamenti nel meccanismo di formazione e aggiustamento dei prezzi in Italia negli anni successivi a quelli esaminati nell'IPN? In particolare, in un contesto di prolungata stagnazione economica e in presenza di due profonde fasi recessive che hanno depresso il livello dei consumi su livelli storicamente bassi, è aumentato il grado di flessibilità nominale, anche verso il basso,? Questo lavoro si propone di fornire una risposta a tali domande analizzando, come nell'IPN, le quotazioni delle voci elementari di beni e servizi rilevate mensilmente dall'Istat per il calcolo dell'indice dei prezzi al consumo (NIC).[3] Come nella menzionata letteratura empirica

1 Alvarez e Hernando (2007) mostrano che i prezzi tendono a essere più rigidi nei paesi con mercati dei prodotti relativamente più regolamentati e meno aperti alla concorrenza.

2 Fabiani, S., A. Gattulli, R. Sabbatini e G. Veronese (2006), "Consumer price setting in Italy", Giornale degli Economisti e Annali di Economia, Bocconi University, vol. 65(1), p. 31-74. Il lavoro considera le quotazioni di prodotti analoghi a quelli esaminati nella presente analisi.

3 L'analisi è stata condotta grazie alla collaborazione dell'Istat, che ha consentito di effettuare elaborazioni su un sottoinsieme della base informativa dei microdati raccolti mensilmente nell'ambito della rilevazione territoriale sui prezzi al consumo. Si

sull'argomento, il grado di flessibilità viene misurato attraverso la durata del periodo in cui i prezzi tendono a restare invariati o, in maniera equivalente, la frequenza con cui essi sono rivisti e in quale direzione.

L'analisi è incentrata sul periodo 2006-2013 e i risultati vengono esaminati sia nella loro evoluzione anno per anno e in relazione alle recenti fasi recessive, sia nel confronto con quelli ottenuti nel contesto dell'IPN per il periodo 1996-2001 al fine di valutare se vi sia stata nell'ultimo decennio una tendenza all'aumento della flessibilità dei prezzi, in particolare con riferimento ai beni e servizi tipicamente caratterizzati da un grado relativamente elevato di rigidità nominale. Un'attenzione particolare è dedicata alle caratteristiche dell'aggiustamento dei prezzi nella recessione del 2008-09 e, soprattutto, quella in corso dal 2011.

I dati utilizzati sono a frequenza mensile e rappresentano un campione di oltre 960.000 prezzi elementari riferiti a 49 beni e servizi inclusi nel paniere dell'indice NIC, rilevate tra gennaio 2006 e dicembre 2013.

Per la stima degli indicatori di flessibilità vengono utilizzati due approcci metodologici, in linea con i lavori dell'IPN. Il primo si basa sul calcolo della durata delle quotazioni di prezzo dei singoli prodotti, ovvero il numero di mesi in cui il prezzo di un dato prodotto rilevato presso un dato rivenditore resta invariato. Il secondo approccio si basa sul calcolo della quota dei prodotti che in ogni mese registrano una variazione di prezzo; sulla base della media di tali quote in un determinato intervallo temporale, ovvero della frequenza media di aggiustamento dei prezzi, si può derivare anche una valutazione della durata. In entrambi i metodi i risultati dipendono in modo significativo dalle ipotesi effettuate per il trattamento delle prime e delle ultime osservazioni di ogni sequenza di quotazioni/prodotto, il cosiddetto problema del *"censoring"*. Nell'analisi, ove possibile, verranno presentate le evidenze ottenute con diversi approcci a tale problema, privilegiando comunque quelle basate sul metodo qui definito "*censoring* intermedio".

I risultati principali possono essere riassunti come segue.

- Tra il 2006 e il 2013 la durata media del periodo in cui i prezzi restano invariati si attesta tra i 4 e i 6 mesi (a seconda del trattamento del *censoring*), circa tre mesi in meno rispetto a quanto rilevato dal precedente studio per il periodo 1996-2001. I prezzi dei beni energetici variano quasi ogni mese; quelli dei servizi restano mediamente stabili per poco meno di un anno.
- Ogni mese circa il 15 per cento dei prodotti registra in media una variazione di prezzo, secondo l'approccio metodologico privilegiato nel lavoro.
- Trovano conferma le differenze nel grado di flessibilità nominale per le diverse categorie di prodotto. Il prezzo di pressoché tutti i beni energetici e di quasi un terzo di quelli alimentari freschi varia ogni mese. Per le altre componenti l'incidenza degli aggiustamenti mensili scende su livelli intorno all'11 per cento per i beni alimentari lavorati e i servizi e al 6 per cento per i beni non energetici e non alimentari. Questi ultimi si confermano la tipologia di prodotto caratterizzata da rigidità nominali relativamente elevate.
- Dal confronto con il periodo 1996-2001 emerge negli anni più recenti un deciso aumento della percentuale di prodotti i cui prezzi vengono aggiustati in media ogni mese (dal 9,5 al al 15,5 per cento sulla base del metodo da noi preferito). Considerando la direzione

ringraziano in particolare Alessandro Brunetti, Federico Polidoro, Paola Pompei, Luca Rondini, Antonella Simone e Davide Zurlo.

dell'aggiustamento, si registra una crescita dell'incidenza sia dei rincari (dal 6 al 9,3 per cento ogni mese) sia soprattutto delle riduzioni (dal 3,4 al 6,2 per cento).

- Anche la dimensione degli aggiustamenti è mediamente più elevata che in passato, in particolare nel caso delle riduzioni, la cui entità si attesta nella media del periodo al 13,6 per cento (7,4 nel periodo 1996-2001).
- L'aumento della frequenza e della dimensione delle riduzioni di prezzo ha contribuito al graduale attenuarsi dell'asimmetria della distribuzione delle variazioni di prezzo nel comparto dei beni non alimentari e non energetici e in quello dei servizi (in quest'ultimo caso il risultato è trainato dalla voce "servizi alberghieri").
- Nella distribuzione moderna (supermercati, ipermercati e hard discount) la flessibilità dei prezzi non solo è più elevata che in quella tradizionale, ma ha anche registrato un aumento più marcato rispetto al periodo 1996-2001. Su tali differenze incide il comportamento dei prezzi degli alimentari lavorati e dei beni non alimentari e non energetici, caratterizzati da una maggiore flessibilità verso il basso nella distribuzione moderna.
- La traslazione ai prezzi degli aumenti dell'aliquota ordinaria IVA nel 2011 e nel 2013 sono stati più rapidi nella distribuzione moderna che in quella tradizionale.
- Nel corso del periodo in esame si osserva una chiara tendenza verso una maggiore flessibilità dei prezzi, soprattutto nel biennio finale dell'orizzonte temporale. In particolare, le nostre stime indicano che le fasi recessive hanno avuto un impatto sul meccanismo di aggiustamento dei prezzi. Per i beni NAE tale impatto si è manifestato con una maggiore frequenza di aggiustamenti verso il basso, di entità maggiore, e rincari di ampiezza meno elevata. Per i servizi si sono invece ridotte sia la frequenza sia l'entità dei rincari.

2 L'inflazione: gli andamenti aggregati

Tra il 2006 e il 2013 l'inflazione misurata dall'indice dei prezzi al consumo per l'intera collettività nazionale (NIC) in Italia ha raggiunto un massimo del 3,3 per cento nella media del 2008 e un minimo dello 0,8 per cento nel 2009, risentendo fortemente dell'andamento delle componenti più volatili (tavola 1). Le oscillazioni medie annue dei prezzi dei carburanti, superiori in valore assoluto al 10 per cento tra il 2008 e il 2012, hanno riflesso la dinamica delle quotazioni petrolifere e, tra la fine del 2011 e il 2012, l'aumento delle accise e gli effetti del deprezzamento dell'euro. L'inflazione della componente alimentare ha toccato invece un picco nel 2008, al 5,9 per cento per gli alimentari trasformati e al 4,5 per quelli freschi, soprattutto a causa dei rincari delle materie prime sui mercati internazionali, in particolare dei cereali.

La crescita sui dodici mesi dei prezzi dei beni non alimentari e non energetici (NAE) è rimasta pressoché stabile per quasi tutto il periodo in esame, intorno all'1 per cento, superando tale soglia nel corso del 2011 e del 2012 anche per effetto dell'aumento dell'aliquota ordinaria IVA nell'autunno del 2011. Dalla fine del 2012 essa si è tuttavia dimezzata, attestandosi su livelli vicini allo 0,5 per cento. L'inflazione dei servizi ha oscillato su livelli prossimi al 2 per cento, con un picco del 3,0 per cento nel 2008, spiegato in parte dal comparto dei servizi di trasporto, in particolare di quelli aerei, che risentono fortemente del costo del carburante; anche questa componente ha subito un netto rallentamento dallo scorcio del 2012.

Il periodo in esame include quattro fasi cicliche distinte: (i) una fase di crescita dal primo trimestre del 2006 al primo del 2008; (ii) la recessione globale tra il secondo trimestre del 2008 e il secondo

del 2009, durante la quale il prodotto e i consumi privati hanno subito nel complesso un calo rispettivamente di 7 e di 3 punti percentuali; (iii) un biennio di moderata ripresa in cui il PIL ha recuperato circa un terzo dalla perdita cumulata durante la recessione e i consumi sono tornati (alla fine del 2010) sui livelli di inizio 2008; (iv) una seconda fase recessiva avviatasi nel terzo trimestre del 2011, che ha riportato alla fine del 2013 PIL e spesa delle famiglie su un livello inferiore di circa 9 e 8 punti percentuali, rispettivamente, rispetto ai picchi del primo trimestre del 2008.

Una valutazione degli eventuali effetti che le fasi recessive potrebbero aver avuto sul comportamento dei prezzi al consumo sarà condotta nell'ultima sezione di questo lavoro, prendendo in considerazione le componenti meno soggette a shock esterni, ovvero i beni non alimentari e non energetici e i servizi[4].

Tavola 1 – Inflazione, PIL, consumi e prezzi in euro delle materie prime dal 2006 al 2013
(variazioni percentuali sul periodo precedente)

	Inflazione						PIL	Consumi	Materie prime alimentari	Petrolio	Cambio $/Euro
	Indice Generale	Alimentari Trasformati	Alimentari freschi	Beni Neig	Servizi	Energetici non regolamentati					
2006	2.1	2.0	1.4	0.8	2.2	6.1	2.1	1.4	8.9	18.2	0.9
2007	1.8	2.5	3.4	0.8	2.1	0.7	1.3	1.2	5.0	2.5	9.2
2008	3.3	5.9	4.5	0.9	3.0	10.4	-1.1	-1.1	15.6	23.1	7.3
2009	0.8	2.1	1.5	1.0	1.8	-13.2	-5.5	-1.5	-8.0	-32.6	-5.3
2010	1.5	0.6	-0.3	1.0	1.9	11.2	1.7	1.2	17.8	37.1	-4.8
2011	2.8	2.4	2.5	1.3	2.3	14.6	0.7	0.0	13.8	33.8	4.9
2012	3.0	2.7	2.2	1.2	2.1	14.3	-2.3	-4.1	4.0	8.4	-7.6
2013	1.2	2.0	3.0	0.5	1.5	-1.6	-1.9	-2.7	-0.7	-5.2	3.3

Fonte: nostre elaborazioni su dati Istat e FMI.

3 Il dataset

Nel periodo analizzato l'Istat ha rilevato mensilmente un numero di quotazioni elementari compreso in media tra 550.000 e 600.000 di cui circa 500.000 raccolte a livello locale dagli uffici comunali di statistica di più di 80 capoluoghi di provincia; la restante parte è rilevata in modo centralizzato. Questo lavoro è basato su un sottoinsieme dei dati rilevati dagli uffici comunali di 17 città[5], costituito da un totale di 965.298 quotazioni relative a 49 prodotti inclusi nel paniere del NIC (su un totale di 603 nel 2013) nel periodo compreso tra gennaio 2006 e dicembre 2013. Il campione di prodotti è stato selezionato in modo da essere quanto più possibile confrontabile con quello utilizzato nel lavoro svolto con metodologie analoghe quasi dieci anni fa sulle variazioni dei prezzi nel periodo 1996-2003 (tavola A1 in Appendice).

[4] I servizi di trasporto non sono inclusi nel dataset a disposizione.

[5] Si tratta di 16 capoluoghi di regione (Aosta, Torino, Genova, Milano, Trento, Venezia, Trieste, Bologna, Firenze, Ancona, Perugia, Roma, Napoli, Bari, Palermo e Cagliari) a cui si aggiunge Reggio Calabria. Mancano i capoluoghi di regione di Abruzzo, Basilicata e Molise.

I beni e i servizi considerati rappresentano circa un quinto del paniere del NIC, con differenze per le diverse tipologie: essi coprono la quasi totalità dei beni energetici non regolamentati, mentre gli alimentari freschi e i beni NAE risultano sottorappresentati (tav. 2) [6].

Tavola 2 – Quotazioni elementari per tipologia di prodotto

Tipologia di prodotto	Quotazioni elementari nel database		Peso % dei prodotti inclusi nel nostro campione nell'indice NIC (2012=100)	Peso % nell'indice NIC (2012=100)	
	numero	%	peso effettivo	peso riscalato (1)	copertura del campione
Alimentari lavorati	308.252	31,93	2,41	10,43	23,11
Alimentari non lavorati	150.759	15,62	1,02	6,46	15,76
Beni energetici	34.380	3,56	4,61	9,04	51,04
Altri beni (NAE)	264.176	27,37	3,26	28,57	11,39
Servizi	207.731	21,52	8,90	43,26	20,58
Totale	965.298	100	20,20	97,76	20,66

Fonte: nostre elaborazioni su dati Istat. (1) Il peso riscalato è costruito in modo che la somma dei pesi delle singole voci di ogni tipologia di prodotti equivalga al peso di tale tipologia nel paniere del NIC.

Le informazioni (metadati) disponibili per ogni quotazione elementare sono riassunte nella Tavola A2 in Appendice. Esse permettono di seguire nel tempo il prezzo di un prodotto di una determinata marca venduto presso un dato esercizio commerciale, ovvero di individuare ciò che nel presente lavoro viene definita come "traiettoria di prezzo".

I prodotti subiscono una sostituzione se: i) non sono più disponibili in un esercizio, iii) l'esercizio chiude, ii) l'articolo di riferimento cessa di essere il più venduto, o iv) in occasione della revisione annuale del campione. Nei primi due casi si tratta di una sostituzione forzata, negli ultimi due di una scelta dell'Istat; i metadati associati a ciascuna quotazione di prezzo consentono di identificare l'occorrenza di una sostituzione, ma non di distinguere la sua natura.

Riguardo alla tipologia di esercizio commerciale, circa il 39 per cento delle quotazioni elementari del campione a disposizione sono rilevate presso supermercati, ipermercati e hard discount ("distribuzione moderna"; tav. 3), il 46 per cento presso rivenditori di tipo "tradizionale" (minimercati, negozi tradizionali, cooperative di consumo, mercati rionali e negozi tradizionali specializzati non alimentari) e il restante in "altri" rivenditori (unità diverse, esercizi non classificabili altrove, cinema, farmacie, esercizi specializzati in medicinali non soggetti a prescrizione, studi medici e poliambulatori).

Queste proporzioni sono grosso modo rappresentative del paniere complessivo del NIC e, nel confronto con i dati esaminati in passato relativi al periodo 1996-2003, segnalano un significativo incremento della rilevanza della distribuzione moderna (il cui peso è aumentato di oltre 10 punti percentuali) a scapito di quella tradizionale.

[6] Non sono invece presenti i beni energetici controllati, come le tariffe del gas e dell'energia elettrica. Nel complesso è quindi presente la metà della componente energetica.

Tavola 3 – Quotazioni elementari per tipologia di rivenditore

(percentuali non pesate)

Canale distributivo	% di quotazioni elementari	
	1996-2003	2006-2013
Tradizionale	56,8	45,8
Moderno	27	39,3
Altro	16,2	14,9
Totale	100	100

Fonte: nostre elaborazioni su dati Istat.

4 La metodologia d'analisi

La nostra analisi sfrutta sia le informazioni concernenti ogni quotazione (prezzo) elementare, sia i metadati a essa associati. Per semplificare l'interpretazione di risultati e a scopo di chiarezza, si riportano brevemente di seguito le definizioni di base utilizzate per ottenere i risultati presentati nelle sezioni successive.

Quotazione elementare: è il prezzo P del prodotto j (j =1,.., n_j, dove n_j è il numero totale di prodotti), venduto in un esercizio commerciale l in una data città e osservato al tempo t (t=1,….T). La quotazione elementare è quindi descritta da $P_{jl,t}$ e il prodotto elementare è definito dalla coppia (j,l). A titolo di esempio, per il prodotto j "caffè", la quotazione elementare $P_{jl,t}$ è il prezzo del caffè di una determinata marca venduto presso l'esercizio l di una data città e rilevato nel mese t. Come già accennato, il nostro dataset è costituito da circa 965.000 quotazioni elementari mensili[7] ($P_{jl,t}$) e 49 prodotti (n_j), rilevati in esercizi commerciali di 17 città nel periodo da gennaio 2006 a dicembre 2012 (T).

Price spell: una sequenza ininterrotta di quotazioni elementari invariate relative al prodotto elementare (j,l), cioè la sequenza $P_{jl,t}$, $P_{jl,t+1}$,…, $P_{jl,t+k-1}$, dove $P_{jl,t+s} = P_{jl,t}$ per $s=1,…,t+k-1$. Il price spell è quindi descritto da tre elementi: la data della prima quotazione (t), il prezzo ($P_{jl,t}$) e la durata (k) del periodo in cui il prezzo resta invariato, cioè $\{P_{jl,t}, t, k\}$.

Traiettoria di prezzo: una successione di s *price spell* relativi al prodotto (j,l), cioè ($\{P_{jl,t}, t_1, k_1\}$, $\{P_{jl,t+k1}, t_2, k_2\}$, $\{P_{jl,t+k1+k2}, t_3, k_3\}$,….,$\{P_{jl,t+k1+…+ks-1}, t_s, k_s\}$). La lunghezza della traiettoria per il prodotto elementare (j,l) è la somma della durata di tali sequenze $L_{jl}=(k_1 +… +k_s)$.

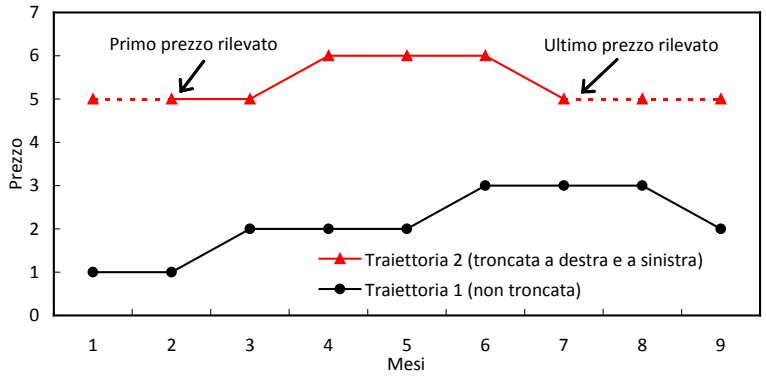
La figura 1 fornisce una rappresentazione grafica di queste definizioni. La traiettoria di prezzo 1 può essere descritta come la successione di quattro *price spell* (con durata rispettivamente di 2, 2, 2 e 1 mesi): ($\{P$=1, t_0=1, k_1=2$\}$, $\{P$=2, t_0=3, k_2=3$\}$,$\{P$=3, t_0=6, k_3=3$\}$, $\{P$=2, t_0=9, k_3=1$\}$). La traiettoria di prezzo 2 è invece la successione di tre *price spell*, tutti con durata di tre mesi: ($\{P$=5, t_0=1, k_1=3$\}$, $\{P$=6, t_0=4, k_2=3$\}$,$\{P$=5, t_0=7, k_3=3$\}$.

Sulla base delle definizioni appena fornite, le politiche di aggiustamento dei prezzi possono essere esaminate seguendo due approcci distinti: i) durata dei *price spells* (metodo della durata o *duration approach*); ii) frequenza di aggiustamento dei prezzi, misurata indirettamente attraverso la percentuale di prodotti per i quali in ogni mese si registra una variazione di prezzo (metodo della frequenza o *frequency approach*). Il primo metodo consente di derivare una misura della frequenza "implicita" come inverso della durata, il secondo una misura di durata "implicita" come

[7] Una media mensile è stata utilizzata per le quotazioni rilevate bimensilmente.

inverso della frequenza. Essi sono pertanto, sotto determinate condizioni, equivalenti e comportano gli stessi risultati.

Figura 1 – Traiettorie di prezzo



In entrambi i casi la stima di misure sintetiche relative all'intero campione di prodotti o ad alcune tipologie o sotto-categorie richiede l'aggregazione delle statistiche ottenute a livello di prodotto elementare. Il metodo di aggregazione può influire significativamente sui risultati (cfr. Baharad ed Eden, 2004[8]): la nostra analisi segue un approccio di tipo *bottom-u*p, basato sull'ipotesi che i prodotti abbiano un elevato grado di omogeneità all'interno di una determinata categoria. Per garantire la rappresentatività dei risultati ottenuti le statistiche aggregate (medie, mediane o deviazioni standard) sono inoltre ponderate, cioè calcolate riscalando il contributo di ogni prodotto con il peso della tipologia a cui esso appartiene nel paniere dell'indice NIC.

4.1 Il metodo della durata

L'applicazione di questo metodo prevede come primo stadio l'identificazione delle traiettorie di prezzo, cioè le successioni di quotazioni relative a ogni combinazione prodotto-rivenditore mese per mese. Le traiettorie si interrompono quando il prodotto viene sostituito, per diverse ragioni, da un altro bene o servizio. Una volta definite le traiettorie, vengono identificati al loro interno i *price spell*, cioé le sequenze tra un aggiustamento di prezzo e il successivo, e se ne calcola la durata media. Seguendo l'esempio fornito nella Figura 1, la durata media dei *price spell* della traiettoria 1 è la semplice media delle singole durate (2, 3, 3, e 1), che equivale a dividere il numero di osservazioni (9) per il numero di *spell* (4).

La durata media dei prezzi può essere calcolata utilizzando diverse formule. L'approccio più semplice consiste nell'aggregare tutti gli *spell* attribuendo a ognuno di essi lo stesso peso:

$$\bar{d} = \frac{1}{N_{spells}} \sum_{j=1}^{n_j} \sum_{s=1}^{N_{sj}} d_{js} = \frac{N_{osservazioni}}{N_{spells}}$$

dove j è il prodotto (J=49), d_{js} è la durata dello *spell* s del prodotto j e N_{sj} è il numero di *spell* per il prodotto j.

[8] Baharad, E. e B. Eden (2004), "Price rigidity and price dispersion: evidence from micro data", Review of Economic Dynamics, vol. 7, pp. 613-41.

Chiaramente, questa formula attribuisce un peso maggiore ai prodotti che registrano variazioni più frequenti e presentano quindi un maggior numero di *spell*. Tale limite si supera calcolando in primo luogo la durata media degli *spell* per prodotto e successivamente aggregando tale durata media su tutti i prodotti in esame:

$$\bar{d}_j = \frac{N_{osservazioni\ per\ il\ prodotto\ j}}{N_{spells\ per\ prodotto\ j}}; \quad \bar{\bar{d}} = \sum_{j=1}^{n_j} \frac{1}{n_j} \bar{d}_j$$

Se si tiene in considerazione il peso dei singoli prodotti nel paniere del NIC oppure, come nel caso adottato in questo lavoro, il peso riscalato (che rapporta il contributo dei singoli prodotti al peso nell'indice NIC della tipologia a cui essi appartengono), si ottiene la durata media ponderata dei *price spell*, aggregata per prodotto:

$$\bar{\bar{d}}^{w} = \sum_{j=1}^{n_j} \omega_j \bar{d}_j$$

4.2 Il metodo della frequenza

L'analisi dell'aggiustamento dei prezzi basata sul metodo della frequenza è utilizzata da molti lavori in letteratura (si veda per esempio Bils e Klenow, 2004[9]).

Per ogni prodotto *j*, la frequenza media di aggiustamento per prodotto al tempo t è definita in questo lavoro come il numero di osservazioni per cui si osserva una variazione di prezzo ogni periodo (NUM_{jt}, dove t=2,….,T), rapportata al totale delle osservazioni relative allo stesso prodotto nel periodo (DEN_{jt}):

$$F_{jt} = \frac{NUM_{jt}}{DEN_{jt}} = \frac{Totale \quad Variazioni}{Totale \quad Osservazioni}$$

e di conseguenza la frequenza media per prodotto è data da:

$$F_j = \frac{\sum_{t=2}^{T} NUM_{jt}}{\sum_{t=2}^{T} DEN_{jt}}$$

La stessa formula può essere utilizzata per calcolare separatamente la frequenza degli aggiustamenti verso l'alto (basso), semplicemente sostituendo al numeratore il numero di osservazioni per cui si osserva in ogni periodo una variazione positiva (negativa) di prezzo:

$$F_j = \frac{\sum_{t=2}^{T} NUMUP_{jt}}{\sum_{t=2}^{T} DEN_{jt}} \quad \left(F_j = \frac{\sum_{t=2}^{T} NUMDW_{jt}}{\sum_{t=2}^{T} DEN_{jt}} \right)$$

Sotto determinate condizioni di stazionarietà del processo che genera i *price spell* sia nel tempo sia tra prodotti e ipotizzando che le politiche di aggiustamento dei prezzi avvengano a intervalli discreti, la durata media degli *spell* relativi al prodotto *j* viene derivata come inverso della frequenza:

9 Bils, M. e P. Klenow (2004), "Some evidence on the importance of sticky prices", Journal of Political Economy, vol. 112, no. 5.

$$\bar{T}_j = \frac{1}{F_j}$$

Come per il metodo della durata, la frequenza media di aggiustamento dei prezzi per tipologia di prodotto e per il complesso dei beni e servizi è ottenuta (a seconda che sia semplice o pesata) utilizzando le seguenti aggregazioni:

Frequenza media complessiva non ponderata: $\bar{\bar{F}} = \sum_{j=1}^{n_j} \frac{1}{n_j} \bar{F}_j$

Frequenza media complessiva ponderata: $\bar{\bar{F}}^{w} = \sum_{j=1}^{n_j} \omega_j \bar{F}_j$

Per un generico intervallo di tempo e per un sottoinsieme di osservazioni, per esempio quelle riguardanti una tipologia di prodotto, la formula utilizzata per le frequenze medie riportate in questo lavoro è la seguente:

Frequenza media per un sottoinsieme J di quotazioni nel periodo T: $F_{JT}{}^{w} = \sum^{j \in J} \sum^{t \in T} \omega_j F_{jt}$

Uno degli aspetti più vantaggiosi di questo approccio è che esso non richiede la disponibilità di dati per periodi di tempo lunghi; in linea di principio, la finestra di osservazione può essere addirittura inferiore alla durata media dei *price spell*. In secondo luogo, esso consente di escludere esplicitamente dal computo della frequenza periodi (uno o più mesi) caratterizzati da eventi di carattere eccezionale che potrebbero distorcere i risultati, come ad esempio un incremento dell'aliquota IVA. Infine, il metodo risente meno di quello basato sulla durata della perdita di osservazioni legata al problema del *censoring*, esposto nel seguito.

4.3 Il trattamento del *censoring*

Entrambi gli approcci appena descritti risentono delle ipotesi adottate riguardo alla prima e all'ultima osservazione di ogni traiettoria: queste infatti, pur essendo le rilevazioni estreme effettuate dall'Istituto di statistica, non necessariamente coincidono con la prima e l'ultima quotazione relativa al prodotto in esame.

La natura del problema – che in letteratura viene definito *censoring* – è illustrata nella figura 1: il primo *spell* della traiettoria 2 è troncato a sinistra (*left-censored*) in quanto la rilevazione inizia nel periodo t=2 sebbene la quotazione sia presente anche in t=1; l'ultimo *spell* della stessa traiettoria è troncato a destra (*right-censored*), in quanto la rilevazione termina nel periodo t=7 sebbene la quotazione sia presente anche nei due mesi successivi. La prima e l'ultima rilevazione di prezzo non coincidono con la prima e l'ultima quotazione, mentre questa coincidenza si verifica nella traiettoria 1. Empiricamente, il *censoring* può essere affrontato seguendo due strategie opposte:

No censoring – Il problema viene completamente ignorato e si utilizzano nell'analisi tutti gli *spell*.

Censoring completo – Si ipotizza che il primo e l'ultimo *spell* di ogni traiettoria siano troncati; essi vengono pertanto esclusi dall'analisi. I risultati basati su questa strategia hanno il limite di sfruttare un numero più basso di osservazioni (le quotazioni appartenenti agli *spell* centrali di ogni traiettoria) rispetto a quelle potenzialmente utilizzabili.

Rispetto a queste due strategie "estreme", possono essere adottate soluzioni intermedie. Il troncamento delle traiettorie è infatti in molti casi legato alla presenza di cambi di prodotto, di

varietà o di ditta. Come già accennato, tali cambi possono: i) essere effettuati dal rilevatore a seguito della non disponibilità del prodotto o della chiusura del rivenditore (sostituzione forzata); ii) essere dovuti al ribasamento dell'indice, che avviene alla fine di ogni dicembre (sostituzione opzionale). Dal momento che i metadati disponibili non permettono di distinguere tra le due diverse tipologie, nella nostra analisi si ipotizza che tutti i cambi (di prodotto, di varietà o di ditta) che hanno luogo nel mese di gennaio siano opzionali, cioè legati al ribasamento, mentre tutte le altre sostituzioni siano forzate. Sulla base di questa ipotesi, la terza strategia è la seguente:

Censoring intermedio – Vengono considerati troncati solo il primo e l'ultimo *spell* delle traiettorie che hanno inizio a gennaio e/o terminano a dicembre, mentre quelli delle traiettorie che iniziano o si interrompono per una sostituzione forzata (in qualunque altro mese) sono considerati non troncati. Un chiaro vantaggio di questa soluzione è che aumenta il numero di osservazioni incluse nell'analisi.

Questo approccio, soprattutto per alcune categorie di prodotti, può indurre una sottostima della frequenza di aggiustamento (o una sovrastima della durata). Un chiaro esempio è fornito dai beni di abbigliamento: all'inizio di ogni stagione viene tipicamente introdotto un nuovo modello, venduto a un dato prezzo fino a quando non è sostituito da un modello successivo, lievemente diverso, dello stesso bene; secondo il *censoring* intermedio, il vecchio modello non registra variazioni di prezzo. Questa distorsione può essere attenuata formulando l'ulteriore ipotesi che nello stesso mese in cui un modello non è più venduto e viene sostituito da un nuovo modello, il suo prezzo (anche se non più rilevato) registri una variazione. Su tale ipotesi è fondato il quarto approccio:

Censoring intermedio con pseudo-cambiamenti di prezzo – Come nel caso precedente, si considerano troncati e si escludono dall'analisi solo il primo e l'ultimo *spell* delle traiettorie connesse con sostituzioni opzionali. Si assume inoltre che il primo e l'ultimo *spell* delle traiettorie che iniziano o terminano per sostituzioni forzate (non troncati) coincidano con una variazione di prezzo. Tale variazione rientra nel calcolo della frequenza ma, chiaramente, viene esclusa da quello dell'ampiezza degli aggiustamenti, in quando si tratta di una variazione "implicita" e non effettivamente osservata.

Le stime relative alla durata e alla frequenza di aggiustamento dei prezzi sono fortemente dipendenti dall'approccio al *censoring* adottato. Dal momento che nessuno dei metodi appena esposti è esente da limitazioni, le statistiche più rilevanti ai fini della nostra analisi (presentate nella sezione successiva) verranno calcolate utilizzandoli tutti e quattro, ove possibile.

L'attenzione sarà comunque incentrata sui risultati ottenuti sulla base del c*ensoring* intermedio, a nostro avviso meno vincolato a ipotesi forti rispetto agli altri.

5 I risultati

5.1 Le tipologie di prodotto

Le traiettorie di prezzo identificate nella nostra analisi sono quasi 30.000. La loro durata media è pari a 33 mesi; essa è particolarmente elevata per i beni alimentari freschi e i prodotti energetici (quasi 50 mesi in entrambi i casi), più breve per i beni NAE (22 mesi). L'ampia dispersione per tipologia di prodotto permane anche in termini di mediana (tav. 4). Rispetto all'evidenza relativa al periodo 1996-2001 (fornita dal lavoro di Fabiani et al, 2006), si riscontra un allungamento delle

traiettorie relative agli alimentari trasformati e agli energetici, a fronte di un lieve accorciamento di quelle relative agli altri beni e ai servizi.

A seconda del metodo adottato per il *censoring*, la lunghezza dell'intervallo di tempo in cui i prezzi rimangono invariati, ovvero la durata degli *spell*, oscilla in media tra i 4 mesi nell'ipotesi di *censoring* completo e i 6 mesi in quello di *no censoring* (tav. 5). La durata mediana risulta più bassa, pari a un solo mese. Entrambe le statistiche sono sensibilmente inferiori per i beni energetici e gli alimentari freschi, più elevate nel comparto dei servizi e per i beni NAE.

Tavola 4 – Traiettorie di prezzo per tipologia di prodotto

(statistiche non pesate)

	2006-2013				1996-2001			
	N. osservazioni	Media	Mediana	Deviazione standard	N. osservazioni	Media	Mediana	Deviazione standard
Alimentari freschi	3.038	48	40	34	1.297	48	46	29
Alimentari trasformati	8.406	37	25	31	6.304	33	25	26
Beni NAE	12.034	22	12	23	6.815	30	24	24
Energetici	694	49	44	34	717	43	36	27
Servizi	4.808	43	31	33	3.725	49	47	31
Totale	**28.980**	**33**	**21**	**31**	**18.858**	**36**	**30**	**28**

Fonte: nostre elaborazioni su dati Istat.

Negli anni tra il 2006 e il 2013 la durata appare essersi ridotta, rispetto ai calcoli effettuati per il periodo 1996-2001, di un intervallo che varia da 1 a 4 mesi, sia per la media sia per la mediana, a seconda del trattamento del problema del troncamento. La riduzione ha riguardato tutte le varie categorie di prodotto.

Tavola 5 – La durata dei *price spells* per tipologia di prodotto

(mesi per le statistiche relative alla durata)

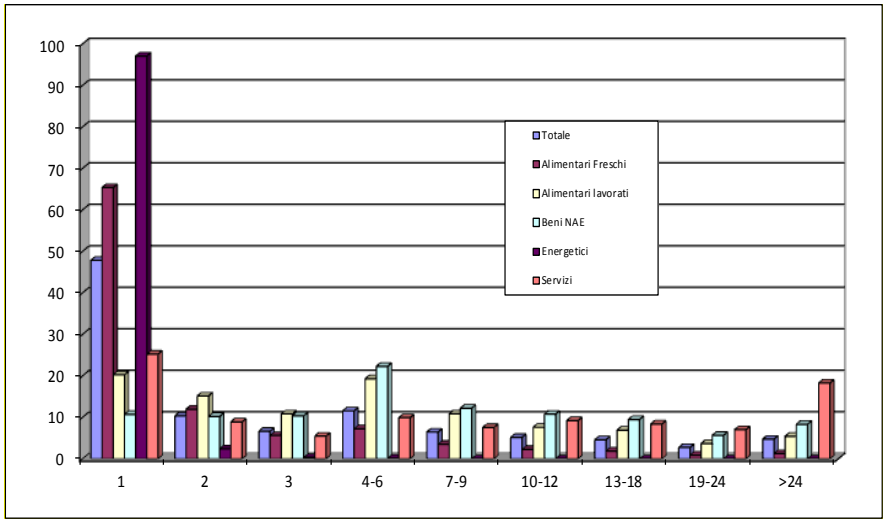
	2006-2013				1996-2001			
	N. osservazioni	**Media**	**Mediana**	**Deviazione standard**	**N. osservazioni**	**Media**	**Mediana**	**Deviazione standard**
Alimentari freschi	50.266	4	1	7	13.447	9	3	14
Alimentari trasformati	41.802	8	4	11	19.689	9	5	11
Beni NAE	26.909	10	6	11	13.505	14	10	13
Energetici	32.665	1	1	0	14.845	2	1	1
Servizi	15.096	10	3	16	7.822	15	11	16
Totale no censoring	166.738	**6**	**1**	**10**	**69.308**	**10**	**5**	**13**
Totale censoring completo	**120.357**	**4**	**1**	**7**	**43.886**	**6**	**2**	**9**
Totale censoring intermedio	**141.319**	**4**	**1**	**7**	**58.397**	**8**	**4**	**11**

Fonte: nostre elaborazioni su dati Istat. Statistiche ponderate per il peso delle tipologie di prodotto nel paniere NIC. L'approccio *censoring* intermedio con pseudo-cambiamenti di prezzo non è mostrato nella tavola perché con il metodo della durata produce lo stesso risultato del *censoring* intermedio.

La Figura 2 conferma che non solo la media e la mediana ma l'intera distribuzione della durata degli *spell* è fortemente eterogenea tra le tipologie di prodotto. Nel caso degli energetici, il 97 per cento degli *spell* rilevati nell'intero periodo ha una durata di solo un mese; la percentuale scende al 65 per cento nel caso dei beni alimentari freschi e si attesta ben al di sotto del 30 per cento per le altre tipologie, raggiungendo il minimo (11 per cento) per i beni NAE. La distribuzione è nel

complesso più uniforme per alimentari trasformati, servizi e beni NAE, con una media di poco inferiore a un anno e una mediana compresa tra i 3 e i 6 mesi.

Figura 2 – Distribuzione della durata dei *price spells* per tipologia di prodotto
(percentuali; metodo no censoring)



Fonte: nostre elaborazioni su dati Istat. Statistiche ponderate per il peso delle tipologie di prodotto nel paniere NIC.

Queste prime evidenze riguardo alla durata dei prezzi trovano conferma nel calcolo diretto della frequenza di aggiustamento. Quest'ultima, tra il 2006 e il 2013, si è attestata in media tra il 14,1 per cento nell'ipotesi di *no censoring* e il 16,5 per cento in quella di *censoring* completo (15,5 per cento nell'ipotesi intermedia; tav. 6). Al di là delle differenze nei livelli, l'andamento della frequenza media di variazione dei prezzi anno per anno appare relativamente omogeneo tra i vari metodi di trattamento del *censoring*: dopo un punto di minimo toccato nel 2009 si osserva, indipendentemente dal metodo utilizzato, un significativo aumento nel 2011, quando l'aliquota ordinaria dell'Iva è stata innalzata di un punto percentuale, e un proseguimento di tale tendenza nell'ultimo biennio dell'orizzonte temporale.

Focalizzando l'attenzione sui risultati ottenuti con l'approccio intermedio, che come già accennato è quello da noi ritenuto più robusto, emerge che nell'arco di tempo in esame la frequenza media di aggiustamento delle quotazioni è scesa da circa il 15 per cento nel 2006 al 14 nel 2009 ed è risalita successivamente, con un aumento particolarmente significativo nell'ultimo anno, in cui ha raggiunto il 19,1 per cento.

Si conferma l'esistenza di differenze sostanziali nei pattern di aggiustamento dei prezzi per categoria di prodotto: ogni mese pressoché tutti i prodotti energetici registrano una variazione di prezzo, così come circa il 30 per cento di quelli alimentari non trasformati. Per le altre tre componenti l'incidenza degli aggiustamenti mensili è sensibilmente inferiore, su livelli poco al di sopra del 9 per cento nel caso degli alimentari lavorati e dei servizi e tra il 5 e il 9 per cento in quello dei beni non energetici e non alimentari. Per il comparto dei servizi, il risultato è guidato dall'aggiustamento dei prezzi degli alberghi: escludendo tale voce, la frequenza media si riduce drasticamente, a circa il 4 per cento.

Tavola 6 – La frequenza delle variazioni di prezzo

(percentuali)

	No censoring	Censoring completo	Censoring intermedio	Censoring intermedio con pseudo cambiamenti di prezzo
2006	12,3	15,7	14,8	14,4
2007	13,4	15,9	14,9	16,6
2008	13,6	15,6	14,6	15,7
2009	13,1	14,8	14,0	15,1
2010	13,8	15,5	14,6	15,9
2011	15,7	17,1	16,4	17,6
2012	15,3	17,8	16,7	17,8
2013	16,6	20,0	19,1	20,5
2006-2013	**14,1**	**16,5**	**15,5**	**16,7**
Alimentari freschi	27,5	30,8	29,4	29,7
Alimentari trasformati	9,2	12,0	10,7	11,5
Beni NEA	5,4	7,6	5,9	8,7
Energetici	97,0	97,2	97,1	97,1
Servizi	9,0	11,4	11,1	11,4

Fonte: nostre elaborazioni su dati Istat. Statistiche ponderate per il peso delle tipologie di prodotto nel paniere NIC.

Dal confronto con l'evidenza relativa al periodo 1996-2001 emerge un deciso aumento della frequenza media di aggiustamento dei prezzi, e quindi una riduzione della loro durata, negli anni più recenti: prendendo come riferimento l'approccio intermedio al *censoring*, l'incidenza media degli aggiustamenti mensili passa dal 9,5 al 15,5 per cento e la durata implicita da 10,5 a 6,5 mesi (Tav. 7). L'aumento è confermato anche considerando separatamente gli aggiustamenti verso l'alto e quelli verso il basso. Secondo l'approccio da noi preferito, si registra una crescita significativa dell'incidenza mensile sia dei rincari (da 6 a 9,3 per cento ogni mese) sia delle riduzioni (da 3,4 a 6,2 per cento).

Tavola 7 – Il confronto con il periodo 1996-2001

(percentuali)

	Freq. variazione dei prezzi		Durata media	
	2006-2013	1996-2001	2006-2013	1996-2001
No censoring	14,1	8,8	7,1	11,3
Censoring completo	16,5		6,1	
Censoring intermedio	15,5	9,5	6,5	10,5
Pseudo cambiamenti di prezzo	16,7		6,0	
	Freq. aumento prezzi		**Freq. diminuzione prezzi**	
	2006-2013	1996-2001	2006-2013	1996-2001
No censoring	8,6	5,6	5,5	3,2
Censoring completo	9,8		6,6	
Censoring intermedio	9,3	6,0	6,2	3,4

Fonte: nostre elaborazioni su dati Istat. Statistiche ponderate per il peso delle tipologie di prodotto nel paniere NIC.

Un'analisi più approfondita delle singole tipologie di prodotto mostra che l'incremento più significativo della flessibilità dei prezzi tra i due periodi in esame riguarda in primo luogo i servizi, per i quali la frequenza di aggiustamento risulta più che raddoppiata in media da un periodo all'altro e in secondo luogo gli energetici non regolamentati (tav. 8). Per le altre tipologie l'incremento della frequenza di variazione tra un periodo e l'altro oscilla tra circa 2 punti percentuali per i beni NAE e gli alimentari lavorati e più di 8 per gli alimentari non lavorati. La maggiore flessibilità osservata in media nel periodo più recente è il risultato di una tendenza crescente nell'arco temporale in esame: considerando le sole componenti "core", che sono meno influenzate da shock di natura esterna, tra il 2006 e il 2013 la frequenza di variazione è passata da 5,3 a 7,7 per cento per i beni NAE e da 10,7 a 16,2 per cento per i servizi.

Tavola 8 – Le tipologie di prodotto

(percentuali per la frequenza e numero di mesi per la durata; metodo censoring intermedio)

	ALIMENTARI FRESCHI						ALIMENTARI TRASFORMATI					
	Freq. aumento	Freq. diminuzione	Freq. variazione	Asimmetria	Durata media	Durata mediana	Freq. aumento	Freq. diminuzione	Freq. variazione	Asimmetria	Durata media	Durata mediana
2006	14,3	15,3	29,6	-1,0	3,4	2,0	5,2	3,8	9,0	1,4	11,1	7,3
2007	16,3	10,5	26,8	5,8	3,7	2,2	9,5	2,9	12,4	6,6	8,1	5,2
2008	16,1	11,6	27,7	4,5	3,6	2,1	9,3	2,7	11,9	6,6	8,4	5,5
2009	12,7	13,2	25,8	-0,5	3,9	2,3	4,0	4,0	8,0	0,0	12,5	8,3
2010	14,2	12,4	26,6	1,8	3,8	2,2	4,4	4,2	8,6	0,2	11,6	7,7
2011	19,2	14,3	33,5	4,9	3,0	1,7	9,2	3,2	12,4	6,0	8,1	5,2
2012	18,3	14,4	32,7	3,9	3,1	1,8	7,3	3,9	11,2	3,4	8,9	5,8
2013	18,8	16,1	34,9	2,7	2,9	1,6	7,8	4,7	12,5	3,1	8,0	5,2
2006-2013	**16,2**	**13,3**	**29,4**	**2,9**	**3,4**	**2,0**	**7,2**	**3,6**	**10,7**	**3,6**	**9,3**	**6,1**
1996-2001	**11,2**	**9,8**	**21,1**	**1,4**	**4,7**	**2,9**	**5,2**	**3,2**	**8,4**	**2,0**	**11,9**	**7,9**
	BENI NEIG						**ENERGETICI**					
	Freq. aumento	Freq. diminuzione	Freq. variazione	Asimmetria	Durata media	Durata mediana	Freq. aumento	Freq. diminuzione	Freq. variazione	Asimmetria	Durata media	Durata mediana
2006	3,4	2,0	5,3	1,4	18,9	12,7	46,0	41,7	87,7	4,3	1,1	0,3
2007	3,7	1,8	5,5	1,9	18,2	12,3	71,9	23,9	95,8	48,0	1,0	0,2
2008	3,9	2,0	5,8	1,9	17,2	11,6	43,9	55,3	99,2	-11,4	1,0	0,1
2009	3,3	1,9	5,1	1,4	19,6	13,2	56,0	42,6	98,6	13,4	1,0	0,2
2010	3,2	2,0	5,2	1,2	19,2	13,0	66,4	31,6	98,0	34,8	1,0	0,2
2011	5,3	1,9	7,2	3,4	13,9	9,3	77,2	21,6	98,9	55,6	1,0	0,2
2012	3,4	2,2	5,6	1,2	17,9	12,0	51,6	47,1	98,7	4,5	1,0	0,2
2013	4,4	3,3	7,7	1,1	13,0	8,7	53,8	43,7	97,5	10,1	1,0	0,2
2006-2013	**3,8**	**2,1**	**5,9**	**1,7**	**16,9**	**11,4**	**58,8**	**38,3**	**97,1**	**20,5**	**1,0**	**0,2**
1996-2001	**3,0**	**1,0**	**4,0**	**2,0**	**25,0**	**17,0**	**34,0**	**27,9**	**61,9**	**6,1**	**1,6**	**0,7**
	SERVIZI						**TOTALE**					
	Freq. aumento	Freq. diminuzione	Freq. variazione	Asimmetria	Durata media	Durata mediana	Freq. aumento	Freq. diminuzione	Freq. variazione	Asimmetria	Durata media	Durata mediana
2006	5,5	5,1	10,7	0,4	9,3	6,1	7,9	6,9	14,8	1,0	6,8	4,3
2007	5,4	3,7	9,1	1,7	11,0	7,3	10,2	4,7	14,9	5,5	6,7	4,3
2008	5,3	3,5	8,8	1,8	11,4	7,5	8,2	6,4	14,6	1,8	6,8	4,4
2009	5,3	4,1	9,4	1,2	10,6	7,0	7,9	6,2	14,0	1,7	7,1	4,6
2010	6,2	4,2	10,4	2,0	9,6	6,3	9,0	5,6	14,6	3,4	6,8	4,4
2011	6,3	4,6	10,9	1,7	9,2	6,0	11,1	5,3	16,4	5,8	6,1	3,9
2012	7,1	6,0	13,1	1,1	7,6	4,9	9,3	7,5	16,7	1,8	6,0	3,8
2013	9,0	7,2	16,2	1,8	6,2	3,9	10,7	8,4	19,1	2,3	5,2	3,3
2006-2013	**6,4**	**4,7**	**11,1**	**1,7**	**9,0**	**5,9**	**9,3**	**6,2**	**15,5**	**3,1**	**6,5**	**4,1**
1996-2001	**3,7**	**1,1**	**4,8**	**2,6**	**20,8**	**14,1**	**6,0**	**3,5**	**9,5**	**2,5**	**10,5**	**6,9**

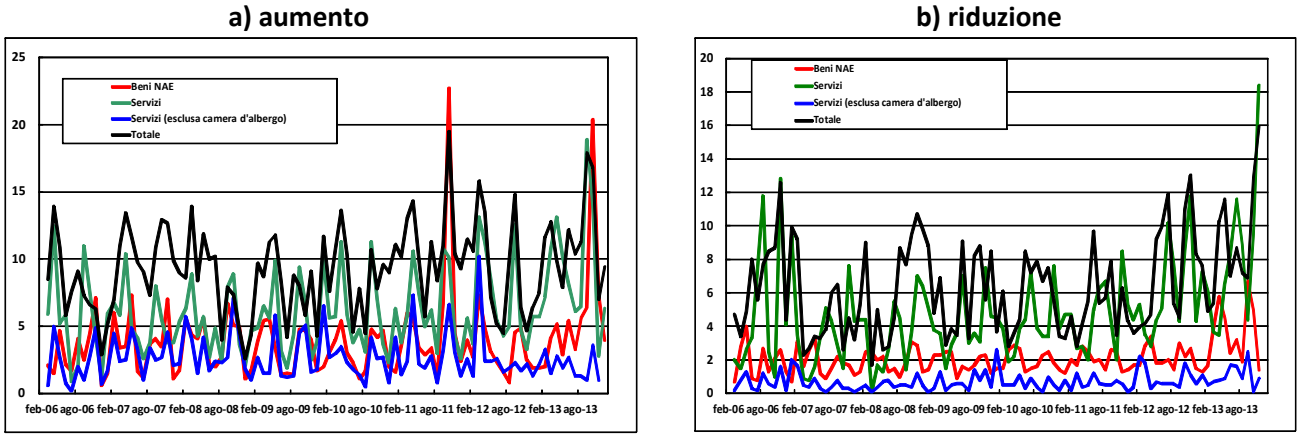
Fonte: nostre elaborazioni su dati Istat. Statistiche ponderate per il peso delle tipologie di prodotto nel paniere NIC.

Anche focalizzando l'attenzione sui soli aggiustamenti verso l'alto risulta evidente l'aumento della frequenza, sia nel confronto con il 1996-2001, sia come tendenza nell'arco del periodo. Per i servizi l'incidenza dei rialzi di prezzo passa da una media del 3,7 a una del 6,4 per cento da un periodo all'altro, crescendo di circa quattro punti percentuali tra il 2006 e il 2013 (dal 5,5 al 9 per cento);

nel comparto dei beni NAE la discontinuità complessiva tra i due periodi e la crescita della flessibilità durante quello più recente sono meno rilevanti (dal 3,0 al 3,8 per cento in media e dal 3,4 al 4,4 per cento tra il 2006 e il 2013). Peraltro, i risultati relativi a questo comparto risentono fortemente del rialzo dell'aliquota ordinaria dell'IVA nell'autunno del 2011, in concomitanza del quale si è verificato un aggiustamento dei prezzi di circa il 20 per cento dei prodotti (figura 3). La categoria per la quale nella media del 2006-2013 si osserva l'incremento più significativo rispetto al passato è quella energetica (dal 34 al 59 per cento).

E' comunque rispetto alla flessibilità verso il basso che si riscontrano nel periodo più recente indicazioni di un cambiamento particolarmente rilevante rispetto al passato, soprattutto per le componenti "core": nel 2006-2013 l'incidenza media delle riduzioni di prezzo è raddoppiata per i beni NAE e più che quadruplicata per i servizi rispetto al 1996-2001. Per entrambe le tipologie di prodotto la discontinuità più significativa si osserva nell'ultimo biennio del campione, con una frequenza che, dal 2011 al 2013, passa rispettivamente dall'1,9 al 3,3 per cento e dal 4,6 al 7,2 per cento (anche in questo caso il risultato soprattutto per effetto dei più frequenti cali di prezzo dei servizi alberghieri).

Figura 3 – Frequenza di aggiustamento dei prezzi
(percentuali; metodo censoring intermedio)



Fonte: nostre elaborazioni su dati Istat. Medie ponderate sulla base del peso delle tipologie di prodotto nel paniere NIC.

A seguito di questi mutamenti e in particolare all'incremento della frequenza degli aggiustamenti al ribasso, anche l'asimmetria nei meccanismi di prezzo, misurata come differenza tra incidenza degli aumenti e incidenza delle diminuzioni, si è attenuata nel periodo più recente rispetto al 1996-2001, sia per la componente dei beni NAE sia per i servizi (tav. 8, quarta colonna di ogni pannello). Per contro, i forti rincari delle materie prime osservati in molti degli anni più recenti hanno determinato una maggiore asimmetria nel comparto dei beni alimentari e degli energetici. I prezzi dei carburanti hanno infatti risentito con molta rapidità delle oscillazioni dei corsi petroliferi, mentre le pressioni al rialzo sulle quotazioni delle materie prime alimentari hanno influenzato soprattutto i prezzi dei beni alimentari lavorati (in particolare pasta e pane nel 2007 e nel 2008, e nel 2011 e 2012 anche per gli altri prodotti).

Per quanto riguarda i servizi, l'incremento della simmetria delle variazioni di prezzo è stato trainato in particolare dalla maggiore frequenza delle riduzioni della voce "Camera d'albergo" (passata dall'1,6 per cento del periodo 1996-2001 a circa il 18 per cento in media tra il 2006 e il 2013), presumibilmente in connessione con il più diffuso utilizzo della rete internet; la frequenza

delle riduzioni è cresciuta costantemente nell'arco di tempo in esame, portandosi durante la recessione su livelli prossimi a quella dei rincari (intorno al 20 per cento nel 2012 e al 30 per cento nel 2013). Escludendo tale voce le statistiche relative alla frequenza di aggiustamento dei prezzi nel comparto dei servizi restano su valori molto vicini a quelle calcolate per il quinquennio 1996-2001 (fig. 3).

Alla maggiore flessibilità dei prezzi si è associata negli anni più recenti anche una dimensione degli aggiustamenti, sia verso l'alto sia soprattutto verso il basso, mediamente più elevata (tav. 9): l'entità media dei rincari è passata dal 6,9 all'8,6 per cento e quella delle riduzioni di prezzo dal 7,4 al 13,6 per cento. La maggiore ampiezza di queste ultime è ascrivibile soprattutto alla componente dei beni NAE e dei servizi, per la quale si osservano variazioni medie di prezzo di entità molto consistente rispetto al passato. Gli aggiustamenti nel comparto dei prodotti energetici – i più frequenti – sono nell'ordine del 2 per cento, sia al rialzo che al ribasso.

In sintesi, la distribuzione delle variazioni di prezzo è divenuta negli ultimi anni meno asimmetrica che in passato, grazie soprattutto a un aumento rilevante di frequenza e dimensione delle variazioni verso il basso.

Tavola 9 – L'ampiezza delle variazioni di prezzo per tipologia di prodotto
(percentuali; metodo censoring intermedio)

	ALIMENTARI FRESCHI		ALIMENTARI TRASFORMATI		BENI NEIG	
	Aumento medio	Riduzione media	Aumento medio	Riduzione media	Aumento medio	Riduzione media
2006	10.0	-10.9	6.1	-5.4	7.3	-7.3
2007	11.0	-10.7	7.3	-6.8	8.1	-10.7
2008	11.0	-11.9	7.0	-8.7	7.1	-10.7
2009	11.2	-12.1	6.7	-7.4	7.6	-13.4
2010	12.3	-11.6	7.0	-7.3	7.1	-11.5
2011	9.2	-10.1	6.3	-7.9	8.0	-13.2
2012	9.5	-10.2	5.6	-7.0	9.4	-10.4
2013	9.2	-10.0	5.4	-6.0	5.8	-8.2
2006-2013	10.5	-11.1	6.6	-7.4	7.6	-11.6
1996-2001	7.3	-8.0	5.9	-5.9	6.5	-8.1
	ENERGETICI		**SERVIZI**		**TOTALE**	
	Aumento medio	Riduzione media	Aumento medio	Riduzione media	Aumento medio	Riduzione media
2006	1.4	-2.0	12.8	-8.5	9.1	-7.5
2007	1.7	-1.2	9.8	-10.3	8.6	-9.5
2008	2.1	-4.2	10.1	-12.8	8.4	-11.0
2009	2.0	-1.7	10.3	-12.5	8.7	-11.5
2010	1.8	-1.2	9.3	-14.6	8.2	-11.6
2011	2.0	-0.9	10.7	-13.1	8.8	-11.5
2012	2.0	-1.5	10.8	-12.4	9.3	-10.2
2013	1.0	-1.4	10.9	-19.1	8.1	-12.0
2006-2013	1.8	-1.7	10.2	-19.2	8.6	-13.6
1996-2001	1.8	-1.7	8.9	-11.9	6.9	-7.4

Fonte: nostre elaborazioni su dati Istat. Medie ponderate per il peso delle tipologie di prodotto nel paniere NIC.

5.2 Le tipologie distributive

Gli aggiustamenti di prezzo sono molto più frequenti se la distribuzione è di tipo moderno (supermercato, ipermercato o discount): nei negozi tradizionali i prezzi del complesso dei beni alimentari e di quelli NAE, per i quali è possibile effettuare un confronto per tipologia distributiva, tendono a variare con frequenza nettamente inferiore e a restare pertanto stazionari più a lungo (la frequenza è pari all'8,4 per cento, a fronte del 12 per cento nella distribuzione moderna; tav. 10).[10]

Tavola 10 – La frequenza e l'ampiezza delle variazioni di prezzo per canale distributivo

(percentuali; metodo censoring intermedio)

		ALIMENTARI FRESCHI					ALIMENTARI TRASFORMATI				
		Freq. aumento	Freq. diminuzione	Freq. variazione	Aumento medio	Riduzione media	Freq. aumento	Freq. diminuzione	Freq. variazione	Aumento medio	Riduzione media
2006	Moderno	16,4	17,3	33,7	11,0	-12,2	6,0	4,6	10,6	6,1	-6,2
	Tradizionale	*10,8*	*11,8*	*22,6*	*8,2*	*-9,5*	*3,0*	*1,2*	*4,2*	*6,8*	*-6,0*
2007	Moderno	18,7	13,1	31,8	12,0	-11,5	10,9	3,7	14,6	7,0	-7,0
	Tradizionale	*13,9*	*8,3*	*22,3*	*9,9*	*-9,2*	*6,7*	*1,2*	*7,9*	*7,6*	*-5,9*
2008	Moderno	18,7	12,8	31,5	11,3	-12,9	10,6	3,2	13,8	7,4	-12,1
	Tradizionale	*12,9*	*10,3*	*23,2*	*10,8*	*-12,1*	*6,6*	*1,3*	*7,8*	*6,2*	*-7,8*
2009	Moderno	13,8	15,8	29,6	11,7	-12,1	4,5	5,0	9,5	7,0	-7,5
	Tradizionale	*11,4*	*10,3*	*21,7*	*11,6*	*-13,1*	*2,8*	*1,5*	*4,3*	*6,3*	*-6,1*
2010	Moderno	16,7	14,4	31,1	13,2	-12,3	4,7	4,9	9,6	7,4	-7,2
	Tradizionale	*11,6*	*10,2*	*21,9*	*10,5*	*-11,6*	*3,6*	*2,0*	*5,6*	*6,7*	*-7,6*
2011	Moderno	21,9	16,5	38,3	9,9	-10,9	10,2	3,8	14,0	6,3	-6,9
	Tradizionale	*15,9*	*11,9*	*27,8*	*8,4*	*-9,5*	*6,7*	*1,4*	*8,0*	*6,0*	*-9,8*
2012	Moderno	20,6	15,9	36,5	9,9	-10,6	8,0	4,4	12,4	5,4	-6,9
	Tradizionale	*15,4*	*11,6*	*26,0*	*9,6*	*-12,1*	*5,2*	*1,9*	*7,1*	*6,1*	*-6,4*
2013	Moderno	20,8	17,3	38,0	9,7	-11,1	8,8	5,4	14,2	5,3	-6,0
	Tradizionale	*16,2*	*13,9*	*30,1*	*8,3*	*-8,8*	*4,9*	*3,1*	*8,0*	*5,3*	*-5,7*
2006-2013	**Moderno**	**18,5**	**15,2**	**33,8**	**11,1**	**-11,8**	**8,0**	**4,3**	**12,3**	**6,7**	**-7,8**
	Tradizionale	***13,5***	***10,9***	***24,5***	***9,8***	***-11,2***	***5,2***	***1,6***	***6,8***	***6,4***	***-7,5***

		BENI NAE					TOTALE				
		Freq. aumento	Freq. diminuzione	Freq. variazione	Aumento medio	Riduzione media	Freq. aumento	Freq. diminuzione	Freq. variazione	Aumento medio	Riduzione media (%)
2006	Moderno	3,5	3,0	6,4	6,9	-7,4	6,0	5,5	11,5	7,3	-7,9
	Tradizionale	*3,1*	*1,3*	*4,4*	*7,0*	*-8,4*	*4,2*	*2,9*	*7,1*	*7,1*	*-7,9*
2007	Moderno	4,0	1,9	5,9	6,8	-12,4	7,8	4,0	11,8	7,6	-10,8
	Tradizionale	*3,3*	*1,4*	*4,7*	*7,7*	*-10,7*	*5,6*	*2,4*	*8,0*	*8,0*	*-9,4*
2008	Moderno	3,5	2,9	6,4	7,0	-10,2	7,4	4,5	11,9	7,7	-11,0
	Tradizionale	*3,7*	*1,4*	*5,0*	*7,6*	*-10,7*	*5,7*	*2,7*	*8,4*	*7,8*	*-10,3*
2009	Moderno	3,2	2,5	5,7	8,3	-14,7	5,1	5,0	10,1	8,5	-12,7
	Tradizionale	*3,2*	*1,4*	*4,5*	*7,2*	*-15,3*	*4,3*	*2,7*	*7,1*	*7,7*	*-12,9*
2010	Moderno	3,1	3,1	6,2	7,9	-11,0	5,5	5,2	10,7	8,6	-10,3
	Tradizionale	*3,1*	*1,4*	*4,5*	*7,1*	*-11,7*	*4,5*	*2,9*	*7,4*	*7,6*	*-10,8*
2011	Moderno	5,4	2,8	8,2	7,4	-13,6	9,0	5,1	14,0	7,6	-11,7
	Tradizionale	*5,0*	*1,5*	*6,5*	*8,2*	*-13,4*	*7,0*	*3,0*	*10,0*	*7,7*	*-11,9*
2012	Moderno	3,3	2,8	6,1	7,0	-7,5	*7,0*	*5,1*	*12,1*	*7,1*	*-7,8*
	Tradizionale	*3,2*	*1,5*	*4,7*	*9,5*	*-11,6*	*5,5*	*3,2*	*8,7*	*8,7*	*-10,4*
2013	Moderno	4,4	4,1	8,5	4,2	-8,0	*7,9*	*6,4*	*14,2*	*5,3*	*-8,0*
	Tradizionale	*4,2*	*2,9*	*7,1*	*5,9*	*-11,2*	*6,2*	*4,6*	*10,8*	*6,1*	*-9,3*
2006-2013	**Moderno**	**3,9**	**2,8**	**6,7**	**7,3**	**-11,0**	**7,0**	**5,0**	**12,0**	**7,7**	**-10,4**
	Tradizionale	*3,6*	*1,5*	*5,1*	*7,7*	*-12,2*	**5,5**	**3,0**	**8,4**	**7,8**	**-11,0**

Fonte: nostre elaborazioni su dati Istat. Medie ponderate per il peso delle tipologie di prodotto nel paniere NIC.

[10] Non è possibile effettuare un confronto omogeneo con i risultati relativi al periodo 1996-2001 che sono calcolati solo in base al metodo censoring intermedio con pseudo cambiamenti di prezzo e solo per il totale. L'evidenza disponibile segnala comunque un incremento della frazione di prodotti il cui prezzo varia ogni mese, intorno a 2 punti percentuali per la distribuzione moderna e poco meno di 1 punto percentuale per quella tradizionale.

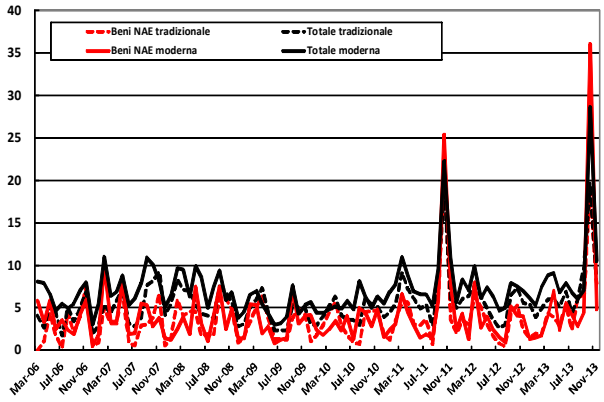
Questo risultato dipende soprattutto da una minore flessibilità verso il basso: la frequenza di riduzione dei prezzi praticati nei negozi tradizionali è in media circa il 3 per cento, due punti percentuali in meno di quanto osservato nei supermercati e negli altri rivenditori non tradizionali. Per quanto riguarda le tipologie di prodotto, le differenze sono particolarmente marcate nel caso degli alimentari trasformati e dei beni NAE, per i quali la frequenza di calo dei prezzi nella distribuzione tradizionale è circa la metà che in quella moderna.

L'ampiezza media degli aggiustamenti non presenta invece significative differenze a seconda della tipologia distributiva. La divergenza maggiore riguarda i beni NAE, per i quali si osserva un'ampiezza mediamente più elevata delle riduzioni di prezzo nella distribuzione tradizionale, e gli alimentari freschi, che tendono a registrare rialzi più consistenti nel comparto moderno.

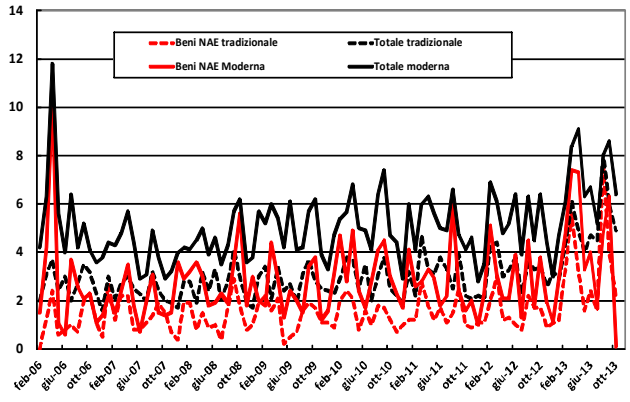
Anche nell'ottobre 2011 e nello stesso mese del 2013, in occasione del rialzo dell'aliquota ordinaria dell'IVA, che ha riguardato all'incirca l'87 per cento dei prodotti inclusi nella categoria dei beni NAE, la frequenza dei rincari in tale categoria è stata più elevata nella distribuzione moderna che in quella tradizionale (fig. 4a), segnalando una traslazione ai prezzi più rapida della variazione dell'IVA.

Figura 4 – Frequenza di aggiustamento dei prezzi dei beni non alimentari e non energetici
(percentuali; metodo censoring intermedio)

a) aumento



b) riduzione



Fonte: nostre elaborazioni su dati Istat. Medie ponderate sulla base del peso delle tipologie di prodotto nel paniere NIC.

5.3 Un'analisi degli effetti delle due recessioni

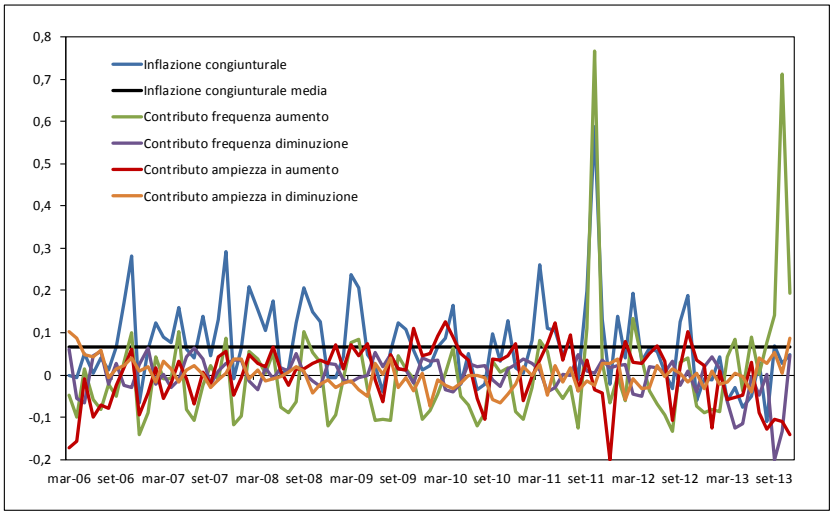
Per ogni periodo l'inflazione aggregata o per singola tipologia di beni può essere approssimata dalla somma del prodotto tra la frequenza e l'ampiezza delle variazioni di prezzo in aumento e il corrispondente prodotto per le variazioni in diminuzione: $\pi = F^{+}\Delta p^{+} + F^{-}\Delta p^{-}$.

Partendo da questa relazione è possibile scomporre il tasso di inflazione in quattro componenti: l'inflazione media su tutto il periodo, il contributo delle frequenze (il cosiddetto margine estensivo), il contributo dell'entità delle variazioni (margine intensivo) e un residuo.

La figura 5 mostra graficamente questa scomposizione prendendo come riferimento l'inflazione congiunturale dei beni NAE costruita sulla base dei 16 prodotti del nostro dataset appartenenti a tale categoria e isolando il contributo dell'inflazione media, della frequenza degli aggiustamenti

(verso l'alto e verso il basso) e della rispettiva ampiezza di questi ultimi[11]. Da essa emerge che larga parte dell'andamento del tasso di inflazione congiunturale dei prodotti in esame è spiegata dalla frequenza di aumento dei prezzi; questa componente cattura anche larga parte della componente stagionale e i due episodi di rialzo dell'aliquota ordinaria IVA nell'ottobre del 2011 e nell'ottobre del 2013.

Figura 5 – Inflazione congiunturale dei beni NAE: scomposizione
(percentuali)



Fonte: nostre elaborazioni su dati Istat.

Tavola 11 – Le variazioni di prezzo dei beni NAE in occasione dell'aumento dell'aliquota IVA
(percentuali)

	Ottobre 2011	Ottobre 2013
a) Frequenza di aumento	20.6	17.9
b) Frequenza di diminuzione	2.3	3.9
Ampiezza media variazioni di prezzo	0.6	0.0
c) Ampiezza media variazioni in aumento	3.6	1.9
d) Ampiezza media variazioni in diminuzione	-8.4	-7.0
Ampiezza mediana variazioni in aumento	1.7	1.2
Ampiezza mediana variazioni in diminuzione	-6.9	-8.5
Contributo variazioni in aumento (a*c)	0.7	0.3
Contributo variazioni in diminuzione (b*d)	-0.2	-0.3
Variazione media dei prezzi (a*c+b*d)	0.5	0.1

Attraverso questa scomposizione la distribuzione delle variazioni di prezzo in ogni singolo periodo può essere rappresentata attraverso un numero limitato di statistiche. La tavola 11 riporta un

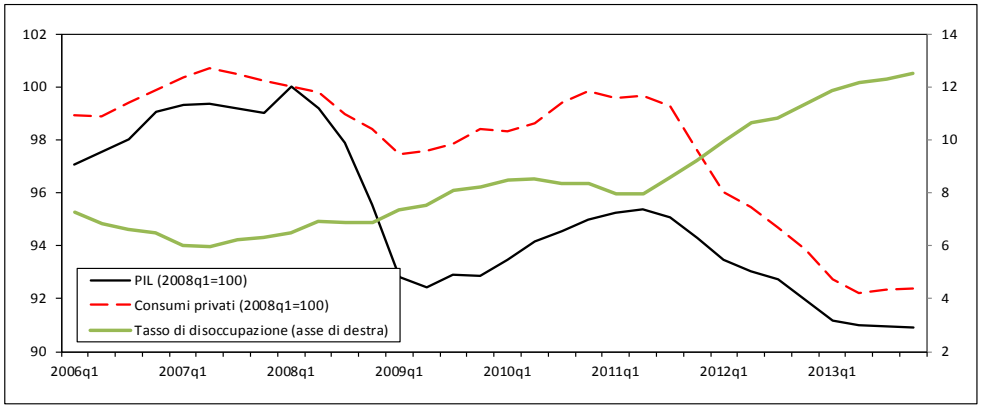
[11] I contributi sono calcolati moltiplicando la frequenza (o l'entità) in aumento (o in diminuzione) in deviazione dalla media su tutto il periodo per la media della corrispondente ampiezza (o frequenza) in aumento (o in diminuzione). Per costruzione tali contributi hanno media zero. I residui, non riportati nel grafico, sono invece ottenuti moltiplicando le variabili in deviazione dalla media.

esempio relativo ai beni NAE[12] nelle due occasioni in cui è avvenuto il rialzo dell'IVA. Da essa si evince che l'aumento più contenuto dei prezzi nell'ottobre del 2013 rispetto al 2011 è spiegato da tre fattori, che hanno tutti agito nella stessa direzione: i) una percentuale minore di prodotti per i quali si è registrato un aumento di prezzo nel mese (17,9 per cento contro 20,6); ii) un'ampiezza mediamente inferiore di tali rialzi (1,9 per cento contro 3,6) e iii) una percentuale maggiore di prodotti per i quali si è registrato un calo di prezzo.

Nel complesso del periodo 2006-2013 si sono succedute due fasi di moderata crescita e due recessioni, la seconda delle quali è proseguita nel 2014. Mentre la recessione del 2008-2009 ha avuto un effetto sui consumi complessivamente limitato e temporaneo[13], quella iniziata nel 2011 ha, alla fine del 2013, determinato una contrazione della spesa delle famiglie di entità analoga a quella del prodotto rispetto al picco ciclico del primo trimestre del 2008 (fig. 6). Nello stesso periodo, dalla metà del 2011 il tasso di disoccupazione è salito dall'8 a oltre il 12 per cento.

Figura 6 – PIL, consumi e tasso di disoccupazione

(indici 2008q1=100 per PIL e consumi; percentuali per il tasso di disoccupazione)



Fonte: nostre elaborazioni su dati Istat.

In entrambe le fasi recessive e in particolare nell'ultima l'inflazione "core" (beni NAE e servizi), meno soggetta a shock esterni rispetto a quella dei prodotti energetici e alimentari, si è ridotta notevolmente, sia in termini congiunturali sia in termini tendenziali. La scomposizione dell'inflazione resa possibile dalla ricchezza del nostro dataset ci consente di identificare gli aspetti del meccanismo di aggiustamento dei prezzi attraverso i quali si è determinata tale riduzione, ovvero la relazione tra la fase ciclica (misurata dall'andamento di consumi, del PIL e del tasso di disoccupazione) e la frequenza, entità e direzione delle variazioni di prezzo.

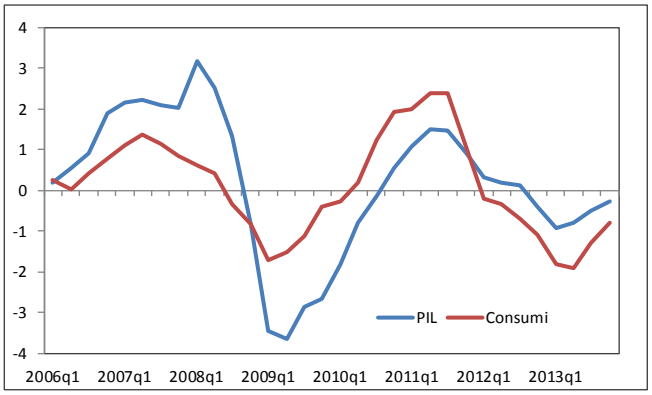
A tal fine, sottoponiamo a stima una serie di modelli che mettono in relazione ciascuna delle componenti dell'inflazione con una costante, una dummy per tener conto dei due rialzi dell'IVA, un set di dummy stagionali, il tasso d'inflazione (misurato dalla variazione tendenziale del sub-indice relativo alla tipologia di prodotto in esame, con un ritardo compreso tra 1 e 5 trimestri) e una proxy dell'andamento del ciclo economico, con un ritardo compreso tra 0 e 4 trimestri. Per quest'ultima si considerano varie specificazioni: la deviazione del PIL o dei consumi rispetto a un

[12] Nella tavola 11 le statistiche sono calcolate direttamente dalle osservazioni ponderate per il peso dei singoli prodotti nell'indice NIC. Nella figura 7 la ponderazione avviene a livello di singole statistiche per i prodotti.

[13] Per un'analisi delle precedenti recessioni si veda "Le principali recessioni italiane: un confronto retrospettivo" di Antonio Bassanetti, Martina Cecioni, Andrea Nobili e Giordano Zevi, Banca d'Italia, Questioni di Economia e Finanza no. 46, luglio 2009.

trend di lungo periodo (ottenuto applicando un filtro HP; fig. 7), o il tasso di disoccupazione. La spesa per consumi è riferita ai consumi totali delle famiglie residenti.

Figura 7 – Deviazione del PIL e dei consumi del rispettivo trend di lungo periodo
(percentuali)



Fonte: nostre elaborazioni su dati Istat.

I risultati dell'esercizio, condotto con metodo OLS utilizzando come variabili dipendenti la frequenza e l'ampiezza mensile media di aumento o diminuzione, sono riportati nella tavola 12, che presenta anche (nell'ultima riga) una stima dell'effetto di un calo dell'1 per cento del PIL o dei consumi rispetto al trend, o dell'aumento di un punto percentuale del tasso di disoccupazione sull'indice dei prezzi dei prodotti NAE e su quello dei servizi al netto degli alberghi. Tale stima è effettuata utilizzando la frequenza o l'entità media delle variazioni nel periodo campionario.

Nel caso dei beni NAE emerge una relazione statisticamente significativa (segnalata in grassetto) tra la fase ciclica – misurata dall'andamento dei consumi rispetto al trend (colonna 5) e del tasso di disoccupazione (colonna 6) – e la frequenza di riduzione dei prezzi. L'effetto sembrerebbe relativamente contenuto: un aumento di 1 punto percentuale del tasso di disoccupazione o un calo di uguale entità dei consumi rispetto al trend incrementano la frequenza degli aggiustamenti verso il basso dei prezzi dei beni NAE di circa 0,2 punti percentuali, con un effetto complessivo di soli 0,01 punti sul rispettivo indice. Se si considera tuttavia che il tasso di disoccupazione è cresciuto di quattro punti percentuali tra la metà del 2011 e la fine del 2013, l'impatto stimato sull'inflazione dei beni NEA è stato pari a circa mezzo punto percentuale. La caduta del PIL e del consumi appare anche significativamente correlata con l'ampiezza delle riduzioni di prezzo (colonne 10 e 11), amplificando l'impatto negativo sull'inflazione di tali aggiustamenti.

I risultati relativi alla sensitività ciclica degli aggiustamenti verso l'alto dei prezzi sono significativi solo con riferimento all'ampiezza delle variazioni e nella specificazione in cui la variabile ciclica è approssimata dal tasso di disoccupazione (colonna 9): la relazione è inversa, segnalando che l'inasprirsi della fase recessiva comporta aggiustamenti di entità più ridotta, con un impatto complessivo sull'inflazione dei beni NAE analogo a quello derivante dalle più frequenti riduzioni.

Per quanto riguarda i servizi l'impatto più rilevante dell'andamento ciclico sembrerebbe derivare da una minore frequenza (colonna 14) e da una minore ampiezza media dei rincari (colonna 20) a seguito del calo della spesa per consumi. L'aumento della disoccupazione avrebbe comportato solo un effetto lievemente positivo sulla frequenza di diminuzione dei prezzi (colonna 18). Le uniche due equazioni con un impatto statisticamente significativo dell'output gap (equazioni 19 e

22) assocerebbero a una ripresa ciclica un'ampiezza minore delle variazioni in aumento e una maggiore nel caso di quelle in diminuzione.

Nel complesso per i beni NAE le due fasi recessive sono associate a una maggiore incidenza delle riduzioni di prezzo, di entità maggiore, e una minore ampiezza delle variazioni in aumento. Nel caso dei servizi si sarebbe invece ridotta sia la frequenza sia l'entità dei rincari di prezzo. Tra le variabili cicliche utilizzate l'output gap risulta nella maggior parte dei casi non significativo, mentre consumi e tasso di disoccupazione mostrano maggiore capacità esplicativa.

Tavola 12 – L'effetto dell'andamento ciclico su frequenza e ampiezza delle variazioni di prezzo

Beni NAE

Variabile dipendente	Frequenza aumento			Frequenza riduzione			Ampiezza media aumento			Ampiezza media riduzione		
Misura del ciclo	Output gap	Cons. gap	Tasso di disocc.	Output gap	Cons. gap	Tasso di disocc.	Output gap	Cons. gap	Tasso di disocc.	Output gap	Cons. gap	Tasso di disocc.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dummy IVA	**8.05**	**8.32**	**16.74**	0.44	0.52	0.89	**-3.25**	**-3.75**	-1.90	1.35	1.18	-0.59
(t-stat)	**12.38**	**12.83**	**16.07**	0.94	1.32	1.63	**-4.73**	**-4.46**	-1.61	1.79	1.33	-0.42
Inflazione	**-1.48**	**-1.24**	**-0.78**	-0.43	-0.40	**-0.55**	**1.99**	0.68	**1.96**	**-1.46**	**-2.12**	**-1.03**
(t-stat)	**-3.14**	**-2.51**	**-1.90**	-1.29	-1.39	**-2.59**	**4.23**	1.07	**4.26**	**-2.82**	**-2.86**	**-1.90**
Ritardo inflazione	2	3	5	2	2	5	1	3	5	1	1	5
Ciclo	0.11	-0.18	0.08	-0.04	**-0.22**	**0.21**	-0.17	0.27	**-0.28**	**0.40**	**0.58**	0.09
(t-stat)	1.27	-1.54	1.13	-0.71	**-3.04**	**5.36**	-1.88	1.72	**-3.34**	**4.09**	**2.60**	0.88
Ritardo variabile ciclica	4	1	0	0	1	4	4	1	3	4	4	4
R2	0.92	0.91	0.87	0.19	0.41	0.56	0.75	0.57	0.42	0.60	0.46	0.25
Effetto sui prezzi	0.00	0.01	0.00	0.00	**-0.01**	**-0.01**	0.01	-0.01	**-0.01**	**-0.01**	**-0.01**	0.00

Servizi al netto degli alberghi

Variabile dipendente	Frequenza aumento			Frequenza riduzione			Ampiezza media aumento			Ampiezza media riduzione		
Misura del ciclo	Output gap	Cons. gap	Tasso di disocc.	Output gap	Cons. gap	Tasso di disocc.	Output gap	Cons. gap	Tasso di disocc.	Output gap	Cons. gap	Tasso di disocc.
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Dummy IVA	0.08	0.11	1.57	-0.29	-0.28	-0.61	-1.23	-1.50	-1.15	0.75	1.00	1.82
(t-stat)	0.12	0.18	1.20	-1.07	-1.10	-1.73	-1.58	-1.98	-0.87	1.00	1.23	1.44
Inflazione	0.80	0.95	0.16	-0.18	-0.23	0.07	1.52	1.49	0.21	-1.06	-0.82	-0.42
(t-stat)	1.88	2.04	0.37	-0.91	-1.24	0.63	2.79	2.62	0.49	-2.12	-1.48	-1.04
Ritardo inflazione	1	5	5	5	5	4	1	5	5	1	1	1
Ciclo	-0.12	**0.44**	-0.11	-0.05	-0.10	**0.07**	**-0.32**	**0.55**	-0.15	**0.36**	0.35	-0.13
(t-stat)	-1.19	**3.10**	-1.13	-1.20	-1.84	**2.70**	**-2.39**	**3.15**	-1.52	**2.93**	1.73	-1.40
Ritardo variabile ciclica	4	2	4	0	1	3	3	2	4	2	3	0
R2	0.31	0.48	0.25	0.12	0.19	0.21	0.46	0.55	0.27	0.43	0.31	0.14
Effetto sui prezzi	0.00	**-0.02**	0.00	0.00	0.00	**0.00**	**0.01**	**-0.01**	0.00	**0.00**	0.00	0.00

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APPENDICE

Tavola A1 – Lista dei prodotti inclusi nel dataset

(i pesi sono espressi in percentuale e si riferiscono all'indice NIC per il 2012)

DESCRIZIONE	PESO	Tipologia	Periodicità
Pane	1.05	Alimentari lavorati	mensile
Pasta di semola di grano duro	0.40	Alimentari lavorati	mensile
Spinaci surgelati	0.01	Alimentari lavorati	mensile
Zucchero	0.12	Alimentari lavorati	mensile
Caffè tostato	0.22	Alimentari lavorati	mensile
Acqua minerale	0.27	Alimentari lavorati	mensile
Vino da tavola	0.21	Alimentari lavorati	mensile
Birra nazionale	0.14	Alimentari lavorati	mensile
Carne fresca bovino adulto, tritata	0.33	Alimentari non lavorati	mensile
Alici fresche di pescata	0.19	Alimentari non lavorati	bimensile
Latte fresco	0.30	Alimentari non lavorati	mensile
Banane Centro America	0.14	Alimentari non lavorati	bimensile
Pomodori da sugo tipo San Marzano	0.06	Alimentari non lavorati	bimensile
Jeans uomo	0.30	Altri beni	mensile
Camicia cotone uomo	0.49	Altri beni	mensile
Calze uomo	0.17	Altri beni	mensile
Scarpe sportive da uomo	0.44	Altri beni	mensile
Scatola di costruzioni in plastica	0.05	Altri beni	mensile
Alimenti per cani	0.11	Altri beni	mensile
Dentifricio	0.10	Altri beni	mensile
Piastrelle	0.08	Altri beni	mensile
Armadio guardaroba	0.75	Altri beni	mensile
Set di asciugamani	0.04	Altri beni	mensile
Ferro da stiro	0.18	Altri beni	mensile
Lampadina a risparmio energetico	0.03	Altri beni	mensile
Pneumatico auto cilindrata fino a 1500	0.19	Altri beni	mensile
TV color	0.18	Altri beni	mensile
Pallone	0.09	Altri beni	mensile
Valigia	0.04	Altri beni	mensile
Gasolio per auto con servizio alla pompa	1.94	Beni energetici	bimensile
Benzina verde con servizio alla pompa	2.10	Beni energetici	bimensile
Gasolio per riscaldamento	0.57	Beni energetici	bimensile
Domestica a ore	1.62	Servizi	mensile
Pasto in pizzeria	1.86	Servizi	mensile
Birra al bar	0.16	Servizi	mensile
Cappuccino al bar	1.03	Servizi	mensile
Gelato confezionato	0.15	Servizi	mensile
Lavatura e stiratura abito uomo	0.35	Servizi	mensile
Lavaggio auto	0.04	Servizi	mensile
Riparazione auto - equilibratura gomme	0.25	Servizi	mensile
Autorimessa	0.41	Servizi	mensile
Taxi	0.09	Servizi	mensile
Cinema	0.09	Servizi	mensile
Camera albergo categoria 3 stelle	2.10	Servizi	mensile
Taglio capelli uomo	0.18	Servizi	mensile
Messa in piega	0.30	Servizi	mensile
Idraulico	0.12	Servizi	mensile
Elettricista	0.04	Servizi	mensile
Fotocopia	0.14	Servizi	mensile

Tavola A2 – I metadati

Anno	
Mese	
Provincia	*Nome della città*
Ditta	*Codice della ditta*
Zona	*Agricola, centro storico, etc*
Tipologia distributiva	*Grande magazzino, supermercato, etc.*
Marca	*Descrizione Marca*
Codice prodotto	*Codice COICOP*
Codice traiettoria	*Codice che identifica la combinazione prodotto, rivenditore e città*
Descrizione Varietà	*Descrizione del prodotto*
Prezzo rilevato	*Prezzo effettivamente rilevato.*
Prezzo rilevato per unità	*Prezzo per quantità (per esempio per litro d'acqua)*
Prezzo mese precedente	
Prezzo scontato	
Prezzo base	*Prezzo del dicembre dell'anno precedente*
Codice di controllo	
Cambio marca	*variabile=1 se si è rilevato il prezzo di un'altra marca*
Cambio varietà	*variabile=1 se si è rilevato il prezzo di un'altra varietà*
Cambio quantità	*variabile=1 se si è rilevato il prezzo di una diversa quantità*
Cambio ditta	*variabile=1 se si è rilevato il prezzo presso un'altra ditta*
Segnalazione stima	

Failing to forecast low inflation and Phillips curve instability: a euro-area perspective.*

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Abstract

Professional forecasters failed to anticipate the sharp fall in inflation in the euro area in 2013-2014. We investigate whether this forecasting failure can be partly attributed to a break in the elasticity of inflation to the output gap. Using structural break tests and time varying parameter models we find that this elasticity has indeed increased substantially in the past two years. We offer two (observationally equivalent) interpretations of this result. The first is that the increase in the cyclicality of inflation has stemmed from lower nominal rigidities or weaker strategic complementarities in price setting. A second possibility is that current output gap estimates are understating the amount of spare capacity in the economy. We estimate that, in order to reconcile the observed fall in inflation with the historical correlation between consumer prices and the business cycle, the output gap should be wider by around one third.

*We wish to thank two anonymous referees and the Editor for useful comments. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banca d'Italia.

The ECB never expects inflation to deviate from the target of just under 2 per cent. Yet each month inflation undershoots, and the ECB is apparently taken by surprise.

Münchau W., 2014[1]

1 Introduction

Debate over the Phillips curve has gained momentum since the 2008 financial crisis. In the course of the recession that followed that crisis, a puzzle had emerged, in that inflation in advanced countries had not fallen as much as a traditional Phillips curve, as discussed by Williams (2010) and Ball and Mazumder (2011). The decline of euro area inflation between 2013 and 2014 is pointing in the opposite direction. Following the sovereign debt crisis, the euro area fell into a severe recession, which generated sizeable output losses in the countries more directly involved, in particular Greece, Spain, Portugal, Italy and Ireland. The recession was followed by a sharp fall in consumer price inflation, with core (net of food and energy) inflation dropping in the euro area to historically low levels in mid-2014. Two features stand out in this rapid inflation decline. First, it is broad based across countries, although relatively more intense those that have been hit the hardest by the sovereign debt crisis. Second, it was not anticipated by professional forecasters. This is particularly surprising if we consider that the fall in economic activity that most of the euro area countries have experienced after 2011 has generated significant gaps between actual and potential output in these economies.

Two plausible explanations, not mutually exclusive, can be put forward. One is that forecasters underestimated the output gap over this horizon. This hypothesis relates to the usual difficulty of separating trends from cycles in real time, a task made even more difficult by the severity of the shock to GDP. The issue of quantifying structural and cyclical factors behind economic activity is crucial for the conduct of monetary policy and it is at the center of the policy debate, as testified by the 2014 Jackson Hole speech by ECB President Draghi.[2] A second possibility is that forecasters conditioned on an *accurate* measure of the output gap (where by *accurate* we mean the output gap that would have been available to them ex-post) but the response of inflation was stronger than estimated with data up to 2012. This second hypothesis, which has so far found less echo in the debate, is the focus of our paper. Drawing from the econometric literature, which has long identified structural breaks as the main cause of forecast failure, we investigate through structural break tests and time varying parameter models whether the recent deep and long lasting fall in economic activity has been accompa-

[1] Münchau, W (2014), Draghi is running out of legal ways to fix the euro, Financial Times, 17 August.
[2] See `http://www.ecb.europa.eu/press/key/date/2014/html/sp140822.en.html`.

nied by an increased sensitivity of euro area inflation to cyclical conditions, measured by the coefficient of the output gap in a backward looking Phillips curve.

We find that the sensitivity of inflation to business cycle conditions has indeed increased from 2013 onwards. This is consistent both with the muted response of consumer price to the global recession in 2008-2009[3] and with the sudden decrease in inflation that followed (albeit with some delay) the sovereign debt crisis. An analysis of the sub-aggregates of the consumer price index shows that this feature holds for both goods and services, i.e. tradable and non tradable products.[4]

Our findings are in line with the evidence put forward in a number of papers that investigate the inflation-unemployment relationship in the U.S. .Stock and Watson (2010), for instance, find that unemployment is more useful for predicting inflation in recessions than in booms, a feature also highlighted in Olivei and Barnes (2004). Stella and Stock (2012), using a multivariate unobserved component model that implies a time varying Phillips curve, find that since 2008 the slope of the curve has become steeper.

We provide two alternative explanations for our findings. The first is that the crisis could have induced some changes in the structure of the economy that could have favoured a stronger responsiveness of prices to the output gap. We show that in a new Keynesian Phillips curve a rise in inflation cyclicality stems either from lower nominal rigidities, i.e., a higher frequency of price adjustment, or from weaker strategic complementarities in price setting, which could result from a significant fall in the number of firms in the economy. This latter channel arises in the model because an exogenous decrease in the number of firms implies lower elasticity of demand and higher desired markups. A second explanation is that even the ex-post output gap measures are *underestimating* the amount of slack in the economy. This, in turn, would be picked up as a change in the model parameters due to an omitted variable bias. We derive an estimate of the output gap that is consistent both with the observed fall in inflation and with the lower correlation between inflation and the output gap estimated before 2013. This counterfactual output gap is significantly wider, by around one third, than the one currently estimated by international Institutions. A third factor potentially at work is a downward adjustment of inflation expectations, which could be feeding back to actual inflation. The importance of this mechanism cannot be assessed within the theoretical model (given the hypothesis of rational expectations) and, in the absence of a reliable measure of expectations, it is also hard to gauge empirically, although a robustness check (in which we control for inflation *forecasts* elicited from professional forecasters) leaves unaltered our baseline results.

[3]For Italy, for example, estimates based on a DSGE model find that the Phillips curve was relatively flat up to 2012, see Riggi and Santoro (2015).

[4]For simplicity of exposition in the paper we will simply call *goods* the *non-energy industrial goods* subcomponent of the consumer price index.

The paper is structured as follows. Section 2 motivates the paper by discussing how forecasters overestimated inflation in 2013 and 2014. Section 3 presents the empirical analysis. Section 4 discusses alternative interpretations of the evidence. Section 5 concludes. An online Appendix provides additional material.

2 The inflation surprise

The pronounced slowdown in euro area inflation in 2013 and 2014 was not correctly predicted by forecasters. Figure 1 shows actual inflation between 2001 and 2013, together with 4 steps ahead inflation forecast errors computed (as the difference between actual and expected inflation) on the basis of the Consensus Economics survey.[5] In the figure we also present the price of oil (in euros). Three features stand out:

- Between 2001 and 2008, when consumer price inflation overshot the ECB target and fluctuated slightly above 2.0%, professional forecasters were systematically surprised on the upside. There are two plausible explanations for this outcome. First, at the end of the Nineties, many euro area countries had pursued disinflationary policies (mainly by restraining wage growth) in order to comply with the Maastricht criteria. However, after joining the Monetary Union, these policies were relaxed, thus fostering inflation rates (Busetti et al., 2007). Second, between 2003 and 2008, oil (and other commodity) prices were subject to a sequence of positive shocks, with brent prices more than doubling from 30 to 70 euros per barrel, providing continuous upward pressure on euro area inflation.
- After the unexpected collapse of oil prices that followed the financial crisis, inflation fell sharply and forecast errors turned negative for the whole of 2009. This was the first spell of negative errors observed since 2001. As oil prices returned to pre-crisis levels starting in 2010, forecast errors once again turned positive.
- In 2013 and 2014, following the sovereign debt crisis, inflation slowed down gradually and a second spell of negative forecast errors was recorded. Comparing the two episodes of negative inflation surprises (the one in 2009 and the one in 2013-2014) two differences can be observed. First, the most recent one is more persistent, as no sign of reversion in forecast errors has yet emerged. Second, it has occurred in the context of stable oil prices. These features suggest that professional forecasters failed to predict low inflation in the euro area because they were mostly surprised by the slackening of core (net of food and energy) inflation, i.e. the inflation component that is more related to cyclical conditions. This intuition is further reinforced by looking at oil price futures collected in February

[5] We use the quarterly survey of professional forecasters conducted by Consensus Economics in March, June, September and December, which provides forecasts for the next seven quarters for a number of macro variables.

2012, also presented in Figure 1, which show that the relative stability of oil prices in the next two years was largely expected by the markets, so that no negative surprise stemmed from oil commodity prices.[6]

As forecast failure in the econometric literature is frequently associated with structural breaks, we investigate whether the recent negative, persistent, inflation surprise is associated with a change in the elasticity of core inflation to the output gap in a backward looking Phillips curve, of the type commonly used to for forecasting (Stock and Watson, 2008). The next section turns to an empirical investigation of this hypothesis.

3 Empirical evidence

Our empirical analysis is based on the following backward looking Phillips curve:

$$\pi_t = \mu + \sum_{j=1}^{k} \beta_j \pi_{t-1} + \gamma y_{t-1} + \Gamma' z_t + \eta_t \tag{1}$$

where π_t indicates (quarter on quarter, seasonally adjusted and annualized) consumer price inflation, y_t is a measure of economic slack and z_t is a vector of other explanatory variables. In our application we set $k = 2$ as two lags are more than enough to capture the persistence of the inflation process.

We consider six different measures of inflation. The first three are the core Harmonized Index Consumer prices (HICP) net of food and energy (Core) and its two sub-components, goods and services. The other three are the corresponding indicators net of the impact of indirect taxation (defined CoreX, GoodX and ServicesX in the rest of the paper), which are computed by Eurostat under the assumption that indirect tax increases are passed through fully and immediately to final consumer prices. The importance of such indicator has risen in recent years, owing to the sequence of indirect taxation hikes with which a number of countries have tried to reduce fiscal deficits and restore market confidence.[7] They are therefore relevant for our study since the actual inflation rate could have been kept temporarily high by indirect tax increases.

We interact these inflation measures with output gaps computed by the European Commission (EC), the Organisation for Economic Co-operation and Development (OECD) and the International Monetary Fund (IMF). These output gaps are shown in Figure 2. In our analysis

[6] Oil price futures in euros are obtained under the assumption of constant euro/US dollar exchange rate from the first quarter of 2012 onwards.

[7] Notice that if VAT increases are not passed through to final prices these indicators provide a lower bound of the actual inflation rate net of tax increases.

we consider data from 1999 to the third quarter of 2014. We choose to discard data prior to the inception of the euro motivated by the findings in Benati (2008), according to which the inflation targeting pursued by the ECB has significantly changed the statistical properties of the inflation process, so that any findings obtained using data before 1999 are unlikely to shed any light on current inflation developments.

3.1 End of sample instability tests

The first analysis we conduct is based on structural break tests. Since we are interested in parameters instability at the end of the sample, conventional break tests like those of Andrews et al. (1996) are not well suited to our purpose, due to the fact that the number of observations in the period of potential change is low compared to the sample size. Also the extension to the end-of sample case by Andrews (2003) only has power when the change-point is known. Busetti (2012) addresses these issues and introduces a number of new tests designed to have high power at the end of the sample when the location of the break is not known a priori. The improvement in power is obtained by either limiting the possibility of a change-point to the last part of the sample or by giving increasing weight to the likelihood that a break will occur as the end of the sample is approached. In our application we will focus on two versions of the Locally Most Powerful (LMP) test proposed by Busetti (2012). These tests are designed to have power against the alternative of random walk type variation in the model parameters, a widely used assumption in models with time varying coefficients (Cogley and Sargent, 2005).

Given a linear regression like the one in equation (1), involving T observations and k regressors collected in a vector x_t, the LMP statistics has the following form:

$$L_\pi = \hat{\sigma}^2 (T - \pi T)^{-2} \sum_{t=\pi T+1}^{T} S_t' V^{-1} S_t$$

where $\hat{\sigma}^2 = \hat{u}_t' \hat{u}_t / (T-k)$, $\hat{u}_t$ are the regression residuals, $S_t = \sum_{j=t}^{T} \hat{u}_j x_j$, $V = T^{-1} \sum_{t=1}^{T} x_t x_t'$, and π is the last fraction of the sample where the break is supposed to have occurred. The two tests that we use are functions of this statistics and are computed as:

$$Sup - L = \underset{\pi \epsilon \Pi}{Sup}(L_\pi)$$

$$Exp - L = \log \int_{\pi \epsilon \Pi} \exp(L(\pi)) \pi d\pi$$

We apply these two tests for $\pi = 0.10$ and 0.25 (i.e. the last 10 and 25% of the sample),the fractions for which critical values have been tabulated by Busetti (2012). Overall, we consider

the 18 different specifications that can be obtained by interacting the six measures of inflation with the three output gaps that we have selected. The results of the analysis are shown in Table 1. The table is organized in two vertical panels corresponding to the baseline specification (in which we do not add any control variable z_t) and to an alternative specification in which we add as a control variable the percentage change of non-energy import prices[8], to control for the effect of the exchange rate on consumer prices. In each cell we report 1 if the null hypothesis of coefficients stability is rejected at the 10% confidence level, 0 otherwise. The results can be summarized as follows:

1. When using the aggregate core index (Core) no evidence of instability emerges. On the contrary, when the underlying core inflation components are considered separately (Goods and Services), both the exp-L and the sup-L tests detect a break in the model parameters in the last portion of the sample, a result that holds regardless of the measure of output gap considered and whether or not import prices are included in the regression.
2. When we clean the price indices of the upward pressure of recent indirect tax increases, evidence of instability emerges also for the aggregate core inflation index (CoreX) and it is confirmed for the prices of services (ServicesX). Again this result is spread across different measures of output gap and it is not affected by the inclusion of import prices. In this case, however, evidence of a break is not picked up by the tests for the prices of goods (GoodsX).
3. Overall, a significant fraction of the stability tests (66%) suggests that some instability in the inflation-output nexus has indeed emerged in recent years. The figure is quite high especially if one considers the difficulty that break tests have in detecting parameter shifts that are slow and gradual, as evidenced by Benati (2007).

3.2 Time varying parameter models

To further investigate the hypothesis of parameter instability we now relax the assumption of constant parameters and specify a time varying coefficient model:

$$\pi_t = \mu_t + \sum_{j=1}^{k} \beta_{j,t}\pi_{t-1} + \gamma_t y_{t-1} + \Gamma_t' z_t + \eta_t \tag{2}$$

Parameter estimates will produce a path for the coefficients, therefore allowing us to gauge the direction of the change signalled by the break tests.

[8]This is estimated as the residual of a regression of the percentage change of the import deflator to the percentage change of oil prices in euros.

Given the large number of models under analysis we use a non-parametric estimator, which is computationally much less cumbersome than the Bayesian methods customarily used in the context of models with time varying parameters. The nonparametric approach has long been used in econometrics in the case of deterministic structural change. It has been recently extended to the case of stochastic time variation by Giraitis et al. (2013) and Giraitis et al. (2014). The idea of this estimator is that, in the presence of structural change, older data should be discounted in favour of more recent information. This is achieved by weighting observations with decaying weights when computing sample correlations. Collecting the right hand variables of equation (2) in the column vector X_t, the dependent variable in Y_t and the time varying parameters in the vector ρ_t, the estimator has the form:

$$\rho_t = \left[\sum_{j=1}^{T} \omega_{j,t} X_j X_j'\right]^{-1} \left[\sum_{j=1}^{T} \omega_{j,t} X_j Y_j\right]$$

The sample moments are therefore discounted by the function $\omega_{j,t}$:

$$\omega_{j,t} = cK\left(\frac{t-j}{H}\right) \tag{3}$$

where c is an integration constant and $K\left(\frac{t-j}{H}\right)$ is the kernel function determining the weight of each observation j in the estimation at time t. This weight depends on the distance to t normalized by the bandwidth H. Giraitis et al. (2013) show that the estimator has desirable frequentist properties and suggest the optimal bandwidth value $H = \sqrt{T}$. We follow their suggestion and estimate the parameters ρ_t using a Gaussian kernel and set $H = \sqrt{T}$. Although, asymptotically, the estimator is Normally distributed, we derive confidence bands via bootstrap simulations, given the low number of observations in our sample.[9]

The estimated evolution of the output gap coefficient (γ_t) is shown in Figure 3, which is organized in four panels. The left hand panels show estimates obtained using, respectively, core inflation (top) and core inflation net of indirect taxation (bottom) and a baseline specification with no additional control variables. The right hand panels display analogous estimates obtained controlling for import prices. In each plot we report the 15th, 50th and 85th percentiles of the empirical distribution of the estimated γ_t, together with the estimate obtained with a constant coefficient model and data up to 2012q4.[10]

[9]When computing confidence bands we also allow for changes in the variance of the errors η_t. At each point in time of the bootstrap simulation we therefore draw the errors from a Normal distribution with mean zero and variance σ_t^2. We estimate also σ_t^2 with nonparametric methods as suggested by Giraitis et al. (2014): $\sigma_t^2 = 1/T \sum_{j=1}^{T} \omega_{j,t} u_j^2$.

[10]Since we have three different measures of the output gap, we account for output gap uncertainty by pooling bootstrap estimates from specifications with different output gaps and compute the percentiles on the empirical

In all cases, the median estimate of γ_t shows an increasing tendency from the end of 2012, to a value of around 0.25/0.30. This is almost three times as large as the estimate obtained from a fixed coefficient model. Notice that this latter estimate is also well below the 15th percentile of the empirical distribution of γ_t from 2013 onwards. To assess which component of inflation is driving these results, we inspect the estimated gap coefficients for goods and services separately, as shown in Figures 4 and 5. Results on the subcomponents are overall in line with those of the aggregate as the responsiveness of both goods and services prices to the business cycle has increased markedly in recent years. When controlling for import prices, in particular, a significant discontinuity appears in 2013-2014.

To explore a possible role for inflation expectations we augment the baseline specification with a forward looking inflation measure, i.e., expected inflation 6 quarters ahead, as surveyed by Consensus Economics. The results are presented in Figure 6 for the core index, and in Figures 7 and Figure 8 for goods and services. The inclusion of inflation forecasts results in an increase in estimation uncertainty (relatively more pronounced for the prices of goods) but does not remove the upward trend of the median estimates at the end of the sample.

Finally, a break in the inflation/output gap relationship could also involve other parameters of equation 2, like the intercept and the dynamics, also with detrimental effects on forecast accuracy (Hendry and Mizon, 2014). We therefore explore whether the persistence of the inflation process, measured by the sum of the autoregressive coefficients, $\beta_1 + \beta_2$, or the long run mean, $\mu_t/(1 - \beta_1 - \beta_2)$, have changed in recent years.[11] The analysis reveals that the long-run mean of core inflation has remained steady around its historical average (1.5%, Figure 9). Also the sum of the autoregressive coefficients, has stayed rather stable around zero since 2006, confirming the the results obtained by Benati (2008) who finds that the serial correlation of inflation is typically zero in monetary areas with a well defined nominal anchor, like the medium-term ECB inflation target.

4 Interpretation of the evidence

Having documented an increase in the sensitivity of inflation to the output gap we discuss possible interpretations of such evidence along two lines. First, we go through the theoretical pricing model by Sbordone (2007) and explore which changes in the structure of the economy would lead to an increase in the slope of the Phillips curve. An alternative explanation is that the nonlinearity in the parameters of the empirical model is simply indicating an underestimation of the actual output gap. On this respect we provide an estimate of the gap that would

distribution of the estimated coefficients.

[11] Notice that our long-run mean estimate, obtained in the baseline specification with no control variables, implies a zero long-run forecast for the output gap, y_t.

result in a stable Phillips curve.
We start from a discussion of the Phillips curve implied by the model by Sbordone (2007):[12]

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \zeta \widehat{s}_t \tag{4}$$

where π_t denotes inflation, β is the discount factor, $\widehat{s}_t$ denotes real unit labor cost (where a hat indicates the log- deviation from the steady state) and ζ is a convolution of deep parameters capturing the sensitivity of price changes to variations in real unit labor costs, which, in this class of models, are related to the output gap by an approximate log-linear relationship. Notice that the above equation is purely forward looking, while the model used in the empirical analysis has a backward looking nature. This is not a major issue, since our aim is not taking equation (4) to the data, but using it to organize a discussion on the possible sources of increased inflation cyclicality.

As shown in the Appendix, the slope coefficient can be defined as:

$$\zeta \equiv \frac{(1-\alpha\beta)(1-\alpha)}{\alpha} \frac{1}{1+\overline{\theta}(N)\left[\overline{\epsilon}_{\mu}(N)+\overline{s}_{y}(N)\right]} \tag{5}$$

where β is the discount factor, α is the degree of price stickiness ($\frac{1}{1-\alpha}$ is the average price duration), N is the number of firms, $\overline{s}_y(N)$ denotes the elasticity of marginal costs to the firm's own output, $\overline{\theta}(N)$ is the steady state elasticity of the firm's own output demand to its relative price and $\overline{\epsilon}_{\mu}(N)$ is the elasticity of the markup function to the firm's market share evaluated at steady state.

On the basis of (5) we can thus disentangle the different channels through which a steepening of the Phillips curve could have occurred:

1. *Lower nominal rigidities.* More frequent prices changes (i.e., lower α) induce a steeper Phillips curve.

2. *Lower elasticity of marginal cost to the firm's own output.* To understand this mechanism suppose there is a positive shock to real marginal costs $\widehat{s}_t$. This induces an increase in prices and a loss in demand. The latter, in turn, produces a fall in marginal costs (due to decreasing returns to scale) that will partially offset the initial shock and, therefore, reduce the need to adjust prices. It follows that a lower elasticity of marginal costs to output ($\overline{s}_y(N)$) requires a relatively larger price adjustment.

3. *Lower steady state elasticity of the firm's own output demand to its relative price.* The mechanism is akin to the one described in the previous point. For a lower steady state

[12] Model's details are provided in the Appendix.

elasticity of demand ($\overline{\theta}(N)$), the loss in demand resulting from the initial adjustment to a shock to $\widehat{s}_t$ is milder, hence inducing a relatively larger price adjustment.

4. *Lower elasticity of the markup function evaluated at steady state.* When the elasticity of substitution between differentiated goods is decreasing in the relative quantity consumed of the variety, firms face a price elasticity of demand that is increasing in their good's relative price. This makes the desired markup increasing in the firm's relative market share (decreasing in firms' relative price). If the elasticity of the markup function evaluated at steady state ($\overline{\epsilon}_\mu(N)$) decreases, the Phillips curve steepens. Indeed, when the elasticity of demand is increasing in the relative price, firms are reluctant to change their price as they would face a more elastic demand curve than firms whose relative price declines as a result of price fixity.

This model therefore suggests two possible explanations for an increase in ζ. One explanation is lower nominal rigidities, i.e., a higher frequency of price adjustment (smaller α), which could have been favoured, for instance, by structural reforms in stressed countries. Empirical evidence on recent changes in the frequency of price adjustment in the euro area is, however, scarce and characterized by mixed results. Moreover, it only covers data prior to 2013. For example, for Italy, Fabiani and Porqueddu (2013) show that in the period between 2006 and 2012 the average duration of consumer prices in Italy has indeed declined to five months, from eight months between 1996 and 2001, indicating that increased sensitivity of prices to cyclical conditions might be partly accounted for by lower nominal rigidities. On the other hand, Berardi et al. (2013) find that during the Great Recession, the patterns of price adjustment in France were only slightly modified: the frequency, average size and dispersion of price decreases increased only marginally.[13] Ongoing research at the Eurosystem level through a new wave of the Wage Dynamics Network[14] will provide better data and more evidence on this issue.

The second explanation rests on the three remaining channels, known in the literature as *strategic complementarities*. As shown in the Appendix they vary with the number of firms; hence so does the slope of the Phillips curve. When the number of firms decreases, the steady state elasticity of demand $\overline{\theta}$ goes down (in line with the general intuition that the larger the number of goods that are traded in the market, the more likely it is that demand declines in response to a small increase in prices); this tends to increase inflation cyclicality. By contrast, the elasticity of the mark-up function $\overline{\epsilon}_\mu$ and the elasticity of the marginal cost to firm's own output $\overline{s}_y$ go up and this tends to result in lower inflation cyclicality. If the first effect dominates

[13] By using the CPI research database collected by the Bureau of Labor Statistics, Vavra (2013) explores the business cycle properties of the distribution of price changes in the US and find that while price change dispersion (i.e. the second moment of the price change distribution) is strongly counter-cyclical, the rise in the frequency of adjustment during recessions is modest. Dixon et al. (2014) find similar results for the UK.

[14] See `https://www.ecb.europa.eu/home/html/researcher_wdn.en.html`.

the other two, inflation cyclicality will increase as N falls. To sum up:

$$\zeta \equiv \frac{(1-\alpha\beta)(1-\alpha)}{\alpha} \frac{1}{1+\overline{\theta}(\underset{+}{N})\left[\overline{\epsilon}_{\mu}(\underset{-}{N})+\overline{s}_{y}(\underset{-}{N})\right]} \tag{6}$$

The combination of these effects shapes the relationship between the slope of the Phillips curve and the number of firms, as shown in Figures 10 and 11 under two different calibrations for the parameters controlling the elasticity and the curvature of the demand function taken from the literature (see the Appendix for details). It turns out that under these calibrations the relationship between inflation cyclicality and the number of firms is almost everywhere negative.

A formal test of the hypothesis linking consumer prices and the number of firms in the economy is difficult because of poor data quality regarding business demography in the euro area. Keeping these caveats in mind, some preliminary analysis on available data indicates that, in the case of Italy and Spain, the sovereign debt crisis induced a significant reduction in the number of firms. This suggests that the fact that strategic complementarities played a role in the steepening of the Phillips curve cannot be ruled out.

An alternative interpretation of the increase in γ_t hinges on the fact that the output gap is a latent variable, whose measurement is rather problematic especially during a deep recession such as the one that has hit the euro area since 2011. Measurement errors in the output gap estimates might have contributed to the finding of a Phillips curve steepening in the more recent quarters. A question that arises is how wide the gap should be in order to explain the observed fall in inflation in the context of a stable Phillips curve. To provide an answer we construct alternative output gaps assuming that, starting from 2011Q3, cyclical developments have been more adverse than assessed by current estimated, and re-estimate our baseline specification until we obtain a stable estimate of γ_t . Results are shown in Figure 12. Red lines are the output gap estimated by the EC (upper panel) and the corresponding estimated profile of γ_t (lower panel).[15] Blue dashed lines illustrate the counterfactual output gaps and the corresponding estimates of γ_t . What emerges is that, if the finding of the increased inflation cyclicality was entirely attributable to an underestimation of the amount of spare capacity in the economy, the actual euro area output gap would be around -4%, 1.5 percentage points wider than currently measured.

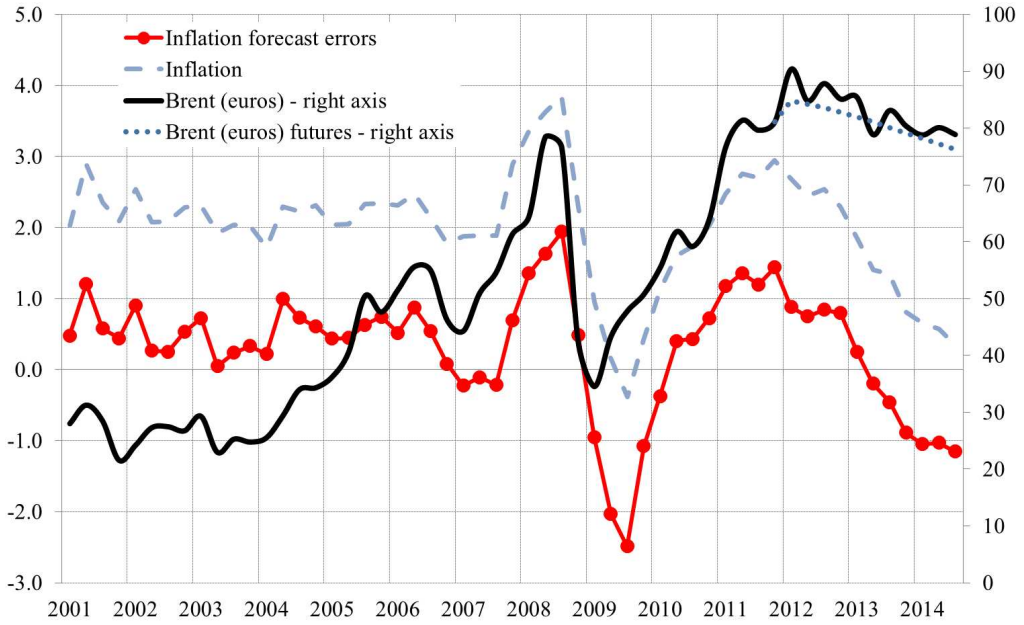
[15]Results obtained on the basis of the OECD and IMF gaps are very similar.

5 Conclusions

The bout of disinflation between 2013 and 2014 has been broad based across the euro area and more intense in those countries that have been hit the hardest by the sovereign debt crisis. Despite the persistent economic weakness, professional forecasters largely failed to predict the decline in inflation: those surveyed by Consensus Forecast systematically over predicted average inflation for 2013 and 2014. In this paper we explore, from an empirical point of view, whether this over-prediction can be partly attributed to a structural break of inflation cyclicality. Time varying estimates of the elasticity of inflation to the output gap reveal that in 2013 and 2014 there has been a significant increase in the sensitivity of inflation to the business cycle.

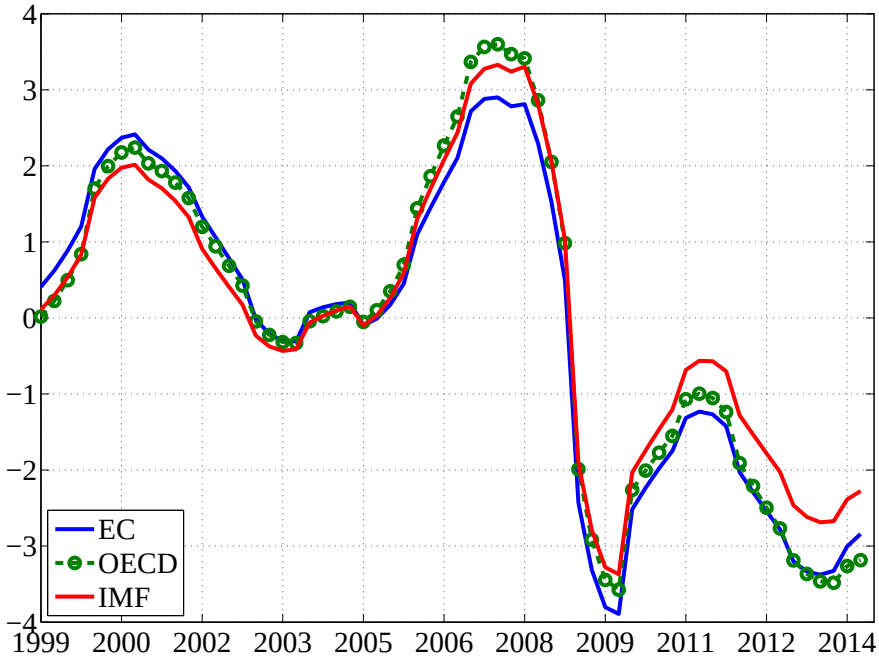
A steepening of the Phillips curve might have resulted from changes in the structure of the economy. In this respect either lower nominal rigidities, due perhaps to structural reforms in stressed countries, or a decrease in strategic complementarities in price setting, related to the fall in the number of firms in the economy as a consequence of the two recent recessions, could have led to a higher elasticity of consumer prices to the output gap. An alternative explanation is that the structure of the economy has not really changed but the gap between actual and potential output is wider than currently measured. We show that a downward adjustment of the output gap by about one third could in fact rationalize the observed fall in inflation. Only more data, especially at the firm level, on wage and price setting after the Sovereign debt crisis will help to sort the issues.

Figure 1: Inflation, forecast errors and oil prices



Note to Figure 1. The forecast errors are computed on the basis of the quarterly survey of professional forecasters conducted by Consensus Economics in March, June, September and December, which provides forecasts over the next seven quarters.

Figure 2: Output gaps



Note to Figure 2. EC data are from the 2014 Spring forecasts. OECD data are from the 2014 Interim Autumn Economic Assessment. IMF data are from the 2014 October World Economic Outlook. Annual data are interpolated at the quarterly frequency through a quadratic polynomial.

Table 1: End of sample instability tests, rejections at the 10% confidence level

		Baseline			Controlling for import prices		
Test	Π	Gap-EC	Gap-OECD	GAP-IMF	Gap-EC	Gap-OECD	GAP-IMF
			Core			Core	
exp-L	75	0	0	0	0	0	0
exp-L	90	0	0	0	0	0	0
sup-L	75	0	0	0	0	0	0
sup-L	90	0	0	0	0	0	0
			Goods			Goods	
exp-L	75	1	1	1	1	1	1
exp-L	90	1	1	1	1	1	1
sup-L	75	1	1	1	1	0	1
sup-L	90	1	1	1	1	1	1
			Services			Services	
exp-L	75	1	1	1	1	1	1
exp-L	90	1	1	1	1	1	1
sup-L	75	1	1	1	1	1	1
sup-L	90	1	1	1	1	1	1
			CoreX			CoreX	
exp-L	75	1	1	1	1	1	1
exp-L	90	1	1	1	1	1	1
sup-L	75	1	1	1	1	1	1
sup-L	90	1	1	1	1	1	1
			GoodsX			GoodsX	
exp-L	75	0	0	0	0	0	0
exp-L	90	0	0	0	0	0	0
sup-L	75	0	0	0	0	0	0
sup-L	90	0	0	0	0	0	0
			ServicesX			ServicesX	
exp-L	75	1	1	1	1	1	1
exp-L	90	1	1	1	1	1	1
sup-L	75	1	1	1	1	1	1
sup-L	90	1	1	1	1	1	1

Note to table 1. In each cell we report 1 if the test statistics is higher than the 10% critical values tabulated in Busetti (2012), 0 otherwise.

Figure 3: Slope of the Phillips curve: core inflation

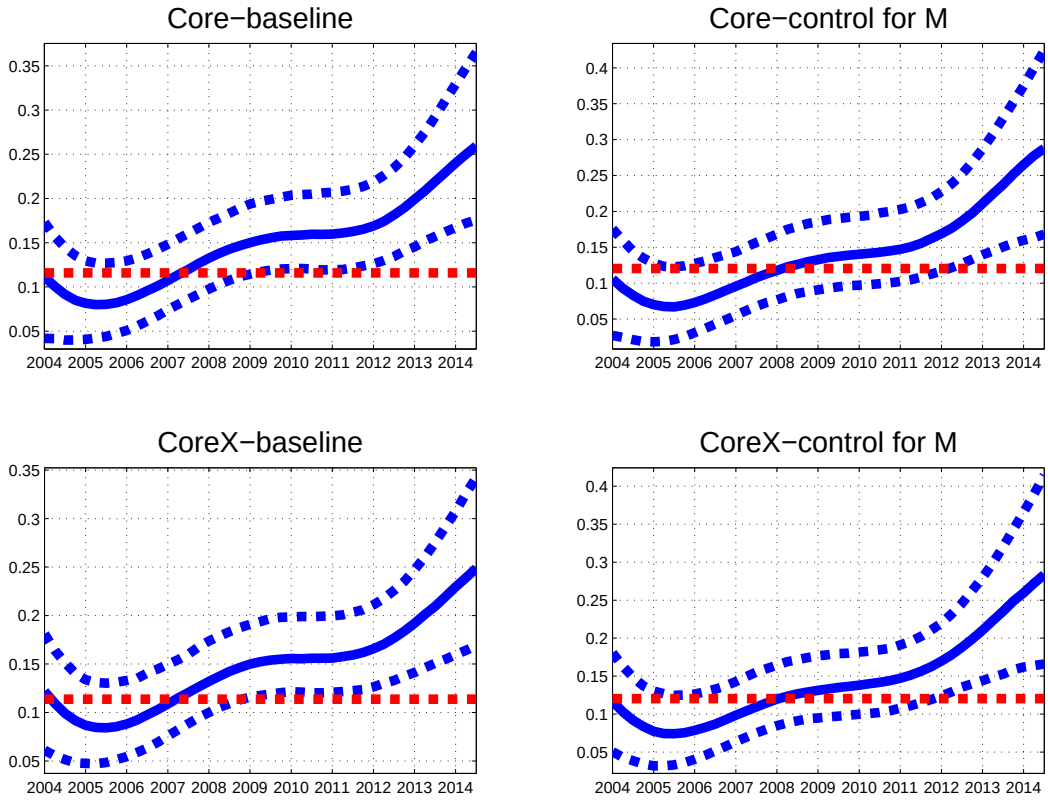


Figure 4: Slope of the Phillips curve: goods prices

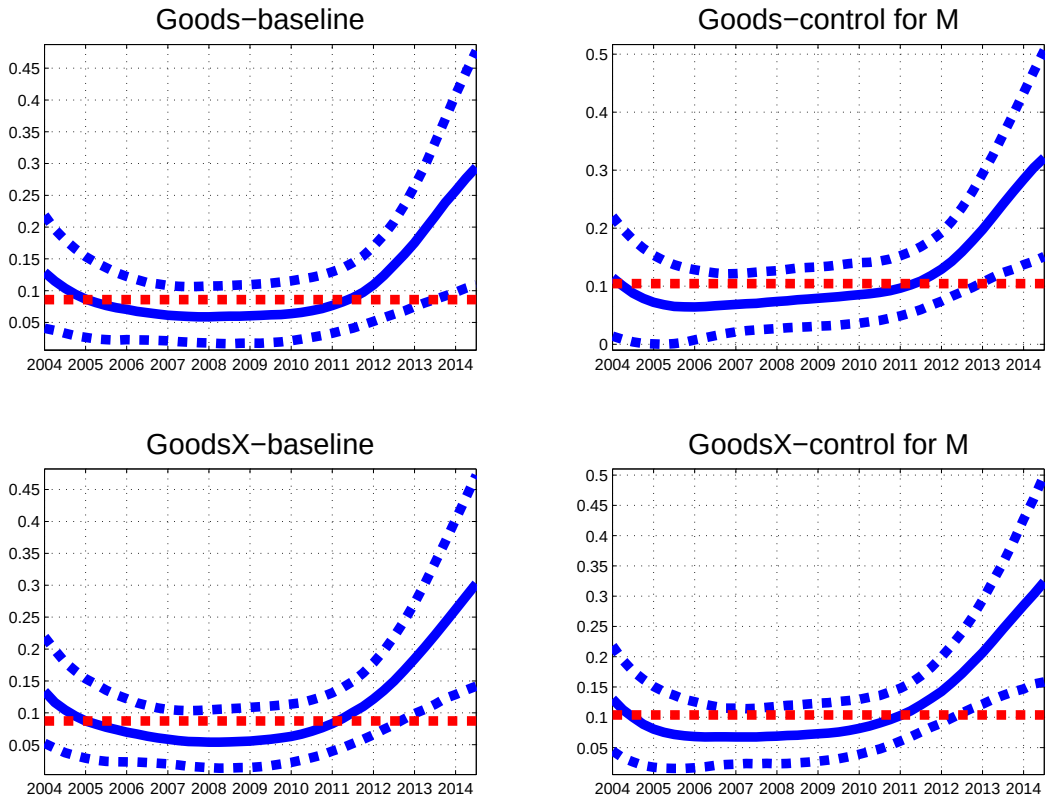


Figure 5: Slope of the Phillips curve: services prices

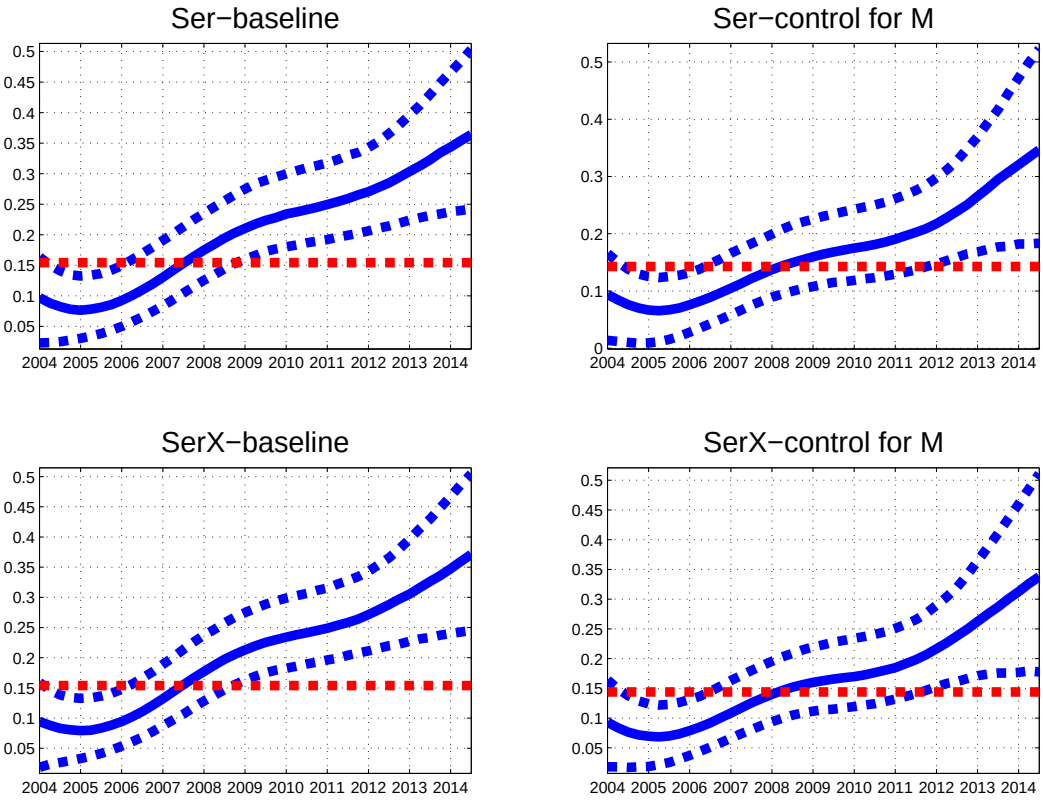


Figure 6: Slope of the Phillips curve: core inflation, controlling for expectations

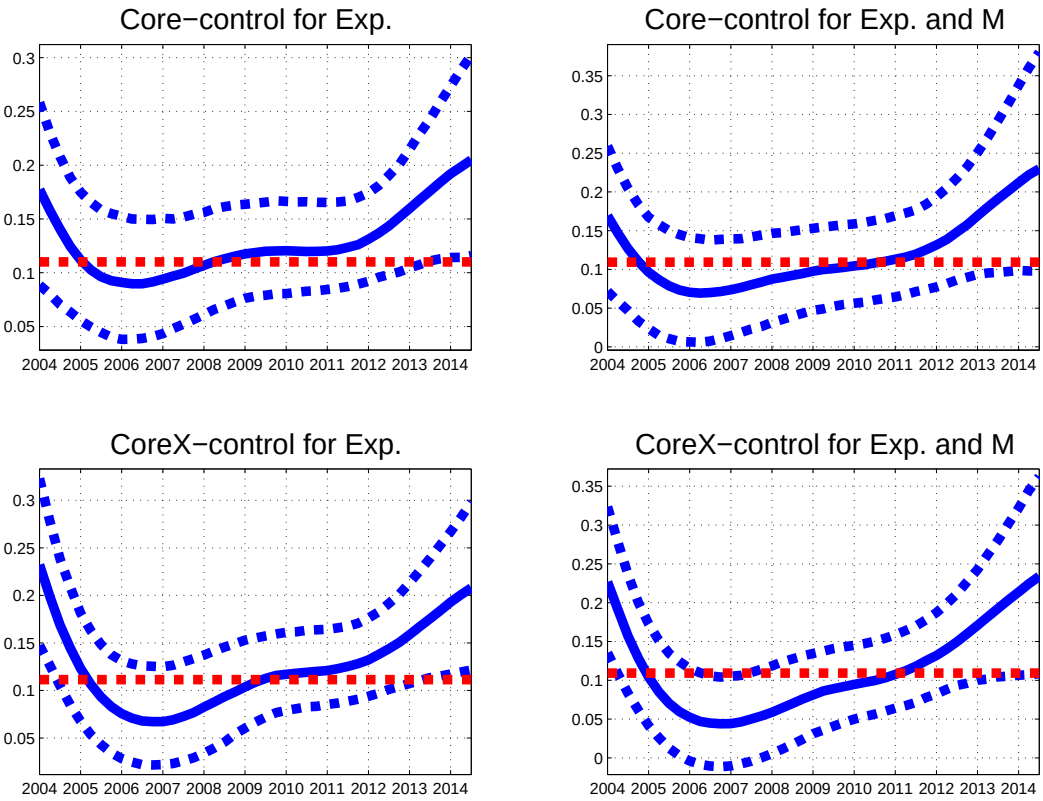


Figure 7: Slope of the Phillips curve: services prices, controlling for expectations

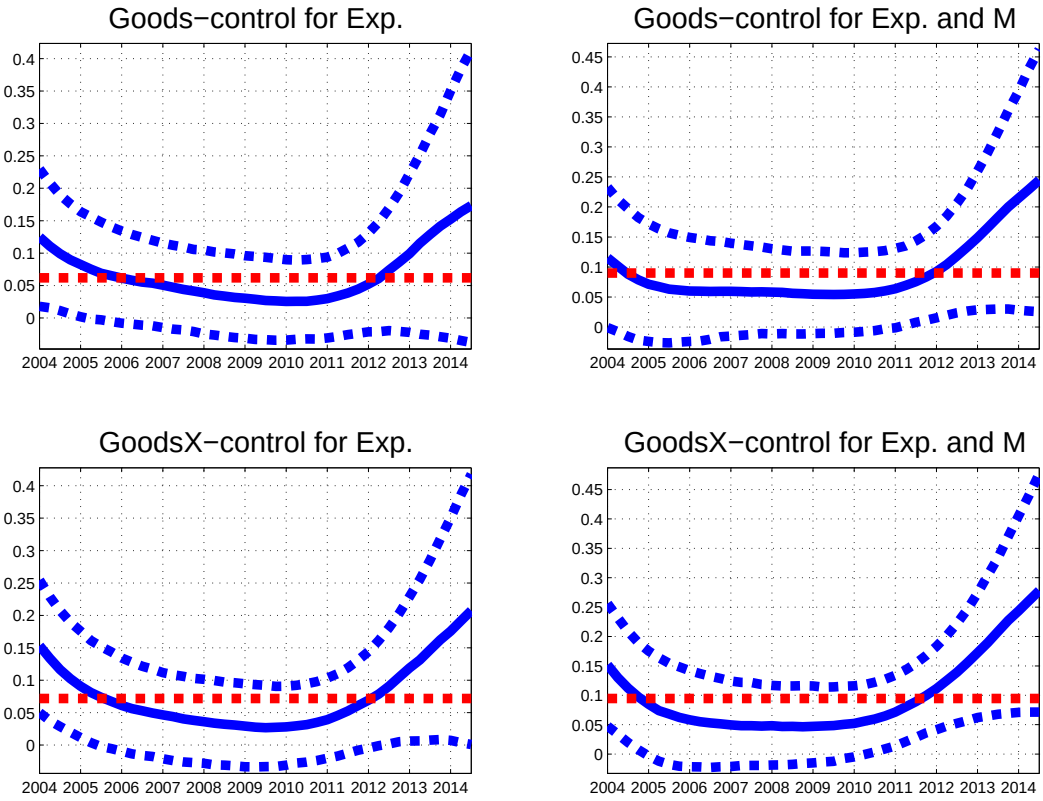


Figure 8: Slope of the Phillips curve: goods prices, controlling for expectations

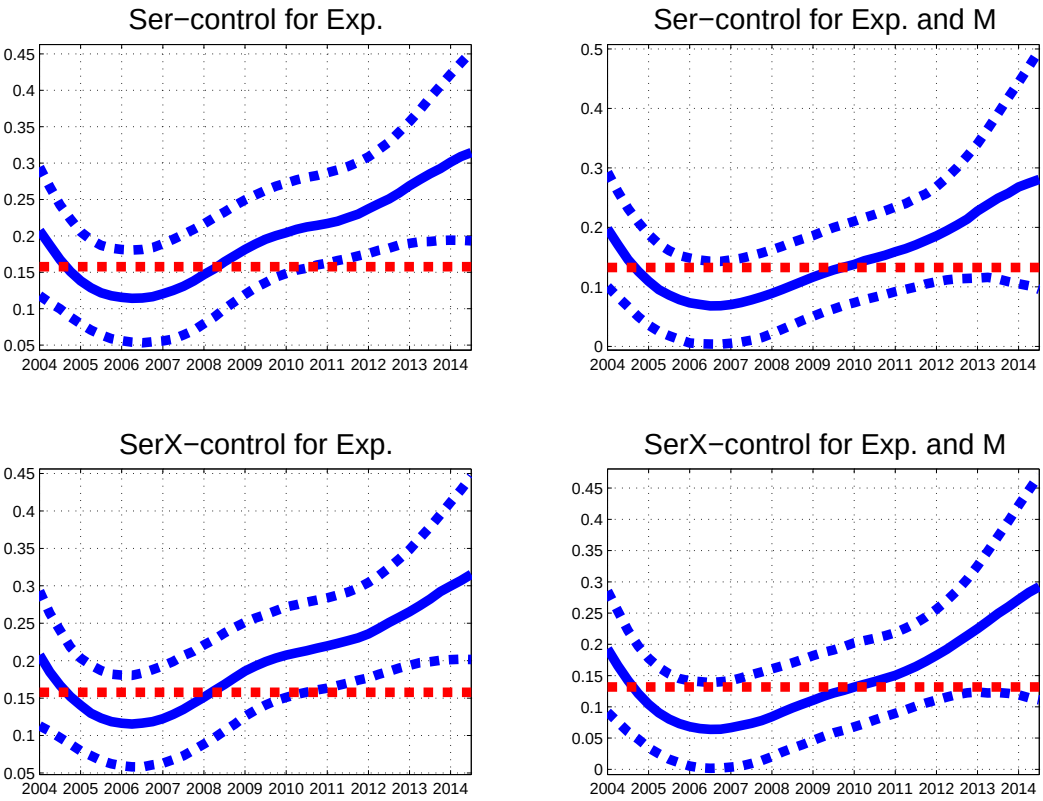


Figure 9: Long run mean and persistence

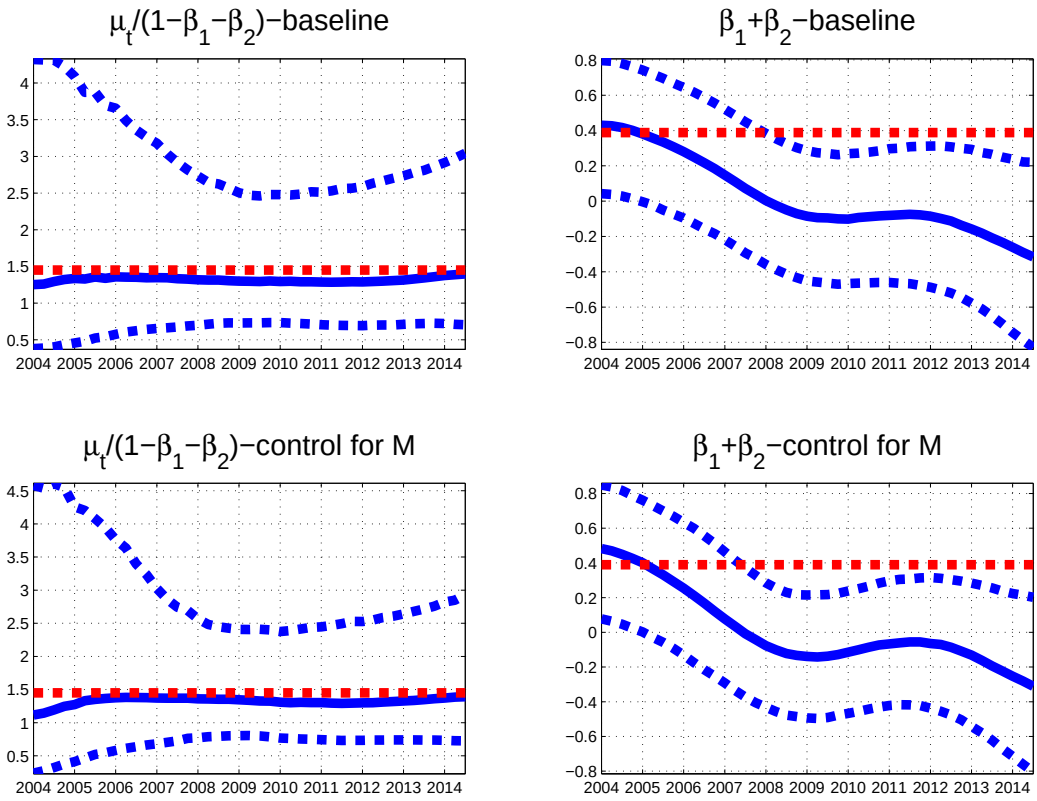


Figure 10: Slope of the Phillips curve and number of firms ($\eta = -2$, $\gamma = 1.14$)

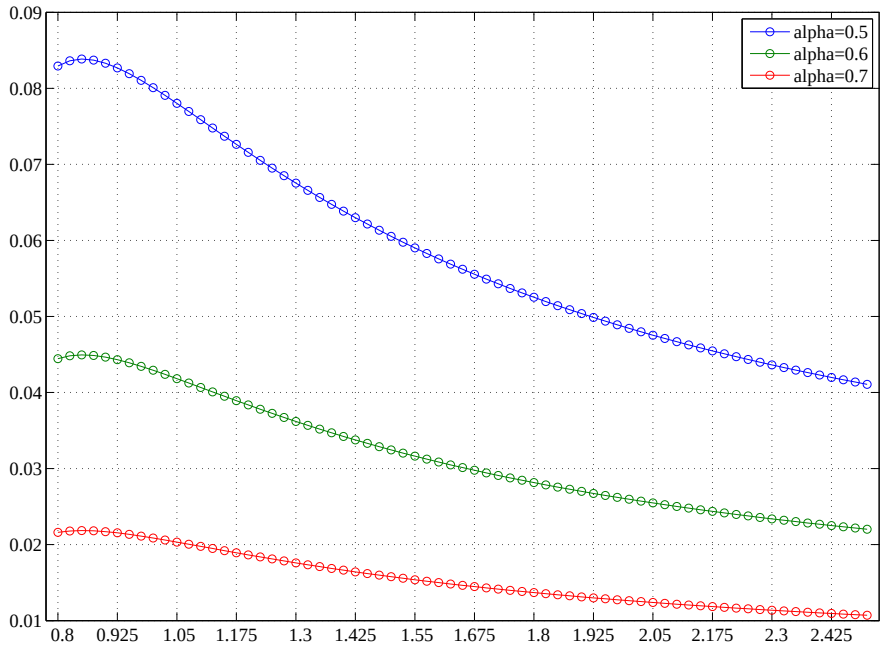


Figure 11: Slope of the Phillips curve and number of firms ($\eta = -3$, $\gamma = 1.07$)

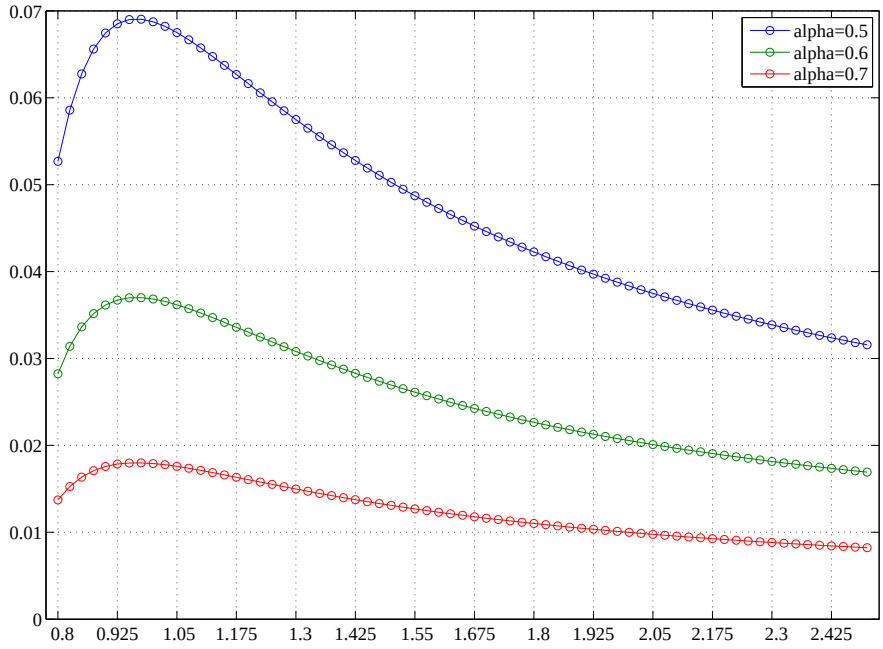
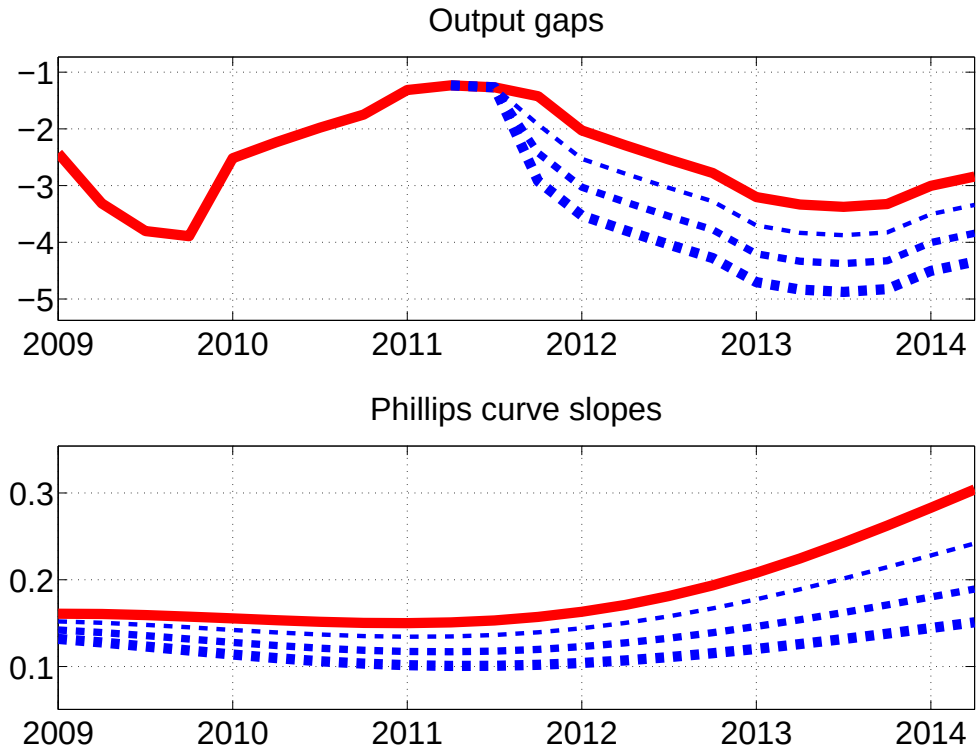


Figure 12: Counterfactual output gaps



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