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by Alessio Ciarlone

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REMITTANCES IN TIMES OF CRISIS: EVIDENCE FROM ITALIAN CORRIDORS

by Alessio Ciarlone*

Abstract

Defying expectations, remittance flows to low- and middle-income countries withstood the shock related to the outbreak of the COVID-19 pandemic. Against this backdrop, remittances sent from migrant workers in Italy have been no exception. Relying on detailed data for a large panel of remittance-receiving economies, this paper explores the key drivers of remittance outflows from Italy and finds empirical support to plausible explanations for their resilience during the pandemic. The impulse response functions obtained via a local projection approach confirm the paramount role of remittances as automatic stabilizers. Notwithstanding a reduction in their personal incomes due to the recession in Italy, migrant workers stepped up their financial support to their families back home to cushion the impact of the pandemic. In this regard, a shift from informal to formal remittance channels played a significant role. More specifically, the acceleration in the digitalization of financial services during, and because of, the pandemic had important spillover effects on migrants' remittances, thus overcoming the hurdles created by the COVID-related restrictions adopted in both the sending and the receiving countries.

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* Bank of Italy, Directorate General for Economics, Statistics and Research.

1. Introduction[1]

Remittances by migrant workers to relatives in their home countries are a vital financial service. The last twenty years have witnessed a substantial increase in this type of cross-border flow to low- and middle-income countries, with a large strand of the literature highlighting its strong impact on economic and financial development (OECD, 2005; WB, 2006; Fajnzylber and Lopez, 2008; IMF, 2008; Yang, 2011). Remittances have now become the most significant consumption smoothing mechanism for recipient households during periods of economic hardship (WB, 2015), as well as an increasingly important piece of the global social protection system and an essential lifeline for the poor (Adams and Page, 2005; Gupta *et al*., 2009; Inoue and Hamori, 2016).

The outbreak of the COVID-19 pandemic led to the sharpest and most widespread global output contraction in recent history; it forced countries to implement severe restrictions on people's mobility and to shut down non-essential businesses for extended periods. What distinguishes the pandemic shock from others that hit the global economy in the recent past – the 2008-09 global financial crisis, for instance – is that it has been common and synchronised across both advanced and emerging countries. Hence, at the onset of the pandemic, some studies warned against the large adverse impact that it could have had on remittances (WB-Knomad, 2020; Chami and Sayeh, 2020), also on the backdrop of the results reached by a strand of empirical studies showing how remittances can increase business cycle synchronization – and hence the transmission of downturns – from (mostly advanced) sending to (mostly developing) receiving countries (Barajas *et al*., 2010; Barajas *et al*., 2012). Against all odds, this negative prediction proved wrong.

Defying initial expectations, in fact, this key source of external financing for low- and middle-income countries (LICs) have been able to withstand the adverse impact of the COVID-19 pandemic, at least at an aggregate level. According to the WB-Knomad (2022), by end-2020 remittance inflows to LICs stood at $542 billion in nominal terms, a mere 0.8% contraction compared with a year earlier ($546 billion) and significantly less than the decline recorded as a result of the 2008-09 global financial crisis (-5.0%). Moreover, remittance inflows are estimated to have recorded a robust rebound in 2021 – 10.2% in nominal terms, the strongest growth performance since 2018 – reaching an historical high of almost $600 billion by year-end. Remittances now stand more than threefold above official development assistance levels and more than 50% above foreign direct investment to LICs.[2]

A variety of reasons have been put forward to explain the resilience of remittance flows during the COVID-19 pandemic as well as their subsequent rebound.

First, migrants stepped up their support to families back home in an *altruistic* move in the face of the crisis, this willingness being also supported by the exceptional emergency fiscal stimulus packages and accommodative monetary policies implemented in (mainly advanced) host countries.[3] According to IFAD-WB (2021), migrants' intention to send money back home apparently have not been affected by the negative impact of the COVID-19 pandemic on their incomes. On the contrary, the dire situation in the country of origin induced even migrants who were not remitting regularly to support their relatives. Resilience in the sending of money to families and friends was also a result of better preparedness for hardships by migrants after a series of earlier shocks (i.e. the 2008-09 global financial crisis). Longitudinal surveys, for instance, reveal that migrants considered themselves more responsive compared to previous

[1] I would like to thank Pietro Catte, Riccardo Cristadoro, Giorgio Merlonghi, Emidio Cocozza, Alberto Coco, Marco Albori, Daniela Marconi, Elona Dushku, Meri Papavangjeli and two anonymous referees for their useful comments on earlier versions of this paper; any error and omission remain my own responsibility. The views expressed are those of the author and do not necessarily reflect those of the Bank of Italy. Please do not quote without permission.

[2] By end-2021, remittances are expected to amount to 5% of domestic GDP in more than 50 low- and middle-income countries. In cases like Tonga, Lebanon, Somalia and Tajikistan, remittances are expected to represent as much as six times this measure.

[3] As a matter of fact, many migrants in the main sending countries were supported by furlough schemes or were working in sectors classified as essential services and so remained actively working throughout lockdowns.

crises, having learned from past instances of job losses and income disruptions (IFAD-WB, 2021). Having accrued precautionary savings to draw from in case of further real or financial shocks, migrants probably sacrificed both short- and longer-term personal consumption plans to meet the immediate needs of their families back home.

A second reason is related to the alleged major shift from informal to formal channels in sending remittances that occurred because of lockdowns. As the story goes, international travel restrictions and stricter custom controls severely disrupted informal channels, including cash-in-hand carry. Amid border closures, it is believed that remittance senders and informal brokers were obliged to rely upon regulated channels and products, rather than informal cash transfers (IFAD-WB, 2021). According to the WB (2021), in some regions sending money via certain unregulated methods (e.g. via a bus driver carrying the funds or cash in pockets) became suddenly unfeasible under strict lockdowns. At the same time, a large number of regulators across the globe interviewed by the WB in a series of pulse surveys (WB, 2021) observed, throughout the COVID-19 pandemic, a shift from unregulated channels to formal financial services and regulated money transfer operators (MTOs) or remittance service providers (RSPs).

Finally, it is believed that the COVID-19 pandemic has been pivotal also for accelerating the use of digital channels to transfer money. At least initially, with the adoption of strict containment measures in an attempt to prevent a further diffusion of the virus, many local MTOs had to shut down their activity since they were not immediately classified as essential services. Hence, there were no many choices for migrants – other than relying upon digital channels – to send money back home. As a matter of fact, international remittances sent and received globally via mobile devices increased by 65% (to $12.7 billion) in 2020 (GSMA, 2021).[4] The shift to digital services has, in part, been catalysed by the efforts of many governments in both advanced and emerging economies to create an enabling environment for digital financial services and remittances.[5] But there has also been a strong push from private RSPs, which implemented financial incentives (primarily, reduced fees) to encourage greater use of digital financial services and to attract more customers to their digital products.

It should be acknowledged, nevertheless, that the presence and significance of these channels is mainly based on anecdotal evidence, on reports based on proprietary data of market operators and presumptions stemming from the experience gained after the occurrence of past shocks.

Against this backdrop, the objective of this paper is to provide a formal empirical evaluation of the forces that have been driving remittances since the onset of the COVID-19 pandemic. In doing so, the paper will take the perspective of an important remittance-sender country (Italy) by relying on the time series of migrant workers' remittance outflows produced by the Bank of Italy for its balance of payments accounting. The availability of a detailed decomposition of remittance outflows towards almost 250 receiving countries offers the opportunity to take into account the impact that the conditions in both the sending (host) and receiving (home) countries had on this important kind of financial flow.

Using the local projection approach (Jordà, 2005), the empirical analysis suggests that remittance outflows from Italy responded positively to both the COVID-19 infection rates in home countries and the adverse impact that the diffusion of the virus had on economic activity there. This happened notwithstanding the likely reduction of migrants' incomes generated by the spread of the virus, and the related GDP contraction, in Italy. Hence, the analysis confirms both the *altruistic* motive guiding migrants' remitting behaviour – also in the face of lower personal incomes – and the consequent *countercyclical* role played by remittances with respect to the evolution of the business cycle at home. Migrants stepped up their financial support to their families to cushion the impact of the pandemic, even if this implied a

[4] At the global level, important market players like Western Union and MoneyGram have reported impressive year-on-year growth rates (equal to 22 and 28%, respectively) in revenues from digital money in 2021Q3. Similarly, digital-only providers such as World Remit, TransferWise, Azimo and Remitly all experienced a substantial growth in customer and transaction numbers in the same timeframe.

[5] Public authorities introduced a variety of new policy measures, including: reducing fees for digital transfers, relaxing mobile wallet and transaction limits and allowing remote mobile money registration.

reduction in personal short- to medium-run consumption paths, or even dissaving. Moreover, stricter containment measures in home countries have dampened remittance flows, suggesting that these initiatives may have made it harder for families to receive financial flows from abroad, especially in countries where such measures were particularly stringent. Finally, the resilience in remittance outflows appears to be accompanied by a shift from informal to formal channels triggered by widespread border closures and travel restrictions. In the same direction, the acceleration impressed in the digitalisation of financial services during, and because of, the pandemic have had important spillover effects on migrant workers' remittances back home, likely overcoming the difficulties raised by the containment measures implemented in both remittance-sending and remittance-receiving countries.

The paper is structured as follows: Section 2 contains a brief overview of the strands of existing literature that are closer to the perspective of this paper; Section 3 discusses the dataset of remittance outflows from Italy and shows some stylised facts related to the impact of the COVID-19 pandemic; Section 4 describes the empirical strategy; Section 5 presents its main results; Section 6 concludes laying down some policy implications.

2. Related literature

The steady rise in remittances to LICs observed during the last twenty years has been accompanied by an increasing interest by the theoretical and empirical literature, which has explored many different dimensions regarding this paramount financial flow: their motivations, their drivers and determinants, their impact and implications – on economic and financial development, poverty reduction, inequality, human capital, health, labour market conditions, financial inclusion and so on – at both ends of the corridor. Since there is not enough space here to review the results of such an extensive body of economic literature, I will focus the attention only upon those specific strands that the present paper intends to deal with.[6]

A large part of the theoretical and empirical work on the topic has been devoted to uncovering the primary motives that drive migrants' decision to remit. At an individual level, these motives influence directly the amount, the timing and the frequency of remittances; at a more aggregate level, they may affect the volume of these flows as well as their variability over the business cycle in both sending and receiving countries (De *et al*., 2016). Among the reasons that are supposed to drive migrants' remitting behaviour, the most basic distinction is between *altruistic* motives and those driven by *self-interest* (Lucas and Stark, 1985). Migrants may remit for *altruistic* reasons to increase average consumption levels of their family members at home (Stark, 1995; Shimada, 2011) and may accordingly be responsive to negative events experienced by recipient communities and thus also have an *insurance* role (Agarwal and Horowitz, 2002; Gubert, 2002). According to the *self-interested* motivations, remittances may be used for the *repayment* of debts incurred for the migrant's education (Poirine, 1997; Ilahi and Jafarey, 1999; Antoniades *et al*., 2018) or intended to fund future *investment* – whether in human or physical capital – in their home countries by the migrants themselves or to secure a future *inheritance* from elders being supported in the home country (Hoddinott, 1994; de la Brière *et al*., 2002; Osili, 2004). Docquier and Rapoport (2006) provide a theoretical model of the remittance sending decision by migrants that incorporates a whole range of motives including altruism, exchange (i.e. compensation for services rendered to the migrant by the recipients), insurance, loan repayment and investment, clearly recognising that some – or even all – of them could coexist simultaneously.

As anticipated, the motives that drive remittances are closely related to their cyclical behaviour and to the relationship with the dynamics of the economic activity in both the host and the home country. If remittances are sent with an *altruistic* motive, they are likely to be *countercyclical* with respect to the output in the home country: the volume of remittance inflows will increase during an economic downturn,

[6] The interested reader is referred to WB (2006), Fajnzylber and Lopez (2008), IMF (2008) and Yang (2011) for other useful references.

compensating the receiving families for the fall in income (Agarwal and Horowitz, 2002). On the other hand, if remittances are sent with a *self-interest* and/or a *profit-driven* motive, such as *investment* or *inheritance*, they are likely to be *procyclical* and would decline during an economic downturn in the receiving country (Giuliano and Ruiz-Arranz, 2009). At the same time, an increase in migrants' income in the host country will lead to an increase in remittances under both motives (Cooray and Mallick, 2013; De *et al*., 2016). Existing macroeconomic studies – either using bilateral corridors data or adopting a wider geographical perspective – remain inconclusive as to how remittances react to business cycles in migrants' home countries. While some analyses find that these flows are negatively correlated with income levels in recipient economies (El-Sakka and McNabb, 1999; Bouhga-Hagbe, 2006; Singh *et al*., 2011; Frankel, 2011), others find instead that they are procyclical (Giuliano and Ruiz-Arranz, 2009; Sayan, 2004; Lueth and Ruiz-Arranz, 2008; Cooray and Mallick, 2013). On the contrary, the results of the literature are more mutually consistent in suggesting the existence of a positive association between remittances and growth in the country of the migrants' employment (Barajas *et al*., 2010; Frankel, 2011; Abdih *et al*., 2012; De *et al*., 2019).

A closely related question concerns the assessment of whether and how remittance flows may help families in the home countries withstand and/or cushion the occurrence of adverse shocks, such as: natural disasters (Yang, 2008); discretionary fiscal policy, systemic financial and banking crises and exchange rate instability (Combes and Ebeke, 2011); drops in rainfall (Arezki and Bruckner, 2012); unexpected increases in food prices (Combes *et al*., 2014); armed conflicts or sudden collapses in the terms of trade (Bettin *et al*., 2015). The results confirm the fundamental role played by remittances as *automatic stabilisers*, able to smooth consumption in home economies in the face of adverse external shocks.

Another strand of the literature relevant for this paper's research purposes focuses on the share of total remittances that transit through informal channels (such as unregulated money transfer firms or family and friends who carry remittances across borders). An accurate measurement of these unrecorded flows is essential to evaluate the true impact of remittances on recipient countries and to design appropriate policy responses to the challenges and opportunities related to migration. While it is extremely difficult to estimate the flows that pass through informal channels, it is widely acknowledged that the share recorded through official balance of payments statistics largely underestimates the actual amount of flows that transit from one country to another. In one of the few empirical works attempting to estimate the size of informal flows for a large number of countries, Freund and Spatafora (2008) find that informal remittances may amount to between 35 and 75% of the formal official counterpart. This order of magnitude has been confirmed by other results based on both macro studies (Page and Plaza, 2006; Ratha and Shaw, 2007; Magnani *et al*. 2016; Ferriani and Oddo, 2019) and household surveys (Abrar and Siddiqui, 2003; WB, 2014; Dinarte-Diaz *et al*., 2021). It is worth mentioning here that one of the key factors affecting the choice of relying on formal *vs*. informal channels – in addition to the migrants' personal characteristics, the presence of a well-developed financial system that the customer trusts, the existence of dual exchange rates and a black market – is represented by the extent of the overall transaction costs the migrants have to meet to send money home.[7]

Notwithstanding much debate at the international level, the impact of the outbreak of the COVID-19 pandemic on remittance flows – as well as the actual role played by the often cited underlying drivers and channels – has not been thoroughly studied in empirical models yet. The only exception is represented by the analysis contained in Kpodar *et al*. (2021), which represents the reference benchmark for my analysis. Using data on remittance flows into 52 receiving countries – for the large majority of which, nevertheless, there is no information about the sending side – the paper provides a first assessment of the dynamics and drivers at play during the pandemic and suggests a set of potential factors underlying the stunning resilience of remittance flows. Among them, the *altruistic* motive related to the spread of the virus in home countries turns out having played an important role. The present paper aims to improve upon this analysis

[7] As a matter of fact, the steady reduction of transaction costs is seen as paramount to continue supporting remittance flows to LICs (Ahmed *et al*., 2021).

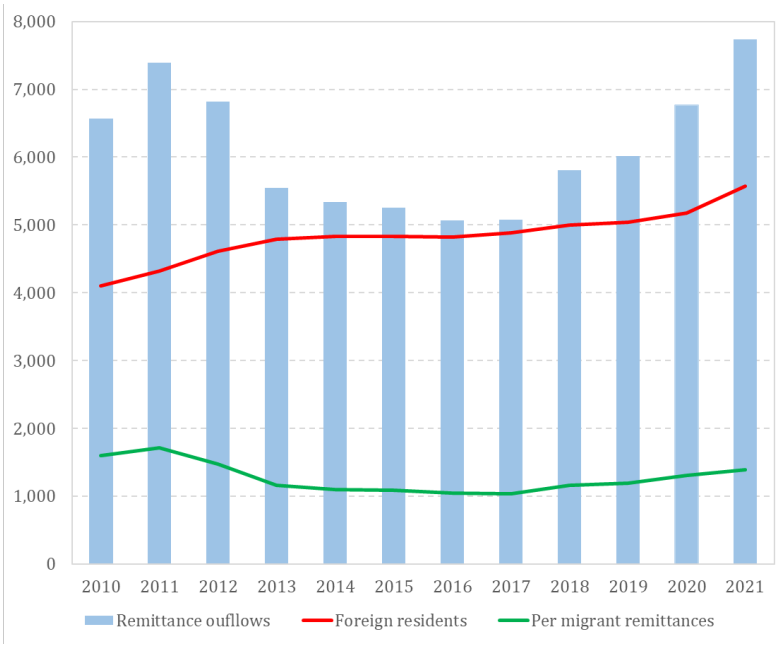
in a number of ways. First of all, the structure of the available remittance dataset, which includes one sending side (Italy) and clearly identified receiving countries, is ideal to account for the contemporaneous evolution of various factors at both ends of the corridors and to assess their impact on remittance outflows.[8] Second, this paper provides a more thorough analysis of the impact that the wave of severe restrictions on people's mobility may have had on the emergence of previously unrecorded remittance flows into regulated formal channels, especially innovative digital ones. Third, the main results are robust to an extensive series of tests related to the specific definition of the dependent variable, alternative potential regressors and estimation timelines.

3. Stylised facts

The core variable of my analysis is the flow of remittances that foreign workers residing in Italy send to their home countries through payment institutions or other authorized intermediaries – MTOs, banks and post offices – as recorded in official balance of payments statistics. These data are published by the Bank of Italy on a quarterly basis and broken down by (almost 250) recipient countries (corridors).

After becoming a net-immigration country in early '90s, Italy experienced a boom in its migrant population in the '00s, turning into one of the leading euro-area countries in terms of remittances sent abroad.[9] The dynamics of outbound remittances and foreign population in the country in the last decade or so is presented in **Chart 1**.

Chart 1. Remittance outflows and foreign residents in Italy



Source: Bank of Italy and Istat.
Note: remittances are in million euros; foreign residents are in thousands; data refer to the 31st of December of the year indicated and include all nationalities.

[8] In Kpodar *et al.* (2021), the variables related to the sending side are only indirectly estimated by relying on the 2017 migrant stock matrix compiled by the WB to calculate, for each migrant-hosting country, its share in the total migrants originating from a given country.

[9] According to the outward remittances data made available by the WB – Knomad, average annual outflows for the period 2018-2021 for Germany, France and Spain were €20.4 billion, €15.0 billion and €0.3 billion, respectively. According to the same source, in the same period Italy recorded an average outflow of €10.4 billion per year.

After having reached slightly more than €7 billion in 2011,[10] remittance outflows followed a progressive decline reflecting the severe impact that the euro area sovereign debt crisis had on Italian output and unemployment. Having reached a trough in 2016, remittance outflows have undertaken a new upward trend, recording a significant cumulative increase in the years up to 2021 (+52.6% in nominal terms, to €7.7 billion), when they reached a historical record. These developments appear to reflect the steady strengthening of outflows directed especially towards South Asia, Eastern Europe, Northern Africa and the Middle East. In 2021, the total amount of outward remittances accounted for almost 0.4% of Italy's GDP.

At the same time, the number of foreign residents continued to grow steadily up to 2014, stabilising afterwards at around 5 million (8.4% of the total resident population).[11] Reflecting the wedge between the growth rates of remittance outflows and foreign workers, per-migrant remittances decreased from around €1,700 in 2011 to a trough of €1,040 in 2017, before rebounding to €1,400 by end-2021.

In terms of the main corridors, in the period 2018-2021 slightly more than half of Italy's outbound remittances were directed to only seven countries: Bangladesh and Romania represented the main destination countries with a share of 12 and 9.4% of the total remittance outflows, respectively; the Philippines, Pakistan and Senegal followed suit (6.7% each, on average) with Morocco and India closing the group (5.8% each, on average). **Table 1** offers a glimpse of total remittance outflows, foreign resident population and per-migrant remittances broken down by the first 40 recipient countries.

Table 1. Total remittances, resident population and per-migrant remittances (2020-21 avg.)

Country	Total remittances	Resident population	Per-migrant remittances	Country	Total remittances	Resident population	Per-migrant remittances
Albania	181	427,381	423	Mali	80	19,683	4,049
Algeria	1	18,503	58	Moldova	147	120,592	1,224
Bangladesh	790	148,458	5,309	Morocco	489	421,598	1,157
Bosnia and Herzegovina	7	21,677	310	Nigeria	221	116,069	1,910
Brazil	91	51,228	1,774	North Macedonia	19	55,794	337
Bulgaria	31	53,500	586	Pakistan	517	128,565	4,000
China	16	309,709	51	Peru	258	94,104	2,743
Colombia	84	18,951	4,428	Philippines	520	161,554	3,210
Cuba	3	22,635	119	Poland	23	82,261	285
Dominican Republic	143	29,683	4,813	Romania	584	1,111,065	526
Ecuador	166	72,419	2,296	Russia	61	38,585	1,582
Egypt	68	133,832	505	Senegal	453	108,645	4,160
El Salvador	37	18,154	2,019	Serbia	33	33,110	999
France	32	30,538	1,061	Spain	50	29,296	1,702
Gambia	63	21,775	2,861	Sri Lanka	334	109,808	3,042
Germany	28	35,204	808	Tunisia	93	95,379	969
Ghana	74	50,161	1,470	Turkey	34	20,084	1,677
India	394	159,361	2,471	Ukraine	289	232,257	1,246
Ivory Coast	83	29,856	2,784	United Kingdom	19	29,990	645
Kosovo	11	38,753	289	United States	19	17,115	1,110

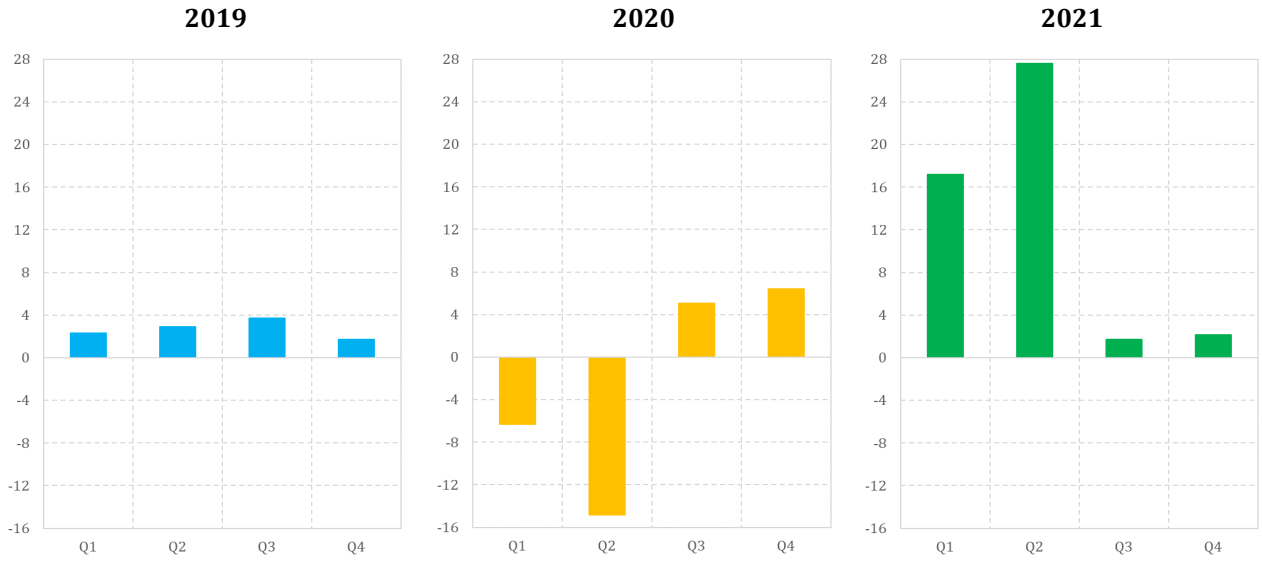
Source: Bank of Italy and Istat.
Note: Total remittances are in million euros and remittances per migrant are in euros.

[10] Ferriani and Oddo (2019) relates the peak reached in 2011 to the growth in remittances to China; if, on the one hand, this may have been justified by the significant presence of Chinese residents in many Italian regions, on the other hand it may also suggest that the MTOs channel was not only used by Chinese workers to remit money home but also misused by Chinese entrepreneurs to make other payments or to repatriate business profits. As a matter of fact, starting in 2012, the stricter supervisory controls on the activity of MTOs may have contributed to the fall in officially recorded flows to China.

[11] The largest national communities of migrants originate from Romania, Albania, Morocco, China and Ukraine.

Turning to the developments observed since the onset of the pandemic crisis, for each of the recipient countries available in the official Italian balance of payments statistics and for each of the last three years (2019-2021), two variables were calculated: the quarterly year-on-year growth rate of remittance outflows (the main dependent variable in the empirical exercise) and the relative sample median. **Chart 2** compares the dynamics of remittance growth in the last three years while **Chart A1** in the Appendix shows, for the first 50 destination countries, the overall change in remittance outflows in 2020-21 with respect to 2018-2019.

Chart 2. Evolution of the yearly growth rate of remittance outflows



Note: The chart reports the sample median year-on-year growth rates.

The presence of V-shaped dynamics in 2020 is clear. The sample median annual growth rate of remittance outflows started off the year already below the corresponding level in early 2019, before falling sharply as the COVID-19 pandemic spread out and drastic containment measures were put in place to stop the pandemic. Nevertheless, the dynamics of remittances quickly recovered to move back into positive territory already in 2021Q3: by end-2020, the sample median annual growth rate stood at a mere –3%. The rebound in outward remittances continued during the first two quarters of 2021, at the end of which the sample median annual growth rate stood at a remarkable +9.4%.

The presence of a V-shaped recovery in remittance outflows from Italy appears even more remarkable on the backdrop of the adverse impact that the spread of the COVID-19 pandemic had on the employment levels of migrants in the country. According to a recent report by the Italian *Ministero del Lavoro e delle Politiche Sociali*, in fact, the sanitary and economic crisis led not only to a significant downsizing of the employment base (equal to 7% for EU workers and 6% for extra-EU ones), but also to a sharp decline of the unemployed and a subsequent transfer from the labour force to inactivity.[12] As a consequence, the employment rate fell by 4pp for EU and 3.5pp for non-EU workers against a more modest 0.6pp for Italian workers. At the same time, the improvements that had begun to be appreciated in 2019, with a first decrease in the incidence of absolute poverty, were abruptly stopped and the living conditions deteriorated again. Looking at the incidence of family poverty by disaggregating it based on the citizenship of the components, in 2020 families of only foreigners in a condition of absolute poverty continued to

[12] The number of job seekers fell by 13.9% for EU and 11.6% for non-EU foreigners, while the number of inactive people in working age increased by 18.7% and 15.1%, respectively.

record the highest values and saw their condition worsened (almost 400 thousand families, equal to the 26.7% of the total against a 24.4% a year before).

4. The empirical strategy

To pursue my research objective, I adopted the local projection (LP) approach (Jordà, 2005). It consists of a semi-parametric technique to estimate a set of impulse response functions (IRFs) that directly plot a sequence of linear projections of the future value of the dependent variable on the current information set (Kilian and Kim, 2011). In essence, this approach estimates the impact of a shock to/change of an independent variable *x* today on the outcome variable in the future y_{t+h} for every horizon h=0,1,2,…, H. In other words, for each horizon h, it requires to run a separate regression of the outcome variable *y* in time $t+h$ on the information set available at time t. IRFs are then obtained as a subset of the estimated slope coefficients of the projections.

As put forward by Auerbach and Gorodnichencko (2012) and Ramey and Zubairy (2018), the main advantage of the LP technique is its flexibility for tracing the dynamic response of a variable to a shock to/change of an exogenous variable of interest. LP regressions (as opposed to, for instance, a structural VAR) do not involve any non-linear transformation of the estimated slope coefficients to obtain impulse responses, while dynamic multipliers depend only on the quality of the local approximation (Jordà *et al.*, 2013). LP regressions do not constrain the shape of the IRFs and hence are more robust to lags misspecifications;[13] moreover, since LP IRFs are (typically) estimated by means of ordinary least squares (OLS), it is easy to extend the analysis to a panel framework like the present one and use interaction terms to capture the likely existence of asymmetries and non-linearities in a rather simple and direct way. In this setting, LP regressions (as opposed, for instance, to panel VARs) have the ability to economize on the number of estimated parameters because they avoid the need to run an equation for all the variables in the system, therefore circumventing the "curse of dimensionality" and the need to apply simplifying restrictions. Finally, the LP approach allows for incorporating in a direct and easy way various time-varying features of the economies, while also allowing for their endogenous response to shocks. Because of its flexibility and ease of implementation, the LP procedure has been increasingly used in almost all fields of the economic literature.

Against this backdrop, the baseline specification can be described in very general terms as in Equation (1):

$$\Delta Y_{c,t+h} = u_{c,h} + \sum_{i=1}^{m} \alpha_i \Delta Y_{c,t-i} + \sum_{i=0}^{n} \beta_i x_{\{c,Ita\},t-i} + \sum_{i=1}^{p} \theta_i Z_{\{c,Ita\},t-i} + \varepsilon_{c,t+h} \quad (1)$$

For each horizon h, the term $\Delta Y_{c,t+h}$ measures the quarterly year-on-year growth (log-changes) in remittance outflows from Italy to country *c* in quarter $t+h$; to properly take into account the likely existence of inertia in the remittance behaviour, lagged values of the dependent variable are also present in the set of regressors. In turn, $x_{\{c,Ita\}}$ represents the exogenous variable of interest – be it related to country *c* or to Italy – the shocks to/changes of which are supposed to influence the dynamic behaviour of the growth rate of remittance outflows. Finally, $Z_{\{c,Ita\}}$ contains a set of other control variables – again, related to both country *c* and Italy, introduced in lagged form to control (as far as possible) for endogeneity – $u_{c,h}$ is the country-specific fixed-effect and $\varepsilon_{c,t+h}$ is the error-term (all of which are horizon-specific). All variables are expressed in logs or delta logs.[14] The model is estimated on a quarterly basis from 2020Q1 to 2021Q4

[13] If the VAR is a good approximation of the data generating process (DGP), then this is the optimal procedure for all time horizons. However, if the VAR is a poor representation of the actual DGP, IRFs are biased (Ronayne, 2011), with the bias coming mainly from two sources: i) the small-sample bias of the estimates of the VARs slope parameters; and ii) the additional bias induced by the non-linear transformation of the estimated parameters (Kilian and Kim, 2011). More recently, Plagborg-Møller and Wolf (2021) showed that LPs and VARs estimate the same impulse response as long as lagged data are controlled for flexibly.

[14] To deal with zero values, ln(1+*x*) is used, with *x* being the variable.

using the Driscoll-Kraay standard errors (Driscoll and Kraay, 1998), which help circumvent some drawbacks inherent in LP – i.e. the fact that parameters may not necessarily be efficient due to serially and cross-sectionally correlated standard errors that may translate into larger confidence intervals, an issue that is further exacerbated when the forecast horizon increases due to the decreasing sample size in each round of estimations.

It is worth recognizing, nevertheless, that the highly unbalanced panel, the quarterly frequency of the data and the relatively small amount of observations available for estimation purposes imposed drastic decisions about the actual structure of the estimated equation: i) the forecast horizon *h* has been set equal to 2, i.e. IRFs are plotted on a two quarters horizon; ii) both *m* and *p* have been set equal to *0* while *n* has been set equal to *1*, i.e. only one lag of the dependent variable, the shocked variable and the other controls are allowed to enter the specification; iii) contrary to what is suggested by Teulings and Zubanov (2014), the model cannot control for the forward leads of $x_{\{c,ita\}}$.[15] This means that the estimated equation will take the final form:

$$\Delta Y_{c,t+h} = u_{c,h} + \alpha_1 \Delta Y_{c,t-1} + \beta_0 x_{\{c,Ita\},t} + \beta_1 x_{\{c,Ita\},t-1} + \theta_1 Z_{\{c,Ita\},t-1} + \varepsilon_{c,t+h} \quad (2)$$

5. Estimation results

Equation (1) has been initially estimated by recurring to a relatively contained set of potential determinants of remittance outflows growth. This baseline model has been subsequently enriched by a set of proxies aimed to capture the alleged role played the different channels outlined in Sections 1 and 2 above. Although the empirical methods used are standard, their findings should be interpreted as associational rather than causal.

5.1 The baseline model

Several factors, including data availability, have guided the choice and measurement of the set of variables contemplated in the baseline specification.

While the extant literature in the field has identified a variety of *macro* drivers of migrants' remittances, it seems correct (and indeed possible) to control also for proxies measuring the inherent motivations – which operate at a more *micro* level – that may prompt a migrant to send money back home. In this regard, one of the variable of interest in the baseline specification is the COVID-19 infection rate – measured by the number of *new* infections per million people, as recorded by the Center for System Science and Engineering (CSSE) at Johns Hopkins University – which is supposed to stand for the presence of an *altruistic* or *insurance* motive in driving the behaviour of remittance-sending migrants.

Coming back to more *macro* drivers, it seems also relatively uncontroversial that another key factor determining migrants' remittance flows relates to the dynamics of economic activity in both the remittance-sending and the remittance-receiving country. Hence, I resorted to the quarterly series of real GDP annual growth rates, which are available for almost half of the countries in the sample. In making this choice, I departed from Kpodar *et al*. (2021) who relied, instead, upon data on Nitrogen Dioxide (NO2) emissions per head primarily stemming from burning fossil fuels for transportation and electricity

[15] It should be recognised, in fact, that also other shocks/changes – subsequent to the one occurred at time *t* – may occur. Therefore, the derived IRFs capture the treatment effect given the usual path of subsequent shocks/changes and the usual behaviour of other variables. Teulings and Zubanov (2014) noted that this might bias the results; hence, the LP specification should be expanded to control for shocks/changes occurring between *t+1* and *t+h*. By doing so, it would be possible to sterilise the effect of potential subsequent shocks/changes, thereby isolating the treatment effect of the shock/change at time *t* on the dependent variable.

generation; in a robustness test, nevertheless, I also checked the stability of my results when this variable is explicitly taken into account in the estimation procedure.

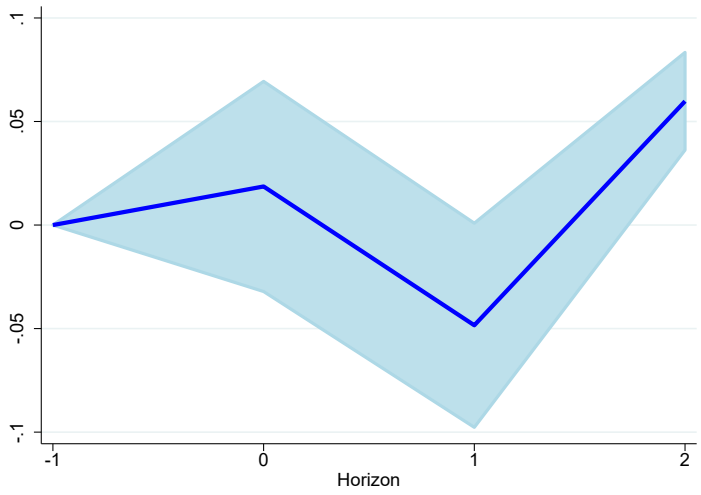
Since both migrants' home countries and Italy simultaneously experienced the supply and demand shocks induced by the pandemic – as well as the ensuing adverse impact on economic activity and individual living conditions – this needs to be controlled for in the model estimation. Hence, the vector $x_{\{c,ita\}}$ and the matrix $Z_{\{c,ita\}}$ account for the COVID-19 *new* infections per million people and the real GDP growth rate of both the remittance-receiving country and Italy.

I also controlled for the change in the (quarterly average) nominal spot exchange rate with respect to the euro, the rationale being that many developing countries may have experienced exchange rate pressures during the pandemic and the resulting depreciation may have affected migrants' decisions about whether, and how much, to remit. Even though both the extent and direction of the effect remains subject to debate in the literature, the exchange rate effect needs to be controlled for to properly isolate the impact of the COVID-19 pandemic on remittance outflows from Italy.

Panel 1. Cumulative effect on remittance growth of a shock to the infection rate at home

	t=0	t=1	t=2
Remittance growth (-1)	-0.516***	-0.768***	-1.122***
	(0.082)	(0.087)	(0.063)
Infections	0.019	-0.048	0.060*
	(0.031)	(0.030)	(0.014)
Infections (-1)	0.027	0.010	-0.034
	(0.026)	(0.027)	(0.025)
Infections_Ita (-1)	0.056	0.030	-0.072*
	(0.026)	(0.021)	(0.022)
GDP growth (-1)	0.072	-0.335	-0.308
	(0.066)	(0.147)	(0.185)
GDP growth_Ita (-1)	-1.124***	-0.426*	0.716
	(0.146)	(0.110)	(0.375)
FX yearly change (-1)	0.354*	0.540*	0.780**
	(0.142)	(0.178)	(0.164)
Obs.	630	540	450
R-squared	0.372	0.485	0.560

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the infection rate at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Taking into account the conditions prevailing in the home country, I begin by showing the IRF of the quarterly year-on-year change in remittance outflows with respect to the number of COVID-19 *new* cases per million people. A positive association between the two series would lend support to the hypothesis that migrants' *altruism* or *insurance* motive has played a role in explaining the resilience of remittance outflows from Italy observed since the outbreak of the pandemic. Indeed, estimation results (**Panel1**) show that remittance growth is positively associated with the COVID-19 infection rate within two quarters after the shock, i.e. a worsening of the pandemic – as attested by an increase in *new* infections – is accompanied by a strengthening in remittance outflows from Italy. For instance, a remittance-receiving country characterised by a 1 standard deviation increase in the number of *new* infections (roughly equal to almost 14,000 additional *new* infected people per quarter for an "average" country) saw a 0.06

percentage points increase in remittances on a cumulative basis after 2 quarters. These results – which are in line with Kpodar *et al*. (2021), who also showed that remittances are positively associated to COVID-19 case within two to five months after the shock – shed further light on the absorption role that remittances may play for those vulnerable households living in countries hit by a shock.

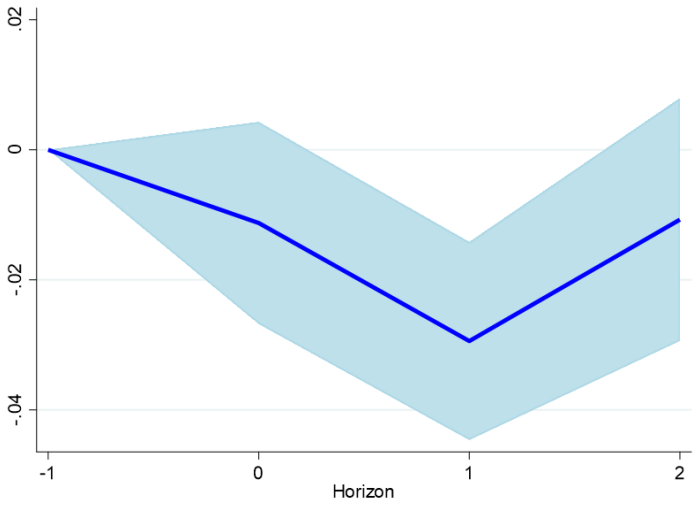
Similarly to Kpodar *et al*. (2021), also my IRF would point to an initial fall of remittances against a shock to the infection rate even if, in my case, such an impact did not turn out being statistically significant. A potential reason behind this delayed behaviour of remittances against the occurrence of an adverse shock back home may be related to the impact of the strict containment measures implemented in both sending and receiving countries. The rise in COVID-19 infections, in fact, triggered a wave of lockdowns that, notwithstanding their rationale based on public health safety considerations, may have brought about unintended consequences for the dynamics of remittances. Quite often, in fact, these measures required a sudden closure of traditionally cash- and physical presence-based MTOs outlets and offices, which persisted for a while up to the point when these services were deemed to be essential by local governments.

I also plot the IRF of remittance growth with respect to an adverse shock to economic activity in the home economy, proxied by a contraction in domestic real GDP (**Panel 2**). A negative association would lend support to the hypothesis that migrants contribute with larger volumes of remittances when their families back in home countries suffer from sudden and unexpected situations of economic hardship, i.e. a fall in economic activity. Indeed, estimation results would confirm the conclusions reached by a strand of economic literature according to which remittances represent an essential *countercyclical* financial flow for recipient countries (El-Sakka and McNabb, 1999; Bouhga-Hagbe, 2006; Singh *et al*., 2011; Frankel, 2011).

Panel 2. Cumulative effect on remittance growth of a shock to economic activity at home

	t=0	t=1	t=2
Remittance growth (-1)	-0.513***	-0.146*	-0.203
	(0.082)	(0.047)	(0.108)
GDP growth	-0.011	-0.029*	-0.011
	(0.009)	(0.009)	(0.011)
GDP growth (-1)	0.082**	-0.101*	0.048*
	(0.014)	(0.027)	(0.014)
GDP growth_Ita (-1)	-1.097***	0.726*	1.074
	(0.103)	(0.196)	(0.838)
Infections (-1)	-0.002	-0.014	0.017
	(0.008)	(0.009)	(0.012)
Infections_Ita (-1)	0.031	0.003	-0.114*
	(0.017)	(0.034)	(0.031)
FX yearly change (-1)	0.343*	0.140	0.083
	(0.126)	(0.123)	(0.127)
Obs.	630	540	450
R-squared	0.403	0.174	0.164

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



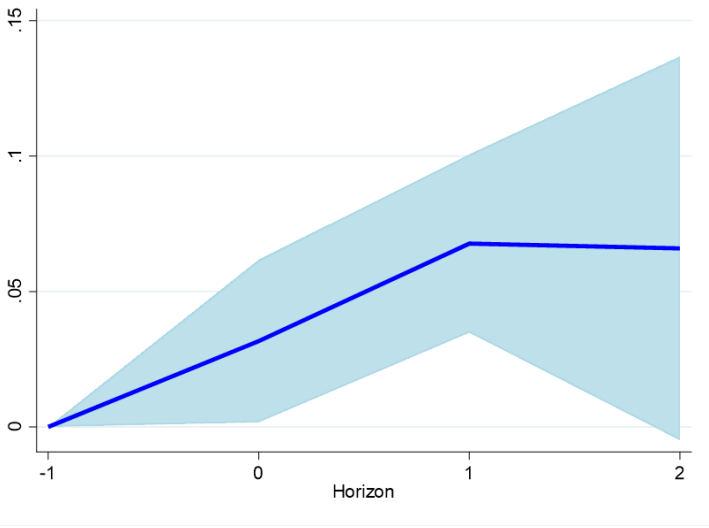
Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to the GDP growth rate at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

The same estimation exercise has been replicated for a shock to the COVID-19 infection rate and the real GDP growth rate in Italy. Regarding this new set of results, it is interesting to notice that the spread of the virus in the host country did not generate any adverse fallout on the amount of remittances sent abroad, rather the opposite. The estimated positive relationship, in fact, would suggest that these flows increased notwithstanding the worsening of the pandemic in Italy (**Panel 3**). The fiscal measures implemented by the Italian government (as by other advanced economies) in the midst of the pandemic – such as cash handouts, wage subsidies, enhanced unemployment benefits and other social transfers – as well as the possibility that migrants were employed in essential services – not affected by the strict lockdown measures – may explain the relative resilience of remittance outflows against the spread of the virus in the host country.[16]

Panel 3. Cumulative effect on remittance growth of a shock to the infection rate in Italy

	t=0	t=1	t=2
Remittance growth (-1)	-0.523***	-0.805***	-1.180***
	(0.079)	(0.100)	(0.085)
Infections_Ita	0.032	0.068*	0.066
	(0.018)	(0.020)	(0.043)
Infections_Ita (-1)	0.065	0.032	-0.072
	(0.027)	(0.023)	(0.027)
Infections(-1)	0.004	-0.027	0.003
	(0.009)	(0.013)	(0.009)
GDP growth (-1)	0.080	-0.262	-0.175
	(0.077)	(0.173)	(0.219)
GDP growth_Ita (-1)	-1.162**	-0.530	-0.022
	(0.212)	(0.290)	(0.942)
FX yearly change (-1)	0.441*	0.890**	1.078**
	(0.151)	(0.201)	(0.148)
Obs.	630	540	450
R-squared	0.378	0.511	0.575

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the infection rate in Italy, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Nevertheless, the downward pressure on remittances stemming from reduced economic activity in Italy may have partially offset the former, rather encouraging, effects. In line with the empirical literature that shows the *procyclicality* of remittance outflows with respect to the economic conditions in the host country (Barajas *et al.*, 2010; Frankel, 2011; Abdih *et al.*, 2012; De *et al.*, 2019), also for Italy remittance growth was adversely impacted by the economic fallout from the pandemic (**Panel 4**): the estimated positive and significant coefficient, in fact, would point to a direct relationship between GDP growth in the host country and the growth of remittance outflows.

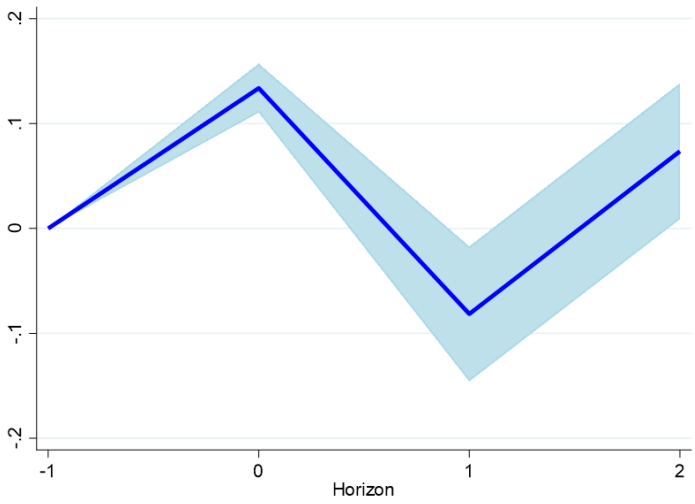
[16] During 2020, to deal with the epidemiological emergency from the outbreak of the COVID-19 pandemic and following the suspension of work activities, extraordinary measures have been introduced to support businesses in the field of ordinary salary integration, ordinary allowance for solidarity funds, layoffs in derogation (*Decreto Cura Italia*, *Decreto Rilancio*, *Decreto Agosto*, *Decreto Ristori*). According to the data of the *Istituto Nazionale di Previdenza Sociale*, in 2020 the share of non-EU workers who benefitted from the different forms of wage integration provided by the Italian laws turned out to be between 99 and 98% of those entitled.

All in all, since the regression controls for economic activity in Italy, the identified impact of the COVID-19 infection rate on remittance outflows embodies the efforts of migrants to assist their families in the country of origin against the economic hardship they were facing. At the same time, by controlling for economic activity in the home country, the significance of the results shows that migrants sought to support their families even more than the economic impact would entail. This could mean that migrants who were employed during the pandemic were able to continue to support their families back home, while those who became partially employed – or lost their jobs – devoted a higher share of their current income to remittances or even dissaved. In this regard, microeconomic studies investigating how the pandemic impacted on the employment status of migrants and, hence, on their actual remitting behaviour at an individual (or family) level would be welcome.

Panel 4. Cumulative effect on remittance growth of a shock to the economic activity in Italy

	t=0	t=1	t=2
Remittance growth (-1)	-0.511***	-0.758***	-1.135***
	(0.080)	(0.082)	(0.077)
GDP growth_Ita (-1)	0.134***	-0.081	0.074
	(0.014)	(0.039)	(0.039)
GDP growth_Ita (-1)	-0.121***	-0.035**	0.046
	(0.005)	(0.008)	(0.023)
GDP growth (-1)	-0.051	-0.283*	-0.367
	(0.083)	(0.107)	(0.189)
Infections (-1)	-0.016*	-0.001	0.000
	(0.006)	(0.008)	(0.009)
Infections_Ita (-1)	-0.001	0.065	-0.098**
	(0.009)	(0.026)	(0.019)
FX yearly change (-1)	0.417*	0.439	0.813**
	(0.145)	(0.219)	(0.164)
Obs.	630	540	450
R-squared	0.436	0.505	0.576

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to the GDP growth rate in Italy, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

5.2 Stringency measures

Many countries around the world have enacted stringent containment measures and non-pharmaceutical interventions to halt the spread of the virus and limit the number of fatalities, in a bid to prevent the medical system from being overwhelmed and to buy time while effective treatments and vaccines were developed and deployed. Interventions have ranged from improved diagnostic testing and contact tracing, isolation and quarantines for infected people and, most importantly, measures aimed to reduce mobility and create social distancing.

In the hypothesis that, at least in those countries where the market for remittance transfers is still mainly cash-based, sending and receiving remittances entails a minimum physical interaction between the service provider and the client, as well as the need to physically move to the nearest agent, an interesting question relates to the potential impact that the containment measures adopted in Italy and in the receiving countries at the other end of the corridor may have had on remittance outflows. Since a potential role has already been highlighted in the comment related to the initial negative impact from a shock to the

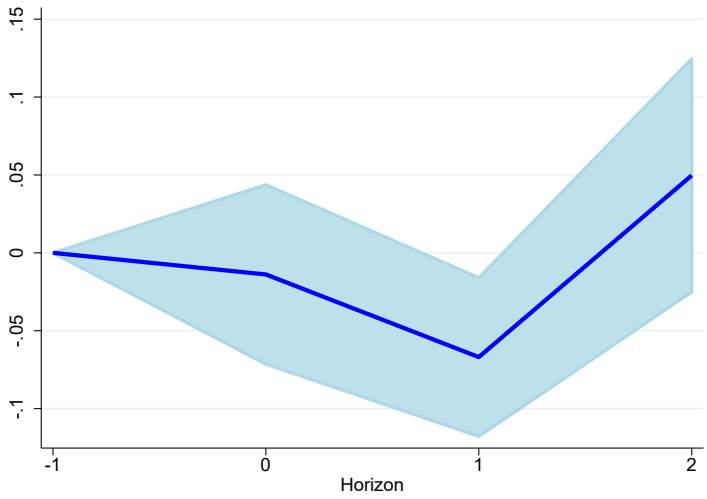
COVID-19 infection rate in home economies, the aim of this section is to dig further into this question by enriching the baseline model with indicators of the containment measures adopted both in Italy and in the home countries.

As far as the measuring of restrictions is concerned, different databases and indicators have been proposed to track the public responses to the pandemic outbreak, with the Oxford Coronavirus Government Response Tracker (OxCGRT; Hale *et al*., 2021) being the most comprehensive database on the non-pharmaceutical interventions enacted by governments worldwide.[17] In particular, the OxCGRT includes a stringency index (OxSI) – a synthetic measure of the severity of restrictions adopted by each country, with values ranging between 0 and 100 to indicate increasingly stricter containment measures – which has been used in the estimation exercise.

Panel 5. Cumulative effect on remittance growth of a shock to containment measures at home

	t=0	t=1	t=2
Remittance growth (-1)	-0.534***	-0.183*	-0.178
	(0.072)	(0.081)	(0.107)
Stringency	-0.014	-0.067*	0.050
	(0.035)	(0.031)	(0.046)
Stringency (-1)	0.010	0.129**	-0.022
	(0.025)	(0.039)	(0.035)
Stringency_Ita (-1)	0.187*	-0.813***	0.656***
	(0.073)	(0.112)	(0.155)
Infections (-1)	-0.002	-0.024	-0.006
	(0.011)	(0.014)	(0.012)
Infections_Ita (-1)	0.042**	0.037*	-0.167***
	(0.013)	(0.015)	(0.023)
GDP growth (-1)	0.163	-0.375	-0.252
	(0.170)	(0.244)	(0.284)
GDP growth_Ita (-1)	-0.887***	0.000	2.930***
	(0.208)	(0.244)	(0.369)
FX yearly change (-1)	0.431	0.309	0.133
	(0.301)	(0.236)	(0.274)
Obs.	609	522	435
R-squared	0.389	0.232	0.281

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 87 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to the OxSI index at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Once controlled for the COVID-19 infection rate and the related impact on economic activity, the response of remittance outflows to stricter containment measures in the home country is clearly negative after one quarter and statistically significant (**Panel 5**). Hence, similarly to Kpodar *et al*. (2021), more stringent virus containment measures in home countries appear to have dampened remittance inflows

[17] The OxCGRT collects publicly available information on 23 indicators of government response to the COVID-19 pandemic, classified in the following types of policy areas: containment and closure; economic measures; health system; vaccines. To help make sense of these data, they are subsequently aggregated into four different indices: overall government response; containment and health; stringency; economic support.

there, suggesting that these measures may have had the unintended consequence of making it more difficult to receive remittances, *ceteris paribus*.

Although the phenomenon was widespread around the globe, it is to be acknowledged that governments in advanced and emerging economies have implemented containment measures in rather varying degrees, with some countries relying on them (much) more than others. Hence, one may wonder whether the differing degrees to which containment measures were adopted in receiving countries may have had a larger (or lower) impact on the flows of remittances directed to them. To perform this estimation exercise, I built a dummy variable HS_c – taking value 1 for countries characterised by an OxSI higher than the average (or higher than the 75th percentile) of the sample distribution and 0 otherwise – that has been subsequently interacted with the OxSI. Equation (2) assumes the new form

$$\Delta Y_{c,t+h} = u_{c,h} + \alpha_1 \Delta Y_{c,t-1} + \beta_0 x_{\{c,Ita\},t} + \theta_0 x_c HS_c + HS_c + \beta_1 x_{\{c,Ita\},t-1} + \theta_1 Z_{\{c,Ita\},t-1} + \varepsilon_{c,t+h} \quad (3)$$

where $x_c$is the OxSI, HS_c is the dummy which discriminates the countries characterised by a relatively higher OxSI and the sum of the coefficients β_0+θ_0 measures the non-linear effect on remittance growth of an increase in containment measures in those countries already characterised by a relatively higher OxSI.

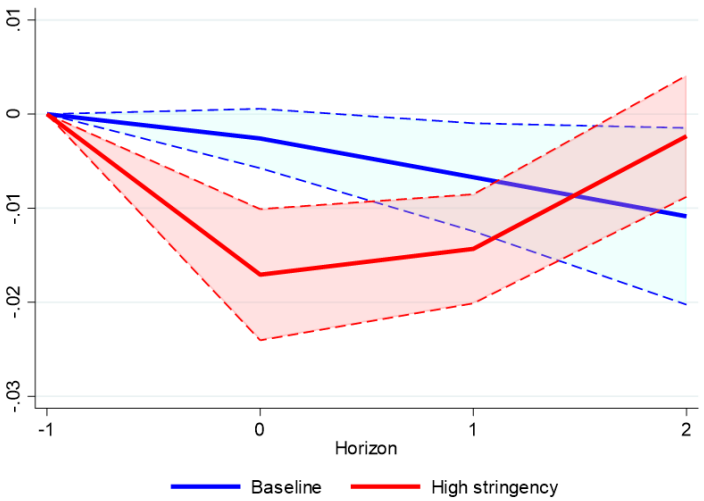
Indeed, estimation results would suggest that the negative response of remittance growth to a shock to the OxSI shown in Panel 5 largely depends upon the intensity of the containment measures already in place, i.e. the higher the OxSI the more detrimental is the impact on incoming remittances of a further increase in containment measures. This conclusion is evident for countries with an OxSI higher than the panel average (**Panel 6**) and even more so for countries with an OxSI higher than the 75th percentile of the sample distribution (**Panel 7**).[18]

[18] With the average value of the OxSI equal to 51.5 and the 75th percentile equal to 68.9.

Panel 6. Cumulative effect on remittance growth of a shock to containment measures in home countries characterised by an OxSI higher than the sample average compared to baseline

	t=0	t=1	t=2
Remittance growth (-1)	-0.545***	-0.798***	-1.184***
	(0.079)	(0.093)	(0.084)
Stringency	-0.003	-0.007	-0.011
	(0.002)	(0.003)	(0.006)
Stringency (-1)	0.001	0.012	0.011*
	(0.003)	(0.005)	(0.003)
Stringency*Dummy_HS	-0.014**	-0.008	0.009
	(0.004)	(0.004)	(0.009)
Dummy_HS	0.014**	0.009*	0.004
	(0.003)	(0.003)	(0.002)
Stringency_Ita (-1)	0.018	-0.049	0.004
	(0.017)	(0.025)	(0.015)
Infections (-1)	-0.001	-0.003	-0.002*
	(0.001)	(0.001)	(0.001)
Infections_Ita (-1)	0.004	0.007*	-0.008**
	(0.002)	(0.003)	(0.001)
GDP growth (-1)	0.014	-0.019	-0.021
	(0.007)	(0.016)	(0.021)
GDP growth_Ita (-1)	-0.086	-0.077*	0.172**
	(0.036)	(0.023)	(0.036)
FX yearly change (-1)	0.048	0.066*	0.099**
	(0.020)	(0.017)	(0.016)
Obs.	609	522	435
R-squared	0.400	0.510	0.584

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 87 countries.

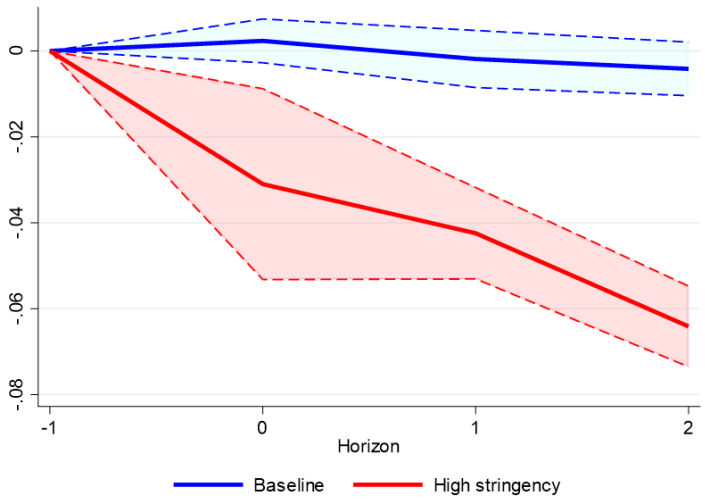


Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the OxSI index at home, conditional on the degree of strictness of the containment measures. The red (blue) line is the response for economies with an OxSI index higher (lower) than the sample average. Shaded areas represent the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel 7. Cumulative effect on remittance growth of a shock to containment measures in home countries characterised by an OxSI higher than the 75th percentile compared to baseline

	t=0	t=1	t=2
Remittance growth (-1)	-0.539***	-0.800***	-1.186***
	(0.080)	(0.093)	(0.075)
Stringency	0.002	-0.002	-0.004
	(0.003)	(0.004)	(0.004)
Stringency (-1)	0.001	0.012	0.012**
	(0.003)	(0.005)	(0.002)
Stringency*Dummy_HS	-0.033	-0.041**	-0.060**
	(0.016)	(0.007)	(0.008)
Dummy_HS	0.023	0.032**	0.058**
	(0.013)	(0.007)	(0.007)
Stringency_Ita (-1)	0.018	-0.049	0.004
	(0.016)	(0.025)	(0.015)
Infections (-1)	-0.001	-0.004*	-0.003*
	(0.001)	(0.001)	(0.001)
Infections_Ita (-1)	0.005	0.008*	-0.008**
	(0.002)	(0.003)	(0.001)
GDP growth (-1)	0.010	-0.023	-0.022
	(0.006)	(0.017)	(0.018)
GDP growth_Ita (-1)	-0.087*	-0.077*	0.172*
	(0.035)	(0.023)	(0.039)
FX yearly change (-1)	0.053*	0.076**	0.112***
	(0.020)	(0.017)	(0.011)
Obs.	609	522	435
R-squared	0.397	0.512	0.596

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 87 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the OxSI index at home, conditional on the degree of strictness of the containment measures. The red (blue) line is the response for economies with an OxSI index higher (lower) than the sample 75th percentile. Shaded areas represent the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

One may also wonder whether, and to what extent, the varying degrees of the stringency measures adopted by governments in receiving countries may have affected the extent of the impact on remittance inflows of a shock to the COVID-19 infection rate. Following Kpodar *et al.* (2021), I introduced in the model an interaction term between the number of *new* COVID-19 cases and the OxSI, with Equation (1) taking the new form

$$\Delta Y_{c,t+h} = u_{c,h} + \alpha_1 \Delta Y_{c,t-1} + \beta_0 x_{\{c,Ita\},t} + \theta_0 x_c w_c + \beta_1 x_{\{c,Ita\},t-1} + \theta_1 Z_{\{c,Ita\},t-1} + \varepsilon_{c,t+h} \quad (4)$$

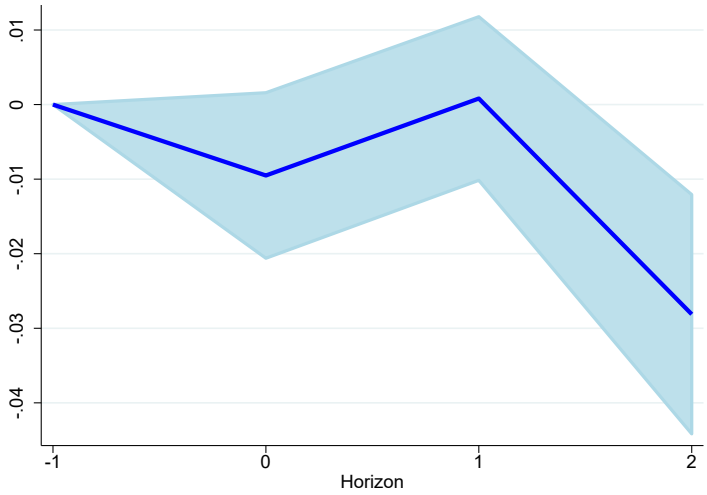
where $x_c$is now the number of COVID-19 *new* cases per million people and w_c is the OxSI.

Estimation results would point to a clear drop in remittances after a shock to the COVID-19 infection rate in those countries characterised by containment measures stricter than the 75th percentile (**Panel 8**), whereas this impact is not visible in countries characterised by an OxSI lower than the 25th percentile (**Panel 9**).

Panel 8. Cumulative effect on remittance growth of a shock to the infection rate in home countries characterised by an OxSI higher than the 75th percentile

	t=0	t=1	t=2
Remittance growth (-1)	-0.611***	-0.802***	-1.049***
	(0.075)	(0.157)	(0.158)
Infections	-0.010	0.001	-0.028**
	(0.007)	(0.007)	(0.010)
Infections (-1)	0.006	-0.006	-0.003
	(0.016)	(0.016)	(0.019)
Infections_Ita (-1)	0.005*	0.003	-0.015***
	(0.002)	(0.002)	(0.003)
Infections*Stringency (-1)	-0.001	0.000	-0.000
	(0.001)	(0.001)	(0.002)
Stringency (-1)	-0.006	-0.006	-0.036
	(0.013)	(0.018)	(0.021)
Stringency_Ita (-1)	0.071*	0.010	0.168**
	(0.028)	(0.022)	(0.054)
GDP growth (-1)	0.002	-0.097	-0.073
	(0.035)	(0.051)	(0.067)
GDP growth_Ita (-1)	-0.032	0.043	0.305**
	(0.048)	(0.059)	(0.090)
FX yearly change (-1)	0.062	-0.016	0.019
	(0.066)	(0.051)	(0.060)
Obs.	165	158	146
R-squared	0.519	0.636	0.615

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 65 countries.

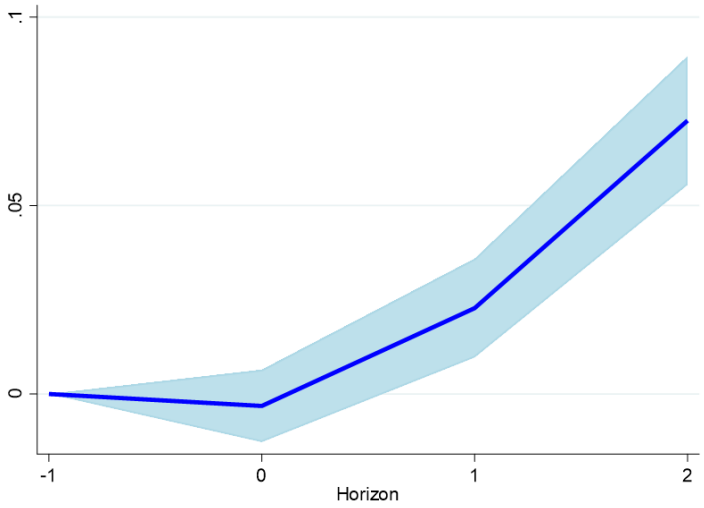


Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the infection rate at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel 9. Cumulative effect on remittance growth of a shock to the infection rate in home countries characterised by an OxSI lower than the 25th percentile

	t=0	t=1	t=2
Remittance growth (-1)	-0.726*	-0.671**	-0.910***
	(0.202)	(0.120)	(0.037)
Infections	-0.003	0.023*	0.073**
	(0.006)	(0.008)	(0.010)
Infections (-1)	0.049*	-0.052	-0.113*
	(0.018)	(0.021)	(0.026)
Infections_Ita (-1)	-0.001	0.004	-0.017*
	(0.001)	(0.007)	(0.005)
Infections*Stringency (-1)	-0.005	0.006	0.015*
	(0.002)	(0.003)	(0.005)
Stringency (-1)	0.005	-0.022	-0.064
	(0.010)	(0.017)	(0.024)
Stringency_Ita (-1)	0.070**	-0.005	0.063**
	(0.014)	(0.034)	(0.013)
GDP growth (-1)	0.006	-0.001	0.029
	(0.023)	(0.085)	(0.068)
GDP growth_Ita (-1)	-0.059	-0.173**	-0.043
	(0.030)	(0.043)	(0.049)
FX yearly change (-1)	0.013	-0.003	0.278**
	(0.055)	(0.100)	(0.046)
Obs.	63	42	30
R-squared	0.753	0.619	0.765

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 15 countries.



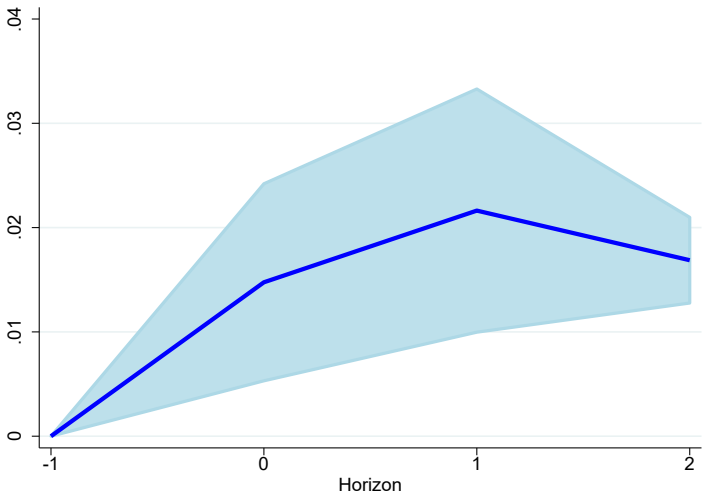
Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the infection rate at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

As far as the measure of the strictness of restrictions in the migrants' host country is concerned, I relied upon the Italian stringency index (ItSI) developed by Borin and Conteduca (2022), which has the advantage, relative to the original OxSI, to take into account a series of more localized and targeted measures adopted in addition to nationwide lockdowns after the very first phase of the pandemic. Estimation results would suggest that remittance outflows do not appear to have suffered from the containment measures implemented in Italy (**Panel 10**). Indeed, the estimated positive association would suggest quite the opposite: notwithstanding the observed increase in the ItSI, migrants have been able to sustain the amount of resources sent back to their families in home countries. Some potential underlying reasons have already been suggested above – migrants may have benefited from the fiscal support programmes adopted by the Italian government and/or were working in services deemed to be essential – while others will be studied in the following sub-sections.

Panel 10. Cumulative effect on remittance growth of a shock to containment measures in Italy

	t=0	t=1	t=2
Remittance growth (-1)	-0.552***	-0.808***	-1.213***
	(0.080)	(0.098)	(0.078)
Stringency_Ita	0.015*	0.022*	0.017**
	(0.006)	(0.007)	(0.002)
Stringency_Ita (-1)	0.011**	0.006*	0.010*
	(0.003)	(0.002)	(0.003)
Stringency (-1)	-0.002	0.003	0.009
	(0.003)	(0.006)	(0.006)
Infections (-1)	-0.002	-0.003	-0.003**
	(0.001)	(0.002)	(0.001)
Infections_Ita (-1)	0.002	0.001	-0.010***
	(0.001)	(0.002)	(0.001)
GDP growth (-1)	0.021*	-0.018	-0.010
	(0.008)	(0.021)	(0.022)
GDP growth_Ita (-1)	-0.073**	-0.007	0.147***
	(0.013)	(0.022)	(0.007)
FX yearly change (-1)	0.064**	0.084*	0.128***
	(0.016)	(0.022)	(0.009)
Obs.	609	522	435
R-squared	0.408	0.499	0.599

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 87 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to the ItSI index in Italy, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

5.3 Travel restrictions and the shift away from informality

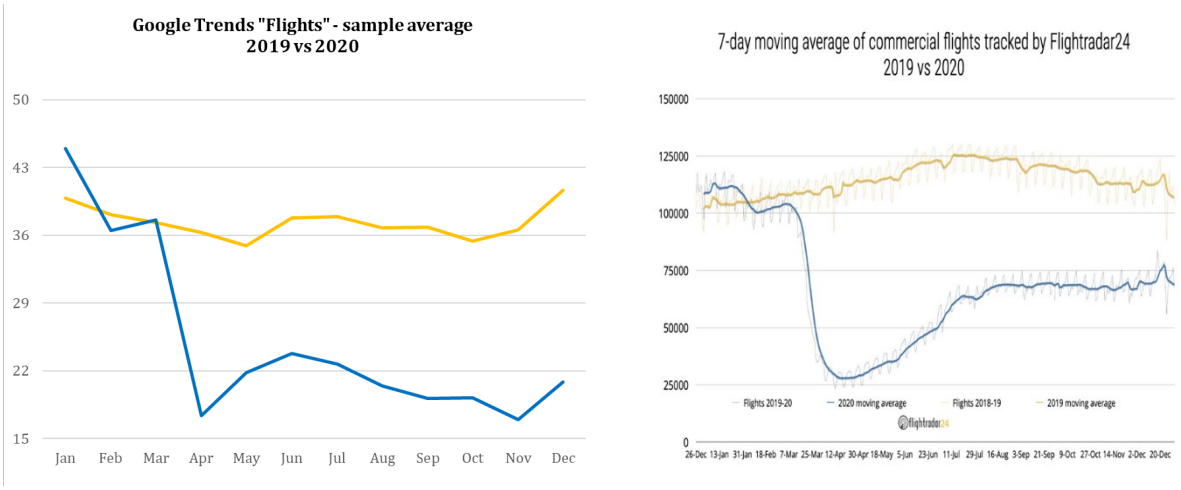
Estimating the volume of informal remittances is challenging, as they involve a substantial number of small transactions that are not registered in any system and thus go easily undetected. To test the hypothesis that a share of remittances were shifted towards regulated formal channels because of the implementation of stringent travel restrictions worldwide, I will follow Austin *et al*. (2021) and rely upon the data extracted from Google Trends, a public website (trends.google.com) managed and maintained by Google that facilitates analysis of Google search queries.[19]

Google Trends are a measure of the "interest" amongst web users in a given *topic* relative to all other topics over a given timeframe, where a *topic* can be anything from a person or an event to a business or a specific product. In extreme synthesis, a Google Trend can be interpreted as an index scaled from 0 to 100, with higher values hinting to a higher "interest" shown by web users for a given *topic* (with respect to all other searches performed in the same period). To the extent that the chosen topic relates to a business, an industry or a product, the Google Trend could be indicative, at least to some extent, of economic activity. In this regard, Narita and Yin (2018) were the first to show how online search frequencies about a country significantly correlate with macroeconomic variables (real GDP, inflation, capital flows), demonstrating their potential role to facilitate a timely assessment of economic conditions.

[19] There is no charge to use the website. The information can be downloaded into CSV files, the charts can be captured as images, shared or directly embedded into webpages. Moreover, given the wide scale usage of the Google search engine, trends data contain a very broad country and topical coverage.

Against this backdrop, I downloaded the Google Trends for the web searches done *in Italy* regarding the term "Flights to …" each of the countries in the sample; the weekly data series have been averaged at a quarterly frequency. **Chart 3** (**left panel**) clearly shows how the "interest" of web users *in Italy* for "Flights to …" any given country declined significantly towards the end of 2020Q1, in correspondence to the COVID-19 travel restrictions imposed by governments across the globe. It also shows (**right panel**) how the fall in the general "interest" by web users may indeed be indicative of the actual decline in flights recorded during the same period.[20]

Chart 3. Google Trends searches for "Flights to …" and actual flights



Note: In both charts the 2019 (2020) dynamics is represented by an orange (a blue) line.

The IRF obtained by adding the country-by-country series of Google Trends for the word "Flights to …" that particular country to the baseline specification clearly indicates the existence of a negative relationship between the growth rate of remittances and the chosen proxy for the shift from informal to formal channels (**Panel 11**). The increase in outflows notwithstanding the fall in the "interest" in (and the actual number of) flights may provide an indirect indication of the greater recourse by migrants to formally regulated channels instead of more informal cash transfers. Of course, this does not mean that the overall volume of remittances actually increased but only that a larger share has shifted to channels that can be more easily and more effectively recorded in official statistics.

To withstand the potentially right remark according to which there might be an endogeneity issue in the estimation outcomes – the reason why remittances increase, in fact, may be simply because migrants save money from not travelling, money that can then be sent to their families back home – I introduce an indicator of the size of the informal channel of each corridor and interact it with the observed fall in flight searches (and actual flights).[21] Once confronted with the common shock of being able to travel no more, one would indeed expect to see remittances growing more towards those destinations for which, from an *ex-ante* point of view, the use of the informal channel was higher.

In this regard, Ferriani and Oddo (2019) document a strong positive relationship between remittances and both the *geographical distance* and the *cost of travel* between Italy and migrants' respective home countries. They interpreted this result as an indirect evidence of unrecorded flows, since the relation between remittances and distance (or travel costs) should be non-significant unless geographical proximity permits remitters to switch to informal transmission mechanisms. In essence, the basic

[20] Flighradar24, for instance, provides daily data on international flights arrivals and departures in almost all the airports of the world upon payment of a fee. This is the variable actually used by Kpodar *et al*. (2021) in their econometric analysis. This is the variable used by Kpodar *et al*. (2021) in their analysis.

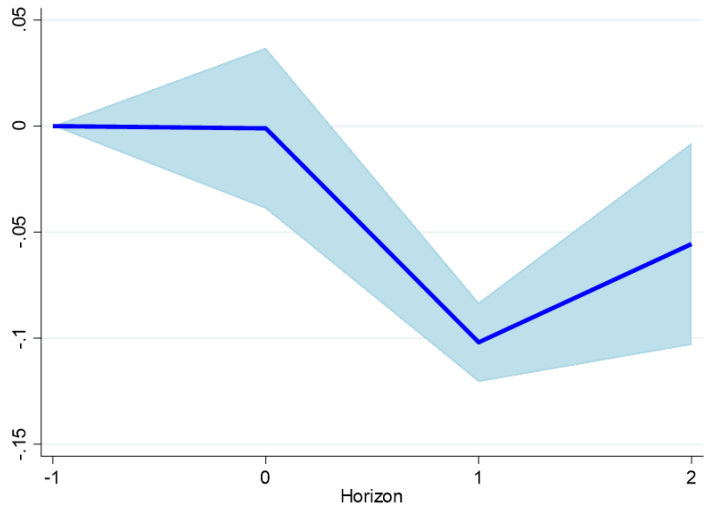
[21] I thank an anonymous referee for pointing this out.

underlying idea is that a migrant would prefer resorting to informal channels when the home country is relatively near and the cost of going back there is relatively affordable, giving him the possibility to return home more frequently and bring with him the savings of his work.

Panel 11. Cumulative effect on remittance growth of a shock to "Flight to …" searches

	t=0	t=1	t=2
Remittance growth (-1)	-0.552***	-0.797***	-1.155***
	(0.073)	(0.083)	(0.062)
Flight searches	-0.001	-0.102***	-0.056
	(0.023)	(0.011)	(0.029)
Flight searches (-1)	-0.116**	-0.045	-0.132**
	(0.024)	(0.020)	(0.019)
Infections (-1)	-0.003	-0.024	-0.003
	(0.006)	(0.010)	(0.005)
Infections_Ita (-1)	0.036	0.017	-0.093***
	(0.016)	(0.020)	(0.007)
GDP growth (-1)	0.150*	-0.213	-0.136
	(0.061)	(0.156)	(0.160)
GDP growth_Ita (-1)	-0.980***	-0.256	0.797**
	(0.130)	(0.119)	(0.109)
FX yearly change (-1)	0.401*	0.555*	0.824***
	(0.120)	(0.184)	(0.086)
Obs.	630	540	450
R-squared	0.409	0.505	0.605

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.

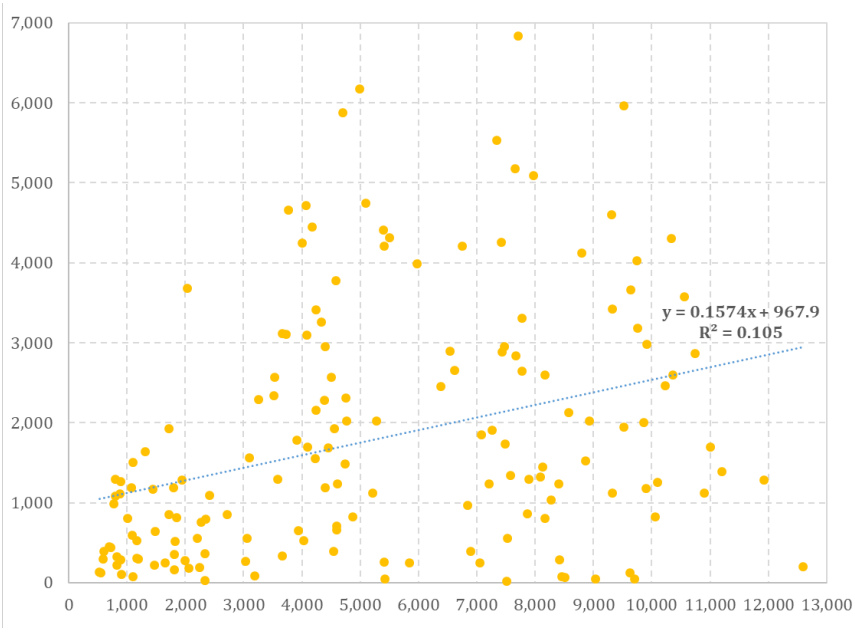


Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to google searches of "flights" destined to each of the sample countries, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Against this backdrop, a readily available measure of the geographical distance between Italy and migrant workers' home countries is published in the GeoDist archive of CEPII and elaborated as the population-weighted distance in kilometres between the demographic centre of gravity of Italy and the demographic centre of gravity of the country of origin of the foreign worker (Mayer and Zignago, 2011). At the same time, a measure of the monetary cost of travelling from Italy to the migrant's home country *c* can be obtained from the microdata on international tourism assembled by the Bank of Italy. In particular, following Ferriani and Oddo (2019), I recurred to the weighted average cost in euros of travelling from Italy to country *c*, where the average is computed with respect to the cost of travel by car or by plane weighted by the number of travellers registered for the two channels.

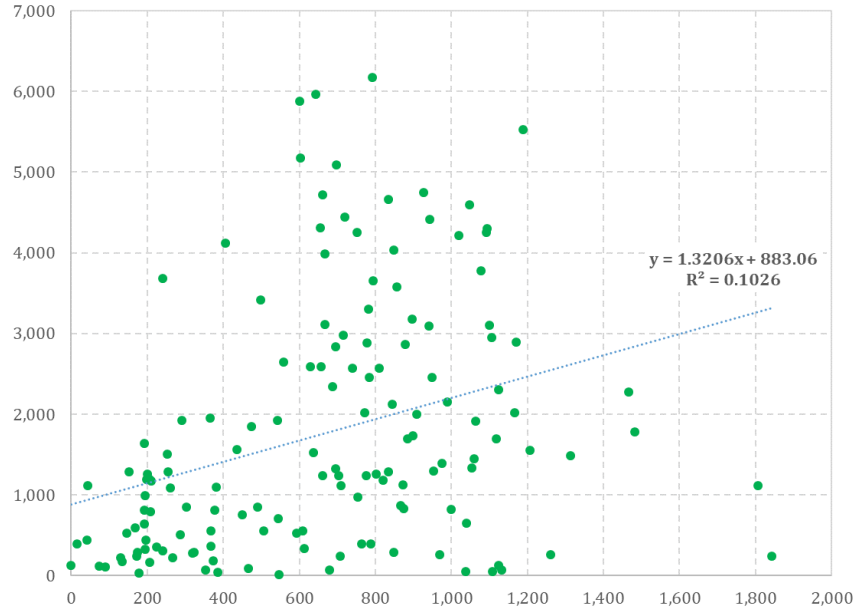
In this regard, **Chart 4** and **Chart 5** display the existence of a clearly positive unconditional correlation between per-migrant remittances and the two measures of geographical distance, on the one hand, and travel costs, on the other. Magnani *et al.* (2016) and Ferriani and Oddo (2019) relied on the hypothesis that this positive unconditional correlation derives from the fact that a part of the actual flow of remittances is not observed for foreigners coming from countries closest to Italy to provide an estimate of the size of the informal channels in the country.

Chart 4. Remittances per migrant and distance of home country



Source: Bank of Italy and CEPII.
Note: Distance is in kilometres and is reported on the X-axis; remittances per migrant are in euros and are reported on the Y-axis.

Chart 5. Remittances per migrant and cost of travelling to home country



Source: Bank of Italy.
Note: Travel costs (2017-2019 average) are in euros and are reported on the X-axis; remittances per migrant are in euros and are reported on the Y-axis.

Having available a measure of both the geographical distance and the travel costs for the majority of the countries in the sample, I built two dummy variables with the aim to isolate those countries whose dimension of the informal channel could be expected to be larger from an *ex-ante* point of view, with LD_c (LC_c) taking value 1 when country c is characterised by a geographical distance (travel cost) from Italy

lower than the 10th percentile of the sample distribution and 0 otherwise.[22] These dummy variables are explicitly introduced in the estimation procedure as interaction terms with the number of "Flights to …" searches, as in Equation (5)

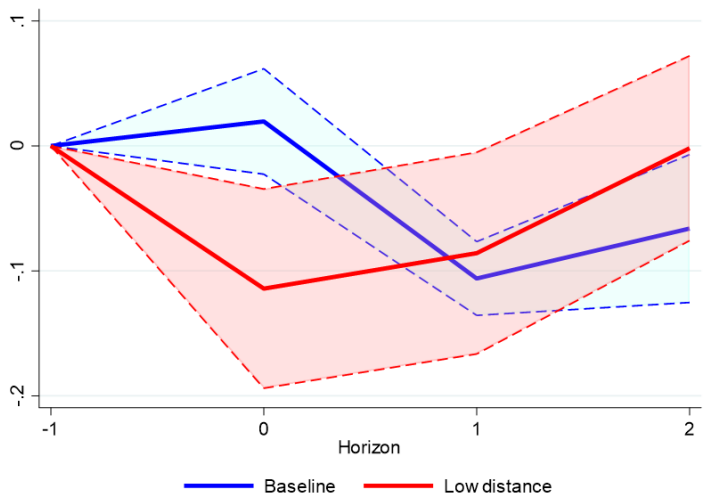
$$\Delta Y_{c,t+h} = u_{c,h} + \alpha_1 \Delta Y_{c,t-1} + \beta_0 x_{\{c,Ita\},t} + \theta_0 x_c LD_c + \beta_1 x_{\{c,Ita\},t-1} + \theta_1 Z_{\{c,Ita\},t-1} + \varepsilon_{c,t+h} \quad (5)$$

where $x_c$is the Google Trends searches, LD_c (LC_c) is the dummy which discriminates the countries characterised by a low distance (low travel cost) from Italy and the sum of the coefficients β_0+θ_0 measures the non-linear effect on remittance growth of a shock to travel restrictions for countries characterised by a lower distance (lower travel cost) from Italy. Estimation results, which are contained in **Panel 12** and **Panel 13** for the two indirect measures of the informal channel, confirm initial expectations: a negative θ_0 would add to a negative β_0, suggesting that, faced with a common shock to travel restrictions, remittances grow more towards those destinations which are less distant or characterised by lower travel costs, i.e. the two conditions that would permit informal channels to be preferred to remit money.

Panel 12. Cumulative effect on remittance growth of a shock to "Flight to …" searches towards countries characterised by a low distance from Italy compared to baseline

	t=0	t=1	t=2
Remittance growth (-1)	-0.559***	-0.798***	-1.151***
	(0.077)	(0.083)	(0.061)
Flight searches	0.020	-0.106**	-0.066
	(0.026)	(0.018)	(0.036)
Flight searches (-1)	-0.122**	-0.047	-0.131**
	(0.025)	(0.021)	(0.018)
Flight searches * Dummy_LD	-0.134*	0.020	0.064
	(0.054)	(0.062)	(0.067)
Infections (-1)	-0.004	-0.024	-0.001
	(0.007)	(0.010)	(0.005)
Infections_Ita (-1)	0.035	0.017	-0.094***
	(0.016)	(0.020)	(0.007)
GDP growth (-1)	0.212*	-0.159	-0.077
	(0.063)	(0.172)	(0.159)
GDP growth_Ita (-1)	-0.977***	-0.283	0.778**
	(0.135)	(0.122)	(0.106)
FX yearly change (-1)	0.384*	0.571*	0.881***
	(0.124)	(0.189)	(0.096)
Obs.	623	534	445
R-squared	0.411	0.503	0.602

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 89 countries.



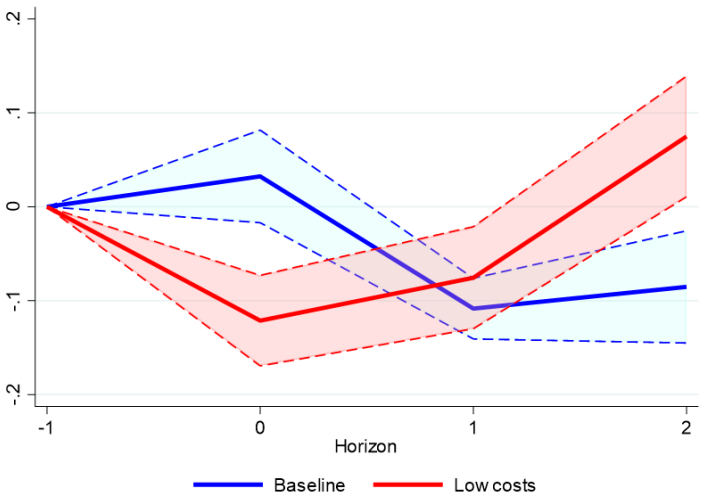
Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the number of google searches of the term "flights" destined to each of the sample countries, conditional on the geographical distance from Italy. The red (blue) line is the response for economies which are distant less (more) than the 10th percentile. Shaded areas represent the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

[22] Hence, the discriminating values are 1,100 Km in case of geographical distance and 200 euros in case of travel costs.

Panel 13. Cumulative effect on remittance growth of a shock to "Flight to …" searches towards countries characterised by low travel costs from Italy compared to baseline

	t=0	t=1	t=2
Remittance growth (-1)	-0.558***	-0.795***	-1.151***
	(0.076)	(0.083)	(0.060)
Flight searches	0.032	-0.108**	-0.085
	(0.030)	(0.020)	(0.036)
Flight searches (-1)	-0.123**	-0.044	-0.128**
	(0.024)	(0.021)	(0.018)
Flight searches * Dummy_LC	-0.154*	0.033	0.160
	(0.048)	(0.050)	(0.062)
Infections (-1)	-0.005	-0.024	-0.001
	(0.007)	(0.010)	(0.005)
Infections_Ita (-1)	0.035	0.017	-0.093***
	(0.015)	(0.020)	(0.007)
GDP growth (-1)	0.167*	-0.219	-0.141
	(0.066)	(0.163)	(0.157)
GDP growth_Ita (-1)	-0.965***	-0.260	0.807**
	(0.132)	(0.119)	(0.101)
FX yearly change (-1)	0.376*	0.563*	0.895***
	(0.122)	(0.175)	(0.098)
Obs.	630	540	450
R-squared	0.414	0.505	0.607

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the number of google searches of the term "flights" destined to each of the sample countries, conditional on the travel costs from Italy. The red (blue) line is the response for economies whose costs are lower (higher) than the 10th percentile. Shaded areas represent the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

5.4 The rush to digitalisation

Switching to digital products and services for sending remittances back home may have helped the digitally agile and financially included migrants circumvent the mobility restrictions and service disruptions brought about by the outbreak of the COVID-19 pandemic. Notwithstanding much discussion in international *fora*, nevertheless, it has to be acknowledged the existence of a general lack of both a shared definition of what can be regarded as a "digital" financial service and/or product and, as a consequence, a relatively unavailability of robust data series potentially useful for estimation purposes.

Against this backdrop, I relied upon different indicators that, in my view, could be able to provide a useful glimpse of how digitalisation has spread in recent years – especially as a by-product of the COVID-19 pandemic – and how it has positively a remittance outflows.

First, I have resorted to a *domestic* measure of digitalisation provided by the payment system statistics produced by the Bank of Italy; more in detail, I looked at the series measuring the overall *value* of the payment transactions made by automated means (such as transfers, direct debits and debit card transactions through traditional point of sales-POS).[23] Since remittances are typically sent to home countries by means of payment institutions or other authorized intermediaries without using bank accounts (i.e. settlement in cash), the use of these series should circumvent the issue related to a possible

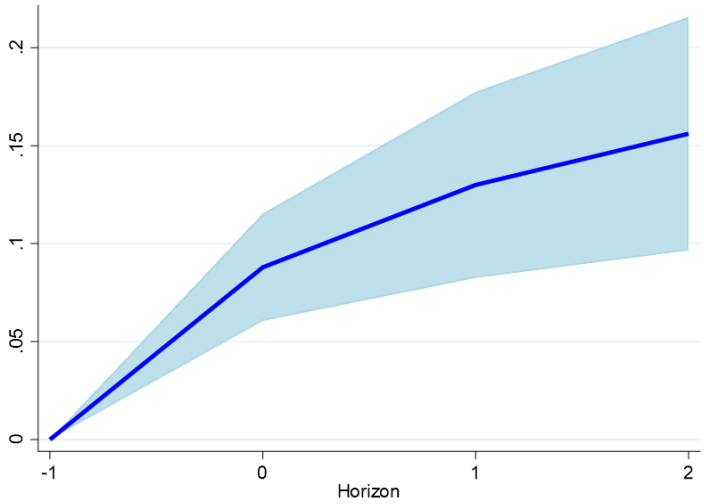
[23] Information about transactions completed by credit cards is also available, although only at an annual frequency.

endogeneity between remittances and the recourse to digital channels. Indeed, the estimation results contained in **Panel 14** would point to the existence of a positive relationship between remittance outflows from Italy and the spread of payments in the country undertaken by automated means, with the cumulative impact gradually increasing throughout the estimation horizon. Being available the data series not only on the overall *value* but also of the overall *number* and *average value* of automated transactions, I replicated the estimates relying upon these alternative indicators and obtained similar conclusions about their relationship with remittance outflows.[24]

Panel 14. Cumulative effect on remittance growth of a shock to digital payments in Italy

	t=0	t=1	t=2
Remittance growth (-1)	-0.508***	-0.802***	-1.206***
	(0.066)	(0.071)	(0.130)
Digital payments	0.088***	0.130***	0.156***
	(0.017)	(0.029)	(0.036)
Digital payments (-1)	-0.103***	0.126***	-0.047
	(0.021)	(0.028)	(0.049)
Infections (-1)	-0.025*	-0.027	-0.024
	(0.011)	(0.016)	(0.019)
Infections_Ita (-1)	0.092***	-0.016	-0.056*
	(0.015)	(0.019)	(0.022)
GDP growth (-1)	0.003	-0.273	-0.215
	(0.167)	(0.212)	(0.229)
GDP growth_Ita (-1)	-0.980***	-1.306***	0.512
	(0.194)	(0.251)	(0.403)
FX yearly change (-1)	0.366	0.869	1.240*
	(0.296)	(0.461)	(0.541)
Obs.	630	540	450
R-squared	0.417	0.507	0.603

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the value of digital payments in Italy, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Second, I have resorted to a *global* measure of digitalisation provided by the mobile money data gathered and distributed by GSMA (Groupe Speciale Mobile Association), a global organisation that gathers the main international mobile operators. Indeed, mobile money has become a very popular payment instrument across many emerging and developing countries and has acquired a pivotal role in increasing the digitalisation of remittances.[25] While Africa is often considered to be the epicentre of mobile money –

[24] Estimation results are not reported here for the sake of brevity but are available from the author upon request.

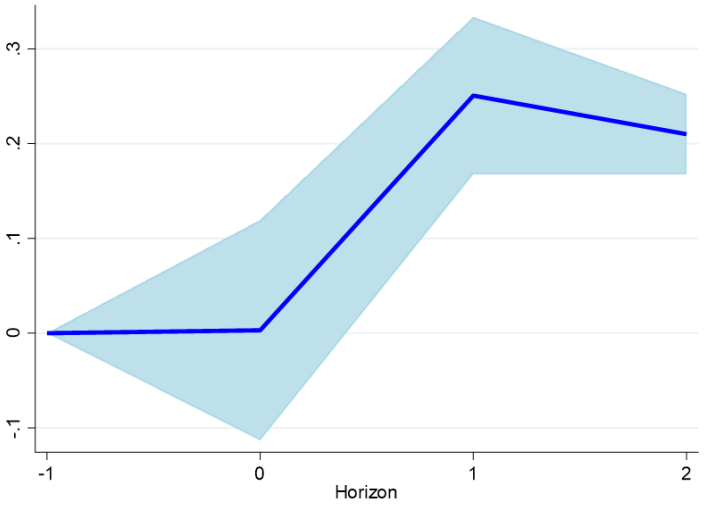
[25] Mobile money is a pay-as-you-go digital medium of exchange and store of value facilitated by a network of mobile money agents. It is a financial service offered by a mobile network operator (MNO) or another entity in partnership with an MNO (Bazarbash *et al.*, 2020; Das *et al.*, 2021). Unlike mobile banking, which requires the use of an application on a mobile device to execute banking services, a bank account is not needed to use mobile money services, the only requirement being the possession of a mobile phone. To use mobile money services, customers only need to register with a mobile money agent – typically small, local retail stores – of the mobile money service provider and to obtain an individual virtual account linked to their mobile phone number, accessible through a SIM card. Customers give cash to the mobile money agent and receive back an electronically stored "mobile money" of equivalent amount via their mobile phones; such mobile money can then be used to pay bills, transfer money to peers and so on.

with M-PESA in Kenya being the clearest example in this regard – the usage of such services has also grown significantly in other parts of the world, including Asia and Latin America (Bazarbash *et al.*, 2020; Das *et al.*, 2021). Moreover, longitudinal studies have documented a wide range of benefits stemming from the use of mobile money services, as they: i) represent a safe, affordable store of value and means of funds transfer for those sections of population with no or limited access to traditional financial services (Dupas *et al.*, 2018); ii) have significantly cut the transactions costs of remittances (Jack and Suri, 2014); iii) have facilitated efficient informal risk-sharing by enabling the timely transfer of money among community members in times of real and financial distress (Jack and Suri, 2014; Riley, 2018).

Panel 15. Cumulative effect on remittance growth of a shock to digital usage globally

	t=0	t=1	t=2
Remittance growth (-1)	-0.474**	-0.784***	-1.206***
	(0.085)	(0.095)	(0.079)
MM transactions	0.003	0.251**	0.210**
	(0.071)	(0.050)	(0.026)
MM transactions (-1)	0.131*	-0.186***	0.101***
	(0.037)	(0.017)	(0.009)
Infections (-1)	-0.015	-0.028	-0.024*
	(0.007)	(0.012)	(0.008)
Infections_Ita (-1)	0.027	0.017	-0.155***
	(0.026)	(0.017)	(0.006)
GDP growth (-1)	-0.071	-0.224	-0.215
	(0.105)	(0.126)	(0.186)
GDP growth_Ita (-1)	-1.651**	-0.781*	-0.102
	(0.338)	(0.301)	(0.093)
FX yearly change (-1)	0.164	0.599*	1.240***
	(0.208)	(0.153)	(0.067)
Obs.	630	540	450
R-squared	0.416	0.532	0.603

Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the value of mobile money transactions globally, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Against this backdrop, the GSMA collects data from mobile money service providers and presents them as a set of measures related to the diffusion of such services for seven geographical regions and an overall global series, available for almost a decade (2011Q4 – 2020Q4). Specifically, the data series are grouped following three dimensions: i) access (number of registered and active agents through which customers can access mobile money services); ii) adoption (number of registered and active mobile money accounts, representing the scale and uptake of mobile money services); and iii) usage (the volume and value of transactions processed by the industry across different products).[26]

To perform the estimation exercise, and to be coherent with the *domestic* measure of digitalisation, I relied upon one of the series belonging to the "usage" family, i.e. the overall value of mobile-money transactions processed by the industry. Also in this case, the fact that international remittances represent

[26] A similar classification is used in the Financial Access Survey of the IMF, a supply-side dataset on access to and use of financial services aimed to support policymakers and analysts to measure and monitor financial inclusion and benchmark progress against peers.

just a 1.5% of the total value of mobile money transactions – and only 0.2% of their overall volume – should make the problem related to the existence of any possible endogeneity between the dependent and the independent variables relatively manageable. The estimated IRF offers again empirical support to the hypothesis that the diffusion of mobile money services had a positive and significant impact on remittance outflows from Italy (**Panel 15**).

6. Robustness

The main results of the analysis have been submitted to an extensive series of robustness checks.

First of all, I took into account a different set of potential determinants of remittance outflows. Migrants' altruistic motivations have been proxied by the number of *new* deaths (per million people) that the COVID-19 pandemic brought about in both the sending and the receiving countries.[27] The adverse impact that the spread of the virus had on economic activity in both host and home countries has been measured by both the annual changes in the industrial production index and, as in Kpodar *et al*. (2021), by data on Nitrogen Dioxide (NO2) emissions per head primarily stemming from burning fossil fuels for transportation and electricity generation.[28] The travel restrictions and the related shift to formal from informal channels has been tested against the number of Italian residents that crossed Italian borders, coming from the Bank of Italy's statistics on international tourism. Finally, the support provided by the acceleration in digitalisation of financial services observed during the COVID-19 pandemic has been assessed against the GSMA series measuring progress in digital "adoption", proxied by the number of registered mobile money accounts (per 1k adults). The estimation results, along with the IRFs describing the response of remittance growth against shocks to these alternative variables, are hosted in **Panels A1-A8** in the Appendix and confirm the conclusions set out in Section 5.

Coming back to the original set of regressors, I performed other two robustness tests. On the one hand, I changed the dependent variable and, as in Kpodar *et al*. (2021), I took into account the year-on-year growth rate of cumulative remittances, defined as the sum of total remittance outflows from the beginning of the year. On the other hand, I changed the time interval and re-estimate the original model in different timeframes, i.e. up to 2021Q3 and 2021Q2 (the last quarter for which estimation results are meaningful). The IRFs for the former and the latter robustness test – contained in **Panel A-9** and **Panel A-10**, respectively – would tend to confirm the results reported in the main estimation exercise.[29]

As a very final remark, the definition and sources of all the variables used in the estimation exercises, a set of summary statistics and the pairwise unconditional correlations are contained in the **Tables A1-A3**, respectively, in the Appendix.

7. Conclusions and policy implications

Relying on detailed data series for a large panel of receiving economies, the objective of this paper was to explore some of the key drivers of remittance outflows from Italy and to assess the empirical support for some plausible explanations of their resilience observed in the context of the COVID-19 pandemic. Estimation results confirm the important role played by remittances as automatic stabilisers:

[27] It is worthwhile recalling that the infrastructure needed to detect COVID-19 infections that complies completely with the guidelines of the World Health Organization is still lacking across many parts of the globe, especially in emerging and developing countries. This makes the data series on contagions of dubious reliability.

[28] In this regard, Deb *et al*. (2020) showed that this variable strongly correlates with high-frequency economic indicators that are traditionally used in macro-economic analysis, such as changes in industrial production indices. A similar correlation has been gauged with respect to the fall in mobility during lockdowns due to the COVID-10 pandemic around the world and, hence, with developments in the service sector (Vichova *et al*., 2021; Vickerman, 2021).

[29] The IRF obtained by re-estimating the model up to 2021Q3 are not reported here for the sake of brevity, but are available from the author upon request.

notwithstanding a very likely reduction in their personal incomes caused by the recession in Italy, migrant workers stepped up their financial support to their families back home to cushion the impact of the pandemic, even if this may have implied lower short- to medium-term consumption. A shift from informal to formal channels may have played a significant role in this regard. In particular, the acceleration impressed to the digitalisation of financial services during, and because of, the pandemic has had important spillover effects on migrant workers' remittances, likely overcoming the difficulties caused by the containment measures implemented in both sending and receiving countries.

Although remittances are expected to continue recovering, the COVID-19 pandemic and its consequences are far from over, posing important downside risks to the outlook for growth in host countries and for migrants' ability to continue supporting their families back home. Some of the factors that supported the resilience of remittances may be considered to be of a temporary nature. For instance, the fiscal and monetary stimulus programs adopted in major migrant destination countries are not supposed to continue indefinitely. Moreover, there may be the risk that the shift from informal cash to formal digital remittance channels, observed at the peak of the COVID-19 pandemic crisis in 2020, may have run out of course. Hence, actors in the public and private sector alike should continue their efforts to preserve, and possibly enhance, this vital financial flow.

First, the magnitude of remittances and their countercyclical role call for bold steps to address the issue of high transfer costs, which still hinder these flows towards many countries. In this regard, it must be acknowledged that, notwithstanding the important steps forward taken in the last decade, further progress is still needed in order to reach the United Nation's Sustainable Development Goal 10.c to reduce to less than 3% the transaction costs and eliminate remittance corridors with costs higher than 5% by 2030.[30] In this regard, it is to be hoped that the initiatives set out at the international level can proceed expeditiously.[31]

Secondly, digitalisation can help in lowering reliance on highly expensive cash-based channels, be they formal or informal.[32] In this regard, nevertheless, not all that glitters is gold. Only those migrants who were already digitally savvy and financially included were also able to reap the benefits from the switch to digital methods. Going forward, therefore, it is important to avoid the risk that digitalisation eventually may translate into new forms of financial exclusion. Among the main lessons drawn from the COVID-19 pandemic (IFAD-WB, 2021), key actions should include a concerted push to improve the digital financial education and inclusion of migrants and the overall consumer protection framework.[33] This will facilitate a wider uptake of new digital products and overcome trust barriers through an increased awareness of

[30] According to the main indicator monitored by the World Bank's Remittance Price Worldwide Database, the global average cost for sending $200 in cash-based remittances stood at 6.3% in 2021Q3. Although this value represents a decline of almost 3.4 percentage points since 2009Q1, when it stood at 9.7%, the trend in the global cost of sending remittances have reached a plateau, with further reductions becoming increasingly difficult to attain.

[31] The G20 Roadmap for enhancing cross-border payments, including remittances, represents an important step forward in this direction. It is a very ambitious and complex initiative that will engage the international community for several years to come. Faster, cheaper, more transparent and more accessible cross-border payments – capable of leveraging the opportunities offered by digital innovation – are expected to bring about significant benefits in terms of economic development and financial inclusion.

[32] According to data from the latest World Bank's Remittance Price Worldwide Database (WB, 2022) – which provides information on an average total cost specifically introduced to track the average price of "digital remittances" – in 2022Q2 such global average cost for digital remittances was 4.8%, while the global average for non-digital remittances was 6.0%. A digital remittance must be sent via a payment instrument in an online or self-assisted manner, and received into a transaction account, i.e., bank account, transaction account maintained at a non-bank deposit taking institution (say a post office), mobile money or e-money account.

[33] The migrant population residing in Italy, for instance, is characterized by low levels of financial education, which represent one of the main obstacles also to the development of digital channels. Despite the widespread ownership of mobile devices (according to survey data, 98% of migrants in Italy own a tablet/smartphone), only one migrant out of three uses it for financial operations, a percentage that rises to 35% for those with bank accounts and to 60% for migrants with an advanced financial awareness profile. Therefore, there appears to be a clear correlation between financial inclusion, financial education and access to digital tools.

the pros and cons of the different instruments and the different financial products that are available to transmit safely and cheaply remittances abroad.

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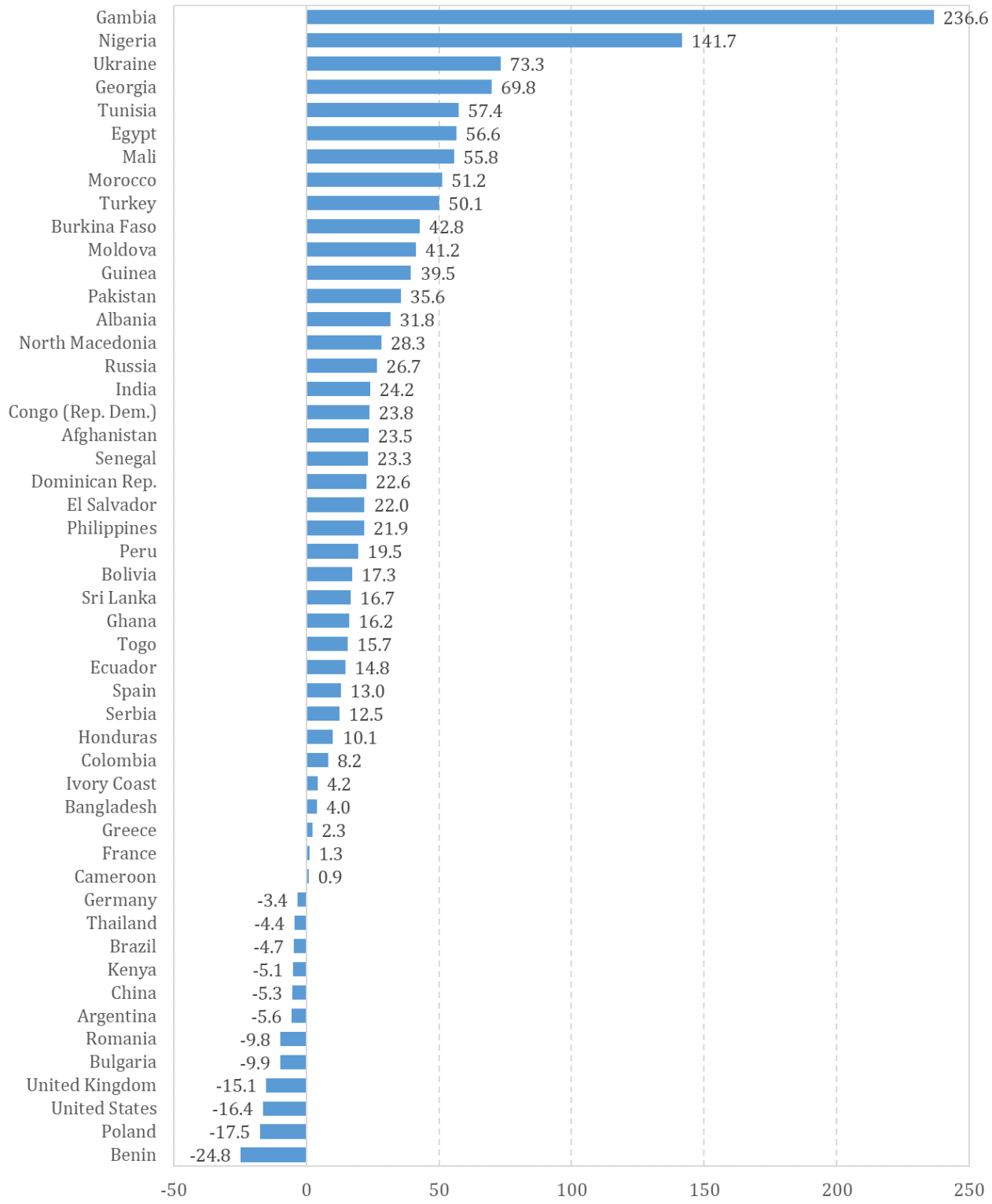
Appendix

Chart A-1. Change in Italy's outward remittances 2018-19 *vs.* 2020-21 (in %)

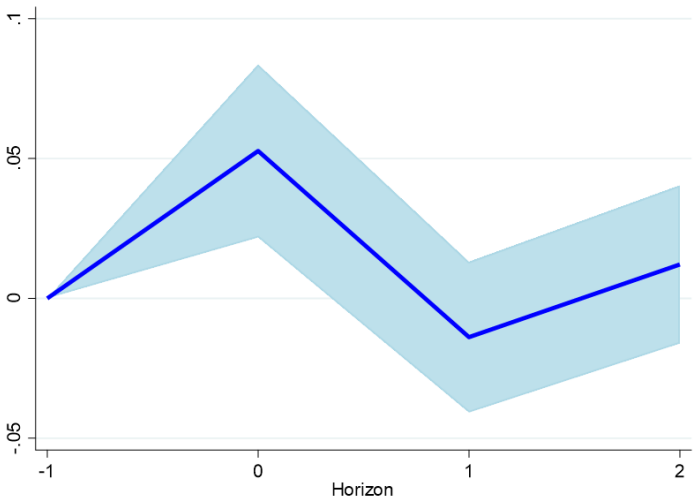


Note: The chart reports the overall change expressed in percentages in Italy's outward remittances destined to the first 50 destination countries.

Panel A-1. Cumulative effect on remittance growth of a shock to the # of deaths at home

	t=0	t=1	t=2
Remittance growth (-1)	-0.497***	-0.785**	-1.345***
	(0.076)	(0.129)	(0.109)
# of deaths	0.053*	-0.014	0.012
	(0.019)	(0.016)	(0.017)
# of deaths (-1)	0.033	0.035	-0.007
	(0.027)	(0.017)	(0.011)
# of deaths_Ita (-1)	0.013	-0.001	-0.061***
	(0.012)	(0.011)	(0.006)
GDP growth (-1)	0.083	-0.272*	-0.195
	(0.117)	(0.088)	(0.166)
GDP growth_Ita (-1)	-0.850**	-0.316*	0.166
	(0.181)	(0.119)	(0.426)
FX yearly change (-1)	0.295	0.544*	0.531
	(0.155)	(0.185)	(0.207)
Obs.	583	495	408
R-squared	0.348	0.468	0.618

Note: estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 89 countries.

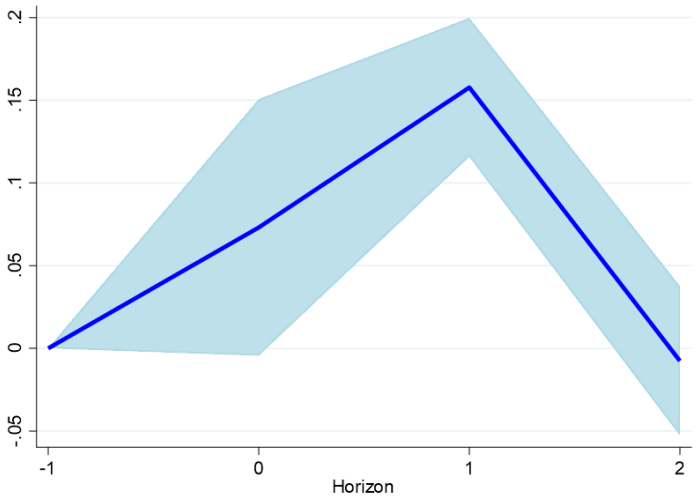


Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the number of deaths at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-2. Cumulative effect on remittance growth of a shock to the # of deaths in Italy

	t=0	t=1	t=2
Remittance growth (-1)	-0.597***	-0.906***	-1.136***
	(0.080)	(0.078)	(0.037)
# of deaths_Ita	0.073	0.158**	-0.008
	(0.047)	(0.026)	(0.027)
# of deaths_Ita (-1)	0.070	0.101**	-0.064*
	(0.043)	(0.019)	(0.021)
# of deaths (-1)	0.003	-0.025**	-0.004
	(0.007)	(0.006)	(0.006)
GDP growth (-1)	-0.016	0.030	0.044
	(0.055)	(0.051)	(0.053)
GDP growth_Ita (-1)	-0.318	-0.711**	-0.126
	(0.415)	(0.106)	(0.195)
FX yearly change (-1)	0.213	0.608*	0.346
	(0.289)	(0.188)	(0.218)
Obs.	583	495	408
R-squared	0.281	0.558	0.594

Note: estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 89 countries.

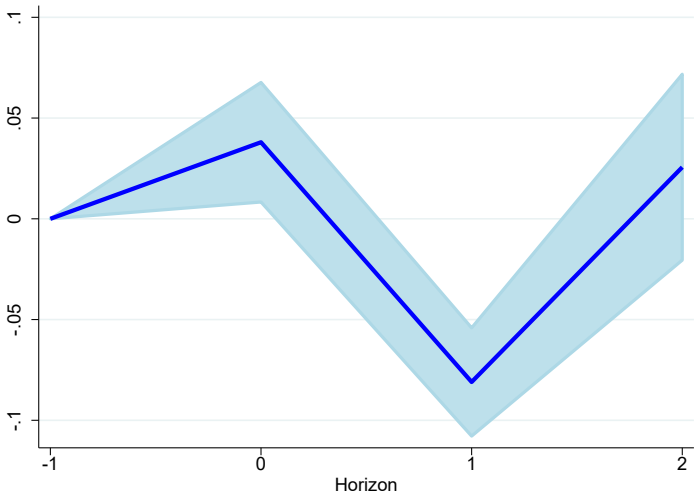


Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the number of deaths in Italy, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-3. Cumulative effect on remittance growth of a shock to the IP growth rate at home

	t=0	t=1	t=2
Remittance growth (-1)	-0.506**	-0.153	-0.112
	(0.088)	(0.106)	(0.127)
IP growth	0.038	-0.081**	0.026
	(0.018)	(0.016)	(0.028)
IP growth (-1)	-0.028	0.075*	-0.218*
	(0.014)	(0.028)	(0.050)
IP growth_Ita (-1)	-0.507**	0.102	0.905
	(0.104)	(0.140)	(0.502)
Infections (-1)	-0.004	-0.018	0.005
	(0.008)	(0.008)	(0.007)
Infections_Ita (-1)	0.065*	-0.028	-0.093*
	(0.024)	(0.032)	(0.029)
FX yearly change (-1)	0.098	-0.087	0.292
	(0.139)	(0.198)	(0.333)
Obs.	560	480	400
R-squared	0.388	0.171	0.185

Note: estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 80 countries.

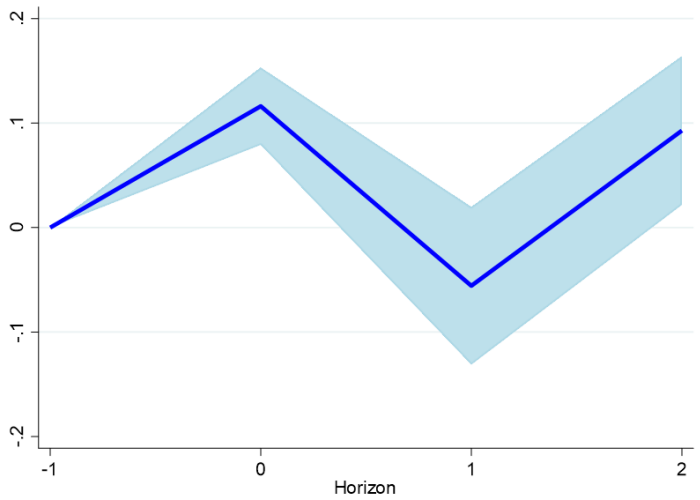


Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to the IP growth rate at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-4. Cumulative effect on remittance growth of a shock to the IP growth rate in Italy

	t=0	t=1	t=2
Remittance growth (-1)	-0.531***	-0.760***	-1.132***
	(0.080)	(0.109)	(0.071)
IP growth_Ita	0.116**	-0.056	0.093
	(0.022)	(0.046)	(0.043)
IP growth_Ita (-1)	-0.086***	-0.043**	0.023
	(0.009)	(0.009)	(0.025)
IP growth (-1)	-0.024	-0.077	-0.200*
	(0.019)	(0.058)	(0.070)
Infections (-1)	-0.019**	-0.016	-0.020
	(0.005)	(0.010)	(0.011)
Infections_Ita (-1)	0.010	0.058	-0.100**
	(0.008)	(0.038)	(0.020)
FX yearly change (-1)	0.285	-0.018	0.473
	(0.157)	(0.279)	(0.262)
Obs.	560	480	400
R-squared	0.429	0.500	0.570

Note: estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 80 countries.

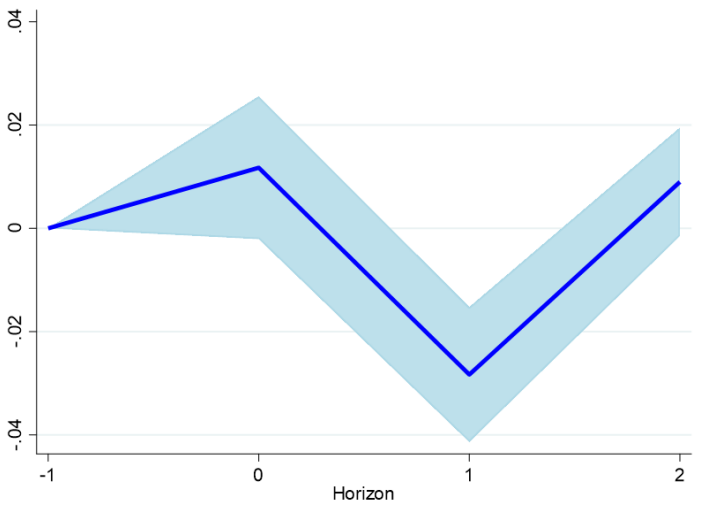


Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to the IP growth rate in Italy, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-5. Cumulative effect on remittance growth of a shock to NO2 emissions at home

	t=0	t=1	t=2
Remittance growth (-1)	-0.532***	-0.240	-0.017
	(0.085)	(0.136)	(0.188)
NO2 emissions	0.012	-0.028*	0.009
	(0.008)	(0.008)	(0.006)
NO2 emissions (-1)	-0.023	-0.023	0.049
	(0.012)	(0.024)	(0.022)
NO2 emissions_Ita (-1)	-0.869***	0.967*	-0.414
	(0.084)	(0.264)	(0.647)
Infections (-1)	0.010	-0.035*	0.023
	(0.010)	(0.009)	(0.021)
Infections_Ita (-1)	0.077*	-0.048	-0.082
	(0.030)	(0.038)	(0.033)
FX yearly change (-1)	0.078	-0.013	-0.024
	(0.166)	(0.144)	(0.252)
Obs.	508	433	357
R-squared	0.394	0.159	0.136

Note: estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 74 countries.

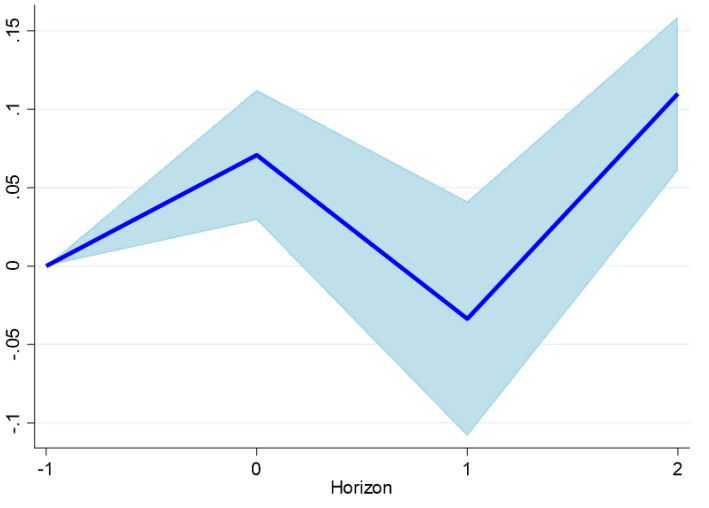


Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to NO2 emissions at home, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-6. Cumulative effect on remittance growth of a shock to NO2 emissions in Italy

	t=0	t=1	t=2
Remittance growth (-1)	-0.565***	-0.869***	-1.280***
	(0.092)	(0.126)	(0.062)
NO2 emissions_Ita	0.071*	-0.034	0.110*
	(0.025)	(0.046)	(0.030)
NO2 emissions_ita (-1)	-0.067*	-0.004	0.118**
	(0.019)	(0.043)	(0.024)
NO2 emissions (-1)	-0.100**	-0.118**	-0.027
	(0.027)	(0.022)	(0.011)
Infections (-1)	-0.011	-0.010	-0.019
	(0.009)	(0.007)	(0.010)
Infections_Ita (-1)	0.057*	0.035	-0.099***
	(0.017)	(0.033)	(0.005)
FX yearly change (-1)	0.012	0.154	0.534
	(0.142)	(0.263)	(0.327)
Obs.	510	434	357
R-squared	0.422	0.482	0.577

Note: estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 74 countries.

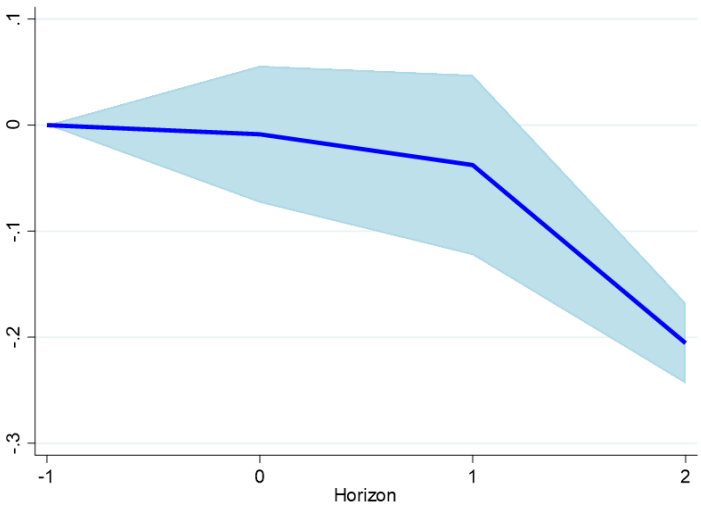


Note: Lines show the estimated impulse responses of remittance growth to a one standard shock to NO2 emissions in Italy, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-7. Cumulative effect on remittance growth of a shock to residents crossing Italian borders

	t=0	t=1	t=2
Remittance growth (-1)	-0.535**	-0.779***	-1.206***
	(0.102)	(0.092)	(0.079)
# of travellers	-0.009	-0.038	-0.206***
	(0.039)	(0.052)	(0.023)
# of travellers (-1)	-0.042	0.019	-0.273***
	(0.074)	(0.095)	(0.027)
Infections (-1)	0.007	-0.009	-0.024*
	(0.008)	(0.006)	(0.008)
Infections_Ita (-1)	0.027	0.031	-0.252***
	(0.063)	(0.063)	(0.016)
GDP growth (-1)	0.089	-0.293	-0.215
	(0.090)	(0.156)	(0.186)
GDP growth_Ita (-1)	-0.880	-0.350	1.452***
	(0.581)	(0.346)	(0.088)
FX yearly change (-1)	0.485	0.669*	1.240***
	(0.254)	(0.256)	(0.067)
Obs.	630	540	450
R-squared	0.378	0.499	0.603

Note: estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.

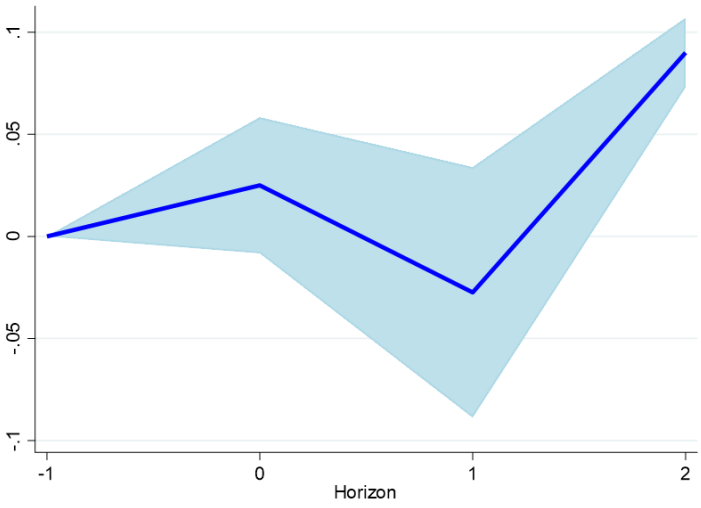


Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the number of residents crossing Italian borders, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-8. Cumulative effect on remittance growth of a shock to digital adoption globally

	t=0	t=1	t=2
Remittance growth (-1)	-0.496**	-0.799***	-1.206***
	(0.089)	(0.097)	(0.079)
MM registered accounts	0.025	-0.027	0.090***
	(0.020)	(0.037)	(0.010)
MM registered accounts (-1)	0.079**	0.106*	0.118**
	(0.014)	(0.034)	(0.017)
Infections (-1)	-0.018*	-0.033	-0.024*
	(0.006)	(0.015)	(0.008)
Infections_Ita (-1)	0.064*	0.033	-0.071***
	(0.023)	(0.023)	(0.004)
GDP growth (-1)	0.004	-0.293	-0.215
	(0.109)	(0.179)	(0.186)
GDP growth_Ita (-1)	-1.470***	-0.632*	0.534**
	(0.177)	(0.182)	(0.116)
FX yearly change (-1)	0.297	0.836**	1.240***
	(0.172)	(0.193)	(0.067)
Obs.	630	540	450
R-squared	0.404	0.501	0.603

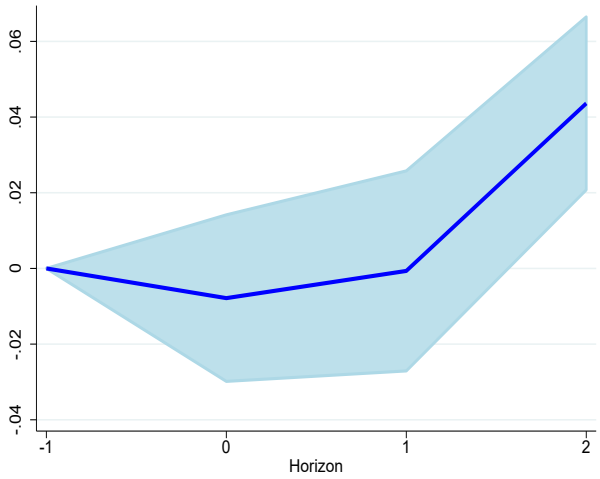
Note: Estimates are obtained using Driscoll-Kraay robust standard errors, which are reported in brackets; *, **, *** denotes significance at the 10%, 5% and 1% level, respectively; the sample includes 90 countries.



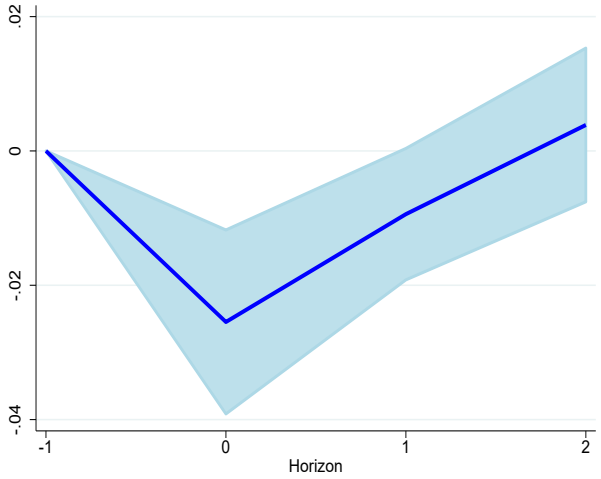
Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the # of mobile money registered accounts, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon *t=0* captures the initial impact quarter of the shock. The vertical axis shows the impact on remittance growth in percentage points. The estimation sample includes Italy's remittance-receiving economies during 2020Q1-2021Q4.

Panel A-9. Cumulative effect on remittance growth of a shock to:

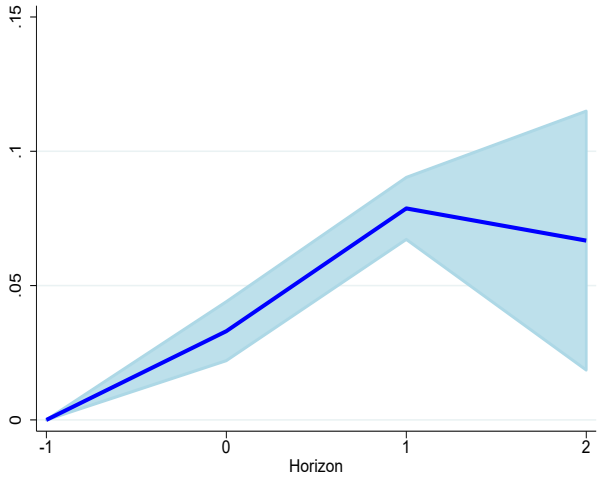
Infection rate in home country



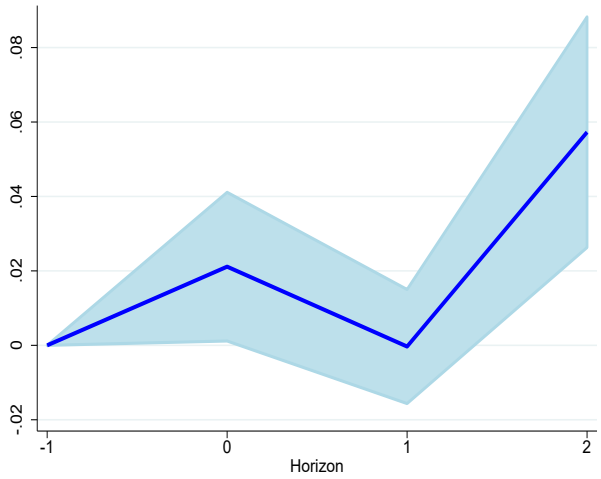
Economic activity in home country



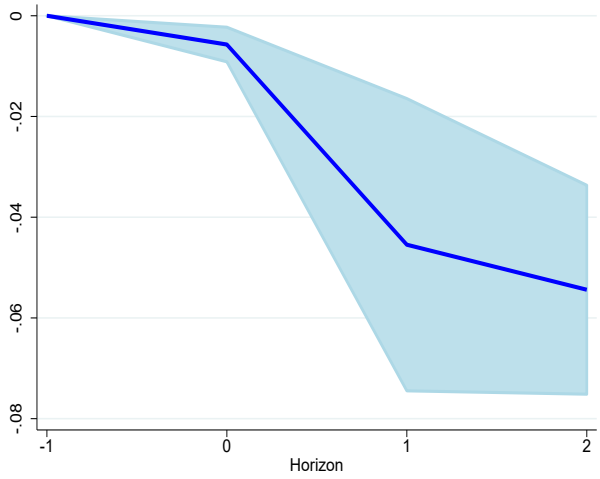
Infection rate in Italy



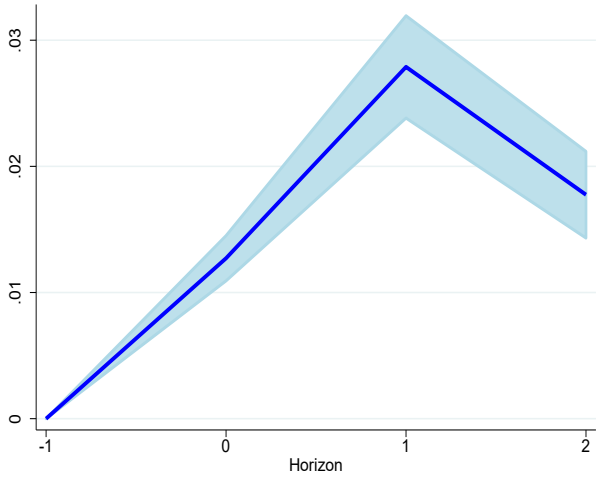
Economic activity in Italy



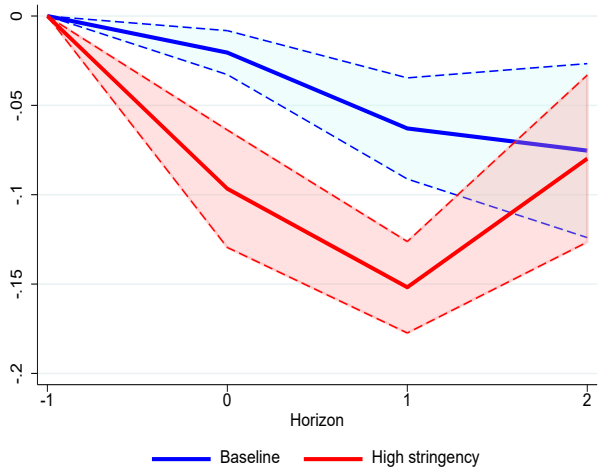
Containment measures at home



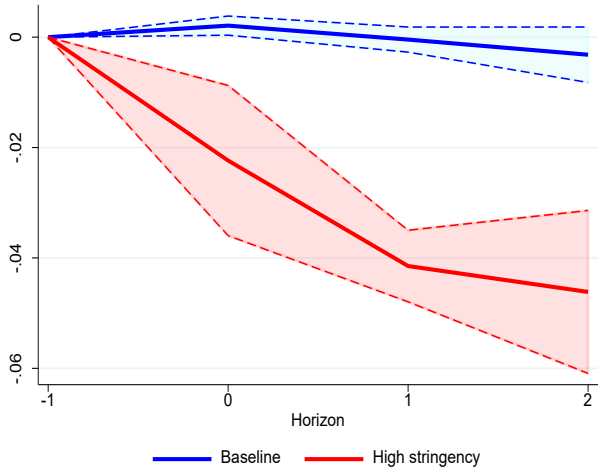
Containment measures in Italy



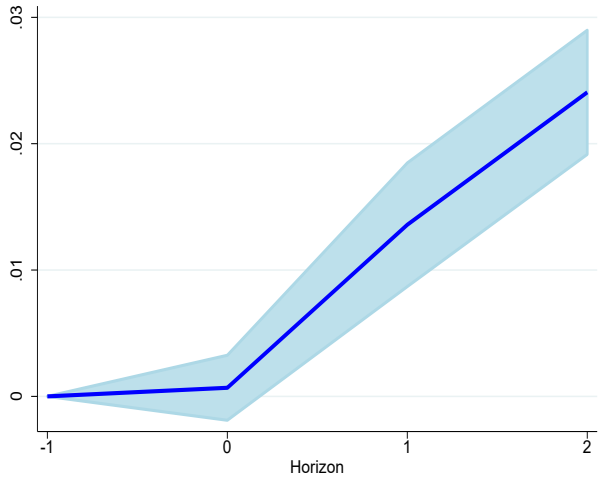
Containment measures and OxSI higher than the sample average



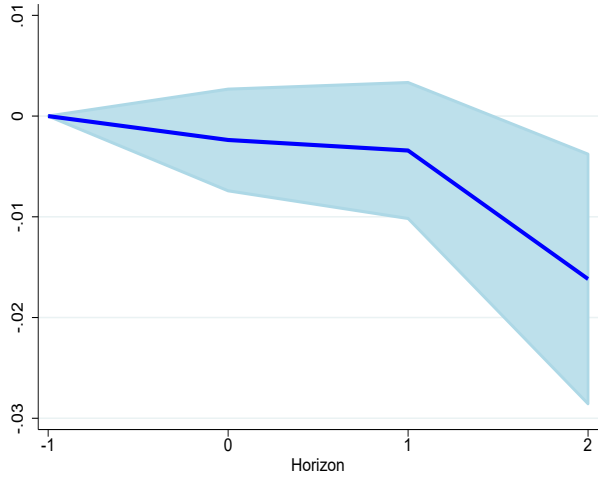
Containment measures and OxSI higher than the 75th percentile



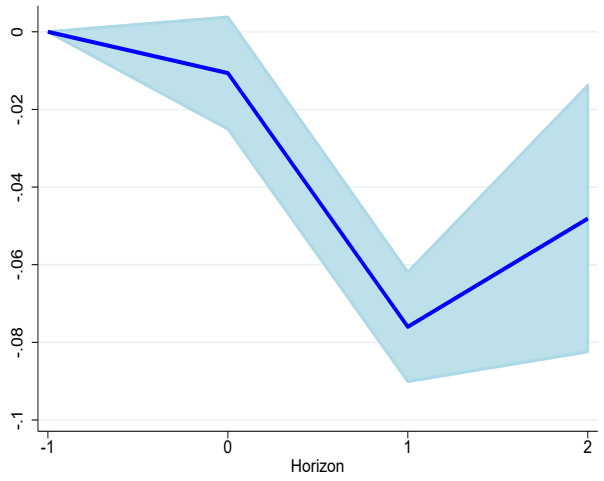
Infection rate and OxSI lower than the 25th percentile



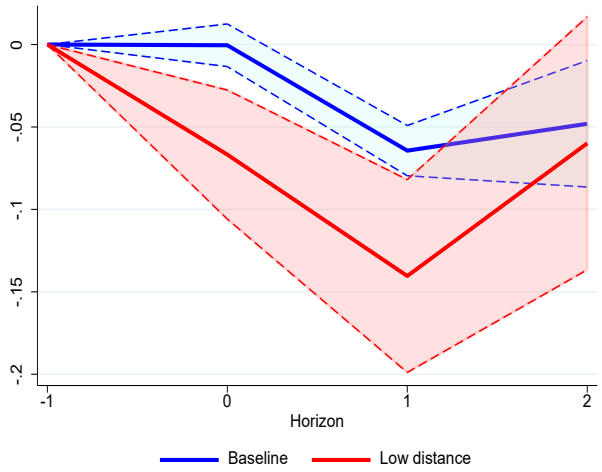
Infection rate and OxSI higher than the 75th percentile



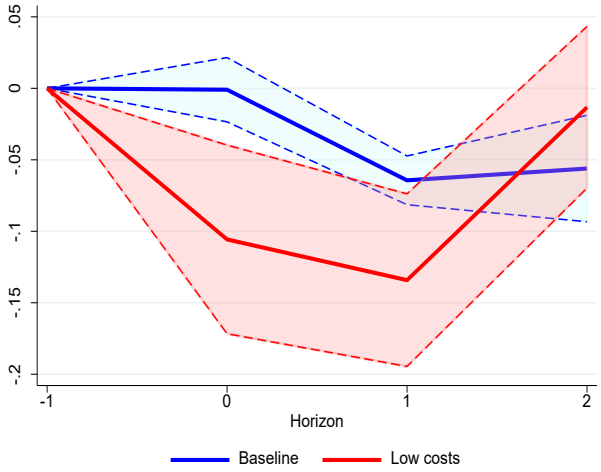
"Flight to …" searches



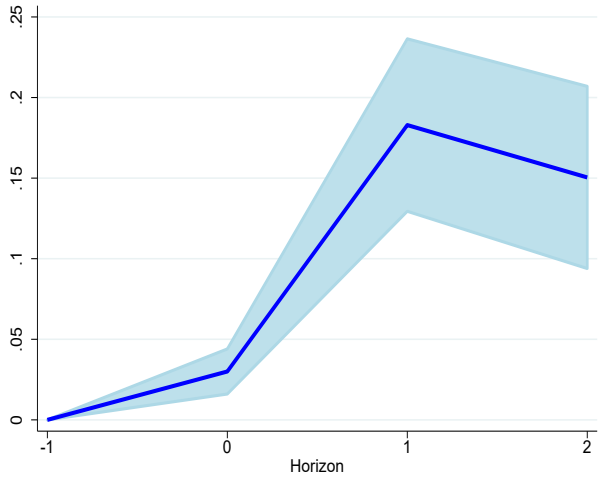
"Flight to …" searches and low distance



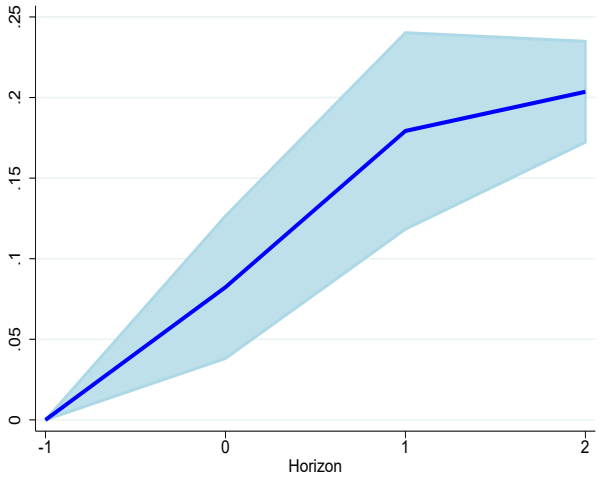
"Flight to …" searches and low travel costs



Digital payments in Italy



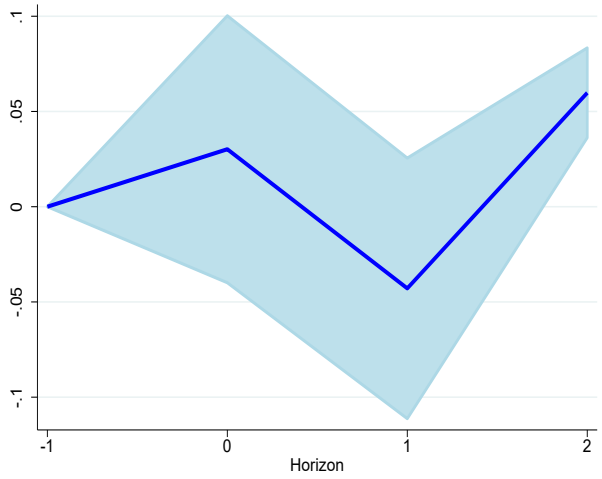
Digital usage globally



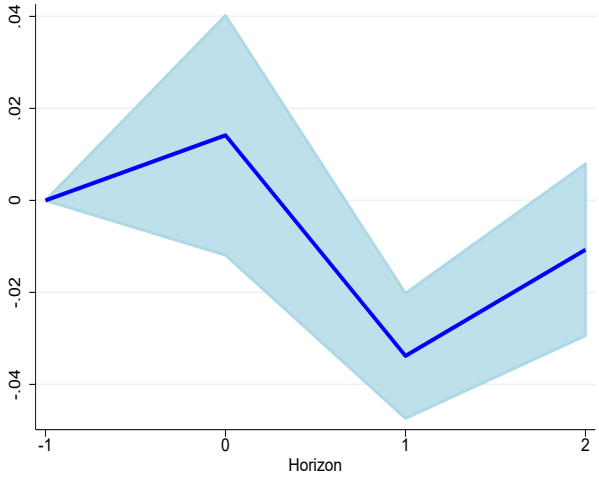
Note: Lines show the estimated impulse responses of cumulative remittance growth to a one standard deviation shock to the indicated variable, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon t=0 captures the initial impact quarter of the shock.

Panel A-10 2020Q1-2021Q2 - Cumulative effect on remittance growth of a shock to:

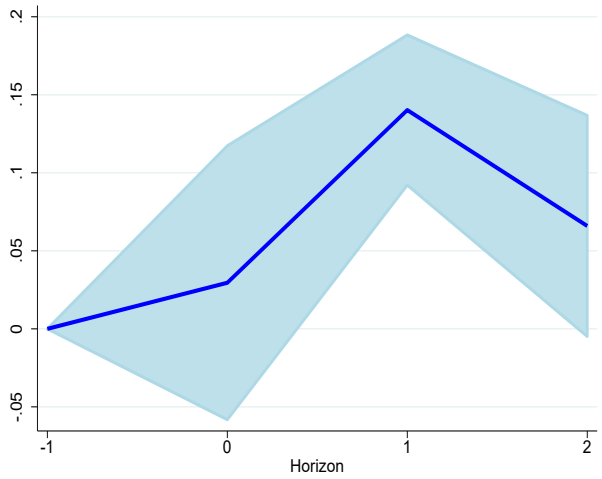
Infection rate in home country



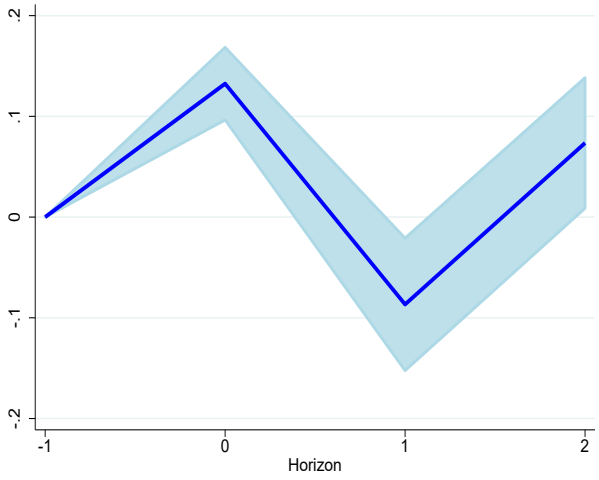
Economic activity in home country



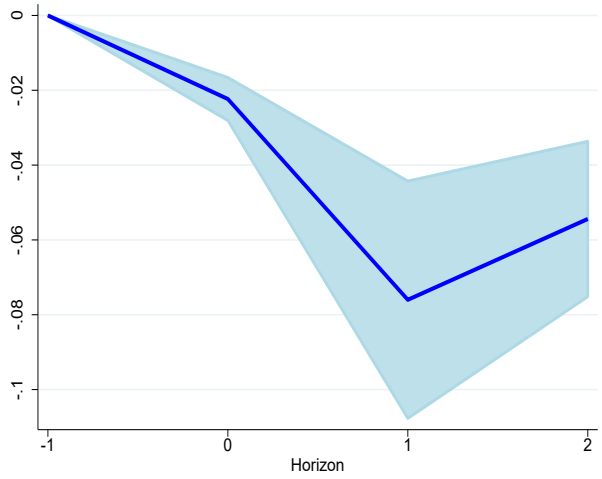
Infection rate in Italy



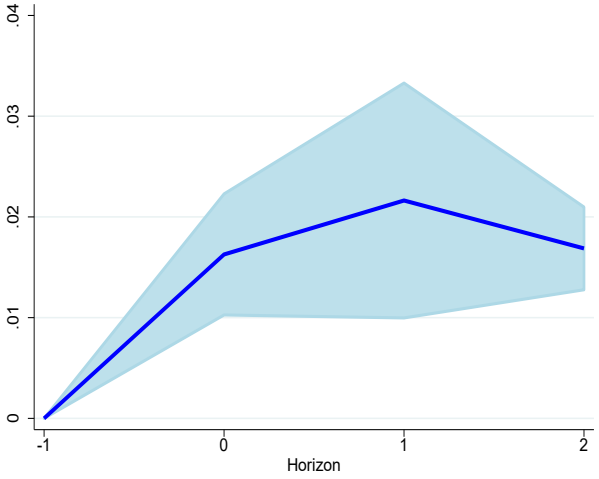
Economic activity in Italy



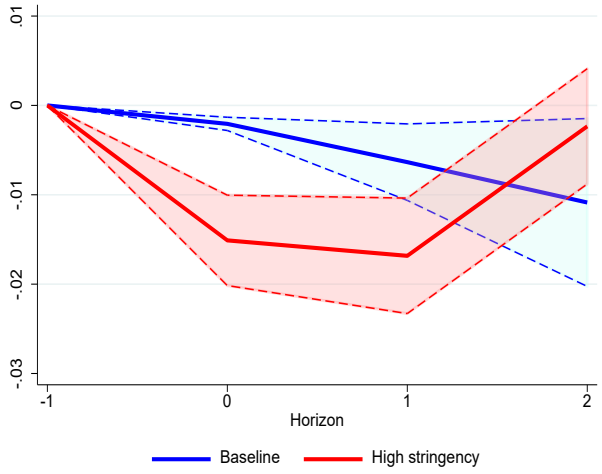
Containment measures at home



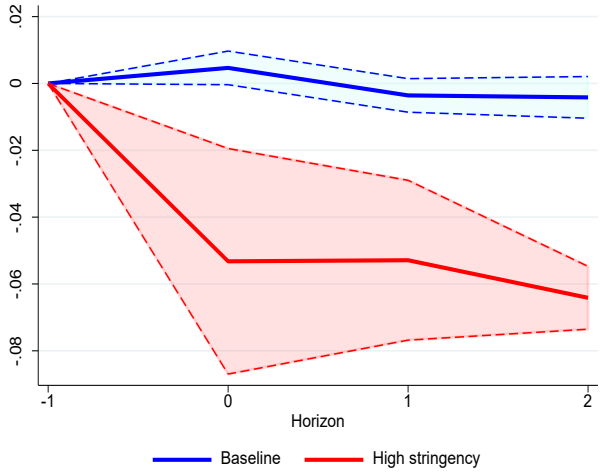
Containment measures in Italy



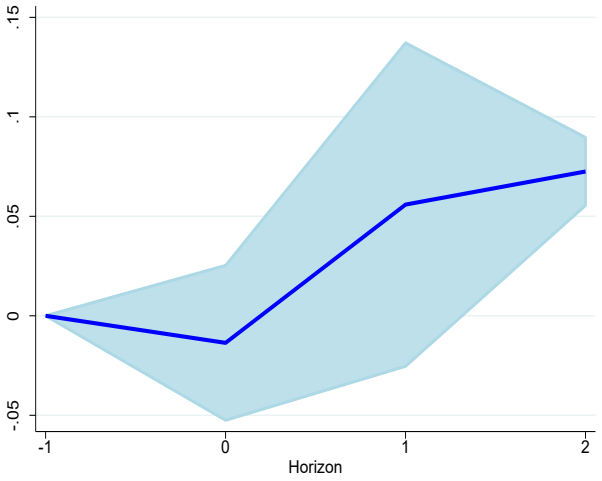
Containment measures and OxSI higher than the sample average



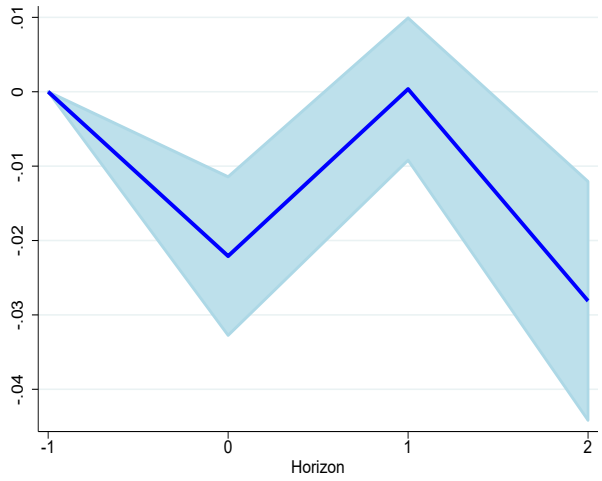
Containment measures and OxSI higher than the 75th percentile



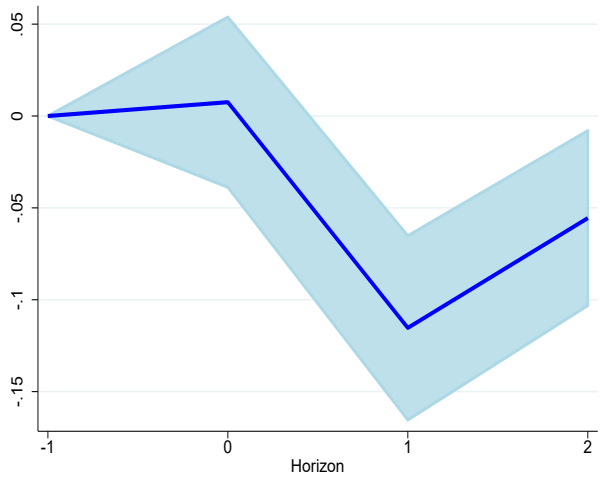
Infection rate and OxSI lower than the 25th percentile



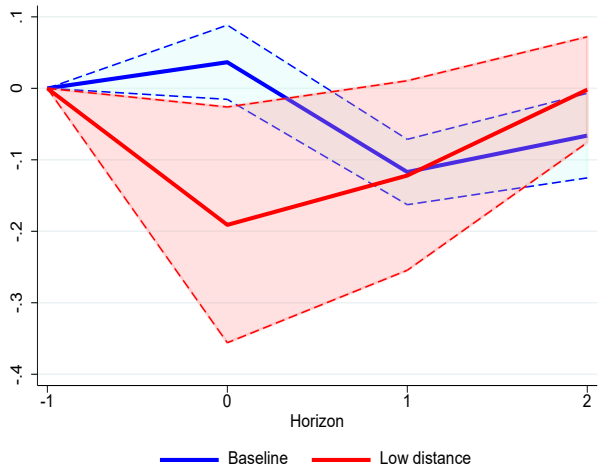
Infection rate and OxSI higher than the 75th percentile



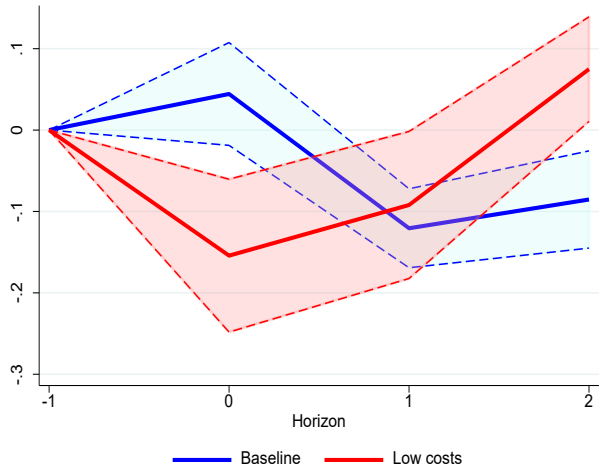
"Flight to ..." searches



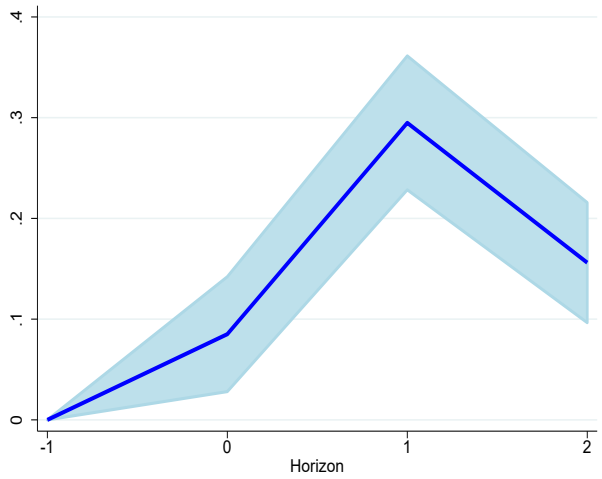
"Flight to …" searches and low distance



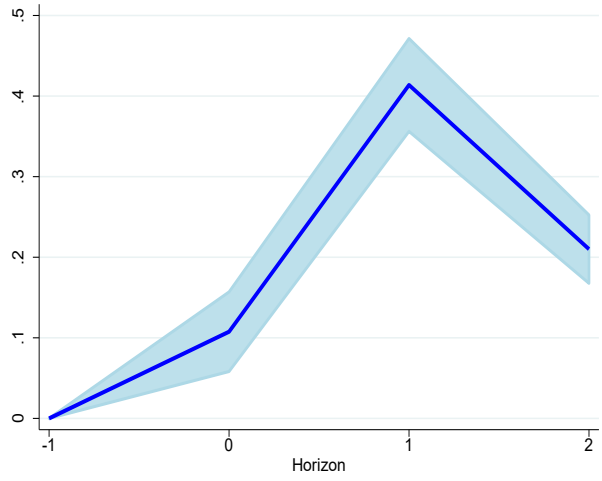
"Flight to …" searches and low travel costs



Digital payments in Italy



Digital usage globally



Note: Lines show the estimated impulse responses of remittance growth to a one standard deviation shock to the indicated variable, with the shaded area representing the 90% confidence interval. The horizontal axis shows time in quarters, where horizon t=0 captures the initial impact quarter of the shock.

Table A-1. Variable definitions and sources

Variable	Definition	Source
Remittances (YoY change)	Remittances sent abroad by foreign workers residing in Italy through payment institutions or other authorized intermediaries (MTOs, banks, and post offices)	Bank of Italy, Foreign workers' remittances
New COVID-19 cases	Number of new COVID-19 cases expressed per million people	Center for System Science and Engineering (CSSE) at Johns Hopkins University
New COVID-19 deaths	Number of new COVID-19 deaths expressed per million people	Center for System Science and Engineering (CSSE) at Johns Hopkins University
GDP	Annual changes in the real gross domestic product	National sources and Datastream
Industrial production	Annual changes in the industrial production index	National sources and Datastream
NO2 emissions per head	Total Nitrogen Dioxide (NO2) emissions divided by total population	Sentinel-5p Data
Stringency index - home country	Composite measure calculated using 9 indicators (8 ordinal containment and closure policy indicators, plus an indicator recording public information campaigns)	The Oxford COVID-19 Government Response Tracker (OxCGRT)
Stringency index - Italy	Composite measure calculated using 11 indicators measuring restrictions enforced at the national, regional, provincial, and municipality level in Italy	Conteduca and Borin (2022)
Google flights	Index measuring the "search" intensity of the term "flights" for a given country	Google Trends
Travellers at the borders	Number of Italy's resident crossing Italy's border in the period indicated	Bank of Italy, International Tourism Statistics
Distance	Populatio weighted distance between Italy and country c	CEPII
Travel costs	Weighted average cost of travelling from Italy to country c at time t. The average is computed with respect to the cost of travel by car or by plane, weighted by the number of travellers registered.	Bank of Italy, International Tourism Statistics
Digital payments - Italy	Value of automated bank transfers, direct debit and point of sales (POS) transactions	Bank of Italy, Payment System Statistics
Digital usage - Global	Value of mobile money transactions (P2P payment, bill payment, bulk payment, cash in to account, cash out from account, merchant payments, international remittances or airtime top up).	GSMA
Digital adoption - Global	Number of mobile money customer accounts that have been registered at the end of the period indicated, expressed per thousand of adults.	GSMA
LCU/EUR exchange rate changes	Annual change of the local currency value of 1 euro (a positive change hints to an appreciation)	Datastream

Table A-2. Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Remittances (YoY change)	1,392	0.1	0.5	-1.0	7.0
Pandemic					
New COVID-19 cases (per million people) - home country	1,392	7,883	13,949	0	116,844
New COVID-19 deaths (per million people) - home country	1,262	136	233	0	1,509
New COVID-19 cases (per million people) - Italy	1,392	11,920	10,299	1,231	29,690
New COVID-19 deaths (per million people) - Italy	1,392	284	219	19	634
Economic activity					
GDP (YoY change) - home country	727	0.0	0.1	-0.4	0.4
Industrial production (YoY change) - home country	640	0.0	0.2	-0.7	3.9
NO2 emissions per head - home country	620	31.2	40.9	1.8	251.6
GDP (YoY change) - Italy	1,392	0.0	0.1	-0.2	0.2
Industrial production (YoY change) - Italy	1,392	0.0	0.2	-0.3	0.4
NO2 emissions per head - Italy	1,392	26.5	6.6	18.1	35.1
Containment measures					
Stringency index - home country	1,304	51.5	21.6	1.5	99.0
Stringency index - Italy	1,392	52.2	14.1	33.1	74.2
Informal channel					
Google flights	1,368	22.8	12.5	1.0	71.3
Number of resident travellers at the borders (thousands)	1,392	5,638	2,514	2,637	10,171
Distance (kilometers)	1,360	5,485	3,528	529	18,461
Travel costs (EUR)	1,304	681	378	16	1,843
Digitalization					
Digital payments - Italy (EUR thousands)	1,392	1,327	143	1,103	1,624
Mobile money transactions (USD millions)	1,392	149,000	27,000	110,000	188,000
Mobile money registered accounts (per 1K adults)	1,392	249	69	144	351
EUR/LCU exchange rate (YoY change)	1,314	0.0	0.5	-1.0	15.7

Table A-3. Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Remittances (YoY change)	1	1																				
New COVID-19 cases (per million people) - home country	2		1																			
New COVID-19 deaths (per million people) - home country	3		0.69	1																		
New COVID-19 cases (per million people) - Italy	4	0.14	0.25	0.22	1																	
New COVID-19 deaths (per million people) - Italy	5	0.08		0.10	0.71	1																
GDP (YoY change) - home country	6	0.22	0.20	0.11	0.22	-0.09	1															
Industrial production (YoY change) - home country	7	0.16	0.08	0.09	0.09		0.43	1														
NO2 emissions per head - home country	8	0.12	-0.19	-0.23					1													
GDP (YoY change) - Italy	9	0.22	0.24	0.18	0.25	-0.19	0.69	0.43		1												
Industrial production (YoY change) - Italy	10	0.27	0.22	0.19	0.35		0.65	0.41		0.94	1											
NO2 emissions per head - Italy	11		0.07		0.46	0.25			0.09	0.08		1										
Stringency index - home country	12	0.06	0.18	0.23	0.09	0.18	-0.09			-0.12		-0.46	1									
Stringency index - Italy	13				0.20	0.67	-0.20	-0.13		-0.34	-0.08	-0.38	0.55	1								
Google flights	14	-0.09	-0.07	-0.13	-0.29	-0.16				-0.06	-0.12	0.12	-0.25	-0.27	1							
Number of resident travellers at the borders (thousands)	15	-0.13	-0.13	-0.15	-0.63	-0.73					-0.21	0.08	-0.52	-0.77	0.43	1						
Distance (kilometers)	16		-0.20	-0.10					0.09				0.09		0.06		1					
Travel costs (EUR)	17		-0.31	-0.28					0.33								0.61	1				
Digital payments - Italy (EUR thousands)	18	0.08	0.29	0.16	0.47	-0.18	0.48	0.24		0.67	0.46	0.52	-0.27	-0.63	-0.07	0.09			1			
Mobile money transactions (USD millions)	19	0.14	0.33	0.23	0.44	-0.11	0.58	0.29		0.75	0.64		0.09	-0.15	-0.24	-0.16			0.72	1		
Mobile money registered accounts (per 1K adults)	20	0.08	0.30	0.17	0.25	-0.42	0.47	0.23		0.62	0.45	-0.10	0.09	-0.36	-0.25				0.71	0.90	1	
EUR/LCU exchange rate (YoY change)	21				-0.07		0.09		-0.12		-0.07					0.07						1

Note: Only the correlations coefficients significant at the 5% level are reported in the table.

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