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Abstract

This paper provides new evidence on reshoring and plant closures ex-ploiting a novel dataset of Italian multinational firms surveyed throughout 2020 and 2021, the years of the Covid-19 pandemic. We find that Covid-19 did not spur large waves of reshoring nor plant closures. Even though the pandemic has caused severe losses to firms, including multinationals, most did not stop foreign production nor are willing to do so in the near future. Furthermore, they maintained existing suppliers. Tariffs and trade policy uncertainty, on the other hand, are more likely to induce reshoring and plant closures. This evidence is consistent with a simple multi-period model, illustrating how offshoring, on the one side, and reshoring or plant closures, on the other side, are asymmetric in important ways. In the presence of sunk costs, reshoring and plant closures require sufficiently large and permanent shocks to demand, trade and foreign production costs to induce behavioural changes. Covid-19 was a major shock, but it was mostly perceived as temporary, while persistent trade policy un-certainty, especially if combined with other shocks, might induce firms to revise their internationalization strategies.

Keywords

Reshoring, MNEs, Global Value Chains, Covid-19, Hetero-geneous firms.

JEL Classification

F14, F23, F60

1 Introduction[1]

Since the 1980s the world economy has become increasingly globalized. International trade, one of the main aspects of globalization, grew faster than output, reaching over 30 percent of world GDP in the first decade of 2000s (World Bank; 2020). During this period, we witnessed the reorganization of the production process along global value chains (GVCs) in which different firms often located in different countries perform specialized segments of the production and multinational enterprises (MNEs) set plants abroad to exploit costs differentials and comparative advantages of foreign countries.

After the 2008 Great Financial Crisis the trade-to-GDP ratio has interrupted its three-decade long growth and stabilized at its pre-crisis level. Several factors, as the increase in emerging markets wages, the advent of new technologies (3D-printing and automation) and new trade policy tensions, coupled with an inevitable deceleration in the degree of fragmentation of the production process, contributed to the current phase of "*slowbalisation*".[2]

Despite global activities of MNEs and their production networks set up over the years continue to constitute a major contribution to the world economy, offshore production started to become less valuable than in the past, at least from a cost-saving perspective. Meanwhile concerns regarding the risks of this organization of production started to emerge.

Against this backdrop, the Covid-19 pandemic was just the last major shock hitting the world economy. The shock was sudden and unexpected, and it involved all countries and all firms from China to the US. GDP collapsed worldwide and firms' losses have been severe and generalized. Production halts and export bans added to the raising trade costs and caused bottlenecks and disruptions along the supply chains. With foreign shocks propagating to the domestic economy, international trade and production networks have been rapidly regarded as contributing to the shock transmission and aggravating the crisis.

As a result, Covid-19 gave new emphasis to the discontents of globalization, and it fueled the discussion on the risks and instability associated with the international fragmentation of production. Among observers and policy makers, some have called for reshoring or at least for a rethinking of GVCs organization and of MNEs location choices, claiming that more localized production would lower uncertainty for consumers and businesses, and secure supply. Several governments introduced measures to encourage firms to source more inputs domestically or to diversify suppliers and to repatriate, or at least "nearshore", production. In April 2020, the Japanese government announced subsidies to

[1] **Acknowledgements:** The authors thank the participants to the European Trade Study Group, Ghent 2021, and to the IMF External Sector Seminar, June 2021, and to the EMNES Annual Conference 2021. We also thank Alessandro Borin, Lucia Tajoli and Chahir Zaki for useful comments and discussions. **Disclaimer:** Views and opinions expressed in this paper are those of the authors and do not necessarily represent those of the institutions with which they are affiliated.

[2] The term slowbalisation (i.e. slow globalization) has been used in Antràs (2020) and *Slowbalisation: The steam has gone out of globalisation*, The Economist, January, 24th 2019: 34-43.

encourage diversifying or reshoring supply chains. In January 2021, the U.S. President signed an executive order aimed at forcing the federal government to buy more goods produced domestically, as a key part of his *Buy American* programme to revive domestic manufacturing. More recently, a study by the European Parliament discusses the pros and cons of reshoring for the EU in the context of Covid-induced supply shortages.[3] However, despite these measures and the uncertain environment, no widespread reshoring seems to be happening.[4] The Global Value Chain Development Report (ADB et al.; 2021, November) maintains that: "So far, there has been no generalized reshoring of production back to the US or Europe, nor would that likely be effective as a response to most of the risks that have emerged. GVCs are more likely to evolve than to shut down" (p. XX). Indeed, the Shanghai American Chamber of Commerce's China Business Report 2020, conducted between June and July, shows that 71% of more than 200 US companies surveyed have no plans to close their facilities in China.[5] Some 14% are relocating production, but not to the US. Only 3.7% reshored. A survey conducted by the Confederation of Swedish Enterprise gives similar results: only 2% of Swedish companies declared that they would bring home their foreign production.[6] In order to improve risk management, about 15% of Swedish companies will increase the share of sourcing from Sweden, while 13% of large companies will increase the number of countries from which they source production inputs. Despite finding evidence supporting a reconfiguration of global supply chains in the medium to long term, the Euler Hermes survey on MNEs based in the US, the UK, France, Germany and Italy found no massive support for reshoring, as only 15% of the firms is considering this strategy.[7] Along this line, the European Round Table for Industry (2021) objects to the need of policy measures to incentivize reshoring/nearshoring by stressing the ability of companies to adapt autonomously to new global scenarios.

At the time of writing, while the debate on de-globalization and reshoring is mounting in the media as well as among policy makers and scholars, the evidence is still scant and mostly anecdotal. This calls for a urgent need for academic research on the topic that might offer empirically founded support to a serious, reasoned, and informed debate.

This paper is a first step in this direction. First, we exploit original representative firm-level data to provide new empirical evidence on internationalization strategies of Italian MNEs in the most recent years and in the aftermath of the Covid-19 pandemic. Second, we rationalize our empirical findings with a theoretical framework that highlights the possible mechanisms behind the observed

[3] "Post Covid-19 value chains: options for reshoring production back to Europe in a globalized economy". European Parliament, Policy Department, Directorate-General for External Policies, March 2021. ISBN 978-92-846-7831-0. DOI 10.2861/118324.

[4] "Coronavirus-induced 'reshoring' is not happening", Alan Beattie, Financial Times, September 30, 2020; "Is a wave of supply-chain reshoring around the corner?", Free Exchange, The Economist, December 16, 2020; "North America will not see significant supply chain reshoring in 2021-25", The Economist Intelligence Unit, June 16, 2021.

[5] AmCham Shanghai's 2020 China Business Report.

[6] Svenskt Naringsliv Survey.

[7] Euler Hermes Global Supply Chain Survey.

patterns.

Our contribution is twofold. To the best of our knowledge this is the first econometric assessment of the impact of the Covid-19 shock on MNEs and on their possible reduction of international exposure. More specifically, we inform the debate on de-globalization and reshoring by providing new evidence that goes beyond case studies and by investigating empirically the possible determinants of closures of foreign production facilities. Furthermore, we propose a multi-period theoretical model to interpret and shed light on our empirical findings and on the possible mechanisms at work. Therefore, we also contribute more in general to the literature on the decision making process of MNEs by stressing the conditions under which they may choose to reduce their degree of internationalization.

We find no evidence of significant reshoring among Italian MNEs nor of other major changes in their internationalization strategy. Moreover, we find that MNEs have proven more resilient and have been less affected by the Covid-19 shock than their domestic counterparts. Our theoretical model highlights that MNEs' internationalization strategies may display hysteresis due to the presence of sunk costs. Moreover, its multi-period setting shows how MNEs are sensitive to several features of the shock and not just to its size. We find that temporary shocks may not induce MNEs to close or relocate their foreign production sites, while long-lasting or permanent (or perceived so) uncertainty usually does.

The rest of the paper is organized as follows: in Section 2 we briefly review the related literature; in Sections 3 we present the empirical evidence; in Section 4 we introduce the theoretical model and discuss simulations for different types of shocks; we also present a simple two-period version to give a graphical intuition of how the mechanisms work. The last section concludes discussing policy implications.

2 Related literature

For a long time the attention of scholars has mainly focused on the causes and consequences of the growing globalization that characterized the decades prior to the Great Financial Crisis (among others: Bernard and Jensen; 1999; Melitz; 2003; Helpman et al.; 2004; Castellani and Zanfei; 2007; De Loecker; 2007; Topalova and Khandelwal; 2011; Halpern et al.; 2015).

With the world entering into a phase of slowbalisation, concerns about the possible negative consequences of an excessive or not well-managed globalization, e.g. on income inequality and on the environment among many, became more pressing. Meanwhile, in the last few years, the study of globalization risks and of the factors behind the decision of MNEs to reduce or reorganize their international activities has gained importance.

The recent literature has investigated how MNEs transmit foreign shocks through their business network of foreign affiliates (Bena et al.; 2021) and domestic partners (Huneeus; 2018; Dhyne et al.; 2021), and, as a consequence,

how globalization correlates countries' business cycles movements (Di Giovanni and Levchenko; 2010; Kleinert et al.; 2015; Di Giovanni et al.; 2018) and exposes to the effects of natural disasters occurring in some countries (Barrot and Sauvagnat; 2016; Boehm et al.; 2019; Carvalho et al.; 2021).

The Covid-19 pandemic has induced a surge in these studies.[8] Recent articles addressed the issue of the consequences of the Covid 19 (exogenous) shock, showing how pervasive lockdown measures, supply chains disruptions and the sudden fall in the demand have hurt firms worldwide, especially small and medium enterprises (Bartik et al.; 2020; Fairlie; 2020). Moreover, the unprecedented nature of the shock has drastically increased uncertainty, already high because of the US-China trade war and a weak World Trade Organization (WTO) (Buchheim et al.; 2020; Baker et al.; 2020; Hassan et al.; 2020).

A rapidly growing literature has focused on the role of internationalisation for shock transmission, investigating to what extent more globally integrated countries have been impacted by the Covid-19 crisis (Sforza and Steininger; 2020; Bonadio et al.; 2021; Eppinger et al.; 2021; Giglioli et al.; 2021) as well as whether internationalized firms have proven more or less resilient (Brancati and Brancati; 2020; Giovannetti et al.; 2020; Borino et al.; 2021).

Related studies analyze the possible impact on the future of globalization and discuss how factors, such as new economic and geopolitical equilibria, automation, trade policy uncertainty and excessive sectoral concentration might interact with the shock to change MNEs' internationalization strategies (Antràs; 2020; Javorcik; 2020; Miroudot; 2020; Di Stefano; 2021).

This literature constitutes an extremely valuable contribution to shed light on this complex topic, because it discusses several factors that contribute to shape the future of globalization. Nonetheless, uncertainty about future developments is still high, both because the theoretical approaches differ and because there is a lack of systematic evidence on the reaction of MNEs to the new context.

Moreover, the existing theoretical tools and empirical evidence hardly capture the complexity of the current situation, and offer only a limited description of the mechanisms at play. During the globalization decades, the main phenomenon of interest in the international economics literature has been indeed the *expansion* of economic activity abroad. Less attention has been devoted to the drivers of the *reduction* of firms' internationalization. Despite the narrowness of this strand of literature, an important contribution has been to highlight crucial asymmetries between internationalization and de-internationalization so that the latter is not simply the reversal of the former. In a seminal contribution Dixit (1989) and Dixit and Pindyck (1994) highlight that the presence of sunk costs, in addition to the uncertainty that characterizes foreign markets, increases the stickiness of past decisions making internationalization difficult to reverse. Impullitti et al. (2013) analyze this issue focusing on exporters. They

[8] At the time of writing, a simple search for the keyword 'Covid-19' in IDEAS/RePEc (one of the main bibliographic repository of Research Papers in Economics) produced more than 22,000 results. For a review see Brodeur et al. (2021); Baldwin and Evenett (2020); Baldwin and Di Mauro (2020); Gans (2020).

find asymmetry between foreign market entry and exit. A firm starts exporting once it achieves a certain threshold of productivity, but it may keep exporting even after efficiency has fallen below the initial entry level. There is a region where "history matters" and results depend on the past history of the firm: it does not enter a market because the thresholds are too high, but if it is "in" it does not exit since it has paid the sunk costs. More recently, Antràs (2020) discussed the hysteresis and the stickiness of offshoring decisions. When setting up production facilities abroad, firms need to invest in physical assets, gather information, define new contracts in a different legal environment, get used to bureaucratic procedures and incur in several other up-front set-up operations. Moreover, the relation-specific investments in product customization, needed to align the incentives and avoid contract enforcement issues when integrating a commercial partner, hardly have an outside value. Therefore plant closures and reshoring imply large additional costs.

With a different approach, more oriented towards understanding the multi-dimensional nature of firms' governance and strategies, international business scholars have also studied MNEs' reduction of internationalization[9] (for a review: Arte and Larimo; 2019; Schmid and Morschett; 2020). The real option theory stands up. In the boundaries of this framework, Damaraju et al. (2015), in line with Dixit and Pindyck (1994) and Antràs (2020), maintain that, when uncertainty in the business environment is high and pervasive, as in the current pandemic, firms are reluctant to divest and prefer to *wait and see*. As also pointed out by Conconi et al. (2016), when internationalisation choices are only partially irreversible, uncertainty will increase the option value of waiting until more information is available. This is due to asymmetries between the real option of divestment and investment as well as to the fact that MNEs, beside incurring sunk costs from exiting a market, may also damage their reputation (Ozkan; 2020). Moreover, as pointed out by Chung et al. (2013), this effect is even more pronounced for large MNEs with dispersed international operations. These firms are less likely to divest their subsidiaries as they can adjust their activities across different subsidiary locations.

A specific strand of this literature has also investigated exit from foreign markets when firms face unexpected exogenous shocks (Liu and Li; 2020; Oh and Oetzel; 2011, 2017; Dai et al.; 2013, 2017). However, these studies mainly focus on country specific shocks such as conflicts, terrorist attacks or natural disasters. In terms of firm decision making process, this consists in deciding whether to exit an uncertain market to relocate in a *less* uncertain one, a situation different from to the current one, since the Covid-19 is a worldwide and not an idiosyncratic shock.

The insights from these different strands of the literature highlight some crucial mechanisms that can help explaining the complexity of the current crisis. This paper provides novel empirical evidence on MNEs reaction to the shock and builds on both the business and economic literature to provide a comprehensive

[9] Scholars have used different terms to describe exit from foreign markets: deinternationalization, divestment, withdrawal, failure, closure, disengagement, liquidation, total sales, and sell-off.

theoretical framework to explain and rationalize the observed patterns.

3 New evidence from Italian firms

The debate on deglobalization and reshoring is still open. A crucial question that needs to be empirically answered is: *Did Covid-19 cause closures of foreign plants and did it induce MNEs to reshore production? Should we expect to see these phenomena in the near future?*

In this section, we provide some evidence for Italian MNEs. We use the Survey of Industrial and Service Firms, original firm-level data, collected by the Bank of Italy in spring 2021, which gathers *quantitative* information on investments, gross sales, workforce and other economic variables from a representative sample of around 5,000 Italian industrial and service firms with 20 or more employees.[10] We combine this sample with *qualitative* information coming from the Business Outlook Survey of Industrial and Service Firms, covering approximately 3,000 industrial firms and 1,000 non-financial private service firms.[11]

Our data is representative of the Italian economy and the sample description reproduces all the main findings from the literature on firms internationalization and MNEs. In line with what is usually observed in normal times, in 2020 (one year into the pandemic) MNEs recorded on average about twice the revenues of non-MNEs and employed more workers (around +80%). They were also more productive (about +20%) and more involved in exporting activities (49% vs. 18% of revenues from exports) compared to non-MNEs (see the summary statistics reported in table A.1 in the Appendix).[12] This evidence is fully consistent with the existing literature (Castellani and Zanfei; 2007; Castellani et al.; 2017; Borin and Mancini; 2016).

Let us concentrate on the effects of the Covid-19 outbreak on internationalization choices. The main stylized fact that we single out is that *among Italian MNEs foreign plant closures have been rare and firms are generally not considering closing plants abroad. Similarly, reshoring is not taking place nor seems to be seen as a viable option.*

As shown in Figure 1, more than 85% of the Italian MNEs did not close any plant abroad between 2018 and 2020, and, even more importantly, are not considering to shut down in the near future, despite the pandemic.[13] In addition, only 2.6% have reshored their production and less than 2% have moved production to other sites (possibly nearer). Therefore, survey data suggest that

[10] Further detail available at https://www.bancaditalia.it/pubblicazioni/indagine-imprese/index.html.

[11] See https://www.bancaditalia.it/pubblicazioni/sondaggio-imprese/index.html for further details.

[12] Based on the survey information, MNEs are defined as firms stably operating in foreign markets, not having closed foreign plants over the last three years. Results presented in the paper are robust to alternative definitions.

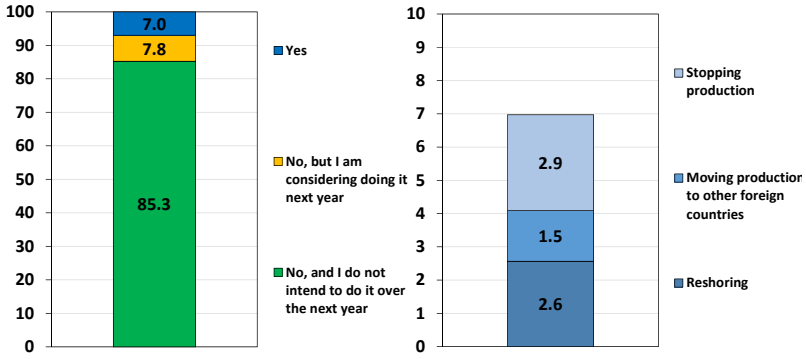
[13] The question asked to companies in the Bank of Italy Business Outlook Survey of Industrial and Service Firms in fall 2020 was "Has your firm closed one or more production facilities abroad over the last three years?".

in the last three years the number of plants closures has been modest and that the pandemic has not dramatically changed MNEs' internationalization plans.

This evidence supports the view that so far the "pandemic did not deliver the big permanent shock to global value chains that many had feared" (Financial Times, 29 July 2021), and is in line with recent international evidence discussed above. Overall, our results support the view that Covid-19 could at most accelerate already existing trends of supply chains rationalization (Antràs; 2020; Bacchetta et al.; 2021; UNCTAD; 2020), but will not end globalization.[14]

Figure 1: MNEs and plant closures

Has your company closed one or more production facilities abroad in the last three years?



Source: own elaboration based on Bank of Italy survey data.

The above stylized fact may come as a surprise to some, considering that integration into foreign markets has been recently seen as linked to shock transmission and higher vulnerability. Why did Covid-19 not induce the mass foreign plant closures and reshoring that many observers had feared after the pandemic outbreak? We try to answer this question laying down a conceptual framework and some hypotheses, and checking whether the evidence is consistent with them.

A first explanation for the lack of closures abroad may be that MNEs have not swiftly changed their international exposure after the Covid-19 outbreak because they have coped better with the shock compared to other firms, and even better than their own expectations formulated right after the outbreak, in February and March 2020. In Section 3.1 we exploit the richness of our firm-level dataset and find supportive evidence for this hypothesis.

Another possibility, which does not exclude, but may complement the previous one, is that the pandemic was not a shock likely to trigger a deep reorganization of MNEs' international activity. The Covid-19 pandemic, despite being a major shock that caused dramatic disruptions, might indeed have been

[14] See also the McKinsey's report by Lund et al. (2020) on this point.

perceived as transitory. Since setting up plants abroad or closing them and reshoring are costly strategic decisions. Hence, they are more likely to respond to structural and medium or long-run factors, rather than to transitory, even if large, shocks. This of course, leads to another question, which is: *If Covid-19 did not cause reshoring, are there other factors that induced those (few) MNEs to close plants or reshore?* In Section 3.2 we show that while proxies of the Covid-19 shock, did not significantly increase the firms' probability to close plants abroad, Brexit and the US trade policy in 2018 and 2019 did.

In a nutshell, our empirical results seem to suggest, first, that MNEs have been impacted relatively less with respect to their domestic counterparts and therefore they did not have to change their internationalisation strategies. Second, due to the presence of high fixed costs to open foreign plants, the actual or expected persistence of the shock is key to determine the pattern of internationalization strategies. The Covid-19 shock is likely not to have triggered mass foreign plant closures because it is (or it is perceived as) transitory, while other shocks (e.g. Brexit and the US trade policy) were (or were perceived as) permanent.

Our results, however, offer only preliminary evidence on the Covid-19 shock on MNEs; hence, a note of caution is needed. First, the actual consequences of the shock may change according to the evolution of the pandemic and especially of the policy response, therefore it is plausible that we have simply not observed any significant change in international exposure yet because value chains reorganization takes time. Some reconfiguration is likely to happen in the medium and long term, but we argue that most of this phenomenon will depend on the policy response, and that, in any case, globalization will not end with Covid-19 as other factors are likely to be more pervasive in shaping firms' decisions. Second, possible different results may emerge as more comprehensive firm-level data will become progressively available. The sample of our analysis is indeed rather small. We start with around 500 MNEs, but only a subset of this sample has information on the impact of both trade policies and Covid-19, coming from different waves of the survey. In addition, with the inclusion of fixed effects, albeit dealing with unobserved confounders, we lose all the observations in those cells where there is no variation in the dependent variable. However, all the regressions use survey weights that make the sample representative of the reference population. Even with the small sample size, the results are stable across specifications and statistically significant.

3.1 Did MNEs manage to cope better with Covid-19?

Let us address our first hypothesis leading to the results on foreign plant closures. We check whether, during the Covid-19 pandemic, MNEs present systematically different performance with respect to other firms, after controlling for several characteristics. To this aim, we estimate the following linear regression model

$$Y_i = \alpha + \beta MNE + \gamma ImpExp + Z_i'\Gamma + \varepsilon_i \tag{1}$$

where we regress different proxies of firm's performance on the firm's internationalization status – a dummy taking value 1 if the firm has plants abroad (MNE) or is a two way trader with no plants abroad ($ImpExp$). We use the the following proxies for firm's performances (Y): revenues growth between 2020 and 2019 ($dRev2020$); a dummy taking value 1 if the firm has reported a drop in revenues higher than 30% over the entire 2020 ($DropRev2020$) or in the first three quarters of the year ($DropRevQ1Q3$); growth in revenues coming from selling in foreign markets ($dRev2020_F$); the percentage change in the share of employees in remote working in 2020 with respect to 2019 ($dSmartWork$), the difference between the realized growth in revenues in 2020 and the expected growth formulated right after the Covid-19 outbreak ($dRev2020 - E(dRev2020)$); a dummy taking value 1 if the firm has faced supply shortages ($SupplyProbl$) and a dummy taking value 1 if the firm has faced severe supply shortages that led to plant shutdowns ($SupplyProdStop$).

The coefficients β and γ measure the difference in performance in 2020 with respect to simple exporters and domestic firms, i.e. the reference category in the regression. To reduce confounding factors we add additional firms' characteristic as covariates (in matrix Z), namely firms' age, employment and labor productivity in 2019, NUTS3 province and NACE 3-digit sector. We also include a dummy taking value 1 if the firm has stopped production in 2020 due to shutdowns mandated by national or local decrees. In this way the estimates of β and γ reflect the effect on performance of the degree of international involvement of the firm, for a given size, productivity, province, sector, and exogenous production halts.

In Table 3.1 we report regressions results. MNEs were able to cope better with the Covid-19 crisis with respect to two way traders and non-MNEs of similar age, size, previous performance, exogenous shutdowns, sector and province. They experienced higher revenues growth in 2020 (column 1) and the share of these firms reporting sizable (larger than 30%) contractions in revenues has been lower, both in the entire 2020 and in the first three quarters of 2020 (column 2 and 3). MNEs outperformed two way traders and exporters especially on sales in foreign markets, compared to exporting-only firms (column 4). MNEs and two way traders increased remote working more than non-GVC firms (column 5). The difference between realized sales in 2020 and the expected sales for 2020 reported right after the Covid-19 outbreak was much higher for MNEs with respect to firms non integrated in GVCs (column 6). In other words, they performed better than their own expectations, compared to other firms. Finally, firms involved in GVCs faced supply shortages (column 7), which in some cases even halted production (column 8).

Overall, despite the fact that GVCs may transmit shocks, (Brancati and Brancati; 2020; Borino et al.; 2021), this evidence seems to support the hypothesis that MNEs have proven more resilient to the shock and could offer some insights on the modest entity of foreign plant closures. This is consistent with the evidence of larger losses for small and medium enterprises (Bartik et al.; 2020; Fairlie; 2020).

Table 3.1: MNEs performance in 2020

	(1) dRev2020	(2) DropRev2020	(3) DropRevQ1Q3	(4) $dRev2020_F$
MNEs	2.253*	-0.061**	-0.108***	8.996***
	(1.68)	(-2.44)	(-2.72)	(3.09)
Two-way traders	-0.943	0.005	-0.010	2.591
	(-0.88)	(0.24)	(-0.34)	(1.15)
Age	-1.210	0.007	0.011	-0.537
	(-1.60)	(0.52)	(0.56)	(-0.32)
GovStop	-0.295	0.011	0.046	-3.884*
	(-0.22)	(0.36)	(1.24)	(-1.67)
$\log(\text{labprod})_{2019}$	0.008	-0.004	-0.045**	-4.352**
	(0.01)	(-0.31)	(-2.23)	(-2.18)
$\log(\text{emp})_{2019}$	0.244	-0.005	0.010	-0.517
	(0.49)	(-0.56)	(0.70)	(-0.68)
N	2045	2045	2076	1666
NUTS3 FE	Y	Y	Y	Y
3-digit Sector FE	Y	Y	Y	Y

	(5) dSmartWork	(6) dRev2020-E(dRev2020)	(7) SupplyProbl	(8) SupplyProdStop
MNEs	4.053***	4.934**	0.098***	0.058*
	(3.02)	(2.17)	(2.69)	(1.71)
Two-way traders	2.452***	0.612	0.057*	0.043
	(3.35)	(0.32)	(1.83)	(1.55)
Age	-0.980	-0.267	-0.027	-0.025
	(-1.27)	(-0.18)	(-1.09)	(-1.47)
GovStop	-2.270*	0.883	-0.015	0.001
	(-1.89)	(0.36)	(-0.50)	(0.04)
$\log(\text{labprod})_{2019}$	4.071***	-0.725	0.0436**	0.007
	(4.41)	(-0.53)	(2.13)	(0.40)
$\log(\text{emp})_{2019}$	3.377***	-0.531	-0.014	-0.015
	(7.38)	(-0.68)	(-1.09)	(-1.31)
N	1923	941	1889	1889
NUTS3 FE	Y	Y	Y	Y
3-digit Sector FE	Y	Y	Y	Y

Note: Standard errors clustered at the 3-digit sector level. Sample weights are used in the regressions. t-statistics in parentheses. *: p<0.1; **: p<0.05; ***: p<0.01.

3.2 What did trigger closures and reshoring?

Let us now investigate which are the factors that led MNEs to close plants abroad over the last three years. Obviously, one potential driver of foreign plant closure is the Covid-19 shock.

To shed some light on this issue, we explore which firms' characteristics are more often associated with the reduction of international exposure. To this end, we estimate the probability that an MNE closed one or more plants abroad between 2018 and 2020 with the following Probit model:

$$Prob(Close_{i,18-20} = 1) = \Phi(\beta_0 + \beta_1 TradePolicy_i + \beta_2 dRev_{i,15-17} + \\ + \beta_3 dRev_{i,2020} + \beta_4 Age_i + \beta_5 GovStop_i + \beta_6 log(labprod)_{i,15-17} + \\ + \beta_7 log(emp)_{i,15-17} + D_i\Gamma + u_i) \quad (2)$$

We include in the regression two variables for trade policy ($TradePolicy_i$). The first is $UStariffs$, a dummy taking value 1 if the MNE reports that the US 2018-2019 tariffs have negatively affected its sales, and the second is $Brexit$, a dummy taking value 1 if –before the deal with the EU– the MNE feared the introduction of tariffs after Brexit.[15] We include lagged proxies of firm performance and size, i.e. average labor productivity ($log(labprod)_{15-17}$), employment ($log(emp)_{15-17}$) and percentage change in revenues ($dRev_{15-17}$), measured between 2015 and 2017, i.e. before the actual plant closure, as well as firms' age (Age). As proxies for the Covid-19 shock, we use the percentage change in revenues in 2020 ($dRev_{2020}$) and a dummy taking value 1 if the MNE reported drops in revenues larger than 30% ($DropRev2020$). In addition, we control for whether production has been shut down by local or general government decrees ($GovStop$) or Covid-19 related input shortages ($SupplyProdStop$). We also include regional and sectoral fixed effects controlling for possible omitted variables.

Table 3.2, column 1 to 6, reports the marginal effects on the probability of closing foreign plants. Column 7 depicts the same probit model but the dependent variable is the probability of having closed or considering to close plant abroad in the near future.

Despite the low number of observations – given by the specific nature of the phenomenon in analysis – results are stable across different specifications and significant. We find evidence that MNEs may react differently to different types of shocks.

In the baseline specification in column 1 we find that protectionist trade policies, here proxied by US tariffs that have directly or indirecly harmed Italian MNEs, are associated with a higher probability of having closed plants abroad (9.56 p.p.). Instead, plants shutdowns determined by the Covid-19 oubreak are not significantly associated with a higher propensity to close foreign plants. As expected, more productive firms are less likely to close foreign plants, as a 1%

[15] The question asked to companies was "How worried is your firm about the introduction of tariff and non-tariff barriers to trade in goods and services between the European Union and the United Kingdom due to Brexit?"

increase in labor productivity is associated with a reduction of -0.64 p.p. in the estimated probability. In addition, a 1 p.p. increase in revenues growth between 2015 and 2017 (in 2020) is associated with a drop of -0.54 p.p. (-0.29 p.p.) in the probability of plant closures.

In column 2 we check whether plant shutdowns due to Covid-19 supply disruptions increased the propensity to close foreign plants, and find no statistically significant effects. In column 3 we find a very strong and positive association between having suffered severe revenues losses in 2020 and having closed foreign plants, while the effect of plant shutdowns imposed by the government or driven by supply disruptions remains not statistically different from zero. This seems to suggest that the Covid-19 shock has acted as any other temporary, but massive, shock on revenues. In column 4 to 6 we include another proxy of trade protectionism, i.e. the potential negative effect of Brexit. The estimated marginal effect is significant and very close to the one obtained for US trade policy, between 8.6 and 11.9 p.p. across different specifications. This suggests that protectionist policies that have negatively affected firm performance ($UStariffs$) or are expected to have a negative impact ($Brexit$) might have a substantial impact on firms' location/exit choices. In addition, columns 4 to 6 show that our results are robust to the inclusion of different regional and sectoral fixed effects, i.e. sector-NUTS1 region, sector and NUTS2 region, and sector-NUTS2 region. Lastly, in column 7 we estimate the probability of having closed foreign plants between 2018 and 2020 or considering this strategy in the near future[16]. Trade policies remain relevant, both in significance and magnitude. Not surprisingly, we find that government shutdowns are associated with a higher probability. As already highlighted at the end of the previous section, we may expect that both trade policies and Covid-19 might induce some reorganization in supply chains over the medium to long term.

In summary, trade policies and trade uncertainty have a significant impact on the decision to close foreign production facilities, while the Covid-19 shock seems to have negatively affected internationalization strategies *only if* sufficiently large. Once this standard channel, i.e. changes in revenues, is accounted for, other dimensions of the pandemic shock, proxied by production shutdowns induced by government restrictions or input shortages, have not (yet) played a role. These results seem consistent with a *wait and see* behavior (Dixit and Pindyck; 1994; Chung et al.; 2013; Damaraju et al.; 2015; Conconi et al.; 2016). Despite the magnitude of the pandemic shock, its persistence is not clear, therefore MNEs require more information before reshoring as a consequence of Covid-19 only; on the contrary, trade policies are probably perceived as having long term impacts therefore contributing more substantially to change internationalisation strategies.

In the next section we propose a theoretical framework to encompass these facts. Specifically, we claim that MNEs internationalization strategies may display some hysteresis due to the presence of sunk costs. The same mechanism, once applied to a dynamic framework, could induce differences in the firms'

[16]Due to data limitation, we cannot directly estimate the probability of future closures.

Table 3.2: Determinants of plant closure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Prob($\text{Close}_{i,18-20} = 1$)			
UStariffs	0.096**	0.121***	0.114***	0.099***	0.075**	0.156***	0.107**
	(2.24)	(2.96)	(2.81)	(2.65)	(2.07)	(3.45)	(2.10)
BrexitUnc.				0.086**	0.085**	0.119***	0.081*
				(2.56)	(2.52)	(2.84)	(1.69)
dRev_{15-17}	-0.005**	-0.006**	-0.006**	-0.006***	-0.004*	-0.003	-0.006*
	(-2.28)	(-2.40)	(-2.46)	(-2.61)	(-1.84)	(-1.08)	(-1.91)
dRev_{2020}	-0.003**	-0.002					
	(-2.27)	(-1.57)					
DropRev2020			0.129***	0.143***	0.129***	0.148**	0.206***
			(2.86)	(3.20)	(2.87)	(2.54)	(3.44)
Age	-0.071**	-0.076***	-0.073***	-0.051**	-0.043*	-0.015	-0.048
	(-2.50)	(-2.77)	(-2.72)	(-2.04)	(-1.71)	(-0.46)	(-1.30)
GovStop	0.037	0.054	0.045	0.029	0.029	0.049	0.124**
	(0.94)	(1.40)	(1.27)	(0.78)	(0.77)	(1.01)	(2.10)
SupplyProdStop		0.023	0.019	0.018	-0.006	-0.002	-0.024
		(0.61)	(0.48)	(0.50)	(-0.16)	(-0.04)	(-0.41)
$\log(\text{labprod})_{15-17}$	-0.064**	-0.062**	-0.053**	-0.051**	-0.051**	-0.096**	-0.001
	(-2.22)	(-2.16)	(-2.12)	(-2.04)	(-2.13)	(-2.56)	(-0.03)
$\log(\text{emp})_{15-17}$	0.011	0.010	0.009	0.009	0.009	0.017	-0.020
	(0.99)	(0.97)	(0.92)	(0.92)	(0.90)	(1.23)	(-1.39)
N	265	244	244	244	234	156	201
Sector-NUTS1 Region	Y	Y	Y	Y			
Sector					Y		
NUTS2 Region					Y		
Sector-NUTS2 Region						Y	Y

Notes: The table reports marginal effects. Robust standard errors. t-statistics in parentheses. *: p<0.1; **: p<0.05; ***: p<0.01. Column 7 takes into account also firms considering to close plant abroad in the near future.

reactions to different types of shocks. In particular, we show that it is not only the size of the shock that matters but also, and perhaps more importantly, its perceived persistence. Thus, severe but transitory shocks may not induce MNEs to close or relocate foreign production to the same extent that mild but permanent shocks do.

4 A theoretical framework

Our aim is to show how the decision to offshore and reshore production are asymmetric in important ways. A crucial insight is that the offshoring decision can be sticky so that reshoring requires either very large or permanent shocks. As it is well known, firms that internationalize are self-selected among the most productive ones. They are better equipped to afford the internationalization costs and benefit from a larger scale of operations. However, once (highly productive) MNEs invested and paid the cost to set-up their international production network, further adjustments are also costly and only major

permanent shocks provide incentives to change.

Our model fits into the international trade literature and builds on Melitz (2003) and Antràs (2015, 2020). The demand side of the model is rather standard. It is composed by a representative consumer who derives utility from consumption of a homogeneous numeraire good and a differentiated good which encompasses a continuum of varieties. Varieties are imperfect substitutes with a constant elasticity of substitution, and the consumer displays love for variety. Demand for each variety, thus, depends negatively on the price of the variety itself and positively on expenditure (or consumer's income) and on the price of substitutes (captured by a price index). Details on the demand side of the model are provided in Appendix A.2.

To investigate MNEs internationalization strategies, we mostly operate on the supply side of the model. We focus on two main elements: first, setting-up a plant at home or abroad implies sunk costs; second, firms maximize profits in a multi-period setting, i.e. they are forward looking. These two elements are not new per se, and readers familiar with the international trade literature, will easily follow our results. Nonetheless, considering these two aspects together allows us to illustrate and rationalize our empirical results.

The differentiated sector is characterized by monopolistic competition. Each firm produces a unique variety $\omega \in \Omega$ using only labor with a technology encompassing increasing returns to scale stemming from a fix cost FC combined with a constant marginal cost MC. As in Melitz (2003), firms can be heterogeneous in terms of (time-invariant, firm-specific) productivity $\varphi(\omega)$.

The firm only sells in the domestic market, but can decide to manufacture the product abroad. Since we are interested in the production location decision, we limit the firms choice to: (0) producing domestically; (1) producing abroad; (2) staying or going out of business. In a multi-period setting, we need to keep track of firm's current status in each period. We denote it with the letter S:

$$S = \begin{cases} 0, & \text{if producing domestically} \\ 1, & \text{if producing abroad} \\ 2, & \text{if not producing} \end{cases} \tag{3}$$

Entering the foreign market or offshoring at time t corresponds to a status change from $S_{t-1} \neq 1$ to $S_t = 1$. Similarly, reshoring is the change from $S_{t-1} = 1$ to $S_t = 0$. Of course, other status changes include entering the domestic market and going our of business. Therefore in each period t, the firm can take different status-change choices contingent on the previous state S_{t-1}.

It is useful to denote status changes with the following indicator variables:[17]

$$I_0 = \begin{cases} 1, & \text{if } S_t = 0 \text{ and } S_{t-1} \neq 0 \text{ (starts domestic production)} \\ 0, & \text{otherwise} \end{cases} \tag{4}$$

$$I_1 = \begin{cases} 1, & \text{if } S_t = 1 \text{ and } S_{t-1} \neq 1 \text{ (starts foreign production)} \\ 0, & \text{otherwise} \end{cases} \tag{5}$$

Given the above internationalization choices, firm's profit depend on the variable production costs associated with each location and on the sunk costs related to setting up production facilities. Producing in the domestic market ($S = 0$) entails a one-time sunk cost F (if $I_0 = 1$), a fix cost $FC = f$ and a marginal cost $MC = aw\varphi(\omega)^{-1}$ determined by the unit labor requirement a, the domestic wage w and the time-invariant firm-specific productivity level $\varphi(\omega)$. Producing in the foreign market ($S = 1$) entails a one-time sunk cost F^* (if $I_1 = 1$), a fix cost $FC = f^*$ and a marginal cost $MC = \tau z a w^* \varphi(\omega)^{-1}$ determined by the foreign wage w^* as well as by the lower productivity of foreign labor ($z \geq 1$ foreign workers correspond to one domestic worker) and the cross-border costs $\tau \geq 1$ from importing the manufactured product back to the home country. These include both the (iceberg) transport costs and any *ad valorem* domestic tariff. Profits in each status S can be compactly written as:

$$\pi(S) = \begin{cases} (aw)^{1-\sigma}\varphi(\omega)^{\sigma-1}B - f - I_0 F, & \text{if } S = 0 \\ (\tau z a w^*)^{1-\sigma}\varphi(\omega)^{\sigma-1}B - f^* - I_1 F^*, & \text{if } S = 1 \\ 0, & \text{if } S = 2 \end{cases} \tag{6}$$

with $\sigma > 1$ beign the (constant) elasticity of substitution between any pair (ω, ω') in Ω and B is a term proportional to the demand faced by the firm.[18]

Because of sunk costs, the optimization problem of the firm must be solved dynamically as the profits in one period depend on the choice made in the previous period in terms of location and production and since it does not have an analytical solution, we solve it numerically. To this goal, define $\mathcal{V}(S_0)$ as

$$\mathcal{V}(S_0) = \max_{(S_t)_{t=1}^{\infty}} E\left[\sum_{t=1}^{\infty} \rho^t \pi(S_t) | \Sigma_t\right] \text{ such that (6) holds in every period,} \tag{7}$$

where Σ_t is the information set available in t and the sequence $(S_t)_{t=1}^{\infty}$ maximizes the expected present value of future profits, discounted at rate ρ, of a firm in state S_0 that produces the variety ω with productivity $\varphi(\omega)$. More generally, this function can be rearranged and we can define the equilibrium relation in a recursive form that must hold in every period:

$$\mathcal{V}(S_t) = \pi(S_t) + \rho E\left[\max\{\mathcal{V}(S_{t+1}) - I_{0,t+1}F - I_{1,t+1}F^*\} | \Sigma_{t+1}\right] \tag{8}$$

[17] For simplicity, we omit the going-out-business I_2 indicator variable since, as long as there are not sunk costs associated with this decision, it plays no active role.

[18] See the appendix A.2 for details.

The state variable is the firm's location of production in the previous period, the choice variable is the location it chooses in the current period. The state variable affects the value of both the current-period profit and the expected continuation value. Notice that the expected continuation value of a firm producing domestically (abroad) that decides to offshore (reshore) will entail the payment of the sunk cost. Sunk costs are also paid by firms currently out of business that decide to restart the production either at home or abroad. In each period domestic firms can enter the market (either to produce domestically or abroad), change production location if they are already operating, or go out of business. Both fixed and sunk costs are set equal to zero when the firm is out of business. The scheme of the numerical algorithm is provided in the Appendix A.3.

Let us now simulate the model in the multi-period framework. We assume that at time 0, before anything happens, all firms are inactive ($S = 2$) and they differ only in terms of productivity level (φ). We draw φ from a Pareto distribution with parameters chosen in order to mimic as close as possible the observed empirical distribution of labor productivity. For the purpose of simulation, the time horizon is set to 20 periods (quarters), which allows to focus on long-run investment and divestment decisions. The values chosen for the other parameters are listed in Appendix A.3.

As a first step, given the simulated distribution of productivity and assuming no other perturbations, we solve the model numerically by finding $\mathcal{V}(S_t)$ as the fixed point of the contraction mapping (8) for each level of φ. Although we do not attempt a proper calibration, this simple model is still able to generate a distribution of firms consistent with the observed one: only a small fraction (around 5%) of firms chooses to offshore.

In a second round of simulations, we focus our attention on internationalized firms to explore the impact of different types of shocks.[19] In particular, we consider changes to the demand (B) and to tariffs (τ).[20]

At the beginning of each period, firms observe the realization of shocks and decide whether to revise their location choices. If they do so, they must pay the associated sunk cost, while remaining in the current state does not involve additional sunk costs.

This setting, while very stylized, allows to check the effect of large vs. small and temporary vs. permanent shocks to one or more variables in combination. For illustrative purposes, in Figure 2 we shock the demand parameter B and tariffs.[21] In this example, the shock to sales is temporary and that on tariffs is persistent. In Figure 3 we see the impact of these shocks on firms' composition

[19] We do this by imposing an appropriate minimum level for φ, say $\underline{\varphi}$, over which we know all firms will invest abroad.

[20] In what follows we focus on these two for illustrative purposes, but other variables can be shocked as well, such trade costs, labor productivity, and firm productivity.

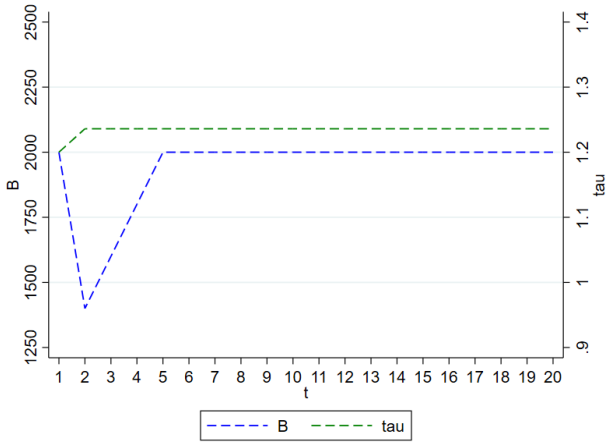
[21] As noted above, this is quite a simplification since B is in fact an endogenous combination of parameters which depend an preferences (which are assumed to be fixed) and on expenditure or income and the price index, which in turn declines with the number of firms. Yet B is exogenously taken as given by the individual firm so that from the firm's perspective a shock to B simply corresponds to a shock in sales.

by location choice. The temporary demand shock alone has no effect on the share of offshoring firms, meaning that the initial shock was not large enough to justify paying the sunk cost of a change in production location. On the contrary, the increase in tariffs, despite being relatively small, triggers reshoring. This is because it is permanent. Lastly, the combined effect of a temporary demand shock with a permanent tariff increase triggers even more reshoring. Note how the demand shock, which alone has no effect, acts now as a multiplier on the tariff shock effect.

The intuition behind these dynamics can be given through equations 7 and 8. As a premise consider that, if no shock occurred, a firm that had chosen to offshore would continue to do so because there would exist a strictly positive margin between the present value of profits expected under offshore production compared to the alternative, this being true even for the least productive firms among those that offshore. A negative but temporary shock on the demand (B) would reduce the current period profit, $\pi(S_t)$, but would not alter the future stream of profits. Therefore, if the firm is either infinitely living or with a sufficiently large number of operating periods ahead, then the reduction of the current period profit may not be enough to erode the initial margin.[22] Instead, an increase of the tariff (τ) would reduce the entire stream of future profits and, therefore, have a much larger impact on the present value of expected profits under offshore production. In this case, it is very likely that a number of firms (namely those with a productivity level lower than a certain threshold $\underline{\varphi}$) would relocate. Namely, those for which the reduction is larger than the sum of the profit margin *and* the payment of the sunk cost from relocating. Finally, let's consider what happens if the increase in tariff is combined with a temporary reduction in demand. In this case, both the current and the future profits of offshored firms would be reduced. Hence, the productivity level below which firms relocate is higher than $\underline{\varphi}$ and some firms that were sufficiently productive to remain abroad under the previous scenario (tariff increase only) can no longer do so, now. A this point, even when the demand returns to its pre-shock level, some firms would no longer find it convenient to pay the sunk cost and offshore again and remain 'locked-in' the domestic production, therefore resulting into an amplification effect of the initial tariff increase.

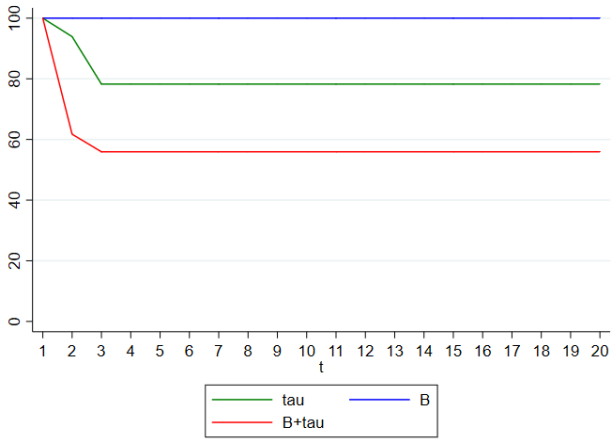
[22] Nevertheless, if the shock on the demand is temporary but sufficiently large, it could induce some firms to reshore in a finite horizon setting.

Figure 2: Shocks on demand and tariffs.



Note: The x-axis indicates the time periods (quarters). Each line describes a different shock. The blue dashed line simulates a 30% drop of the demand level (B, left scale) in period 2, followed by a fast and full recover. The green line simulates a 5% permanent increase of the tariff level (tau, right scale) from period 2.

Figure 3: Effect of the shocks on the number of offshored firms (Offshored firms in period 1 = 100).



Note: The x-axis indicates the time periods (quarters). The y-axis displays the percentage of off-shored firms, normalizing the level in period 1 (i.e. pre-shock) at 100.

4.1 Why firms do not reshore: intuition in the two-period case

We rely on a simpler two-period version of the model to highlight the underlying intuition. Consider a firm that operates only two periods and has to choose whether to locate production domestically or abroad (no inactivity is allowed). To simplify notation, let us assume that there are no sunk costs associated with domestic production ($F = 0$).[23] This greatly simplifies notation, keeping the main mechanism intact.

Equation 6 reduces to a binary choice, so that a firm wants to produce in the foreign market if $\pi(S = 1) > \pi(S = 0)$ either by offshoring its production abroad ($I_1 = 1$) or by remaining offshore ($I_1 = 0$).

Only firms whose productivity lies above a certain threshold find convenient to offshore:

$$\varphi \geq \left[\frac{I_1 F^* + f^* - f}{B[(\tau z a w^*)^{1-\sigma} - (aw)^{1-\sigma}]} \right]^{\frac{1}{\sigma-1}} \geq 0 \tag{9}$$

Notice how Equation (9) implies that there are two different productivity cutoffs: a more stringent one for those who start offshore production ($I_1 = 1$) and a less stringent one for those already producing abroad ($I_1 = 0$). This is consistent with the empirical evidence provided in section 3. First, it confirms that firms that offshore are more productive ex ante ($I_1 = 1$). Further, it suggests that ex post this productivity constraint becomes less binding for those who have offshored ($I_1 = 0$). Once offshoring has occurred, firms hit by a negative shock on productivity or by an increase in tariffs, wages or other costs, may decide to remain abroad, even though that choice would have not been made had the sunk cost not been already paid.

Sunk costs introduce an asymmetry between the ex-ante and ex-post optimal location decisions of the firms. The key mechanism stems from the fact that once sunk costs have been paid to locate the production somewhere, changing is costly. In other words, past decisions carry a weight and firms' internationalization strategies are not easily reverted or modified. On the contrary they are likely to display hysteresis effects and "history matters". To induce a firm to modify the location of its production the shock must be sufficiently large and/or persistent. It is therefore possible that certain shocks would greatly reduce the firm's profits but are not reflected on its location decisions.

Consider the case of a firm that offshored its production in the first period and is now considering reshoring. Ex-ante ($I_1 = 1$), the firm compares both fix and marginal costs of domestic production vs. offshoring, but then, after the choice is made, the sunk component of the fix cost of offshoring does not enter the problem since it was already paid ($I_1 = 0$). This tilts the decision by making offshoring sticky and creating a hysteresis effect. Even after an erosion of the marginal cost advantage of foreign production, the firm may keep production offshore; or equivalently, we need a large increase in the foreign marginal cost in

[23] With this assumption, in equation 6, the indicator variable I_0 plays no role.

order to make reshoring profitable. The larger the sunk cost of offshoring F^*, the larger the hysteresis effect. The presence of sunk costs creates an inactivity zone where the firm does not reshore even though it would have not offshored originally. This effect is represented in Figures 4 and 5 for the firm's scale and productivity (B represents the scale, φ the productivity) and costs (marginal vs. fixed). Figure 4 shows how firms producing at different scales or with different productivity take different decisions: larger and more productive firms are more likely to offshore. This is a standard result, in line with most of the theoretical and empirical literature. Once the firm has offshored, it will not reshore even after a negative shock to sales or productivity, unless the shock is large enough to bring the firm within the reshoring region on the left. Figure 5 shows the combinations of costs of offshoring for which firms stay offshore (i.e., do not reshore) even though they would have not offshored at the new conditions. Given the scale of operations, the firm offshores if costs are low enough to lie in offshoring region (a standard result). Again, once a firm has offshored, it will remain offshore even after negative shocks to either fix cost, labor productivity, trade costs, tariffs, and communication costs, even if the new cost combination lies outside the original offshoring region, provided that the shocks are not too large.

Figure 4: The stickiness of offshoring: scale and productivity of the firm.

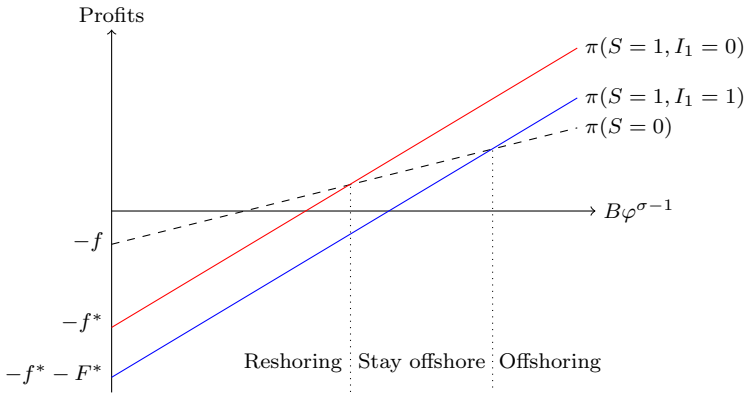
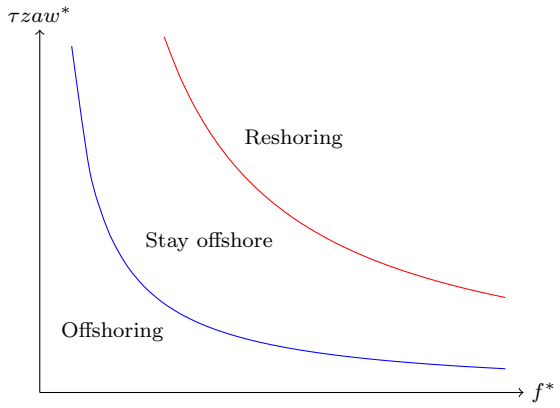


Figure 5: The stickiness of offshoring: marginal vs. fix costs.



5 Conclusion

The Covid-19 outbreak was sudden, large and unexpected. In many countries, GDP collapsed and firm losses have been massive and generalized, with the international production networks (at least partially) contributing to the transmission of the shock, due to supply chains disruptions and sudden production halts, especially in certain manufacturing and medical products. These developments triggered a discussion on the risks and instabilities associated with the international fragmentation of production. Observers and academics evaluated the possibility of reducing reliance on foreign markets and, with the belief that proximity reduced globalization risks, contemplated substituting uncertain foreign supplies with national or geographically closer sources. Along this line, some advocated also for a rethinking of MNEs' location choices and called for nearshoring and reshoring production plants abroad as means to lower uncertainty and secure supply. The most extreme scenarios were those predicting deglobalization and massive waves of reshoring. Against this backdrop, a policy debate followed, with several governments discussing or approving measures to incentivize the reshoring of strategic productions. Yet, despite these fears and measures, systematic evidence is still scant. While disruptions were severe and some firms decided to revise their location and/or sourcing choices, available anecdotal and survey evidence shows that no widespread reshoring is currently happening.

We contribute to the debate by providing novel empirical evidence on the impact of the Covid-19 shock on the internationalization strategies of Italian MNEs. Exploiting new firm-level data surveyed by the Bank of Italy, we find that among Italian MNEs foreign plant closures and reshoring are limited; only a small fraction of firms reshored (or nearshored) production or intend to do so in the near future.[24]

This is consistent with the idea that MNEs, despite being exposed to foreign shocks and severely hit, were also better equipped to face the crisis: they suffered less with respect to less internationalized or domestic firms in terms of sales reduction and other variables, and were faster to react to the shock.

Moreover, as also pointed out by Antràs (2020), theoretical reasons for the hysteresis of internationalization strategies exist. We provide a rationale for the observed evidence using a multi-period model of firm's location choice. Under the assumption that starting production abroad entails the payment of (large) fixed costs, part of which is sunk in nature, we show that international firms self-select among the larger and most productive ones, which makes them better equipped to afford the investment abroad. Once the offshoring choice has been taken and the sunk costs paid, further adjustments are costly and only sufficiently large and/or permanent shocks provide incentives to change behavior and choices. In a multi-period setting, temporary shocks might not trigger reshoring as current losses are compensated by future expected returns; furthermore, the already-paid sunk cost of offshoring does not enter the firm's

[24] The question in the survey asks whether reshoring/nearshoring has occurred in the past three years and whether it is planned for the next year.

optimization problem anymore, while relocating may involve additional costs, making the choice less viable.

The decisions to offshore and reshore production are therefore asymmetric in important ways and the presence of sunk costs makes the offshoring decision sticky, triggering hysteresis in firms' internationalization strategies. A shock like Covid-19, proxied by a large drop in sales, may have limited effects on the internationalization strategies of the firms if it is temporary in nature (or perceived so). Moreover, the model predicts that firm productivity and protectionist trade policies are, respectively, negatively and positively correlated with the probability to close plants abroad.

Our empirical evidence on Italian MNEs is consistent with the indications of the theoretical framework. Through the lenses of our model, we suggest that the Covid-19 shock has not been perceived as permanent and therefore (so far) impacted very little on firms' relocation decisions. This finding is also corroborated by the rapid rebound of world trade, which, despite lockdowns and disruptions, has largely recovered to its precrisis level. On the contrary, the long-term uncertainty brought about by shocks like the Brexit and the US increase in tariffs were considered as long-lasting and had a significant impact on the decision to reshore (or close foreign branches).

Relevant policy considerations emerge. Our simulations suggest that individual shocks might have limited impacts due to sunk costs, but also that the combined effect of multiple shocks can have a multiplying effect and trigger large responses. Hence, while it seems unlikely that the Covid-19 shock will lead to significant reshoring by itself, its combined effect with policy uncertainty or the adoption of protectionist measures is likely to impact relocation and future investment decisions by firms. To face the new conditions, countries and firms need to (re)balance global production efficiency and risk. Efficiency implies selecting only the "best" locations and suppliers, while diversification and some degree of redundancy, despite being costly, help to contain the risk of disruptions. Inward-oriented policies that reduce the diversification of suppliers and markets could be counterproductive precisely for the companies (and workers) they intend to protect. Reshoring may lower the country's overall exposure to foreign shocks but at the same time increase exposure to domestic ones. These policies seem to sacrifice efficiency for nothing as the gains in terms of risk management are unclear. And firms seem aware of this. As highlighted by the European Round Table for Industry (2021) firms are largely able to adapt autonomously to the new global scenario. For instance, when shops were closed because of lockdowns, many firms rapidly moved to target potential customers online through e-commerce.

However, there is one aspect that firms might not appropriately discount which leaves room for policy interventions. While firms are likely to know and manage very well their individual trade-off between efficiency and risk, they might not be well equipped to internalize systemic risk (Acemoglu; 2021). In a competitive market, to gain efficiency and get ahead of competitors, each firm might have an incentive to bear more risk than socially optimal. Country-level and multilateral policies might therefore be better suited to manage systemic

risks.

Successful policy measures should operate on two fronts.

First, they should aim at helping firms internalize the social cost of their decisions in terms of systemic risk. In this case, multilateral outward-oriented diversification policies seem preferable. For instance, to improve the resilience of firms, policies might point towards supporting stockpiling and liquidity. To enhance efficiency, MNEs tend to optimize logistics and minimize storage costs. However, in a world of increasing uncertainty, a focus on the efficiency of transportation and production will leave firms vulnerable to shocks. International cooperation programs for the stockpiling of essential goods, especially intermediates, at the global level could ensure their availability in difficult times. This is particularly important for developing countries.

Second, policies need to consider the structural aspects that make locations attractive. These structural aspects include the business environment, regulation, logistics, labor cost and productivity. Policies that directly aim at affecting firms' decisions are unlikely to be the best option. Subsidies or other immediate economic incentives are short-sighted as they are unlikely to be effective and are probably inefficient. Moreover, to contrast the negative effects of offshoring, rather than removing the gains, policies could aim at compensating the losers of the globalization process (Blanchard and Tirole; 2021; Antràs; 2020; Rodrik; 2018). This may involve redistribution as well as avoiding workers' displacement or providing workers with new skills through specific training programmes.

In conclusion, Covid-19 did not trigger large reshoring waves, at least among Italian firms. MNEs suffered, but also adapted better to the changing conditions and are not easily giving up on the long-term investment undertaken to build their international network. Reshoring has not been chosen by firms and policy makers can hardly know what is better for each firm. Policy uncertainty and protectionism, especially if combined with economic shocks, might force firms to revise their strategies in inefficient ways. In a post-Covid world, some reorganization of global production might take place and is probably desirable, but we must not sacrifice the gains to reduce the costs. This is where policy must play a role: managing systemic risks and alleviating economic and social costs.

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A Appendix

A.1 Tables and Figures

Table A.1: Descriptive Statistics

	Non MNEs	MNEs
Age	40.74	43.57
	(23.04)	(23.01)
Revenues	28453.2	57495.9
	(181856.6)	(412257.6)
% of revenues from exports	0.179	0.395
	(0.274)	(0.323)
Employment	90.5	157.6
	(727.9)	(792.7)
Labor productivity (ln)	5.385	5.647
	(0.902)	(0.875)
N	2809	443

A.2 Theoretical model

Consider a small open economy in which firms sell domestically whatever they produce but have, in each period, the possibility to choose whether to locate their production within the domestic borders or abroad. There is a differentiated sector characterized by a continuum of varieties and an homogeneous sector used as numeraire.

On the demand side, the economy is composed of a large number of individuals with CES preferences over a variety of goods indexed by $\omega \in \Omega$. The utility of the representative consumer is given by:

$$U = (1-\alpha)\, lnq_0 + \alpha lnQ \tag{10}$$

where α is parameter capturing the relative importance of the two goods for the representative consumer; q_0 denotes the quantity of the homogeneous good and Q is a Dixit-Stiglitz CES aggregator of the quantities of the differentiated varieties $q(\omega)$ taking the form:

$$Q = \left(\int_{\omega \in \Omega} q\left(\omega\right)^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}} \tag{11}$$

with $\sigma > 1$ being the (constant) elasticity of substitution between every pair of varieties and Ω being the set of all varieties available to consumers.

Note that the above utility, being a Cobb-Douglas, features a unit elasticity of substitution across sectors. This is a convenient simplifying assumption as it implies that industry expenditure shares are constant: consumers allocate

a fraction α of their spending to the differentiated sector. Similarly the use of Dixit-Stiglitz CES preferences, although restrictive, greatly simplifies the analysis and is standard in the literature. These assumptions are consistent with Melitz (2003). In each period, consumers maximize their utility subject to a budget constraint.[25] They allocate spending across sectors according to α and across varieties to maximize Q. Demand for the numeraire can be obtained residually, while demand for the generic variety is given by:

$$q = \alpha Y P^{\sigma-1} p(\omega)^{-\sigma} \tag{12}$$

where Y is expenditure, $p(\omega)$ is the price of the single variety and P is the ideal price index:

$$P = \left(\int_{\omega \in \Omega} p(\omega)^{1-\sigma} d\omega \right)^{\frac{1}{1-\sigma}} \tag{13}$$

On the supply side, the homogeneous good is produced with labor only with a constant-returns-to-scale technology under perfect competition and is freely tradable. Factor endowments are large enough for the homogeneous good to be always produced. Workers are identical and mobile across sectors so that the wage rate is unique. The differentiated sector is characterized by monopolistic competition among infinitely living firms. Each variety is produced by a single firm whose technology features increasing returns to scale stemming from a fix cost combined with a constant marginal cost of producing. In each period, the variety ω producer takes prices as given and decides whether to manufacture it at home or abroad in order to maximize profits.[26] We also allow for the possibility of going out of business, i.e. not producing at all.

Firms employ only one input (labor) according to the technology

$$q(\omega) = \frac{\varphi(\omega)}{a z(S)} l(\omega)$$

where $l(\omega)$ is the amount of labor employed, $\varphi(\omega)$ is the time-invariant firm-specific level of productivity, a is a unit labor requirement parameter and

$$z(S) = \begin{cases} z > 1, & \text{if } S = 1 \\ 1, & \text{otherwise} \end{cases}$$

is a parameter that allows for a generic loss of productivity whenever firms produce abroad. When firms do not produce, $q(\omega) = l(\omega) = 0$.

In addition to the variable cost paid to rent labor (w, w^*) and the trade costs to import the product back into the home market in case of offshoring

[25] We assume that consumers do not save, therefore, they solve the same optimization problem in every period. We drop the time index to simplify the notation.

[26] A slight generalization would include also headquarter services. In that case, the intermediate good, whether offshored or not, must be combined, in fixed proportions, with headquarter services in order to supply the final goods to the consumer. Supplying a unit of final good requires a_m units of the intermediate good and a_h units of headquarter services whose cost is p_h. Domestic marginal cost of production is, hence, $a_h p_h + a_m w$. Since headquarter services do not play an explicit role in our analysis, we omit them for simplicity.

($\tau \geq 1$), firms face two additional types of costs that do not depend on the scale of production: fixed costs (f , f^*) which are paid *every period* if and only if the amount produced is positive and may differ across locations; and sunk costs (F, F^*) which are paid *only once* when the firm starts producing in a location. Starred variables refer to the foreign market. Both fixed and sunk costs are set equal to zero while the firm remains out of business.

Under CES preferences the optimal price takes the form of a constant markup over the marginal cost,[27] $p_S(\omega) = \frac{\sigma}{\sigma-1} MC_S$, that can be used to compute the per-period profits from domestic sales in status S as in equation 6, and the parameter B is defined as:

$$B = \alpha Y P^{\sigma-1} \frac{1}{\sigma} \left(\frac{\sigma}{\sigma - 1} \right)^{1-\sigma} \tag{14}$$

and is a term proportional to the endogenous residual demand.[28]

A.3 Numerical algorithm

The parameters used in the simulations are listed in Table A.2. The first group includes the inter-temporal discount factor (ρ) and the constant elasticity of substitution in the CES function (σ), values are standard in existing literature. As quite standard in this literature, we assume that labor productivity (φ) is drawn from a Pareto distribution The parameters listed in the second group were chosen in order to generate a simulated distribution sufficiently close to the one observed in the data. Finally, the levels of parameters in the third group have been chosen with no connection to the data, but their relative levels are in line with some observed facts and in line with Antràs (2020). In particular, the domestic cost of labor is assumed to be higher than abroad ($w > w^*$) but producing abroad requires a larger unit requirement of labor ($z^* > z$). Similarly, sunk costs of offshoring and fixed costs for producing above are higher abroad ($F < F^*$ and $f < f^*$). Finally, the cross-border costs are assumed equivalent to a 20% *ad valorem* tariff.

Figure 6 describes the simulating algorithm. At time 0 all firms start being inactive ($S = 2$). They observe the realization of the own productivity level (φ), the parameters and the realization of period shocks, if any. Then, each firm decides whether to remain inactive, produce domestically or offshore by comparing the discounted expected profits in the three cases. Notice that, whenever the firm decides to change its status in terms of location, a sunk cost must be paid, lowering the current-period level of profits. Nevertheless, firms may still decide to change status if such reduction is more than compensated by an increase in the expected discounted flow of future profits. After the choice is made, the firm status is updated and the algorithm moves to the following period.

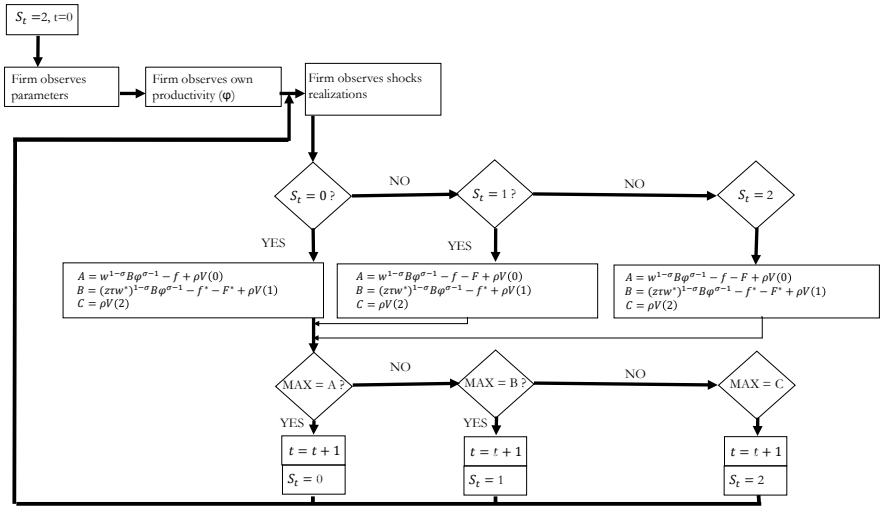
[27] The firm that produces the quality ω chooses $p(\omega)$ to maximize the profit $p(\omega)q^D(\omega) - MC_S q^D(\omega)$, taking as given the demand level derived in 12.

[28] Although B is endogenously associated with the level of demand in the the industry equilibrium, as Antràs (2020, p. 17) points out, "its determination would not undo the comparative statics".

Table A.2: Parameters used in the simulations

Parameter	Value	Description
ρ	0.95	Inter-temporal discounted factor
σ	2.65	Constant elasticity of substitution (CES)
Generalized Pareto distribution of firm productivity (φ):		
Shape	0.25	
Scale	0.50	
Location	0.50	
F	1200	Sunk cost in case of reshoring
F^*	5500	Sunk cost in case of offshoring
f	100	Domestic fixed cost
f^*	300	Foreign fixed cost
w	60	Domestic labor cost
w^*	40	Foreign labor cost
a	1	Unit labor requirement
z	1.2	Foreign unit labor requirement
B	2000	Demand level
τ	1.2	Cross-border costs

Figure 6: Algorithm of the numerical simulation



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