

Wolf, Gerome

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Pandemics, payments and fiscal policy: Lessons from four years after the outbreak of Covid-19

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Gerome Wolf

Pandemics, Payments and Fiscal Policy: Lessons from Four Years after the Outbreak of Covid-19

The outbreak of an unprecedented global health crisis about four years ago put the very foundations of our communities, economies and politics to the test. Policymakers had to learn and react fast to limit human and economic costs at the same time. While the role of health policies such as non-pharmaceutical interventions (NPIs) and the arrival of vaccines for the overall pandemic performance (Baum et al. 2021) are undisputable, certain measures turned out to be more effective than others (Faria-e-Castro 2021; Levelu and Sandkamp 2022; Bayer et al. 2023). Whereas explicit measures such as shelter-in-place orders and shop closures received much attention and met widespread support, less is known about the effectiveness of pre-existing characteristics inherent in the transactional nature of economic interactions. This article highlights the importance of existing markets, technological features such as payments systems and economic decisions at the transactional level in combating the spread of a contagious disease while stabilizing aggregate economic activity.

First, e-commerce, i.e., the sale of goods and services online, offers the opportunity to shift consumption from established, contact-intense shopping towards a less contact-intense mode that substantially reduces consumers' exposure to infection risk and, ultimately, potential death.

Second, recognizing that certain means of payments do not only facilitate the exchange of goods and services but provide additional benefits inherent to them, such as access to credit for consumption smoothing as it is in the case of credit and debit cards, underlines an important channel in consumer spending to cope with adverse shocks. Also, the means of payment may affect consumers' choices directly due to strong complementarity and fragmentation in markets (i.e., some goods can only be purchased with a particular means of payment).

The interaction of e-commerce and electronic payments provides the least contact-intense mode of consuming that is attainable. About half of all online spending is conducted with credit cards; the other half stems from other electronic payment systems with similar characteristics, namely low duration of transaction completion, some form of credit smoothing (e.g., buy now, pay later) and minimum in-person interaction.

Lastly, given that NPIs and stabilization measures can interact with the two aforementioned aspects of

consumer spending, their implementation can jointly determine the effectiveness of the endogenous reallocation of consumption. Generous fiscal support such as direct cash transfers or unemployment insurance can render the substitution from offline to online consumption more effective as (a) the income effect and (b) lower risk premiums both amplify and accelerate consumer spending and the fiscal multiplier during pandemics.

HOUSEHOLD SPENDING DURING PANDEMICS

As the virus spread and became first priority to policymakers, scientists and the public, a large body of literature and evidence on the (potential) consequences and implications of the pandemic evolved. Early descriptive evidence on household spending was produced for the US, such as an "economic tracker" (Chetty et al. 2020) that showed an overall drop in economic activity as a consequence of social distancing and decreased consumption spending mainly by high-income households. Baker et al. (2020), using transaction-level household financial data, found consumption spending reactions

KEY MESSAGES

- Existing and well-functioning e-commerce markets and electronic payment systems improve pandemic performance by providing an effective layer of protection against contagious diseases
- Covid-19 caused a major reallocation shock to consumer spending
- Revolving credit is an effective though underutilized instrument for consumption smoothing during times of economic slack
- Generous fiscal support incentivized social distancing stronger and longer and had heterogeneous effects across the wealth distribution



Gerome Wolf

is a Junior Economist and Doctoral Candidate at the ifo Center for Macroeconomics and Surveys. His research interests lie at the intersection of macroeconomics, financial markets, and machine learning.

Table 1

Consumption Expenditures for Germany			
	2015	2019	2020
Private consumption expenditures (billion euros)	1,602.97	1,804.53	1,708.67
Retail turnover (billion euros)	528.23	595.42	635.24
E-Commerce share (percent of total retail)	9.1	13.3	16.0
E-Commerce share (percent of total in Mastercard SpendingPulse)	-	14.0	15.5
E-Commerce share (percent of total private consumption expenditures)	3.0	4.4	6.0

Source: Federal Statistical Office; Mastercard; own calculations.

particular to the means of payment, points of sale and types of goods. Coibion et al. (2021) analyzed the relationship between public mental health and different public containment strategies in Italy, Sweden, and the UK, and found different pre-existing culturally relative dispositions towards death-related anxiety as well as country-specific sensitivities towards the pandemic. Born et al. (2021) constructed a counterfactual scenario for Sweden for how the pandemic would have evolved if this country had imposed an early lockdown (which it in fact did not); they concluded that the number of infected and deaths could have been reduced significantly without additional output loss, since much of the social restraint happened voluntarily.

Lastly, Mishra et al. (2022), documenting stylized facts for 47 economies based on credit card data scaled to represent total consumer spending, found that the share of online transactions in total consumption increased more in economies with higher pre-pandemic e-commerce shares as well as persistently higher online spending shares in retail and restaurants.

Clearly, containing the transmission of a contagious disease at the transactional level was a key policy prescription, even under limited knowledge about the virus' characteristics. One way to achieve a fast reduction of contacts in the short-run was to restrict consumption and work opportunities that would usually happen in-person and, as a consequence, suppress economic activities, resulting in income losses, losses of tangible and intangible capital, as well as higher uncertainty.

Above and beyond internalized containment measures, households had own incentives to reduce the number of contacts to decrease their infection risk. Allowing for a multi-sector consumption and production economy, incorporating infection risk in the household's optimal consumption decision would induce the household to endogenously reallocate consumption from the contact-intensive, high infection risk to the less contact-intensive, low infection risk consumption mode (Krueger et al. 2022). In other words, in a two-sector economy with online and offline consumption, households could purchase goods and services online rather than in-person and effectively reduce the degree of contact intensity, regard-

less of muted in-person consumption opportunities. In addition, active NPIs would increase the price of in-person consumption, mainly through transaction costs, relative to consuming remotely or after delivery, providing an even stronger incentive to shift towards online consumption and electronic payments. All in all, Covid-19 can be seen as a large reallocation shock (Barrero et al. 2020).

Indeed, e-commerce seems to have played a major role in the containment of the virus. The Brookings Institution titled early on in April 2020 that "e-commerce—defined broadly as the sale of goods and services online—is emerging as a key pillar in the fight against Covid-19. [...] In China, e-commerce companies played a key role in keeping the residents of Wuhan supplied during their two-month lockdown earlier this year."

German private consumption expenditures accounted for approximately 52 percent of total GDP in 2019. For many other countries this share goes up to 80 percent, with some countries experiencing rapid growth in private income and consumption, and others decreasing relative weight of that component of total output. Also, the composition of private consumption expenditures changes over time as new products and services appear, and markets adjust to serve changing consumer preferences. E-commerce has seen continuous growth in the US, amounting to 5 percent of total consumption expenditures in 2007 (USD 117 billion) to 8 percent in 2017 (USD 160 billion), according to Dolfen et al. (2023).

For Germany, e-commerce expenditures accounted for about 3 percent of total consumption expenditures in 2015 but doubled within five years. Within retail, this share increased by seven percentage points within five years, to 16 percent in 2020.

Apparently, existing e-commerce markets (or the ability to rapidly expand them) provide an insuring capacity to shift¹ consumption from contact-intensive to less contact-intensive channels while maintaining economic activity. From a theoretical point of view, the elasticity of substitution can be thought of as a technological constraint that is a function of market structure. The higher the elasticity of substitution is, the easier it is to switch between inputs and maintain the same level of utility or productivity without incurring costs. An additional reduction of physical interactions stems from payment systems that facilitate the transactions. While electronic payment systems such as debit and credit cards are commonly used in some economies such as the US or the Nordics (50-70 percent of citizens aged 15+ owned a credit card in 2017), even some developed economies such as Germany are surprisingly cash-based (53 percent of citizens aged 15+ owned a credit card in 2017 but 74 percent of all transactions were cash-based; see Deutsche Bundesbank (2017)). The determinants of payment

¹ This capacity is also referred to as the elasticity of substitution.

systems adoption are an interesting subject to study in its own right, but private incentives such as rewards and cashbacks, regulations such as interchange fees and cultural stances towards means of payment and debt (e.g., anonymity and moral standards) seem to be important (Humphrey et al. 1996; Schuh et al. 2012; Kay et al. 2014).

E-commerce relies mainly on well-functioning electronic payment systems,² which facilitate least contact-intensive interaction on both transactional methods.

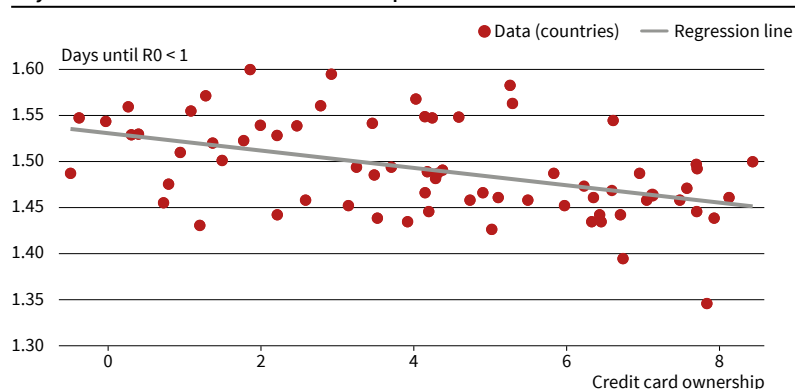
Figure 1 shows, at the country-level, how a larger penetration of credit card ownership was associated with a faster decline in the virus's reproduction number,³ a critical indicator quantifying the multiplicity of an infected individual and used by policymakers to plan their responses. This plot provides suggestive but not necessarily causal evidence, even after controlling for income per capita, that payment systems such as those used on e-commerce platforms are associated with a faster containment of the virus.

Credit cards are not only a means of payment but provide, as the name suggests, access to credit (Fulford and Schuh 2018). Unsecured, revolving credit is the most common form of consumer credit and is also the source of debt that is the easiest to access (Fulford and Schuh 2023). Therefore, consumption decisions operated through a particular payment system exhibit not only strong product and service complementarities and fragmentation, meaning that certain goods and services can only be purchased through a particular means of payment, but also a channel to incorporate credit as a means of consumption-smoothing (Fulford and Schuh 2017; Hundtofte et al. 2019). With credit as an additional instrument to allocate consumption inter-temporally, borrowing conditions may affect the consumer choice. Monetary and fiscal policy can affect borrowing costs directly (e.g., through the nominal interest rate) or indirectly (e.g., through unemployment insurance or direct transfers), whereas different households may face different financial frictions or borrowing costs. For example, more financially healthy households enjoy more favorable borrowing conditions, in terms of higher credit volume and/or lower interest rates. Also, households that reveal more information about themselves through a long spending or credit history (e.g., by using electronic payment systems) can be more appropriately assessed in terms of risk to the lender, which should be reflected in the costs of debt (Kotkowski and Polasik 2021). Under informational frictions (or simply limited information), these costs of debt tend to be higher relative to the more transparent borrower.

² In fact, the reason why Mastercard put an end to their Maestro system is that "it wasn't suitable for online retail platforms anymore."

³ Values above one would lead to an exponential spread of the virus while under a value below one the virus would mechanically die off after some time without additional interventions.

Figure 1
Days until $R_0 < 1$ vs. Credit Card Ownership



Source: The World Bank; author's calculation.

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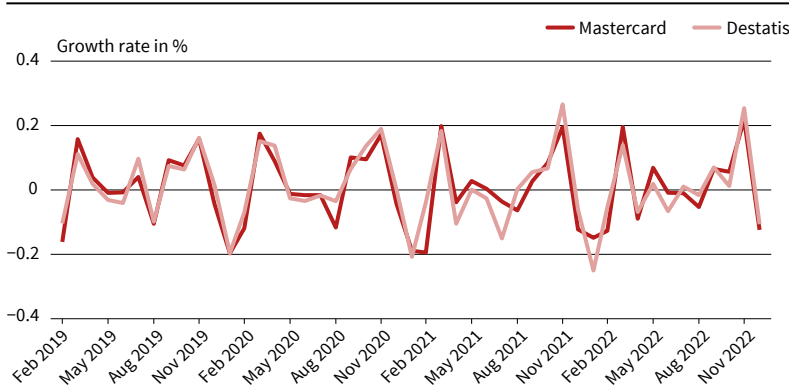
As monetary and fiscal policymakers responded to the pandemic to stabilize incomes and risk premiums, borrowing conditions for households and firms remained largely unchanged, despite a bleaker economic outlook. This should have also improved households' consumption choices if they used credit cards not only for facilitating transactions, but also tapping them as readily available source of credit to smooth consumption against adverse income and health shocks (Sandri and Grigoli 2022; Baker et al. 2023). In theory, the reallocation effects should differ across the two regimes, with one regime characterized by rather accommodative (or generous) fiscal or monetary stances, and the other regime being rather austere (or less generous) if the risk premium channel matters; consequently, the economic effectiveness in terms of the fiscal multiplier would differ as well (Kinda et al. 2022).

(BIG) DATA FOR PANDEMICS AND CONSUMPTION

Scarcity of timely data and information on the behavior of the virus, households, and businesses posed major challenges to coordinate appropriate policies to balance adverse direct health effects and economic costs. Four years after the onset of the Covid-19 pandemic, policymakers and researchers are in a better position to assess the direct and indirect effects of the pandemic and related policies by drawing from relatively high-frequency data (for economic indicator standards) of daily epidemiological and economic outcomes.

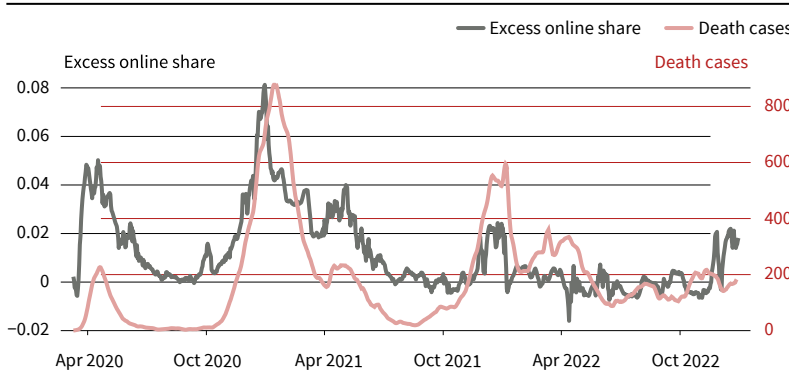
Epidemiological indicators were reported on a daily basis first, allowing to compare the predicted infections and death cases from a standard epidemiological SIR (susceptible-infected-removed) model (Calabrese et al. 2023) with the actual numbers to capture exogenous variation ("shocks") that households did not foresee. Grounded on consumer theory, household consumption should react to (adverse) income and health shocks by scaling down overall consumption. Although reported infection numbers were omnipresent among the public, there was substantial

Figure 2
E-Commerce, Destatis vs. Mastercard



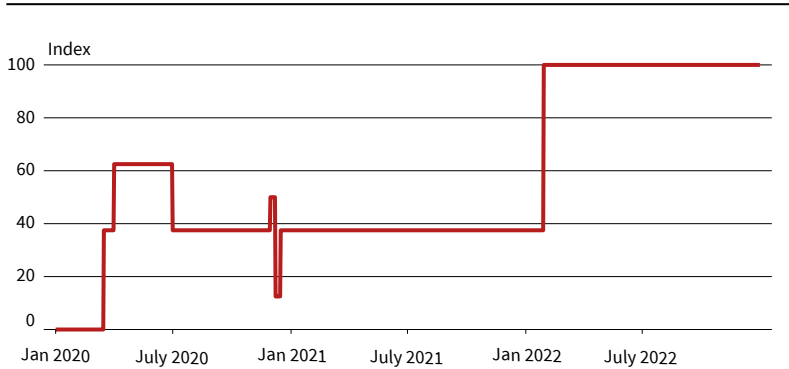
Source: Mastercard SpendingPulse; Federal Statistical Office; author's calculations. © ifo Institute

Figure 3
Excess Online Share vs. Death Cases, Weekly Moving Averages



Source: Mastercard SpendingPulse; Our World in Data; author's calculations. © ifo Institute

Figure 4
Economic Support Index (OxCGRT)



Source: The Oxford Covid-19 Government Response Tracker (OxCGRT). © ifo Institute

measurement error due to limited testing capacities and timely assessment capabilities. The measurement error in the reported number of covid-related deaths is arguably much smaller and, as death rather than an infection is the ultimate consequence that households want to avoid by changing behavior (Coibion et al. 2021), the number of deaths was chosen as a shock variable.

Daily data for Germany from Mastercard provides real-time information on households' consumption expenditures at the national and subnational level

across different spending categories and spending channels, i.e. online and in-store transactions.

These nominal expenditures were extrapolated by Mastercard to be representative of all consumption expenditures across all payment types, based on aggregate sales activity in the Mastercard payments network, survey-based estimates for other payment types (including cash), and broader macroeconomic factors. As Figure 2 illustrates, online spending from Mastercard's Spending-Pulse tracks the official statistics by the Federal Statistical Office (Destatis) very well. The correlation coefficient between the monthly growth rates of Versand- und Internet-Einzelhandel (i.e., e-commerce) reported by the Federal Statistical Office and those transactions measured by Mastercard is about 0.9, and the e-commerce share computed based on Mastercard data (15.5 percent, 2020) matches the e-commerce share reported by the Federal Statistical Office (16.0 percent) almost exactly (Table 1).

Importantly, this procedure ensures that all electronic payment types that offer some form of credit smoothing are included, not only credit cards from the Mastercard network.

Figure 3 shows weekly moving averages of the excess online spending share (share of online transactions in total expenditures) for 2020-2022 relative to its value on the same day-month pair in 2019, which is taken as the reference level in the absence of a pandemic (LHS, solid line). This year-over-year differencing does not only capture the excess amount but also removes seasonal effects (Brave et al. 2021) as well as variation due to changes in the price level. The dashed line on the RHS shows weekly moving averages of the reported number of deaths.

Clearly, both time series co-move strongly with each other, indicating a positive relationship. This does not, however, account for physical shop closures or endogeneity but rather suggests that within the consumption basket there was a substantial reallocation from in-store consumption towards online consumption, reaching peaks of about 5 percent higher online shares during the first wave in March 2020 and 8 percent during the second wave at the end of 2020. To put that into perspective, on that day total expenditures were 30 percent lower compared to the previous year but online expenditures were 50 percent higher, amounting to 400 million EUR in consumption expenditures, or 0.05 percent of GDP in that quarter on a single day.

Lastly, policy responses such as the stringency of implemented measures or the degree of economic support granted by governments were recorded by the Oxford Covid-19 Government Response Tracker (Hale et al. 2021) on a daily basis. The Economic Support Index by OxCGRT identifies periods where households that lost their jobs or couldn't work received direct cash payments covering less—or more—than 50 percent of lost salary, and periods where households (and firms) were provided with some form of debt or

contract relief, such as stopping loan repayments, preventing suspension of services like water, or banning evictions to a narrow or broader extent. As Figure 4 shows, the degree of fiscal support in Germany was rather low in the beginning but increased over the course of the pandemic.

SIMULATION RESULTS

What is the effect of an unanticipated increase in the number of deaths on the reallocation from contact-intensive, in-store consumption towards the less contact-intensive, online consumption channel and what are its dynamics? To answer this question, the aforementioned identified death shock series⁴ was projected on the endogenous variable of interest (Finck and Tillmann 2022), the (excess) online spending share at different horizons using the local projections method by Jordà (2005), including the stringency index⁵ of NPIs to control for “mechanically” limited consumption opportunities in the offline channel and the VDAX, an options-implied volatility measure to capture overall uncertainty that would dampen demand. The result is a so-called Impulse Response Function (IRF), which measures the marginal effect of the shock on the y-axis at different points in time along the x-axis (here days).

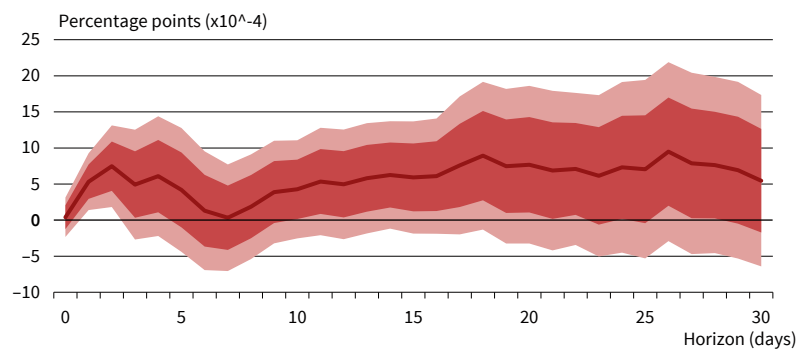
There is an initial increase in the online spending share in the first week after an unanticipated, one-standard-deviation increase in the number of deaths (about ten death cases) followed by a drop and a steady buildup thereafter. The distributed effect of the shock increases over time and is highly persistent, indicating that households adjust their spending habits over that horizon. The marginal effects appear to be small but accumulate over the simulation horizon of 30 days to around 2 percent higher online spending share compared to the old steady state. Ten unanticipated deaths would therefore translate into a 2 percent higher online spending share within a given month, equivalent to an inflow of around 1.6 billion EUR of consumption expenditures in the online sector.

Given that electronic means of payment often provide access to some form of credit for consumption smoothing, the intertemporal substitution decision by the households is subject to borrowing conditions. Monetary and fiscal policies stabilized risk premiums through accommodative stances, in addition to lower aggregate demand for credit and falling costs of debt during the pandemic. The degree of fiscal policy support can be quantified using the Economic Support Index by OxCGRT. By interacting the shock with the empirical CDFs (= cumulative density functions, see Born et al. 2020) of the different regimes (high economic support vs. low economic support) one can

⁴ The shock series was standardized, i.e., demeaned and scaled to have unity variance in order to interpret the shock size in standard deviations.

⁵ An index between 0 and 100, where higher values indicate more stringent measures.

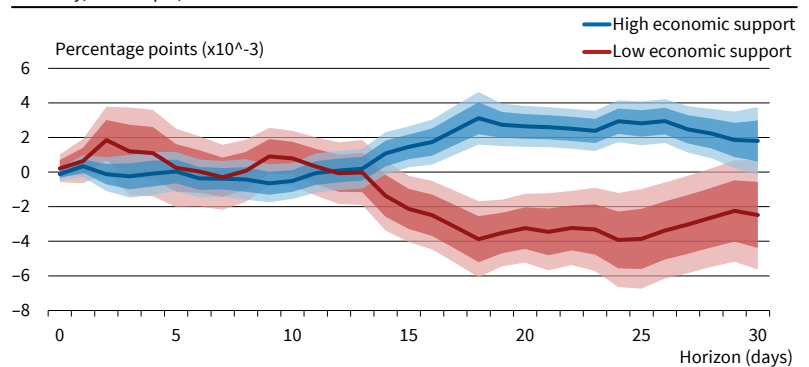
Figure 5
Impulse Response Function
Germany, full sample; online share



Source: Author's calculations.

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Figure 6
State-dependent Impulse Response Function
Germany, full sample; online share

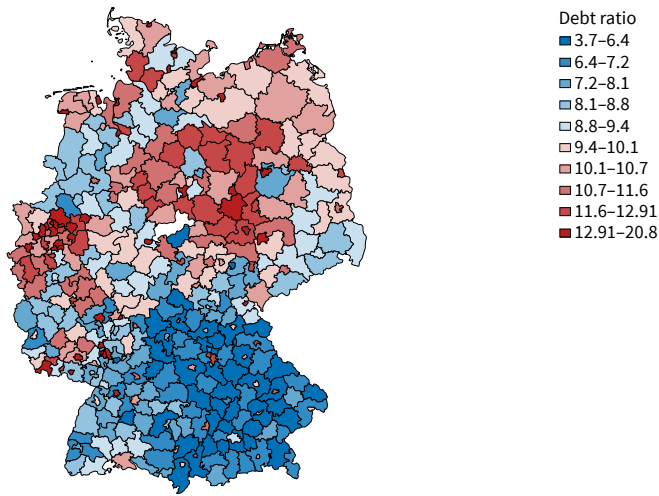


Source: Author's calculations.

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compute IRFs that show the state-dependent effects (Auerbach and Gorodnichenko 2012; Ramey and Zubairy 2018; Auerbach et al. 2020) of a death-cases shock to the reallocation between offline and online consumption. Indeed, the marginal effects seem to be much stronger in the high fiscal support regime, confirming a stronger incentive to substitute between offline and online spending if fiscal policy lowers the risk premium and electronic payments allow for credit smoothing. The two regimes' effects start to diverge after two weeks, with the cumulative effect in the high economic support regime amounting to 4 percent, an effect twice as high as in the unconditional IRF. The low economic support regime, on the other hand, invertedly mirrors almost perfectly the other regime's effect dynamics and magnitude. Two observations can be made from this simulation: First, the degree of fiscal support takes some time to show an effect on the substitution between offline and online consumption. Financial intermediaries might need some time to effectively pass on more favorable borrowing conditions through risk assessment to the households, and households may require some time to adjust their portfolios. Second, higher economic support appears to incentivize social distancing through stabilizing incomes. In the low economic support regime, households substitute away from online consumption and

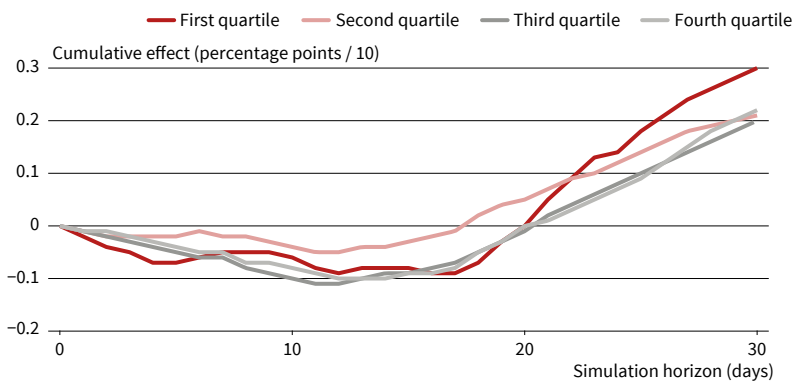
Figure 7
Private Debt (Number of Debtors/100 Inhabitants)



Source: Healthcare-Datenplattform; infas360.

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Figure 8
Impulse-Response-Functions by Debt Quartile, High Fiscal Support Regime



Source: Author's calculations.

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towards more in-person consumption and interactions, perhaps out of need to generate incomes despite infection risk and consume closer to where they work.

Lastly, there is large heterogeneity in initial asset positions of households, a fact that provides different incentives for how to allocate additional stimulus payments (Koşar et al. 2023). Households can either spend the additional money directly, save it to spend it later, or repay existing debt (Sahm et al. 2012). The more indebted a household is, the higher is the incentive to repay existing debt in anticipation of increasing borrowing costs once the stimulus is phased out (Koşar et al. 2023).

Figure 7 displays the heterogeneity of indebtedness across German counties. As spending data from Mastercard is available at the subnational level of Regierungsbezirke, each county had to be assigned to its corresponding Regierungsbezirk, a non-trivial task, since for many counties this level of aggregation does not exist in official statistics conventions and had to be inferred from geographic boundaries. Within each Regierungsbezirk the private-debt rate

(number of debtors/1000 inhabitants) was averaged and Regierungsbezirke were partitioned according to their quartiles.

Re-running the state-dependent simulation for four debt quartiles samples separately confirms the conjecture that less-indebted households (or counties populated by these households) have a higher marginal propensity to consume and a lower marginal propensity to save/repay debt when receiving fiscal support. Figure 8 shows that the cumulative reallocation effect towards online consumption lies in the low-debt quartile (1st quartile), about 1 percent point larger in the high-debt quartile (4th quartile) when those households are provided with generous fiscal aid, which is consistent with the findings of Chetty et al. (2020) and Drummond and Hasnine (2023) for the US.⁶

The simulation results are based on pandemic shocks at the national level. Even though spending and NPI data exist at the subnational level, one-day-ahead forecasts at the subnational level were missing. Most likely, local epidemic dynamics affect local consumption more strongly than national deaths and infections. This analysis, which can be easily done with a calibrated SIR model at the local level, remains to be concluded.

POLICY IMPLICATIONS

E-commerce and electronic payment systems can be considered as structural characteristics of an economy that are associated with greater resilience against a contagious disease. To be better prepared against a potential future pandemic, technological and legal conditions related to the progress towards digitization, such as public investment in research and development, appropriate data protection laws, and efficient processes in public administration bodies should be designed in such a way that e-commerce markets encompass the entire supply chain, including the payment systems, storage and delivery of goods and services that are ideally in line with sustainability aspects.

Recognizing electronic payment systems such as credit cards and debit cards not only as a means of payment, but through its overall penetration also as an effective instrument for consumption-smoothing and reduction of financial frictions in the economy would prescribe supporting higher electronic payment system adoption through private incentives, regulatory measures and cultural campaigns.

Fiscal and monetary policymakers, however, should be aware of the incentives and trade-offs they pose to households' consumption decisions. In particular, lockdown restrictions should not have been imposed without generous fiscal support—and also

⁶ The IRFs depicted here differ from the linear model and state-dependent model, as they show the cumulative effect and not the marginal effects at different time horizons.

not in an environment that did not provide much capacity to shift consumption from the contact-intensive to the less contact-intensive channel, in order to be as effective as possible in both pandemic as well as economic terms.

A thorough analysis of pandemics, e-commerce, payments and fiscal policy could inform about the extent to which automatic stabilizers such as regular unemployment insurance may have contributed to social distancing. More liberal economies such as the UK would have required more explicit policy interventions, such as the early lockdown it imposed, together with substantial fiscal stimulus hitting the public budget in order to combat the crisis, whereas social-market economies with automatic stabilizers such as Germany could have fared better without additional public expenditures, exhibiting lower uncertainty and also recovering faster.

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