How does grant design shape investment, output, and productivity in Europe?

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Abstract

This paper investigates the impact of government investment grants on investments, output and productivity across EU economies. We estimate Bayesian Vector Autoregressions for a wide range of EU countries using priors derived at the EU level. We then use a mix of impact restrictions as well as short-run and long-run sign restrictions to identify two types of grant allotments: demand-support and productivity-enhancing.

We find that, compared to demand-support grants, productivity-enhancing grants translate into much larger gains in investment and output as well. We also find that the permanent increase in productivity is due to the fact that such grants are allocated to more productive investments, such as intellectual property products. In contrast, demand-support grants are more likely to be allocated to replenishing physical capital, as shown by the response of investment in machinery and equipment.

The magnitude of the responses appears to vary substantially across European economies in our sample. We use the EIB Investment Survey to better understand these differences. We match the estimated responses with survey information to characterize the investment environment in each country. We find characteristics, such as the prevailing uncertainty, the cost of bureaucracy, or the degree of fragmentation, do explain part of the differences in the macroeconomic response.

Overall, our analysis emphasizes that the nature of grants and the rationale behind their allotment influence the macroeconomic benefits. Moreover, providing a business environment more suitable to investment also raises the impact of the public financial support to corporate investment.

Keywords: EU policy, Bayesian Vector Autoregression, Long-run restrictions
JEL codes: E22, E32, E62, C32

1. Introduction

The resurgence of industrial policy, particularly within the European Union, reflects a broader reassessment of economic strategy in response to recent global disruptions. In recent years, the European corporate ecosystem has withstand a string of global shocks. The COVID-19 pandemic, the war in Ukraine, and the increase in geopolitical and trade tensions have exposed vulnerabilities in critical supply chains, energy security, and the competitiveness of strategic sectors.

Magerman and Palazzolo (2024) examine the effects of deglobalization on the EU, highlighting both the benefits and drawbacks of reshoring measures. In a more recent article, Bontadini and Meliciani (2025) document the increasing reliance of the EU on external suppliers in key strategic sectors. The authors show that well-targeted industrial policies can enhance strategic autonomy and mitigate external vulnerabilities while maintaining trade openness.

The EIB (2025) Investment Report assesses strategic trends and investment needs to enhance European innovation and productivity. In particular, its second chapter emphasizes the need for well-targeted public investment to maximize its impact and crowd in private investment, while the third chapter examines the investment needs of firms, pointing to the importance of effective grant allocation and coordinated policy measures to maximise the supportive impact.

The renewed focus on industrial policy has provided fiscal authorities with opportunities to expand public investment, including the provision of investment grants to incentivize corporate spending. Recent spending trends reflect this shift. As illustrated in Figure 1, while grant allocation also varies over time, there is a notable increase in investment grants across Europe since 2020. Grant intensity in GDP averages .5% during the period from 2002 until 2025. It declines from a high rate of 0.7% in the beginning of the 2000s to a low of 0.4% before rebounding at the beginning of the COVID-19 pandemic. Figure 1 also indicates the wide dispersion in grant allocation across the 16 European countries considered, countries for which data coverage is not too sparse. The interquartile range varies from 0.7 pp of GDP in the beginning of the period, in 2002, to a low of 0.3 pp of GDP during the COVID-19 period.

As illustrated in Figure 1, there is a notable increase in investment grants across Europe since 2020. Figure 2 indicates that owing to the huge common shock the European countries were faced with, coordination in grant volumes across member states rose sharply around the pandemic. Interestingly, five years after the pandemic, grant intensity

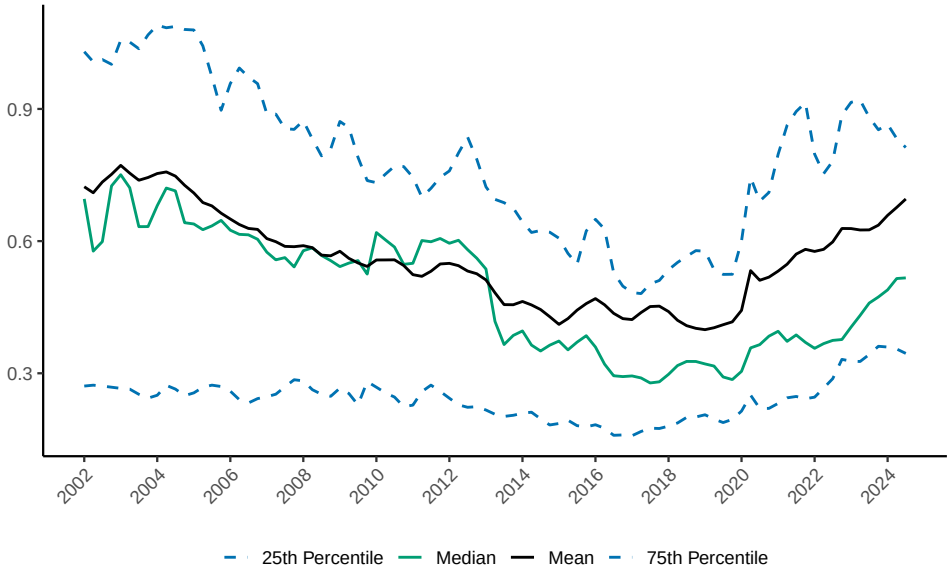

Figure 1: Share of Government Investment Grants in GDP over time.

remains well above pre-pandemic levels. Except for Estonia, every country in the sample shows a clear post-2020 ramp-up in grant allotments. That surge and the heightened cross-country correlations concentrated around 2020 reflects the common, large recession and the near-universal massive fiscal response to mitigate its effects. Coordination has eased since the immediate crisis, although many economies have stayed on broadly similar growth paths. After the COVID-19 pandemic, the renewed focus on industrial policy has provided fiscal authorities with opportunities to expand public investment, including the provision of investment grants to incentivize corporate spending. Recent spending trends reflect this shift.

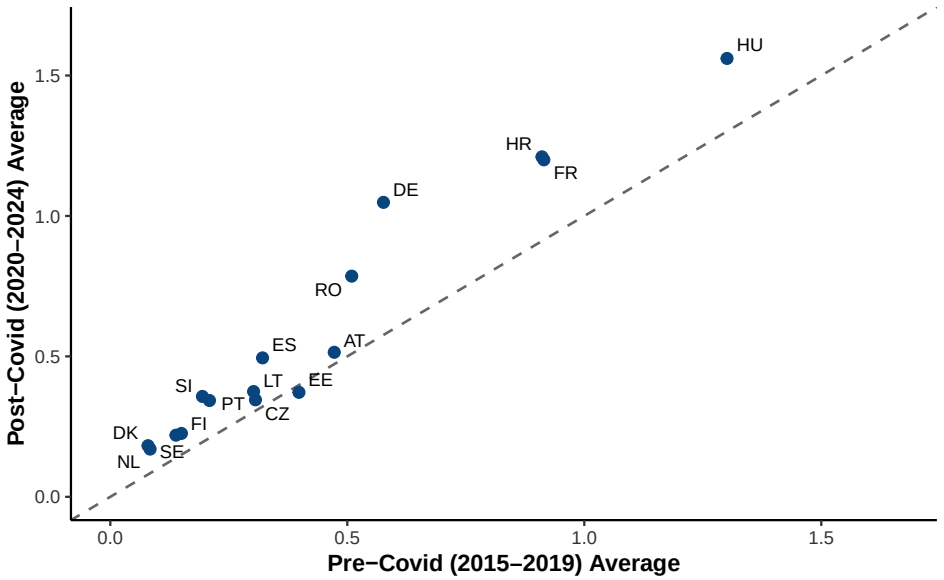

Figure 2: Pre- and Post-Covid trends in grant allotments.

In Figure 3, we observe that the pairwise correlation of grant share in GDP is much lower that of GDP growth. During most of the period, grant allotment is not coordinated, and the changes in intensity across EU countries are rather country-specific. However, we also observe periodic increases in the coordination of grant policies, which also appear to center around recessionary times such as the Global Financial Crisis in 2008 and the Eurozone Sovereign Debt Crisis. This pattern matters for the goals of our paper, as it clearly shows that, especially around recessionary times, a large portion of grants tend to serve the purpose of short-term demand support. This type of grant is likely to have a very different impact on the real economy than other grant schemes that are more targeted towards long-term objectives. However, these two types of grants are pooled into one aggregate in the National Accounts (D.92), and we are unable to observe them separately. Therefore, we rely on econometric techniques based on the co-movements of additional aggregates to disentangle these two types. From macroeconomic series, we identify grants aimed at demand support from those targeting higher productivity growth. In the absence of detailed macro-statistics available at the country level over a long period of time, the analysis aims at shedding some light on the role of grant design and the specific channels at play for their effect to materialize.

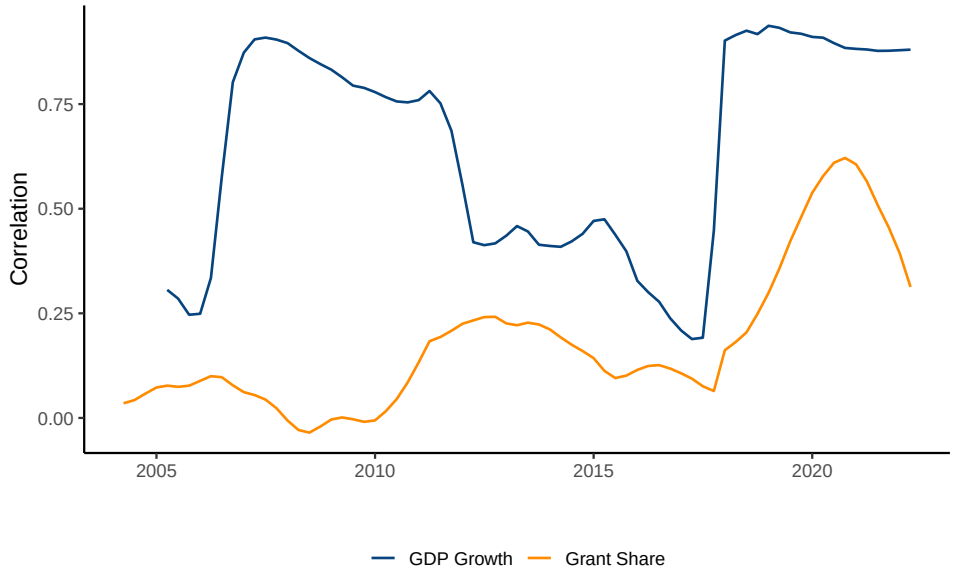

Figure 3: Pairwise cross-country correlation of Grants and GDP Growths.

We find that, while both types of grants have a comparable impact in the short-run, productivity-enhancing grants have a higher impact on long-run productivity and are able to raise investment and output almost twice as high compared to demand-support grants in the long-run. Using the breakdown of corporate investment across main types of assets, we show that productivity-enhancing grants are more effective because they support investments in assets associated with higher productivity. Conversely, demand-support

grants have almost zero impact on investments on intellectual property products, and are more likely to be allocated to replenish the capital stock of machinery and equipment. Meanwhile productivity-enhancing grants raise investment into intellectual property substantially. When investigating the diversity of country responses to the two types of grants identified, we also find that countries where firms report lower impediments to investments not only tend to allocate more of these grants towards investment demand, but also reap higher productivity gains from well targeted grants in the long run.

The rest of the paper is outlined as follows. Section 2 provides an overview of literature on fiscal multipliers and grant allotments. Section 3 presents the data and methodology. Section 4 discusses the empirical results, and finally Section 5 concludes.

2. Literature Review

Empirical work on fiscal policy investigates multiplier effects extensively. Ramey (2019) provides a thorough overview of research on fiscal multipliers following the GFC and finds that the majority of estimates for the expenditure multiplier lie in the small window of 0.6–1. Notable exceptions are periods of recession, when the multiplier tends to exceed this small window (see e.g. Auerbach and Gorodnichenko (2012, 2013) for a thorough investigation into regime dependence). The composition of spending also appears to matter, favoring public investment over transfers. Methodological choices also matter, as using external instruments to capture the expected part of fiscal policy can enlarge the multiplier effect.

A strand of literature closer to our paper investigates the multiplier effect on public investment. Deleidi et al. (2020) find Euro-area multipliers are close to one for public investments (on impact) and grow over time. Afonso et al. (2024) find that public investments are able to crowd in private investments. Ciaffi et al. (2024) show that public investment in R&D and intangibles leads to persistent output and productivity gains. All three of these studies report substantial cross-country heterogeneity both in terms of persistence and magnitude of the public investment multiplier.

How do grant allotments affect output and productivity? This question is more thoroughly investigated in the microeconometrics literature using firm-level data. Grants appear to have a meaningful effect on firm performance, especially on the short-to-medium run. Muraközy and Telegdy (2023) find evidence that firms who received subsidies from EU structural and cohesion funds increased their employment, sales, capital-to-labor ratios and labor productivity post-treatment. Evidence on TFP appeared to be more mixed and some of the treatment effects did fade out after a few years. Santoleri et al. (2024) show evidence that R&D grants improve firm performance through increased innovation

inputs. Furthermore, the effect is causal and attributable to actually receiving the funds as opposed to a selection type effect.

Alexandre et al. (2024) studies "booster" investment grants and documents that a second grant to the same firm yields larger productivity gains. The policy evaluation by Ferrara et al. (2024) investigated Covid-era state aid and reported that these grants helped firms remain active and preserve employees. However, treated firms also showed an increase in probability of default, which may signal that such short term measures do not translate into higher productivity.

To the best of our knowledge, no paper has yet attempted to investigate the propagation of government investment grants at the macro-level. We aim to fill this gap in the literature by using standard macroeconometric frameworks and aggregate data on grant allotments to evaluate their impact. In terms of econometric tools, our work resembles some of the applied econometric work developped to estimate fiscal multipliers. We use BVAR models and disentangle the causal effects of government investment grants by imposing identifying restrictions on their long-run multipliers. How we set these restrictions is largely motivated by research on public investments as well as evidence from grant allotments at the firm level.

3. Data and methodology

We begin by retrieving quarterly series for a set of macroeconomic aggregates for a selection [1] of EU economies. To keep the estimation parsimonious, we employ a small set of variables, thus our vector of endogenous variables is $y_t = [Y_t,\ RLPR_t,\ GRANT_t,\ INV_t^{NR}]$, where Y_t is Real GDP, $RLPR_t$ is Real Labor Productivity, $GRANT_t$ is Government Investment Grants and INV_t^{NR} is non-residential Investments. We define non-residential investments as total investments (gross fixed capital formation) less investment in dwellings. Beyond this proxy for corporate investment, we also consider disaggregating the investment aggregate into investments in machinery and equipment (INV_t^{ME}) and in intellectual property products (INV_t^{IP}).

All series except $GRANT_t$ are retrieved in seasonally adjusted real euros and enter into our models as four-quarter log-differences (year-on-year growth rates). Grants are retrieved in

[1] The 16 countries retained in the BVAR estimations are selected based on the availability of data on government grants: Austria, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Croatia, Hungary, Lithuania, Netherlands, Portugal, Romania, Sweden, Slovenia. We exclude Ireland and a number of small economies (e.g. Cyprus, Malta, Luxembourg) for which the grant allotment appears very sparse and highly heteroskedastic. Given that the country BVAR are not weighted by the size of the economy, their consideration would raise the risk of distorting our results.

unadjusted current prices, as the majority of EU economies do not report these seasonally adjusted. We then remove outliers and decompose the series into seasonal, trend and remainder components using the Bandara et al. (2025) MSTL algorithm. In order to reduce the noise in our estimates, we retain the trend component for the purposes and then deflate using the implicit GDP deflator. The government grant series then enters our models as four-quarter differences in $\frac{GRANT_t}{GDP_t}$.

Our empirical framework for estimating the impact of government grant shocks on the economy is Bayesian Vector Autoregressions (BVAR) identified with impact and sign restrictions. We begin with estimating a standard VAR equation in reduced form

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + u_t, \quad u_t \sim \mathcal{N}(0, \Sigma) \tag{1}$$

on a country-by-county basis. We estimate all models with $p = 4$ lags and Minnesota priors. For setting Bayesian shrinkage parameters, we follow a two-stage procedure. Let λ_c, and α_c denote the parameters for prior tightness and lag-decay estimated for country c, while $\psi_{c,i}$ denotes the vector of cross-variable scaling parameter in country c for each variable i. We set these for each country using the hyperpriors proposed by Giannone et al. (2015). Once we retrieved the optimized prior parameters, we aggregate across them to form a common EU prior. We denote these as $\tilde{\lambda} = median(\lambda_c)$, $\tilde{\alpha} = median(\alpha_c)$ and $\tilde{\psi}_i = median(\psi_{c,i})$. We then estimate the BVAR models for each country with the common EU prior. In each case, the models are estimated using Markov Chain Monte Carlo simulation with 10000 burn-in iterations and 50000 posterior draws for inference.

Our identification challenge is to isolate two very different types of government grant shocks: on the one hand, "demand-support" grants that mostly shift output by increasing spending and not necessarily by long-run productivity gains, and "productivity-enhancing" grants that raise productivity in the long-run, and that are more tilted towards the financing of R&D, human capital or assets with loner economic lives. The challenge lies in the fact that the short-run impact of both shocks is similar, as an increase in any type of grant raises fiscal expenditure, and subsequently output because of the accounting identity.

As the two types of grants are likely to have the same short-term effect, we rely on long-term impact restrictions to identify them. We use a combination of sign and zero restrictions on the contemporaneous and infinite horizon impulse responses following the sate-of-the-art methods of Arias et al. (2018). Our short-run restrictions are symmetric across the two types in order to pin down the contemporaneous propagation. The identification hinges on the restrictions we impose on the infinite-horizon responses to capture the long-run dynamics of the two different grant shocks. As outlined above,

the intuition behind this is that a grant targeted to enhance productivity should translate into lasting productivity gains, while other grants are merely allotted to boost demand.

To showcase the results of our empirical estimates we use impulse responses. We report the responses of investment, output and productivity in levels by accumulating the impulse responses of the changes across the 20 quarters after the initial allocation. Across the countries, we aggregate the individual responses to obtain the EU response by taking the median and indicate the differences with the 68% confidence band of the posterior medians retrieved from the 16 country-by-country BVAR impulse response estimates.

4. Emprical Results

4.1. Macroeconomic impact of government grant shocks

We first estimate a benchmark model comprised of four aggregates to gauge the impact of the two types of government grant shocks on the economies in our sample. We aim to be as agnostic as possible on the restrictions we impose in order to let the data speak. Table 1 below summarizes the restrictions used for our identification strategy.

Shock	Y	RLPR	GRANT	INV_NR
Demand-support (h=0)	+		+	
Demand-support (h=∞)		0		
Productivity-enhancing (h=0)	+		+	
Productivity-enhancing (h=∞)	+	+		

Table 1: Sign and Zero Restrictions for Structural Identification, 4-variate model.

Notes: "+" indicates positive restriction, "-" indicates negative restriction, "0" indicates zero restriction. h=0 refers to short-run (contemporaneous) restrictions, (h=∞) refers to long-run restrictions.

Our identifying restrictions are symmetric in the short run: both types of grant shocks raise fiscal expenditure (grants) and output in the short run. The identification as such hinges on the identifying restrictions we place on the infinite horizon impulse responses. We identify the two types of shocks primarily on productivity. Demand-support grants have no long-run impact on productivity, while productivity-enhancing grants permanently raise it. We impose a positive sign restriction on GDP on the long-run as well, however our results are robust to removing it. Figure 4 shows the impulse responses to grant shocks equivalent to a 1 percent contemporaneous increase in output.

As per our identifying restrictions, productivity-enhancing grants permanently raise productivity, while demand-support grants have virtually no impact on it. Unlike the

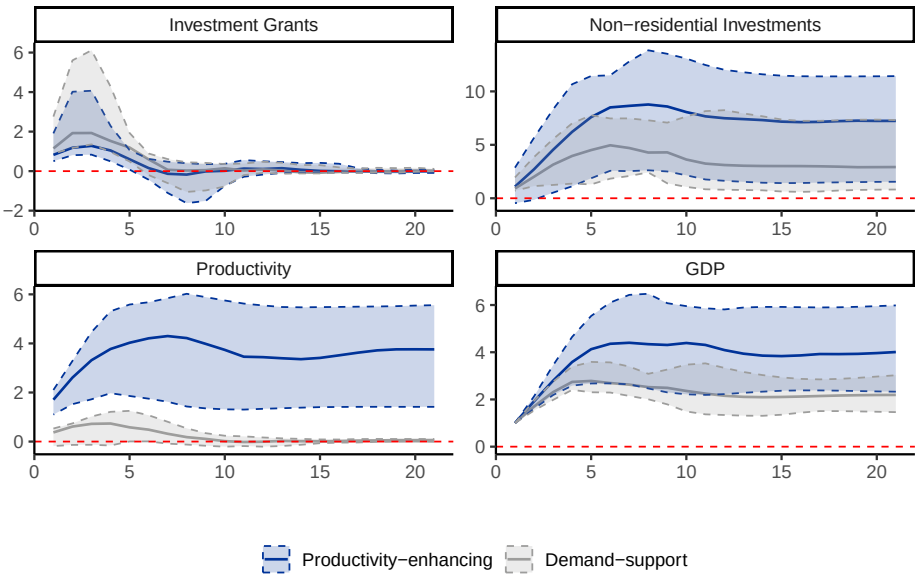

Figure 4: Median impulse responses to different grant shocks.

Notes: Solid lines indicate the point-by-point medians of the posterior median impulse responses from our BVAR estimation exercise. The shaded areas indicate the 68% confidence bands also calculated from the posterior medians.

canonical demand shocks identified in Blanchard and Quah (1988), in our results, demand-support grants raise output permanently. However, this long-run increase in output is markedly smaller, as the increase in productivity gains leads to an approximately twice as large increase in GDP over the long run from productivity-enhancing grants. While investment responds similarly to the two types of grant shocks, productivity-enhancing grants raise investment by a larger amount.

4.2. The two types of grants raise different types of investment

To further investigate the reason for the higher growth and productivity gains from productivity-enhancing grants, we estimate a second model where we replace the single overall investment aggregate with two of its sub-components: investment in machinery and equipment, henceforth ME and investment in intellectual property products, henceforth IPP. The cross-country stylized facts that motivate this split are clearly seen in Figure 5. IPP grows faster on average, exhibits lower cross-country variance, and is markedly more positively correlated with productivity than ME. Taken together, these regularities make IPP a natural candidate for transmitting persistent, innovation-type effects of policy: productivity-enhancing grants that directly support R&D, software, patents and other IP-type spending plausibly generate long-lived productivity gains, whereas demand-support grants that mainly boost conventional capital formation are more likely to raise ME and operate largely through demand and short-to-medium-run channels.

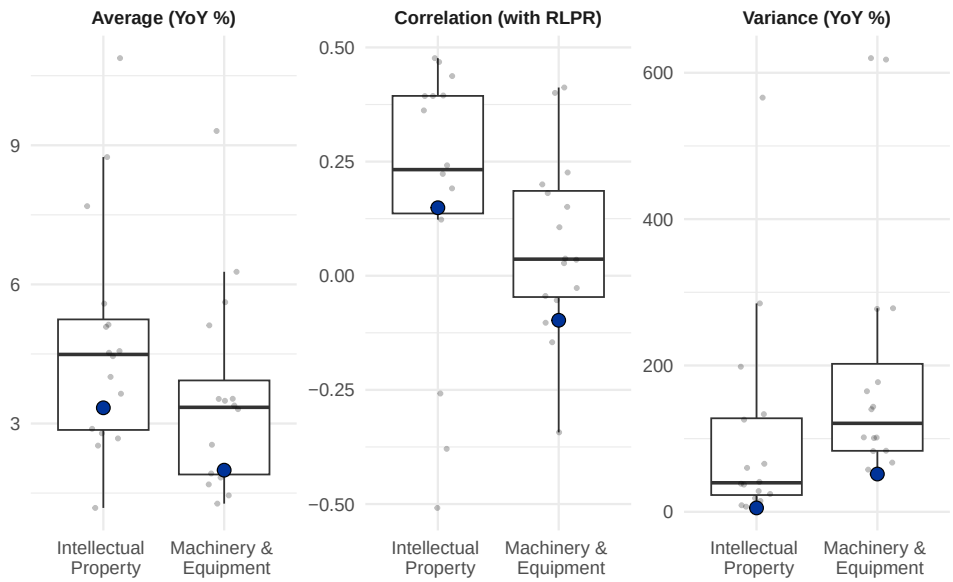

Figure 5: Stylized facts on investment aggregates.

We take the core aspects of the first identification strategy from Table 1, and guided by this evidence we impose additional restrictions on each investment aggregate, conditioning the infinite horizon response of IPP to be positive for productivity-enhancing grant shocks and the infinite horizon response of ME to be positive for demand-support grants. Conceptually, this implies that productivity-enhancing grants raise productivity more, as they are allocated to the more productive asset, while demand-support grants are more likely to be used for capital replacement. Table 2 summarizes the set of identifying restrictions.

Shock	Y	RLPR	GRANT	INV_ME	INV_IP
Demand-support (h=0)	+		+		
Demand-support (h=∞)		0		+	
Productivity-enhancing (h=0)	+		+		
Productivity-enhancing (h=∞)	+	+			+

Table 2: Sign and Zero Restrictions for Structural Identification, 5-variate model.

Notes: "+" indicates positive restriction, "-" indicates negative restriction, "0" indicates zero restriction. h=0 refers to short-run (contemporaneous) restrictions, (h=∞) refers to long-run restrictions.

As seen in Figure 6, the responses of the different investment aggregates seem to verify our main results and assumptions. Both types of grants raise investments in ME, however, this increase is significantly larger for demand-support grants. On the other hand productivity-enhancing grants have a persistently large effect on IPP investment. Such an effect is practically absent for demand-support grants.

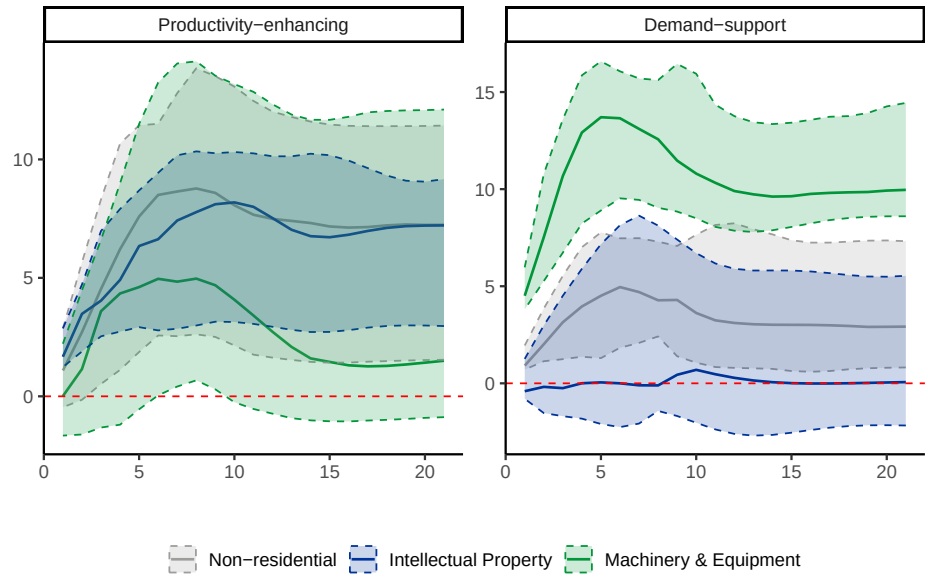

Figure 6: Median impulse responses of different investment aggregates.

Notes: Solid lines indicate the point-by-point medians of the posterior median impulse responses from our BVAR estimation exercise. The shaded areas indicate the 68% confidence bands also calculated from the posterior medians.

4.3. Factors explaining the diversity of the cross-country responses

While the previous results gave compelling evidence on the difference between targeted and generic investment grants, we observed that the confidence bands are quite wide, which implies heterogeneity across how different countries respond to these shocks. In order to investigate the source of this heterogeneity, we turn to the EIB Investment Survey [2]. We download country aggregates from the latest (2024) wave of the Investment Survey on Question 38 regarding long term barriers to investment (access to finance, business regulation and uncertainty) as well as Questions 89 and 91 regarding trade fragmentation and the cost of bureaucracy. We then split the sample along the aggregate responses into whether the country faces high or low impediment in a given factor. For Question 38, we define high impediment if the share of firms reporting the factor to be a major obstacle to long term investment is above the sample median. For Question 89, countries in the high-impediment group are those for which the economy-wide share of firms employing more than 10 per cent of staff for regulatory purposes is above the median. For Question 91, countries in the high-impediment group are those where the economy-wide share of firms facing difficulties in complying with differentiated regulatory requirements across EU economies is above the median.

[2]The EIBIS is an annual EU-wide survey that gathers qualitative and quantitative information on investment activities, financing needs and difficulties firms face. The survey covers both large corporates, as well as small and medium-sized businesses, and the aggregate indicators are derived from information obtained from approximately 12000 firms from the EU27. Further information on the survey, as well as the data we use is obtainable from the EIBIS website.

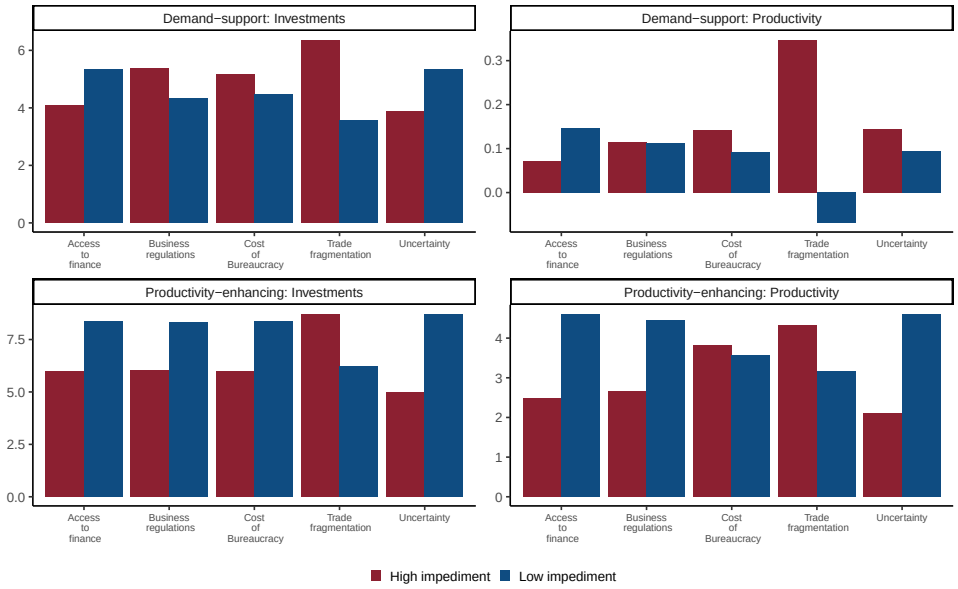

Figure 7: Investment Survey and BVAR outcomes.

In Figure 7, we report the short-run impact of demand-support grants and the long-run impact of productivity-enhancing grants aggregated across the EIBIS factors. Long-run impact is defined as the accumulated impact 20 quarters after the grant allocation, short-run impact is defined as the accumulated impact 8 quarters after the grant allocation. Our findings indicate that higher impediments to investment do in fact lead to lower investment response even for productivity-enhancing grants. These lower investments also lead to markedly lower productivity gains in the long-run, as countries in the low-impediment group realize almost twice as large productivity improvements.

Long-term barriers to investment, albeit to a lesser extent, do spill over to the short-run, as the demand-support grants appear to be less effective at raising investments in the presence of high uncertainty and low access to finance. Trade related disruptions, such as trade fragmentation and cost of bureaucracy appear to matter less for the effect of investment grants on investments and productivity, however this relationship might not be as straight forward. High cost of bureaucracy seems to impede investments in the long-run, however both high-bureaucracy costs and trade fragmentation does not appear to hinder investments in the short and productivity in the long-run. This however is more likely to be a selection bias, as firms more open to trade tend to be more productive and subsequently also invest more. High cost of bureaucracy impeding investments is more likely to be close to the true channel, as having to allocate a higher wage bill to deal with bureaucracy limits the firms' ability to allocate funds to investments.

In line with Baker et al. (2016), uncertainty is the dominant driver of cross-country

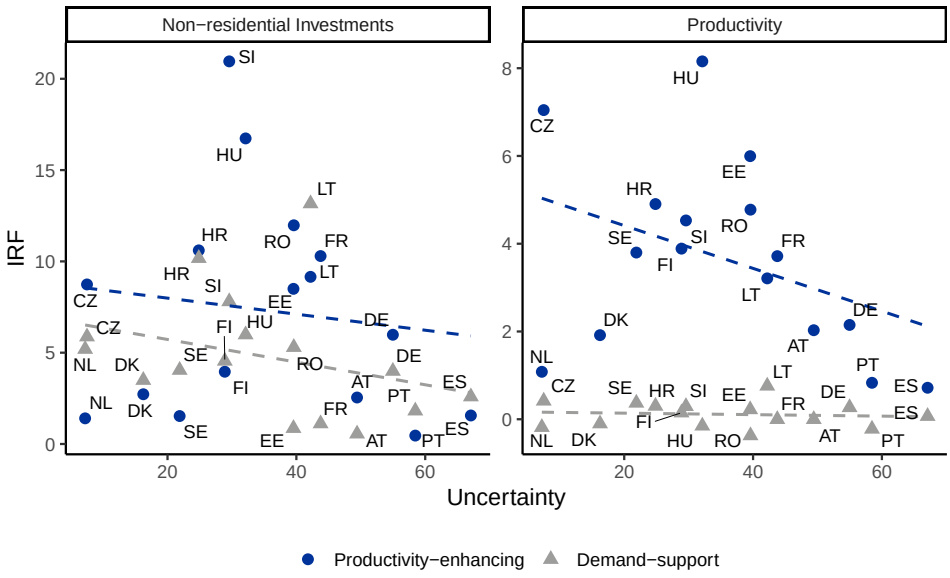

Figure 8: Impact of firm uncertainty on grant efficacy.

heterogeneity in how grant shocks transmit to investment and productivity. Figure 8 shows the negative relationship between the share of firms reporting high uncertainty (EIBIS Question 38) and the country-level accumulated responses from our BVAR estimates. Consistent with the results in Figure 7, high uncertainty is especially damaging for long-run outcomes. Although rising uncertainty reduces investment by similar magnitudes in the short and long run, its macroeconomic cost is larger because the short-run investment gains associated with demand-support grants rarely translate into productivity improvements, whereas investments induced by productivity-enhancing grants generate substantially larger productivity spillovers. Policy-wise, this suggests that combining grants with measures that reduce uncertainty, such as regulatory simplification, better contract enforcement, improved access to finance, will likely increase the payoff of targeted grant programs.

5. Conclusions and policy recommendations

In this paper, we investigated the impact of government grants on investments, output and productivity on a macroeconomic scale across a sample of EU economies. We employed a BVAR model identified with a combination of contemporaneous and long-run restrictions to isolate two distinct types of grant shocks. Both demand-support and productivity-enhancing grants have a similar short run impact on the economies through increasing fiscal expenditure in the short-run. Well targeted grants that increase productivity in the long-run, however, lead to a nearly twofold gain in GDP as well as higher investments. We find that the larger productivity gains from productivity-enhancing grants are a consequence of firms investing more productive assets, such as intellectual

property products.

When linking our results with EIBIS survey data, we find that high investment impediments hinder the effectiveness of productivity-enhancing grants in the long-run, while the short-run impact of demand-support support grants appears to be slightly more stable even in the presence of investment impediments. These conclusions lead us to believe that in order to unlock the full potential of productivity-enhancing grants to boost productivity, it is important to reduce regulatory barriers and keep uncertainty in check.

Overall, our analysis emphasizes that the nature of grants and the rationale behind their allotment influence the macroeconomic benefits. Moreover, providing a business environment more suitable to investment also raises the impact of the public financial support to corporate investment.

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