

WHAT CAN BE LEARNT FROM THE EFFECTIVENESS OF SLOVENIA'S ANTI-CRISIS STATE AID MEASURES DURING THE GREAT RECESSION: APPLICATION TO THE COVID-19 DOWNTURN

Abstract. *The aim of this article is to evaluate the impact of the anti-crisis state aid measures implemented in Slovenia between 2009 and 2015 to combat the Great Recession and use the insights gained to make an ex-ante assessment of a series of fiscal relief and stimulus measures adopted by the Slovenian government during the first 6 months of the Covid-19 pandemic. We find that state aid for R&D, employment and training increased firm revenue and employment growth over a 5-year period, while the specialised anti-crisis measures and the rescue and restructuring state aid failed to improve the performance of subsidised firms. Our preliminary assessment of Slovenia's Covid-19 fiscal policy response reveals that its size is exceptional compared to the previous recession and that the majority of the total fiscal stimulus was allocated through grants and allotted to individuals. Given the premium dividend the grants have shown in our empirical analysis of past anti-crisis state aid measures and findings from the literature on the fiscal multipliers, we expect the anti-corona fiscal policy actions to effectively mitigate the Covid-19 crisis' serious consequences in the short term.*

Keywords: *state aid, coronavirus measures, effectiveness, fiscal policy, firm growth, Covid-19*

Introduction

Covid-19 has truly shaken the global economy amidst the longest expansion recorded in modern history. Despite this, most developed countries' available policy tools at the outset of the ensuing recession have in many ways been limited by the specific economic situation prior to the pandemic. The post-Covid era is namely marked by four defining macroeconomic characteristics, unmatched in earlier recession periods. The first feature is

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the unprecedented scale of public debt in the advanced economies. IMF estimates for 2020 put it in the scale of over 130% of GDP and predict that developed countries will borrow 17% of GDP this year to fund USD 4.2 trillion (EUR 3.5 trillion) of deficit due to spending and tax cuts. The second feature is the extremely low interest rates even as public debt issuance soars. Ten-year government-bond yields are close to zero or even negative for most major developed economies. This is a consequence of secular stagnation (low trendline long-term growth rates) and the unhindered expansion of the monetary base since 2008. In the USA, the UK, the eurozone, and Japan, central banks have created new money reserves worth USD 3.7 trillion in 2020 alone, meaning that by June 2020 their total assets were five times larger than in 2007 (Yardeni Research, 2020). The third characteristic is low inflation. Stagnating prices put no pressure on central banks to slow the growth of their balance sheets or to raise key interest rates. Low inflation also pushes borrowing costs down and allows governments to increase debt to finance stimulus. The fourth feature is the state's growing role in allocating capital across the economy. Buying huge amounts of corporate and public bonds, central banks across the rich world are propping up a considerable fraction of the entire stock of business and public debt.

These four features – zero bound interest rates in particular – have led to a significant reappraisal of the previous conventional wisdom that accommodating monetary policy with low interest rates could maintain macroeconomic stability across the business cycle (Woodford and Xie, 2020). Several other authors have suggested that fiscal transfers and tax cuts can be a powerful tool for reducing the contractionary effect of an increased financial wedge during a downturn, and can even enable the complete stabilisation of both aggregate output and inflation in certain circumstances, despite the binding lower bound on interest rates (e.g. Christiano et al., 2011; Eggertsson, 2011; Correia et al., 2013; Eichenbaum, 2019). Prominent practitioners have recently voiced calls for a stronger role for fiscal policy as well. Christine Lagarde opened her tenure as President of the ECB by calling for a large fiscal stimulus. Similarly, Jerome Powell, the Chair of the FED, recently urged Congress not to withdraw its fiscal stimulus against the pandemic too early.

In this situation when the fine line between monetary policy and government-debt management has become blurred (BIS, 2020: 62) and fiscal policy has been growing in importance for managing the business cycle, it is important to examine the effectiveness of past anti-crisis state aid measures that were an important part of the fiscal policy during the Great Recession. The prominence of state aid in the EU has been upheld by the European Commission's adoption of temporary state aid rules to ensure governments can provide liquidity to the economy to support citizens and save jobs more

easily. The Commission has also, for the first time since its addition to the Stability and Growth Pact in 2011, triggered the general escape clause to allow exceptional fiscal support and coordinated and orderly temporary deviation from the normal requirements of the EU's fiscal rules. Further, on 21 July 2020 the European Council struck a landmark fiscal deal by agreeing on the regular EU multiannual financial framework, worth nearly EUR 1.1 trillion over 7 years, and a one-off Next Generation EU rescue fund of EUR 750 billion to help member states recover from the Covid-19 recession.

The aim of this article is to evaluate the impact of the anti-crisis state aid measures implemented in Slovenia between 2009 and 2015 to combat the Great Recession of 2008 and to use insights arising from the analysis for an ex-ante qualitative assessment of the main fiscal response measures to the coronavirus adopted by the Slovenian government during the first 6 months of the pandemic. Our study possesses novelties compared to the previous literature. Unlike earlier articles that generally aim to evaluate a specific programme, we have data on all disbursements of state aid already well before as well as during the 2008 recession since records are meticulously kept by the Ministry of Finance of the Republic of Slovenia. This adds to our confidence while claiming that our estimates are not biased due to the receipt of other state aid assistance. We use financial and other information for the entire population of firms in Slovenia over a long period of time (1994–2018) and hence avoid a sample bias many other studies suffer from. Moreover, we use advanced econometric methods for socio-economic programme evaluation (propensity score matching (PSM) and difference-in-differences (DiD) regression) to uncover causal effects of anti-crisis state aid on subsidised firms' employment and revenue growth.

We estimate the impact of five different state aid categories either introduced specifically to counter the negative impacts of the 2008 Great Recession (Remedy of a serious disturbance to the economy) or were already in existence but greatly increased in size during the 2009–2015 period (Employment; Rescue and restructuring (R&R); Training; and Research and development (R&D)). The results show the most effective state aid measures in terms of the recipient firm's revenue growth are R&D and Employment state aid categories. As for post-subsidy employment growth, a significant impact is generated by the R&D, Employment and Training state aid categories. Neither the specialised anti-crisis measure nor the R&R state aid succeed to incite revenue and employment growth in the beneficiary firms. The most effective state aid instrument identified is a grant, while the amount of funds allocated significantly increases the relative growth of revenue and employment in subsidised firms. Anti-crisis state aid was more effective for younger recipient firms, firms with higher labour productivity, those employing less-skilled workers with lower wages, foreign-owned

firms and more export-intensive recipients. Our preliminary qualitative assessment of the Slovenian Covid-19 fiscal stimulus reveals that its size is exceptional compared to state aid expenditures during the previous recession and large even when compared to the much broader category of the cyclically adjusted balance during the 2008 crisis. The majority of total fiscal stimulus was allocated through grants or direct social transfers (55% of the total) and allotted to individuals (78% of the total) rather than to employers or firms. Given the premium dividend the grants have demonstrated in our empirical analysis of past anti-crisis state aid measures and findings from the literature on the fiscal multipliers, we expect the anti-Covid fiscal measures to effectively mitigate the Covid-19 crisis' short-term serious consequences.

The remainder of this article is structured as follows. In section 2, we briefly review the extant literature on the effect of state aid on firm performance and the impact of fiscal measures on economic recovery. Section 3 explains the identification strategy and describes the data. In section 4, we present our empirical results for the effectiveness of anti-crisis state aid during the 2008 financial crisis, followed by an application of the findings to the Covid-19-specific fiscal responses in section 5. Section 6 concludes the article with a review of the main findings and some policy recommendations.

Literature review

The traditional economic standpoint on the provision of state aid has been quite sceptical for several reasons. First, governments may grant excessive state aid if the benefits mainly accrue domestically, while the burden falls on foreign competitors or consumers. Second, states may be unable to commit to a specific aid level, which can lead to soft budget constraints, distort international competition and distort the pattern of real comparative advantages. Third, politicians may be unable to fend off the rent-seeking activities of firms to the detriment of consumers. Nevertheless, in the last two decades several studies have appeared arguing that subsidies can be an efficient economic policy instrument (e.g. Nitsche and Heidhues, 2006; Girma et al., 2007). There are important differences in the effectiveness of subsidies, depending on the objectives and market imperfections they aim to address. Below, we first provide a theoretical rationale for granting state aid of the types that are studied in the empirical part, followed by a review of empirical literature on these measures' effectiveness.

The European Commission considers rescue and restructuring state aid as a key policy instrument to support companies in difficulty. The main goal of the tool is to avoid their dissolution with all the ensuing socio-economic costs like unemployment, loss of competition, technical know-how and

expertise or disruption to important services. To avert vested interests and avoid wasteful public spending, a necessary precondition for the granting of R&R aid under EU state aid rules is a sufficiently high probability that the subsidised firm will return to viability after undergoing the compulsory restructuring process.

Both the public good characteristics of R&D outputs and capital market imperfections constitute market failures, which provide the theoretical rationale for public intervention. First, R&D possesses public good characteristics, namely non-rivalry (the cost of providing it to an additional individual is zero) and non-excludability (non-paying users cannot be prevented from accessing it). Hence, private R&D outputs are not perfectly appropriable, which allows lower private than social returns and a socially suboptimal level of R&D (Nelson, 1959; Arrow, 1962; Bloom et al., 2013). Second, R&D investments entail high risk due to the nature of R&D activities, which cannot be used as collateral for loan contracts. Further, there is information asymmetry between creditors/investors and R&D performing firms. Both imperfections of capital markets lead to inadequate or overpriced external capital available to firms for financing their R&D activities (Hall, 2002a; Hall, 2002b). State aid can alleviate these market failures by reducing R&D investment costs and raising the expected profitability of subsidised R&D projects. In this regard, public subsidies incentivise larger private R&D spending (additionality). On the contrary, there are theoretical mechanisms within the public choice theory that lead to intervention instigating full crowding out. The effectiveness of R&D state aid may be diminished either by firms exploiting information asymmetries or self-interested selection practices on the part of public grantors. Public bureaucracies may adopt opportunistic behaviour and sponsor firms with R&D projects that are likely to succeed irrespective of public support. This cherry-picking strategy produces deceptive effectiveness, giving credit to the agency's managers where it is not due, justifying the role of the agency and thus perpetuating its existence.

A large variety of state aid measures falls under the umbrella of active labour market programmes (ALMP). Kluve (2010) classifies these programmes into a set of six core categories, which are very similar to corresponding classifications used by the OECD and Eurostat. First, (labour market) training encompasses programmes like classroom training, on-the-job training and work experience. Their main objective is to enhance the participants' productivity and employability as well as enhance human capital by increasing skills so as to remedy market imperfections stemming from the imperfect appropriability of human capital, positive externalities and information asymmetry. Second, private sector incentive programmes like wage subsidies, financial incentives to workers and self-employment grants encourage employers to hire new workers or maintain jobs that

would otherwise be broken up. Third, youth programmes comprise specific programmes for disadvantaged and unemployed youth, including training programmes, wage subsidies and job search assistance. The fourth category contains measures for the disabled such as vocational rehabilitation, sheltered work programmes or wage subsidies for individuals with physical, mental or social disabilities. The last two categories are usually not handed out to firms in the form of state aids and comprise the direct employment programmes in the public sector (e.g. public works) and services and sanctions category which includes job search assistance and sanctions (e.g. reduction of unemployment benefits).

The nature of the special aid to remedy the serious disturbance to the economy introduced in Slovenia at the outset of the Great Recession in 2009 is similar to that of the aid for rescue and restructuring (henceforth R&R). Extant empirical studies of state aid for R&R usually measure the impact of aid on the survival or financial viability of subsidised firms. In general, the studies provide mixed findings. Nitsche and Heidhues (2006) in their study on the methods to analysed the impact of state aid on competition find that 32% of firms which had received R&R state aid failed to survive. Using case studies of R&R cases notified by the European Commission, London Economics (2004) reports that out of 71 beneficiary firms 47 survived, 22 went bankrupt, and for 2 recipient firms the outcome was unsettled at the time of the analysis. Głowicka (2006), Chindooroy et al. (2007), Nulsch (2014) and most recently Heim et al. (2017) evaluated the impact of R&R aid on firm survival. All four studies use data on R&R aid cases decided by the European Commission. Głowicka (2006) and Chindooroy et al. (2007) both examined whether companies which receive both rescue and restructuring aid are more likely to survive than beneficiaries which only receive rescue aid. The former study found that on average bailouts only delayed firm exit instead of preventing it, while the latter study identified high mortality among firms that had received R&R aid but also that distressed companies were more likely to survive after receiving rescue or restructuring aid. Nulsch (2014) also used a control group of non-aid receiving firms and found that despite the subsidies business failure was often only postponed. However, endogeneity concerns remain in this study and the results do not enable a causal interpretation because the control group is represented by negative aid decisions of the European Commission. Heim et al. (2017) estimated the causal impact of restructuring aid granted by the European Commission between 2000 and 2012 on the survival and financial viability of aided firms. Based on the construction of a non-aid receiving counterfactual group through a matching procedure, they found that restructuring aid decreases the hazard rate of a market exit and increases firms' average survival time by 8–15 years.

Schweiger (2007) analysed the impact of state aid for R&R granted to Slovenian firms between 1998 and 2003 on the allocation of resources. She claims that the aid hindered the efficient static allocation of resources. Her results show that no firm that received aid had exited by the end of the study period, the aid improved the growth rate of the recipient firms' market shares, but did not have a significant impact on their total factor productivity growth, suggesting that R&R aid was distortive. Murn et al. (2009) also analysed the effectiveness of state aid for R&R in Slovenia. By combining firm-level aid and accounting data and applying the PSM approach, they showed that 23.6% of aid recipients did not survive. Further, in the companies that survived, the aid proved to be ineffective for promoting sales, increasing productivity and creating new jobs. Burger and Rojec (2018) studied the effects of crisis-motivated subsidisation of Slovenian firms on their performance during the 2008 recession and found a non-significant impact of the anticrisis subsidies on revenue growth and positive effects on the employment growth of the subsidised firms. The positive effects identified in their study are generated by state aid schemes which are not primarily aimed at alleviating the crisis (R&D, employment and training state aid schemes).

The ex-post evaluation of different types of state aid measures has long been of interest in empirical economic research, probably most frequently with respect to the impact of R&D public policies on several outcomes such as R&D investment and R&D output (e.g. Czarnitzki and Lopes-Bento, 2013; Takalo et al., 2013; Bronzini and Piselli, 2016). The main issue with R&D subsidies is whether they complement or crowd-out private R&D expenditures. Two comprehensive overviews of econometric evidence on the subject (David et al., 2000; Garcia-Quevedo, 2004) report ambiguous results and claim that studies using firm-level data tend to show more of a substitution or crowding-out effect of R&D subsidies on private R&D expenditures. Jaklič et al. (2013) corroborate this finding with Slovenian data. However, in a recent meta-regression analysis Dimos and Pugh (2016) examine whether the empirical literature suggests that R&D subsidies cause the crowding out of private investments and conclude that this is not the case. Nevertheless, their findings reject the crowding out of private investment by public subsidies but reveal no evidence of substantial additionality.

Existing empirical literature on the effects of public support policies on employment is very extensive. A meta-analysis by Kluve (2010) based on data comprising 137 programme evaluations from 19 countries reveals that direct employment programmes in the public sector often appear unfavourable. On the other hand, wage subsidies and job search assistance and sanctions can be effective in increasing participants' employment prospects, while training programmes exhibit moderately positive effects. More recent meta-analysis by Card et al. (2018) summarises the estimates from over 200

empirical studies of ALMP measures and finds that the average impact on employment is close to zero in the short run, but turns more positive 2–3 years after the end of a programme. Further, larger effects are achieved by programmes that emphasise human capital accumulation, by female participants, and beneficiaries who enter from long-term unemployment. ALMPs are also more likely to show positive impacts in a recession.

The existing literature on the effectiveness of state aid measures therefore shows mixed results and that the outcomes depend on the underlying objective and type of the instrument. Anti-crisis state aid related to the promotion of R&D or employment and training is found to be more efficient than aid related to the rescuing and restructuring of firms in difficulties. This is relevant for the Slovenian case where an important part of the anti-crisis aid measures was intended for rescuing and restructuring firms in difficulties and where state aid for R&D, employment and training increased substantially as part of the Great Recession countercyclical fiscal policy.

Data and empirical method

In the first part of the empirical investigation, we study the effect of the anti-crisis state aid on recipient firms' employment and revenue during the 2008 recession using Propensity score matching and Difference-in-differences regression that account for the non-random administering of state aid. Both methods and detailed empirical procedures are described in a separate online appendix to this article.

We use three sources of data in the empirical analysis. All three cover Slovenian firm-level panel data over a long time period and represent the entire population of firms and not only a sample. We link several datasets on an annual basis using unique firm identifiers. First, the annual information on all recipients of state aid and 'de minimis' aid¹, available between 1998 and 2015, come from the Ministry of Finance State aid and 'de minimis' aid records. The following information is available for each state aid administered: grantor (e.g. Ministry for Economic Affairs), official name of the state aid measure (e.g. Guarantee Scheme), state aid category (e.g. Remedy of a serious disturbance to the economy), state aid purpose (e.g. Financial crisis), state aid instrument (e.g. Grants), amount of state aid allocated and recipient name and unique administrative identifier. We linked this database with the annual data on the total population of non-financial Slovenian firms' balance sheets and financial statements for the period

¹ *De minimis aid refers to small amounts of state aid to undertakings which EU countries do not have to notify the European Commission about. The maximum amount is EUR 200,000 for each undertaking over a 3-year period.*

1994–2018 provided by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES). All monetary variables from these two sources are expressed in euros and deflated with appropriate consumer or producer price indices with the base year of 2018. Finally, data on inward and outward FDI come from the Bank of Slovenia. They cover information on inward (foreign-owned firms in Slovenia) and outward FDI (Slovenian subsidiaries abroad).

Table 1: VALUE OF STATE AID AND NUMBER OF RECIPIENTS IN SLOVENIA BY RECESSION-RELATED CATEGORIES (2005–2015)

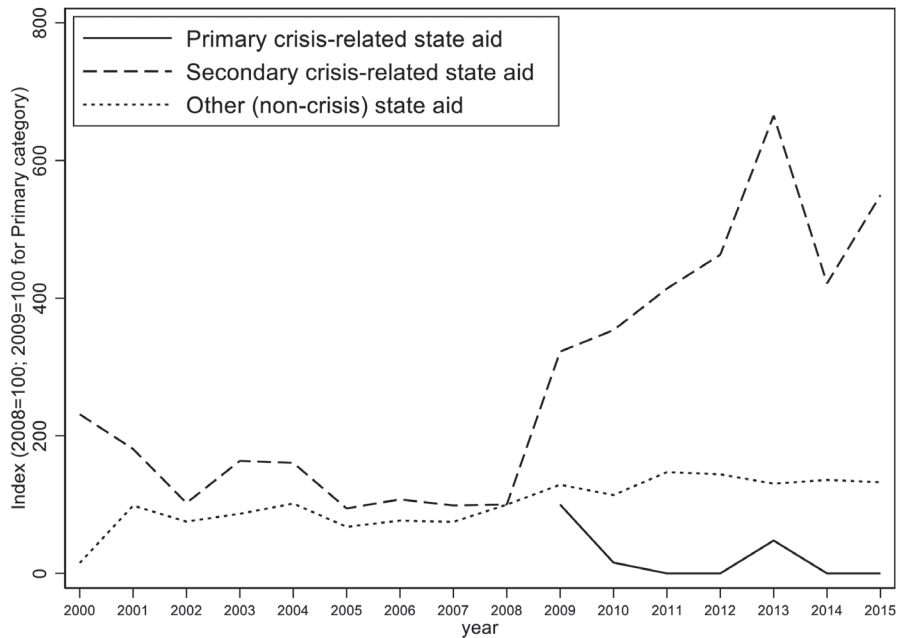
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1 Primary anti-crisis aid	€					215.49	33.89	0.008	0	103.00	0	0
	N					267	338	12	0	2	0	0
2 Employment	€	14.19	19.05	13.44	17.16	38.08	42.43	39.89	99.16	146.19	120.93	102.07
	N	2,643	4,334	3,427	2,609	7,089	7,812	7,898	7,426	12,453	6,636	4,230
3 Rescue & restructuring	€	0.81	2.62	1.08	1.30	3.02	2.65	52.53	0.95	42.64	1.46	97.34
	N	6	16	7	7	15	9	8	6	10	7	3
4 Training	€	1.21	1.82	3.33	0.76	2.67	1.71	0.68	6.57	13.01	2.04	0.72
	N	248	348	366	135	612	502	291	787	1,177	364	122
5 R&D	€	23.20	21.36	23.36	22.52	90.73	100.73	79.58	86.59	75.80	51.39	29.16
	N	352	302	435	480	820	939	1,010	793	725	647	523
Crisis total (1+2+3+4+5)	€	39.41	44.85	41.21	41.73	349.99	181.40	172.69	193.26	380.64	175.82	229.29
	N	3,159	4,864	4,067	3,166	8,497	9,314	9,082	8,705	13,698	7,381	4,754
Non-crisis related	€	177.59	201.45	196.63	262.48	338.21	299.08	386.12	377.97	342.27	356.55	347.67
	N	4,046	5,817	7,117	4,465	5,193	4,093	4,747	4,957	5,898	6,506	5,412
Total	€	217.00	246.30	237.84	304.21	688.20	480.49	558.81	571.23	722.91	532.38	576.96
	N	6,672	10,133	10,584	7,302	12,768	12,564	13,048	12,929	18,359	12,873	9,513

Notes: Values of state aid (€) are expressed in million euros. Number of recipients (N) does not necessarily sum up to the totals because some firms obtained more than one state aid in the same year.

Sources: Evidence of state aids and 'de minimis' aids, Ministry of Finance of the Republic Slovenia; own calculations.

Table 1 presents the total value and number of recipients for each crisis-related state aid programme and other (non-crisis) subsidies (state aids plus de minimis aid) awarded between 2005 and 2015. In 2009, Slovenia introduced a special category of state aid (Remedy of a serious disturbance to the economy) with a distinct purpose (Financial crisis), which we label primary crisis-related aid. However, these were not the only measures within the state aid instruments that Slovenia introduced in its effort to remedy the financial crisis and economic downturn. The number of existing state aid measures increased significantly in value and scope. We identified four categories of state aid that normally target other economic policy aims, but considerably

Figure 1: VALUE OF CRISIS-RELATED AND OTHER STATE AID MEASURES IN THE PERIOD 2000–2015



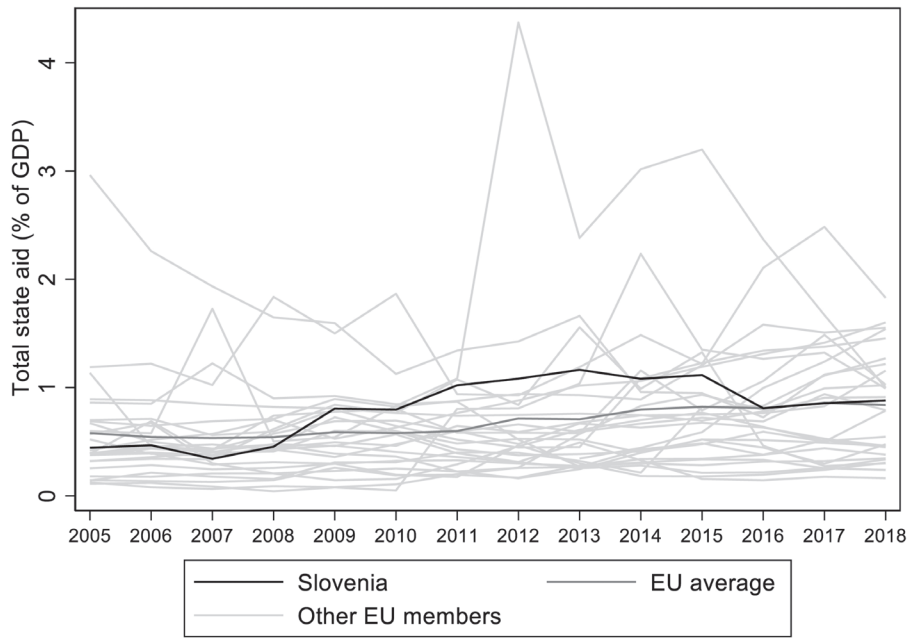
Note: Primary crisis-related state aid denotes a special state aid scheme for suppressing serious disturbances to the economy, while the Secondary crisis-related state aid includes four state aid categories: state aid for employment, R&D, training, and aid for rescuing and restructuring.

Source: Own calculations based on the Evidence of state aid and 'de minimis' aid, Ministry of Finance of the Republic Slovenia.

increased during the 2008 recession. We label them secondary crisis-related aid and they include four state aid categories: i) Employment; ii) Rescue and restructuring; iii) Training; and iv) Research and development.

The number of recipients and the value of crisis-related subsidies rose significantly from 2009 onwards. In 2009, 12,768 firms or sole proprietors received at least one form of state aid (9% of 136,915 firms and sole proprietors combined) and the total amount of subsidies handed out (EUR 688 million) amounted to 1.8% of GDP. The total value of state aids to the non-financial sector peaked in 2013 at EUR 723 million (2.1% of GDP) and almost EUR 4 billion (11% of GDP) including the financial sector, falling back to 1.5% of GDP in 2015. Figure 1 presents the relative changes in primary crisis-related aid, secondary crisis-related aid, and non-crisis state aid between 2000 and 2015. The four categories of state aid that we grouped into the secondary crisis-related aid exhibit a significant increase in funds allocated,

Figure 2: TOTAL STATE AID ADMINISTERED IN EU MEMBERS, 2005–2018



Note: The EU average is the unweighted simple average of all EU member states.

Source: Eurostat; own calculations.

exceeding a 6-fold increase in 2013 compared to the pre-crisis level in 2008. On the other hand, non-crisis related aid measures increased only steadily throughout the recession and show no structural break in the trend after 2009. It is also worth noting that primary crisis-related state aid represented a significant share of total state aid administered only in 2009 (31% of total aid), whereas in other crisis years its share was much lower (14% of the total in 2013) or negligible. These facts support our decision to analyse four additional state aid categories apart from the specialised anti-crisis state aid.

To determine the time interval in which to study the effects of anti-crisis state aid, we consider the unfolding of the recession in Slovenia and the evolution of total state aid in comparison to other EU member states. Slovenia experienced a double-dip recession. Economic activity started to decrease in the third quarter of 2008, shrinking more or less uninterruptedly until 2010Q1. After four quarters of sluggish growth, Slovenia was hit by the second dip that lasted from 2011Q2 to 2012Q4 and was primarily driven by the collapse of the financial sector. On an annual basis, Slovenian GDP fell by -7.5% in 2009 and by -2.6% and -1.0% in 2012 and 2013, respectively. Turning to an international comparison of state aid expenditures, Figure 2 exhibits the path of total non-financial state aid administered from 2005 to 2018

for Slovenia and other EU members, expressed as a share of GDP. Until the wake of the financial crisis, Slovenia had spent a lower share of GDP on state aid than the EU average. Upon the outbreak of the recession in 2008, Slovenia increased the amount of aid substantially more than the average EU member state. Aid allocation rose from 0.45% of GDP in 2008 to 0.81% of GDP in 2009, peaking at 1.16% of GDP in 2013. Between 2009 and 2015, Slovenia spent from 0.22% to 0.46% of GDP more than the EU average on state aid. Considering the evolution of state aid expenditures and the business cycle in Slovenia, we decided to analyse crisis-related state aid between 2009 and 2015.

Results

Table 2 shows mean and median values of the main variables used in our matching procedure. For the subsidised firms, we report statistics for the year before aid was administered to avoid confounding with treatment effects. Firms which received anti-crisis state aid from any of the five categories studied are on average larger in terms of employment and revenue, more export-outward-FDI oriented and older than non-subsidised firms. They are also better performing in terms of ROA, labour productivity and average wage. They are more indebted on average, yet the median values of their debt-assets ratio are similar for both groups of firms. All identified differences are highly statistically significant according to t-tests we performed for each variable.

Turning our focus now to the subsidised firms, Table 3 reports the evolution of revenue and employment in these firms from 2 years prior to receiving the anti-crisis state aid (t_0-2) to 5 years after (t_0+5). To control for the possibly of a non-random distribution of subsidised firms across industries, we also report their relative size compared to the corresponding 3-digit industry average. Both the absolute and relative revenue of subsidised firms was on a downward trend before the state aid year, turning upwards in the following 5-year period. The same pattern holds for employment and relative employment, which both monotonically increased after the state aid was allocated.

Of course, this is still not evidence that the anti-crisis state aid was indeed effective. As revealed in Table 2, subsidised firms differ systematically with respect to many attributes from those of the non-subsidised group of firms already before the aid was administered. These firm characteristics are likely to influence our outcome variables regardless of the effect of the state aid. For example, better performing firms in terms of profitability and productivity may weather the financial and economic turmoil better as they can draw from larger or cheaper financial resources. In this sense, confining

our control group to firms that are in a comparable financial and operating shape as the subsidised firms may reduce the positive treatment effect suggested by Table 3. On the other hand, other differences identified in Table 2 may push in the opposite direction. Larger and older firms are on average growing slower than smaller and younger competitors. Adjusting our set of control firms to these characteristics may therefore reveal higher-than-expected growth of revenue and employment and hence increase the positive treatment effect suggested by Table 3. Both sets of confounding determinants make it impossible to assess the impact of state aid on firm growth at this stage of the analysis. Our PSM procedure presented in the Online Appendix aims to reduce this heterogeneity between the treatment and control groups, providing a clearer view of the consequences of anti-crisis state aid in Slovenia.

Table 2: SUMMARY STATISTICS OF SUBSIDISED AND NON-SUBSIDISED FIRMS, 2009–2015

	Subsidised firms			Non-subsidised firms		
	Mean	Median	St. dev.	Mean	Median	St. dev.
lnEmployment	2.21	2.01	1.69	0.79	0.56	0.97
lnRevenue	13.52	13.41	2.09	11.77	11.72	1.74
VA/Emp.	33,484	27,331	48,564	29,465	20,321	181,986
lnAvg.Wage	9.87	9.92	0.57	9.63	9.69	0.75
Exporter	0.521	1	0.500	0.340	0	0.474
Exp. share	0.164	0.001	0.291	0.125	0.000	0.282
Debt/Assets	0.64	0.60	1.21	2.28	0.63	110.82
ROA	0.01	0.02	0.69	-0.66	0.01	48.80
For. owned	0.059	0	0.235	0.121	0	0.326
Outward FDI	0.061	0	0.239	0.008	0	0.090
Age	10.8	12.0	6.5	9.3	8.0	6.8
	N = 22,781			N = 192,377		

Notes: All t-tests for the equality of means between the subsidised and non-subsidised firms are highly statistically significant (highest P-value = 0.000037).

Source: own calculations.

We start by presenting the results of PSM for the outcome variable total revenue (Table 4). Primary crisis-related state aid exhibits negative effects on the cumulative growth of total revenue 5 years after the subsidy was administered in the range of EUR -6.8 to EUR -9.9 million. However, when imposing stricter matching within the same industry and year, this category of state aid shows no effect on revenue growth compared to a similar control group. State aid measures that aim to foster new employment or prevent redundancies are found to produce a significant improvement in revenue growth over the course of 5 years after the state aid allocation.

The cumulative effect ranges from between EUR 0.37 to EUR 0.67 million of additional total revenue in the recipient firms. Similar to the Primary anti-crisis aid, the Rescue and Restructuring state aid measures and Training state aid measures fail to ignite revenue growth in recipients regardless of the matching procedure we apply. Finally, state aid allocated to R&D and innovation activities performs the best among all the state aid categories studied. Positive results for revenue growth are registered already in the first year and persist and increase in cumulative terms over the entire 5-year period following the state aid allotment. Five years after the state aid, subsidised firms increase their revenues from their pre-subsidy levels by EUR 4.3 million more than similar control firms according to the exact PSM methods. Encouragingly, we find no statistically significant difference in the pre-subsidy revenue growth trend in any of the state aid categories (column DIFt0-1 in Table 4), indicating that treated and control firms were similar before the state aid allocation not only in terms of covariates values but also followed a similar revenue growth trend.

Table 3: REVENUE AND EMPLOYMENT IN THE SUBSIDISED FIRMS BEFORE AND AFTER THE STATE AID

	lnRevenue	relRevenue	Emp.	relEmp.	N
t_0-2	13.63	3.68	57.0	3.92	20,924
t_0-1	13.52	3.64	52.5	3.94	22,781
t_0	13.41	3.57	49.4	4.00	24,445
t_0+1	13.48	3.67	49.7	4.11	23,652
t_0+2	13.54	3.79	50.9	4.22	22,578
t_0+3	13.61	3.91	52.8	4.36	21,667
t_0+4	13.63	3.97	53.4	4.36	18,325
t_0+5	13.68	4.07	56.0	4.39	14,150

Notes: LnRevenue is a natural log of total revenue, relRevenue and relEmp are revenue and employment relative to the firm's 3-digit industry average and Emp. is the number of employees, while t_0 is the year of the anti-crisis state aid.

Source: own calculations.

Table 4: PROPENSITY SCORE MATCHING RESULTS FOR REVENUE
(IN EUR MILLION), 2009–2018

		DIF _{t0-1}	ATET _{t0}	ATET _{t0+1}	ATET _{t0+2}	ATET _{t0+3}	ATET _{t0+4}	ATET _{t0+5}
Primary crisis-related state aid	1NN	1.367	-2.230*	-2.692	-8.293***	-8.291**	-10.812**	-6.797**
		(1.757)	(1.250)	(2.197)	(2.473)	(3.986)	(4.403)	(2.776)
	3NN	-1.305	-0.114	-5.585***	-4.962**	-6.823***	-9.771***	-9.935***
		(1.494)	(1.383)	(1.925)	(1.917)	(2.306)	(2.786)	(2.755)
	1NN-exact	0.756	-1.324	-0.366	-0.533	-1.507	-1.552	-2.125
		(1.731)	(1.078)	(1.810)	(2.478)	(2.517)	(2.740)	(2.745)
Employment state aid	1NN	-0.497	-0.935	-0.152	-0.849	-2.013	-2.438	-2.881
		(1.353)	(1.131)	(1.333)	(1.769)	(1.980)	(2.232)	(2.291)
	3NN	0.064	0.242**	0.521***	0.508**	1.032***	0.920***	0.808*
		(0.132)	(0.115)	(0.198)	(0.213)	(0.236)	(0.252)	(0.482)
	1NN-exact	-0.114	0.211***	0.427***	0.574***	0.755***	0.919***	0.674***
		(0.074)	(0.062)	(0.114)	(0.140)	(0.174)	(0.212)	(0.244)
Rescue & restructuring state aid	1NN	-0.031	0.056	0.105	0.001	0.065	0.312	0.482***
		(0.053)	(0.062)	(0.098)	(0.155)	(0.209)	(0.203)	(0.163)
	3NN	-0.061	0.069	0.134*	0.115	0.180	0.286*	0.365**
		(0.049)	(0.044)	(0.069)	(0.094)	(0.139)	(0.155)	(0.172)
	1NN-exact	0.997	-0.428	2.014	-2.111	-1.468	-6.109*	-9.097*
		(2.672)	(1.831)	(1.377)	(1.590)	(2.640)	(3.531)	(5.192)
Training state aid	1NN	-1.772*	0.308	0.830	-1.960*	-3.726**	-6.052*	-5.995
		(0.918)	(1.248)	(1.533)	(1.020)	(1.569)	(3.535)	(4.792)
	3NN	0.340	1.827	2.058	0.488	-0.489	-4.403	-9.631
		(1.754)	(1.597)	(2.907)	(2.695)	(2.992)	(5.313)	(7.104)
	1NN-exact	0.187	1.007	1.702	0.263	-1.007	-5.149	-10.511
		(1.040)	(1.485)	(1.564)	(1.238)	(1.857)	(4.562)	(6.567)
R&D state aid	1NN	-0.605*	0.150	0.029	0.798	-0.406	-0.743	-1.267
		(0.342)	(0.185)	(0.387)	(0.496)	(0.905)	(1.113)	(1.251)
	3NN	-0.257	-0.316	0.165	0.245	-0.073	-0.581	-0.414
		(0.273)	(0.231)	(0.282)	(0.360)	(0.544)	(0.642)	(0.740)
	1NN-exact	-0.051	0.172	0.063	-0.243	-0.591	-1.079	-0.885
		(0.170)	(0.229)	(0.317)	(0.382)	(0.474)	(0.758)	(0.850)
R&D state aid	1NN	-0.012	0.019	0.047	-0.084	-0.279	-0.367	-0.298
		(0.140)	(0.150)	(0.191)	(0.239)	(0.321)	(0.491)	(0.598)
	3NN	0.208	3.949***	6.830***	7.825***	10.132***	11.706***	12.145***
		(0.874)	(0.997)	(1.506)	(1.908)	(2.075)	(2.310)	(2.584)
	1NN-exact	1.668**	3.165***	5.817***	7.089***	7.922***	9.476***	10.447***
		(0.725)	(0.744)	(1.168)	(1.423)	(1.620)	(1.877)	(2.205)
R&D state aid	1NN	0.281	0.539**	1.139***	2.031***	2.837***	3.358***	4.309***
		(0.286)	(0.266)	(0.469)	(0.624)	(0.822)	(0.919)	(1.179)
	3NN	0.365	0.457*	1.077**	1.984***	2.898***	3.478***	4.392***
		(0.290)	(0.269)	(0.464)	(0.602)	(0.804)	(0.905)	(1.165)
	1NN-exact							

Notes: 1(3)NN denotes (3) nearest-neighbour(s) propensity score matching, exact refers to matching where exact matching within the same 2-digit industry and calendar year was imposed. Values represent estimates of the average treatment effect on the treated (ATET) as defined in equation (1) in the Online Appendix. Abadie and Imbens' (2006, 2016) standard errors are in parentheses. DIF_{t0-1} corresponds to the ATET estimate for the period between t_0-2 and t_0-1 and is the average difference between subsidised and control firms in their revenue growth in this pre-subsidy period. ATET_{t0+1} is cumulative ATET as defined by equation (1) in the Online Appendix and denotes the average difference between subsidised and control firms in their revenue growth between pre-subsidy year t_0-1 and years after the state aid. Common support and calliper=0.05 imposed in all methods. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

Source: own calculations.

Table 5: PROPENSITY SCORE MATCHING RESULTS FOR EMPLOYMENT,
2009–2018

		DIF ₁₀₋₁	ATET ₁₀	ATET ₁₀₊₁	ATET ₁₀₊₂	ATET ₁₀₊₃	ATET ₁₀₊₄	ATET ₁₀₊₅
Primary crisis-related state aid	1NN	-3.0	-3.3	-3.1	-23.6**	-18.3**	-13.3	-25.8**
		(3.2)	(2.6)	(5.9)	(9.3)	(9.1)	(10.9)	(11.9)
	3NN	-5.4*	-4.6	-9.5*	-13.3*	-20.8***	-25.6***	-31.9***
		(3.0)	(2.9)	(5.4)	(7.3)	(7.5)	(9.1)	(9.1)
	1NN-exact	-5.5*	-2.0	2.8	-6.6	-16.5*	-17.2	-17.3
		(2.9)	(2.5)	(5.7)	(8.8)	(9.8)	(11.4)	(11.3)
Employment state aid	1NN	-4.0	-0.9	6.2	-1.1	-5.9	-9.0	-9.6
		(2.5)	(2.4)	(4.7)	(7.1)	(8.1)	(9.7)	(9.7)
	3NN	0.72	2.6***	6.1***	8.1***	9.8***	9.4***	11.8***
		(0.50)	(0.50)	(1.0)	(1.07)	(1.1)	(1.3)	(1.9)
	1NN-exact	0.51*	2.8***	6.5***	8.4***	9.8***	10.3***	10.9***
		(0.28)	(0.26)	(0.49)	(0.60)	(0.65)	(0.76)	(0.89)
Rescue & restructuring state aid	1NN	-0.3	1.8***	3.3***	3.8***	4.1***	4.6***	5.4***
		(0.2)	(0.2)	(0.3)	(0.4)	(0.5)	(0.5)	(0.7)
	3NN	-0.3**	1.6***	3.1***	3.6***	3.8***	4.3***	5.1***
		(0.1)	(0.1)	(0.2)	(0.3)	(0.4)	(0.4)	(0.5)
	1NN-exact	-30.6*	5.0	23.4	4.2	40.4	-6.7	-18.6
		(18.2)	(6.8)	(17.1)	(30.2)	(38.1)	(14.5)	(16.0)
Training state aid	1NN	-10.7	1.0	15.3	26.6	19.6	-0.15	-5.4
		(8.3)	(4.7)	(11.6)	(25.9)	(18.8)	(16.4)	(17.0)
	3NN	12.1	-1.8	16.9	25.9	23.9	16.4	-24.1
		(9.0)	(9.9)	(30.2)	(46.0)	(36.5)	(31.6)	(31.6)
	1NN-exact	6.4	-8.1	9.1	23.0	22.1	11.6	-33.5*
		(5.4)	(6.9)	(14.7)	(33.9)	(24.1)	(18.3)	(19.0)
R&D state aid	1NN	-0.11	2.7***	4.6***	9.2***	9.5***	10.7***	5.5**
		(1.0)	(0.78)	(1.4)	(1.9)	(2.0)	(2.4)	(2.6)
	3NN	.42	2.5***	4.7***	7.67***	9.5***	9.07***	8.3***
		(.75)	(.648)	(.959)	(1.3)	(1.4)	(1.57)	(1.9)
	1NN-exact	-0.7	1.0	1.9*	1.9	2.2	1.8	2.0
		(0.7)	(0.7)	(1.1)	(1.3)	(1.5)	(1.7)	(2.3)
R&D state aid	1NN	-0.6	1.2**	2.1***	2.4***	2.9***	2.6**	3.3**
		(0.6)	(0.6)	(0.8)	(1.0)	(1.0)	(1.2)	(1.5)
	3NN	-1.1	4.3**	18.8***	20.2***	25.6***	27.7***	27.5***
		(2.5)	(1.9)	(4.4)	(4.5)	(5.4)	(6.1)	(6.3)
	1NN-exact	0.16	6.7***	18.6***	22.5***	23.5***	26.3***	29.2***
		(1.8)	(1.7)	(3.2)	(3.8)	(4.3)	(4.7)	(5.3)
R&D state aid	1NN	-1.6*	1.1	3.6***	5.4***	6.7***	7.6***	9.1***
		(0.9)	(0.7)	(1.1)	(1.5)	(1.7)	(2.0)	(2.4)
	3NN	-1.0*	1.1	3.5***	5.5***	7.0***	8.4***	9.6***
		(0.6)	(0.7)	(0.9)	(1.2)	(1.5)	(1.7)	(2.0)

Notes: Refer to the notes under Table 4, substituting the outcome variable revenue with employment.

Source: own calculations

Turning to PSM estimates of the treatment effect on the cumulative growth of employment (Table 5), the results are slightly more encouraging for the effectiveness of the anti-crisis state aid. As for revenue growth, the ATETs for Primary anti-crisis state aid are significant and negative only for the less stringent 1NN and 3NN PSM methods, while imposing exact matching within the same industry and year yields no significant treatment

effects on employment growth for this measure. In contrast, employment state aid measures exhibit significant improvements in cumulative employment growth right from the year when the state aid was granted (around 1.7 additional employees). After 5 years, employee numbers in the subsidised firms increase by 5.1–5.4 persons more than in similar control firms from the same industry and timeframe. Similarly, vocational training and other similar schemes in the Training category create additional employment, although to a somewhat smaller degree: 5 years after the aid is administered, subsidised firms employ up to 3.3 additional workers compared to control firms. The Rescue and Restructuring state aid measures again fail to ignite revenue growth in recipients regardless of the matching procedure we used. Finally, the R&D state aid measures turn out to be not only the most potent among the measures in terms of catalysing revenue growth, but also in terms of fostering new employment. Significant increases in employment appear 1 year after the state aid allocation and increase monotonically up to the 5th year after. Recipient firms exhibit excess employment growth that amounts to 9.1–9.6 additional employees above the employment growth in similar control firms in the same industry and period. As for Table 4, we identify no statistically and economically different trend in employment growth between the treated and control firms prior to the state aid year.

Finally, we examine the results from the DiD regressions on the matched sample of subsidised and non-subsidised control firms (Table 6). The matched sample pools all five anti-crisis state aid categories together because the aim here is not to identify the differences in treatment effect as

Table 6: DIFFERENCE-IN-DIFFERENCES REGRESSIONS ON THE MATCHED SAMPLE OF SUBSIDISED AND CONTROL FIRMS

	Revenue	ln(Revenue)	Employment	ln(Employment)
Y_{t0-1}	1.085*** (0.0406)	0.961*** (0.00754)	0.951*** (0.0133)	0.900*** (0.00347)
D	-30,829 (343,004)	-0.191*** (0.0184)	-2.762** (1.363)	-0.151*** (0.0106)
$D \times T_0$	-99,627 (119,463)	0.114*** (0.0102)	1.009*** (0.317)	0.133*** (0.00541)
$D \times T_1$	-42,580 (102,963)	0.213*** (0.0135)	1.860*** (0.386)	0.180*** (0.00665)
$D \times T_2$	12,830 (106,347)	0.255*** (0.0181)	2.044*** (0.442)	0.178*** (0.00791)
$D \times T_3$	147,437 (146,983)	0.288*** (0.0212)	2.170*** (0.531)	0.186*** (0.00907)
$D \times T_4$	239,911 (216,826)	0.297*** (0.0255)	1.972*** (0.614)	0.187*** (0.0105)
$D \times T_5$	367,808 (289,455)	0.302*** (0.0312)	2.019*** (0.706)	0.190*** (0.0125)
Grant	768,116** (389,604)	0.109*** (0.0331)	0.706 (1.310)	0.0404** (0.0168)

	Revenue	ln(Revenue)	Employment	ln(Employment)
Inter. rate subs.	529,361	-0.0292	-0.834	0.0198
	(528,417)	(0.0311)	(1.343)	(0.0183)
Basic R&D	328,362	0.0342	0.940	0.169
	(947,066)	(0.199)	(1.597)	(0.124)
Tax credit	232,379	-0.0312	1.925	-0.00251
	(515,442)	(0.0283)	(1.208)	(0.0162)
Soc. contrib. relief	-680,394*	-0.0993***	-2.070***	-0.0909***
	(410,065)	(0.0176)	(0.804)	(0.00960)
Guarantee	-1.455e+06***	-0.0148	-6.105***	-0.0322*
	(542,486)	(0.0267)	(1.932)	(0.0165)
Other instruments	531,335	0.328	8.371	0.656
	(731,083)	(0.339)	(14.02)	(0.403)
lnVALUEcrisis _{t0}	-39,434	0.0185***	0.349*	0.0177***
	(52,425)	(0.00391)	(0.207)	(0.00212)
lnVALUEnoncrisis _{t0}	36,666	0.0135***	0.619***	0.00772***
	(87,956)	(0.00161)	(0.148)	(0.000926)
Age	30,120	-0.00611***	-0.118***	-0.0142***
	(38,002)	(0.00214)	(0.0458)	(0.00102)
Est. before 1995	-805,397	0.0382*	0.563	0.0701***
	(594,921)	(0.0232)	(0.666)	(0.0119)
lnVA/EMP _{t0-1}	232,631*	0.00933	2.522***	0.132***
	(132,562)	(0.0142)	(0.335)	(0.00554)
lnK/EMP _{t0-1}	-61,746	0.0239***	0.0531	0.00244
	(65,938)	(0.00412)	(0.0763)	(0.00166)
lnAvgWage _{t0-1}	30,918	-0.0390***	-0.504***	-0.0417***
	(62,571)	(0.00704)	(0.0946)	(0.00251)
Export share _{t0-1}	1.848e+06**	0.0598**	3.156**	0.0876***
	(834,654)	(0.0299)	(1.391)	(0.0147)
For. ownership _{t0-1}	-120,338	0.140***	7.144***	0.121***
	(1.025e+06)	(0.0258)	(2.143)	(0.0136)
Outward FDI _{t0-1}	-3.843e+06**	-0.0150	-8.275***	0.00376
	(1.646e+06)	(0.0324)	(2.870)	(0.0209)
Industry VA growth	22,851	0.00362***	0.0485	-5.86e-06
	(25,634)	(0.00122)	(0.0650)	(0.000550)
Region FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes
Observations	407,574	407,574	407,574	407,574
R ²	0.922	0.626	0.955	0.873

Notes: Observations are weighted by weights from the 3-nearest neighbour propensity score matching stage. T_0 , T_1 , ..., T_5 are included but not reported. Region, year and 2-digit industry fixed effects are included but not reported. Cluster-robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: own calculations.

we already did in the previous PSM analysis, but to uncover potential mediating factors that are common to all state aid measures and determine their effectiveness. In general, we are interested in finding out whether the pre-treatment characteristics of the recipients, value of state aid granted, type of the state aid instrument and industry-specific business cycle moderate the size of the treatment effect. As above, we use total revenue and employment as the outcome variables, but also add into consideration their natural logs.

In the case of untransformed outcome variables, the coefficients reveal the effect in terms of absolute differences (euros and employees). When using logarithmic values, the treatment effects are expressed in terms of relative changes of the outcome variable, cleansing the effect of firm size. Before we interpret the mediating effects of the above confounders, we briefly interpret the set of coefficients on the interaction terms $D \times T_t$. No cumulative treatment effect is identified for the outcome variable revenue, which is probably due to the wide heterogeneity of the measure-specific effects laid out in Table 4. However, in terms of the relative growth of revenue, the state aid treatment effects are significant from the year when the aid was allocated to the fifth year after. From the pre-subsidy year until 5 years after the year it was granted, recipients generated 30% of additional revenue growth. In terms of employment, the effect after 5 years is an additional 2 employees compared to similar control firms, which amounts to 19% excess growth in employment.

The most effective state aid instrument identified is a grant, where funds are allocated in a non-repayable manner. They on average achieve 10% higher cumulative revenue growth and 4% higher growth in employment. Social contribution credits and guarantee schemes were associated with significantly lower anti-crisis treatment effects. Basic R&D and Other instruments also produce on average higher growth effects, although the difference is not statistically significant. Next, we test whether the amount of state aid funds granted affects the absolute and relative treatment effects. The volume of funds allocated significantly increases the relative growth of revenue and employment in recipient firms, but has no effect on the growth of treated firms in absolute terms. Firms that received non-crisis related state aid funds performed better in terms of both revenue and employment growth. Next, the effect of industry-specific growth rate of value added, an indication of the demand shock facing firms, only affects the relative growth of revenue. Finally, the results reveal that the pre-treatment characteristics do influence the effectiveness of the anti-crisis state aid. Namely, these are more effective for younger recipients, firms with higher labour productivity, those employing less-skilled workers with lower wages, foreign-owned firms, and more export-intensive recipients.

Discussion of the results with reference to the Covid-19 crisis

Findings from the assessment of the effectiveness of Slovenia's anti-crisis state aid measures in the Great Recession can be used to qualitatively evaluate the remedy measures put in place after the coronavirus outbreak in 2020. The first cases of the Covid-19 virus in Slovenia were reported on 4 March 2020 and following an upsurge in cases the government declared an

epidemic on 12 March 2020. What followed was a series of fiscal response measures to alleviate the socio-economic impact of the pandemic and the ensuing recession. By August 2020, altogether four “Anti-corona packages” had been implemented (#PKP1 – #PKP4). #PKP1 came into force on April 11 and was the crisis relief package with the largest scope and value, covering measures in the fields of the labour market, family affairs, social protection, healthcare provision, taxes, public finances, public sector wage policy, primary sector, culture, the environment, science, insurance sector, public procurement, insolvency procedures and others. #PKP2, in force since 1 May, was largely about a series of corrections of its predecessor, but also introduced state guarantees for corporate liquidity loans, covering 70% of the principal for large and 80% for small firms. #PKP3 from 1 June extended the additional liquidity loans through the Slovene Enterprise Fund and Slovenian Regional Development Fund, kick-started new investments through a list of priority projects in the public interest, handed out tourist vouchers for all citizens to be spent by the end of 2020 in tourist service providers, subsidised the transition from full- to part-time work, introduced additional state aid measures for digital transformations and R&D in companies and rolled out certain other measures. #PKP4 (starting on 11 July) introduced additional measures to preserve private sector employment and preventive measures ahead of the upcoming second wave of the pandemic.

The Fiscal Council, an independent and autonomous state authority supervising the management of the fiscal policy in Slovenia, began to continuously monitor the fiscal impact of the one-off measures adopted during the Covid-19 pandemic and to regularly update its assessment. We use its latest estimates of the value of major anti-crisis measures from the first three anti-corona packages #PKP1–#PKP3 in order to draw analogies with the anti-crisis state aid measures studied in the empirical part of the study and provide an early ex-ante qualitative assessment (Table 7).

We first examine the value of the anti-corona measures enforced in the initial half-year after the pandemic outbreak. The Fiscal Council’s estimates amount to EUR 2.6 billion in total, which is considerably higher than the EUR 350 million in anti-crisis state aid allocated in 2009 and even compared to the total state aid expenditures of EUR 688 million in that year. The size of the Covid-19 fiscal stimulus is large even when we compare it to the conceptually much broader category of the cyclically adjusted balance (actual public finance balance net of the cyclical component), which peaked² in 2011 at -5.4% of GDP (European Commission, 2019: 26) or roughly EUR 2.0 billion. In terms of the principal beneficiaries of the anti-corona measures,

² We ignore the much larger cyclically adjusted deficit of -11.5% GDP in 2013 due to the exceptional one-off banking sector rescue programme.

Table 7: LIST OF COVID-19 ANTI-CRISIS MEASURES IMPLEMENTED
IN PACKAGES #PKP1– #PKP3

	Value	Beneficiaries	Instrument
#PKP1 and #PKP2			
Measures in the fields of social contributions and labour market			
Financing to cover wages of employees on temporary leave (furlough scheme)	475	individuals	grant
Financing social contributions for employees on temporary leave	279	individuals	soc. con. relief
Financing retirement insurance contributions for working employees	405	individuals	soc. con. relief
Financing sickness leave pay from the first day onward	70	firms	grant
Paying out monthly basic income to self-employed, farmers and religious servants	103	individuals	grant
Financing social contributions for self-employed, farmers and religious servants	60	individuals	soc. con. relief
Measures in the field of social protection			
One-off solidarity supplement for pensioners	67	individuals	grant
One-off solidarity supplement for vulnerable social groups	29	individuals	grant
One-off solidarity supplement for students	8	individuals	grant
Large-family supplement	4	individuals	grant
Salary compensation in case of dismissal on operational grounds	28	individuals	grant
Public sector wage policy measures			
Employee reward scheme	98	individuals	grant
Tax policy measures			
Self-employment income tax prepayment not levied or not settled	18	individuals	tax credit
Corporate income tax prepayment on not levied or not settled	140	firms	tax credit
Deferred payment of taxes	259	firms	tax credit
#PKP3			
Partial subsidisation of transition from full- to part-time work	116	individuals	grant
Financing to cover wages of employees on temporary leave	86	individuals	grant
Vouchers for improving the economic situation in tourism	254	individuals	grant
Compensation for lost income resulting from the closure of healthcare services	88	providers	grant
Wage supplement for dangerous work and exceptional workload	7	individuals	grant
Financing the SID Bank liquidity scheme for road transport businesses	10	firms	int. rate subs.

Notes: Value is in million euros. soc. con. relief = social contribution relief; int. rate subs. = interest rate subsidy.

Source: Fiscal Council (2020).

as much as 78% of the estimated fiscal stimulus was allocated to individuals, either in the capacity of workers, consumers or socially vulnerable individuals. Studies that examined the effects of direct fiscal transfers to individuals typically estimated the marginal propensity to consume (MPC). This is the share of the extra euro of aid that an individual spends on consumption, with the rest going to savings or debt repayment. Studies of 2008 tax rebates in the USA (Parker et al., 2013; Sahm et al., 2010) identified quite large MPCs, on average around 0.25 and as high as 0.67 for financially-constrained households which are the unable to borrow when income is low or that own assets which are hard to liquidate quickly. Further, Ganong and

Noel (2019) using individual bank account data found that consumption by unemployed individuals declines severely when unemployment benefits expire, implying that unemployment benefits significantly affect consumption. Given that most anti-corona transfers were handed out to individuals who are unemployed, on temporary leave, work in heavily hit sectors like culture, or are socio-economically vulnerable in some other respect, we therefore expect their MPCs and hence the fiscal multiplier on their transfers over the next few years to be much higher than the average MPC on individual transfers.

Coibion et al. (2020) is the first Covid-19 comprehensive study of how large one-time transfers to individuals from the US CARES Act³ affected their consumption, saving and labour-supply decisions. Using a large-scale survey of US households, the authors show that only 15% of recipients of this transfer say they spent most of their transfer payment, with the large majority of respondents instead saying they either mostly saved it (33%) or used it to pay off debt (52%). On the whole, US households report having spent on average 40% of their cheques, with about 30% of the average cheque being saved and the remaining 30% being used to pay off debt. Most of the spending went to food, beauty and other non-durable consumer products, whereas little of the spending went to hard-hit industries selling large durable goods. The propensity to spend their stimulus cheques was higher for lower-income households, financially constrained, individuals out of the labour force, for those living in larger households, and those with a lower education. Recipients with mortgages, unemployed workers, and those reporting to have lost earnings due to Covid-19 were more likely to spend the transfers to pay debt off. Except for the employee reward scheme in the public sector and partially the tourism vouchers and wage supplement for dangerous work and exceptional workload, all of the other Slovenian anti-crisis social transfers allotted to individuals were targeted at lower-income households, financially constrained individuals and vulnerable social groups. In this regard, we can expect the effects of Slovenia's measures to be comparable to those employed in the USA. Further, given that Slovenia has one of the highest home-ownership rates (75% vs. 65% in the USA), low household debt (30% of GDP vs. 68% of GDP in the USA) and high levels of liquid deposit holdings (a household saving rate of 25% vs. 14% in the USA), we expect the propensity to spend the stimulus transfers in Slovenia will be somewhat higher than in the USA.

³ In response to the COVID-19 pandemic, the US Congress approved a USD 2 trillion fiscal stimulus package, including one-off USD 1,200 cheque per person (plus another USD 500 per child) to persons with an annual income of less than USD 75,000. Couples who filed jointly and made less than USD 150,000 were given a one-off USD 2,400 cheque (plus another USD 500 per child). The IRS reports that over 150 million payments have been distributed. This part of the package was called an Economic Impact Payment.

If we assume the propensity to consume will be 60% of the transfers received, our back-of-the-envelope calculations suggest the stimulus package could spur EUR 1.2 billion in additional consumption ($2.6\text{bn} \times 78\% \times 60\%$). This would neutralise the majority of drop in household consumption in the first half of 2020 relative to the same period 1 year before (EUR -1.39 bn). Data on consumer spending and services sector revenues indicate the transfers indeed helped to turn aggregate consumption around. Namely, the index of nominal revenue in services and the index of wholesale and retail trade initially decreased to 78 and 77 in May from the January 2020 levels (Jan2020 Index=100), but subsequently recovered to 108 and 105 by July 2020, respectively.

Analysing the distribution of measures according to the fiscal instruments used, we observe that the majority of the total fiscal stimulus was allocated through grants or direct social transfers (55% of the total). In a recent survey of the effects of fiscal policy measures, Castelnovo and Lim (2019) report that fiscal spending increases deliver a stronger stimulus than tax cuts, and that the 1-year median tax multiplier ranges between -0.5 and -0.7, while the spending multiplier ranges between 1 and 1.3 (e.g. Caldara and Kamps, 2017). Spilimbergo et al. (2009) also assert that the fiscal stimulus package has a bigger government spending component relative to tax cuts as the first-round effect on demand is immediate, while individuals may save (part of) a tax cut. Similarly, using a meta regression analysis on a set of 89 studies on multiplier effects, Gechert and Will (2012) found that direct public demand tends to have higher multipliers than tax cuts and transfers and that public investment seems to be the most effective fiscal impulse. From the perspective of the empirical findings in the literature and the findings from our own analysis above, we assess that the fact that most of the fiscal stimulus allocated was channelled through grants works in favour of expecting higher multipliers. However, more by way of public and publicly-stimulated investments is preferable in the coming months, acknowledging that such projects need more preparation time than direct transfers and tax credits. Ideally, government should in the future establish a standing facility of a set of operational public investment projects, ready to be deployed at the first signs of an economic downturn.

Conclusion

Since early April 2020, Slovenia has enacted a series of fiscal policy measures in response to the outbreak and economic repercussions of the Covid-19 pandemic. Given the inability of most central banks in developed countries to implement conventional policy to ease the situation (key interest rate cuts) due to a binding zero lower bound, policymakers are forced

to use unconventional monetary policy interventions (quantitative easing) and expansionary fiscal policy. Recent theoretical and empirical literature suggests that an unconventional fiscal policy with an increase in government purchases along with a zero lower bound policy is effective for stimulating growth (Boubaker, 2018). In light of the calls for an expanded role of fiscal policy from the research community and practitioners alike, it is important to evaluate which fiscal policy measures and moderating factors achieve the greatest impact on the economy. This was the aim of the present study in which we evaluated the effects of five anti-crisis state aid categories in the period 2009–2015 on recipient firms' cumulative growth of employment and total revenue. Using a comprehensive dataset and econometric methods that control for endogenous state aid allotment, we find that measures which are effective in spurring revenue and employment growth are the state aid categories of R&D, employment and training. The special state aid to remedy a serious disturbance to the economy and state aid for rescuing and restructuring both fail to entice the growth of employment and revenue in the subsidised firms compared to similar control firms. The most effective state aid instrument identified is a grant, while the amount of funds allocated significantly increases the relative growth of revenue and employment in the recipient firms. The anti-crisis state aid was more effective for younger recipient firms, firms with higher labour productivity, those employing less-skilled workers with lower wages, foreign-owned firms, and more export-intensive recipients.

In the second part of the empirical analysis, we used the Fiscal Council's latest estimates of the value of major anti-crisis measures from the first three anti-corona packages implemented in Slovenia since April 2020 in order to draw analogies with the anti-crisis state aid measures studied in the empirical part of the study. Our findings show that the first half-year of the Covid-19 recession in Slovenia has been marked by the outstanding size of the anti-crisis fiscal stimulus compared to the previous economic downturn. The majority of the total fiscal stimulus has been allocated through grants or direct social transfers (55% of the total) and allotted to individuals (78% of the total) rather than to employers or firms. Given the paramount effectiveness shown by grants in our empirical analysis of anti-crisis state aid measures during the Great Recession and the findings from the literature on the fiscal multipliers and marginal propensity to spend the stimulus transfers, we expect the anti-Covid fiscal measures to effectively mitigate the Covid-19 crisis' short-term serious consequences.

There are important differences between the Covid-19 crisis and the Great Recession in terms of the initial structural conditions of the Slovenian economy. These differences explain why during the previous downturn state aid was aimed at and distributed to firms, whereas in the Covid-19

recession fiscal policy chiefly targeted individuals. We entered the 2008 recession with a heavily leveraged corporate sector and a banking sector burdened by risky assets, meaning that most of the fiscal space had to be devoted to the bank-rescue package and resolution of the non-performing loans. On the other hand, at the onset of the Covid-19 pandemic, Slovenian corporate debt was low and banks were liquid and adequately capitalised. Further, the monetary response in the euro area included a recalibration of the targeted longer-term refinancing operations (TLTROs) by the ECB and a relaxation of capital requirements by the centralised microprudential authority and by national macroprudential authorities. These measures significantly improved banks' capacity to absorb losses and still support the economy and have thereby mitigated the risk of pro-cyclical deleveraging (Altavilla et al., 2020). The fiscal stimulus was therefore able to target the areas with the largest multiplier effects: neutralising the personal income slump and preventing mass layoffs through furlough schemes. The advantage of the one-off transfers to individuals as opposed to state aid distributed to firms lies in their potency to swiftly boost aggregate demand, but should be weighted against possible drawbacks like public debt growth, an excessive household saving rate, the freeze on creative destruction in the market, and the lower search effort in the job market.

We offer three policy recommendations. First, the present fiscal policy measures should be complemented as soon as possible with public investment projects because the empirical literature on fiscal multipliers shows this type of fiscal stimulus exhibits the highest returns. Second, given that such projects take a considerable time before they are kick-started, the government should in the future establish a standing facility of a set of operational public investment projects, ready to be deployed at the first signs of an economic crisis. Third, given our findings concerning the effectiveness of the Great Recession state aid, we advise the government to bolster those existing state aid categories with a good track record such as state aids which promote R&D, employment and employee training. Such a targeted and structural instrument should gradually substitute blanket social transfers whose advantage lies in their simplicity and promptness, yet lack precision and sophistication.

BIBLIOGRAPHY

- Altavilla, C., F. Barbiero, M. Boucinha, L. Burlon (2020): The great lockdown: pandemic response policies and bank lending conditions. Working Paper Series 2465, European Central Bank.
- Arrow, K. J. (1962): Economic Welfare and the Allocation of Resources for Invention. In R. R. Nelson (ed.), *The Rate and Direction of Inventive Activity: Economic and Social Factors*, 609–625. Princeton: Princeton University Press.

- Bloom, N., M. Schankerman and J. Van Reenen (2013): Identifying Technology Spillovers and Product Market Rivalry. *Econometrica* 81 (4): 1347–1393.
- Boubaker, S., D. K. Nguyen and N. Paltalidis (2018): Fiscal Policy Interventions at the Zero Lower Bound. *Journal of Economic Dynamics and Control* 93: 297–314.
- Bronzini, R. and P. Piselli (2016): The Impact of R&D Subsidies on Firm Innovation. *Research Policy* 45 (2): 442–457.
- Burger, A. and M. Rojec (2018): Impotence of Crisis-motivated Subsidization of Firms: The Case of Slovenia. *Eastern European Economics* 56 (2): 122–148.
- Caldara, D. and C. Kamps (2017): The Analytics of Svars: A Unified Framework to Measure Fiscal Multipliers. *The Review of Economic Studies* 84 (3): 1015–1040.
- Card, D., J. Kluve and A. Weber (2018): What Works? A Meta Analysis of Recent Active Labor Market Program Evaluations. *Journal of the European Economic Association* 16 (3): 894–931.
- Castelnuovo, E. and G. Lim (2019): What Do We Know About the Macroeconomic Effects of Fiscal Policy? A Brief Survey of the Literature on Fiscal Multipliers. *Australian Economic Review* 52 (1): 78–93.
- Chindooroy, R., P. Muller and G. Notaro (2007): Company Survival Following Rescue and Restructuring State Aid. *European Journal of Law and Economics* 24 (2): 165–186.
- Christiano, L., M. Eichenbaum and S. Rebelo (2011): When is the Government Spending Multiplier Large? *Journal of Political Economy* 119 (1): 78–121.
- Coibion, O., Y. Gorodnichenko and M. Weber (2020): How Did US Consumers Use Their Stimulus Payments? (No. w27693). National Bureau of Economic Research.
- Correia, I., E. Farhi, J. P. Nicolini and P. Teles (2013): Unconventional Fiscal Policy at the Zero Bound. *American Economic Review* 103 (4): 1172–1211.
- Czarnitzki, D. and C. Lopes-Bento (2013): Value for Money? New Microeconomic Evidence on Public R&D Grants in Flanders. *Research Policy* 42 (1): 76–89.
- David, P. A., B. H. Hall and A. A. Toole (2000): Is Public R&D a Complement or Substitute for Private R&D? A Review of the Econometric Evidence. *Research Policy* 29 (4–5): 497–529.
- Dimos, C. and G. Pugh (2016): The Effectiveness of R&D Subsidies: A Meta-Regression Analysis of the Evaluation Literature. *Research Policy* 45 (4): 797–815.
- Eggertsson, G. B. (2011): What Fiscal Policy is Effective at Zero Interest Rates? *NBER Macroeconomics Annual* 25 (1): 59–112.
- Eichenbaum, M. S. (2019): Rethinking Fiscal Policy in an Era of Low Interest Rates. *Economic Policy Group Monetary Authority of Singapore*, 90.
- Ganong, P. and P. Noel (2019): Consumer Spending During Unemployment: Positive and Normative Implications. *American Economic Review* 109 (7): 2383–2424.
- García Quevedo, J. (2004): Do Public Subsidies Complement Business R&D? A Meta Analysis of the Econometric Evidence. *Kyklos* 57 (1): 87–102.
- Gechert, S. and H. Will (2012): Fiscal Multipliers: A Meta Regression Analysis. *IMK Working Papers*, No 97, Hans Boeckler Foundation, Macroeconomic Policy Institute.

- Girma, S., H. Görg and E. Strobl (2007): The Effects of Government Grants on Plant Survival: A Micro-Econometric Analysis. *International Journal of Industrial Organization* 25 (4): 701–720.
- Głowicka, E. (2006): Effectiveness of Bailouts in the EU. In Technical Report. CIC Working Papers SP II 2006-05, Wissenschaftszentrum Berlin.
- Hall, B. H. (2002a): The Assessment: Technology Policy. *Oxford Review of Economic Policy* 18 (1): 1–9.
- Hall, B. H. (2002b). The Financing of Research and Development. *Oxford Review of Economic Policy* 18 (1): 35–51.
- Heim, S., K. Hüschelrath, P. Schmidt-Dengler and M. Strazzeri (2017): The Impact of State Aid on the Survival and Financial Viability of Aided Firms. *European Economic Review* 100: 193–214.
- Jaklič, A., A. Burger, M. Rojec (2013): The Quest for More Efficient R&D Subsidies. *Eastern European Economics* 51 (4): 5–25.
- Kluve, J. (2010): The Effectiveness of European Active Labor Market Programs. *Labour Economics* 17 (6): 904–918.
- London Economics (2004): Ex-post Evaluating of the Impact of Rescue Aid on the International Competitiveness of the Sector (s) Affected by Such Aid. Final Report to The European Commission–Enterprise Directorate-General. Brussels: European Communities.
- Murn, A., A. Burger and M. Rojec (2009): Učinkovitost državnih pomoči za reševanje in prestrukturiranje podjetij v Sloveniji. *Naše gospodarstvo* 1 (55): 3–12.
- Nelson, R. R. (1959): The Simple Economics of Basic Scientific Research. *Journal of Political Economy* 67 (3): 297–306.
- Nitsche, R. and P. Heidhues (2006): Study on methods to analyse the impact of State aid on competition (No. 244). Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.
- Nulsch, N. (2014): Is Subsidizing Companies in Difficulties an Optimal Policy? An Empirical Study on the Effectiveness of State Aid in the European Union (No. 9/2014). IWH discussion papers.
- Parker, J. A., N. S. Souleles, D. S. Johnson and R. McClelland (2013): Consumer Spending and the Economic Stimulus Payments of 2008. *American Economic Review* 103 (6): 2530–2553.
- Sahm, Claudia R., Matthew D. Shapiro and Joel B. Slemrod. 2010: Household Response to the 2008 Tax Rebate: Survey Evidence and Aggregate Implications, Chapter 3 in Jeffrey R. Brown (ed.), *NBER Book, Tax Policy and the Economy*, vol. 24, 69–110. Chicago: University of Chicago Press.
- Schweiger, H. (2007): The Impact of State Aid for Restructuring on the Allocation of Resources, University of Maryland. Mimeo.
- Spilimbergo, M. A., M. M. Schindler and M. S. A. Symansky (2009): Fiscal Multipliers (No. 2009–2011). International Monetary Fund.
- Takalo, T., T. Tanayama and O. Toivanen (2013): Estimating the Benefits of Targeted R&D Subsidies. *Review of Economics and Statistics* 95 (1): 255–272.
- Woodford, M. and Y. Xie (2020): Fiscal and Monetary Stabilization Policy at the Zero Lower Bound: Consequences of Limited Foresight (No. w27521). National Bureau of Economic Research.

SOURCES

- BIS (2020): Annual Economic Report 2020. Basel: Bank for International Settlements.
- European Commission (2019): Cyclical Adjustment of Budget Balances: Spring 2019. Brussels: European Commission, DG ECFIN Economic Forecasts. Accessible at https://ec.europa.eu/info/sites/info/files/economy-finance/cabb_spring_2019.pdf, 6. 7. 2020.
- Fiscal Council (2020): Posodobitev ocene dejanskega javnofinančnega učinka sprejetih enkratnih protikriznih ukrepov: Stanje sprejetih ukrepov (6. 7. 2020). Ljubljana: Fiskalni Svet. Dostopno prek http://www.fs-rs.si/wp-content/uploads/2020/07/Stanje_ukrepov_5_7_2020.xlsx, 6. 7. 2020.
- Yardeni Research (2020). Central Banks: Monthly Balance Sheets (5 August 2020). New York: Yardeni Research, Inc. Accessible at <https://www.yardeni.com/pub/peacockfedecbassets.pdf>, 6. 7. 2020.