Economic Analysis

Analyzing the Effect of PPP Loan Issuances to Regional Economies as an Intervention in Underlying Trends

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Background

The Coronavirus Aid, Relief, and Economic Security (CARES) Act, passed at the beginning of the United States' Covid-19 pandemic, was the largest economic stimulus plan passed by Congress both in terms of real and per capita disbursements. Its allocations included direct payments to qualified households, funding for government programs deemed necessary in combating the ongoing pandemic, increases to unemployment benefits and loans to major industries and corporations. Much of the CARES Act sought to augment programs from the American Recovery and Reinvestment Act of 2009; however, legislators oriented the Act towards small businesses through the creation of the Paycheck Protection Program (PPP) to serve as bridge loans for around three months, which was the expected time it would take to control the pandemic. To incentivize uptake and minimize job destruction, the rules stipulated that an eligible borrower was qualified for loan forgiveness so long as they: maintained their payroll and compensation; limited spending of borrowed cash to eligible expenses; and dedicated at least 60% of proceeds on payroll during the span of the loan's coverage (between 8 and 24 weeks).

The efficacy of these relief programs has been the topic of research since the start of the crisis, and the measure of their effects is ongoing as the pandemic wanes and an economic recovery continues in earnest. A good-faith understanding of the impact of these programs should be holistic, in that, their effect is evaluated both in terms of their short-term economic impact in addition to their residual long-term effects, as well as their contribution towards further preventing the spread of the virus. Research limited to just an economic analysis chooses to reduce the ongoing health crisis, its effects on consumer behavior and the secular shifts it has caused as a monolith to be moved by conventional monetary policy, public spending and lending programs.

Research with PPP loan data from August through December 2020 has drawn mixed conclusions about the impact of each round of loan disbursements. Economists in the beltway are more likely to herald the seemingly mild impact of the program as a success both in terms of payroll retention and as a feat of bipartisan cooperation. Meanwhile, academic economists have mostly approached the program with skepticism describing its job-saving measures as overpriced considering its almost one trillion-dollar price tag. This differing of opinions pivots around the estimates of job retention between these two groups of economists. Treasury and other beltway economists have thrown out estimates in the tens of million; while, academic economists have hovered between one and four million jobs retained by the program. Even if we were to assume that the milder academic consensus better estimates job retention, the discussion about the impact of the PPP should not then turn into one about the efficiency of spending per job retained but consider the residual impact of the program as compared to the opportunity cost of its allocated funding.

Proponents of the PPP are likely to remind dissenters that the auxiliary goal of the program was long-term business solvency. In that end, any evaluation should consider the extent to which PPP loans prevented business closures and how this is contributing towards current payroll growth. Likewise, dissenters can point to the inefficient use of funds towards short-term payroll retention and argue that reallocation towards programs like unemployment insurance expansions and rent and mortgage moratoriums would have resulted in a faster recovery; in that, the first wave of Covid-19 could have been cut short if workers had a greater incentive to stay home coasting on the financial cushion padded by this social safety net as was the case in many OECD countries. Though, any attempt to model these counterfactuals would be very difficult given the extreme disparity in controlling Covid-19 between developed countries alone.

This brief seeks to revisit conclusions drawn by previous research and consider the ways in which the PPP affected not only payroll retention but, more so, its residual effects which have shaped the post-pandemic economy. Namely, we will consider business closures, consumer spending, payroll retention across industries, and labor variables at the MSA level in order to paint a more comprehensive picture of the legacy of the PPP. With this, we expect to better understand the value of small business loans during a time like that of the Covid-19 crisis, anticipate the effects of expansion to PPP and eligibility as laid out in the American Rescue Plan Act of 2021, and evaluate the usefulness of this program during future downturns.

Methodology

Analysis of the effect of PPP loans is made possible by a PPP FOIA request and the SBA's publishing of loan details which covers fields such as loan amount, the business' zip code, its NAICS code, opt-in demographic details about the borrower, size of the business and the lender covering the loan. Across four major waves of PPP loan issuances, over four million loans had been written totaling issuances of over half a trillion dollars.

Data of response variables in our analysis have all been sourced publically. Labor statistics such as nonfarm payrolls, participation rates, wages, establishment counts and unemployment rates disaggregated at the MSA and county levels and by industry were sourced from the BLS and its QCEW.[1] Lastly, consumption figures were sourced from the Opportunity Insight Economic Tracker which has covered real-time estimates of economic variables like unemployment insurance claims, small business openings, incomes and consumer spending at the county level.

Our analysis treats the time through which PPP loans were issued as that during which an intervention in an underlying trend occurs. The hypothesis shifts the definition of the underlying trend and whether the loans or its absence represents the intervention depending on our expectation of the effects of the loans on the response variable in question. Taking the case of payrolls as an example, our hypothesis identifies a decrease in nonfarm payroll as the prevailing trend just before, during and after the intervention at period, T. Given the stated purpose of PPP loans, we want to test whether counties and their industries were more likely to experience a flattening or reversal in this downward trend during the intervention period in proportion to the size of their payroll covered by PPP loans; therefore, the loans are assumed to be part of the intervention. It is worth noting that the underlying trend is not always decreasing and the absence of loans may be treated as part of the intervention, if this absence shifts the trend.

1: The Quarterly Census of Employment and Wages (QCEW) program publishes a quarterly count of employment and wages reported by employers covering more than 95% of U.S. jobs.

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These analyses fall into the broader class of regime shift direction methods from which we are borrowing Bayesian change point models as described by Western, et al (2004)[2] and must describe the parameters which define the prior distribution and a single instance which represents the intervention. This instance is defined as the median date during which companies specific to a region's (county or MSA) industry had their loans issued. This date ranges from early April to early June.

Underlying trends are assumed to have a non-linear ARMA movement which is defined in the prior and a constant or scalar component which augments the trend at and after the time of intervention. The distribution of this component varies depending on the shape of the underlying trend and the assumed effect of the intervention (both of which are constant between the same response variable being measured). Non-zero constants and non-one scalars imply an effect during the intervention. To test whether these effects have any relationship to the issuance of PPP loans, they were regressed against the shares of establishments and employees covered by loans specific to that county or industry.

A downward trend will generally take the form,

$$x_t - \mu = z_t \omega_t \frac{\Theta(B)}{\Phi(B)}, \quad z_t = \frac{\delta_t}{1 - \omega_1 B} P_t$$

Where $\frac{\Theta(B)}{\Phi(B)}$ is a stationary ARMA model with a backshift operator. This expansion represents an immediate effect which is assumed to eventually tend to zero and is modeled with $P_t = 1$ when $t = T$ and $P_t = 0$ otherwise. We assume $|\omega_1| < 1$. The coefficients ω_1 and δ_t are the intervention parameters which are estimated by the series.

Concerning the intervention, we recognize that each issuance of loans was concurrent with other policies which likely amplified changes to labor and consumption statistics. One example which we discuss in more detail when analyzing trends in consumer spending is the first round of economic relief payments. A more robust analysis would try and control for the effect of relief payments across average regional disbursements and purchasing power. Yet, this proves difficult, as we must take into account the effects of each fiscal policy and their intersection with one another. Our paper assumes negligible effects of relief payments on short term small business labor statistics and estimates the intersecting effect of economic relief payments and PPP loan disbursements.

Analysis

As described by the CARES Act, it, "establishes the Paycheck Protection Program to provide eight weeks of cash flow assistance to small businesses through federally guaranteed loans to employers who maintain their payroll. Such assistance shall be to cover costs such as payroll, paid sick leave, supply chain disruptions, and employee salaries. The division further provides that certain amounts owed on such loans are eligible to be forgiven." At face value, the success of the program is measured against payroll, total benefits and business closures. We should expect to see companies covered by PPP loans to experience fewer layoffs, decreases in total benefits and a lower probability of business closure at least over the covered period. These results are supported by findings from a July 2020 NBER

2: Western, Bruce and Meredith Kleykamp. 2004. *A Bayesian Change Point Model for Historical Time Series Analysis*. Political Analysis, *Volume 12, Issue 4: Special Issue on Bayesian Methods*. Cambridge University Press. pp. 354 – 374.

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paper (Bartik et al., 2020)[3] which finds that the issuance of PPP loans increased short term business survival expectation by 14 to 30 percent.

Of course, the intended purpose of the PPP was not just economic stability for select companies over two months but the creation of a platform from which the recovery could launch itself. Therefore, let us first consider the long-term effect of PPP loan issuances on these baseline variables in the year since the start of the crisis.

Figure 1. **PERCENT OF PAYROLL COVERED BY PPP LOAN** (%)
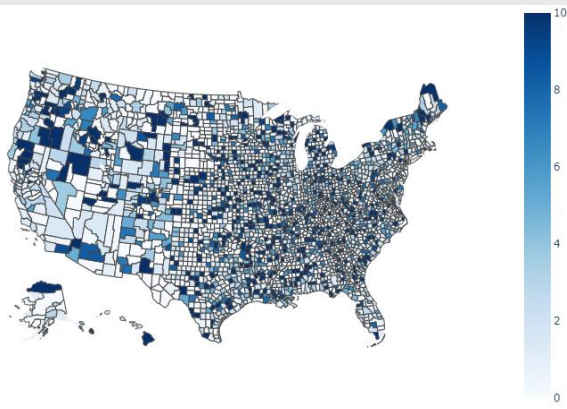
Source: BBVA Research and SBA

Figure 2. **SCALAR EFFECT OF PPP INTERVENTION ON NFP BY COUNTY**
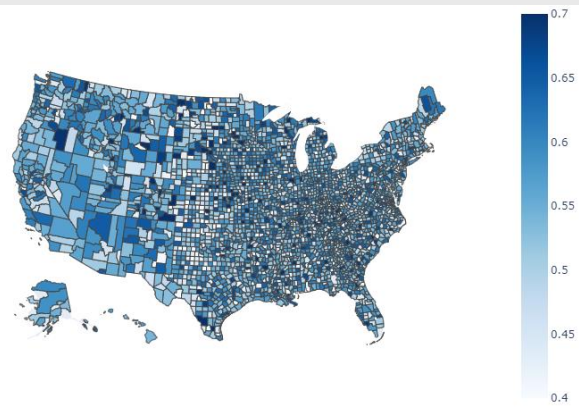
Source: BBVA Research

At the county level, the latest release of employment statistics tracks through 3Q 2020. Counties, controlled for by industry composition, which saw more than 5% of its payroll covered by PPP loans saw a statistically significant difference at 95%-confidence between changes in total quarterly income, total quarterly contributions and weekly wages in 3Q 2020. By this 3Q 2020, workers in these counties were expected to lose $1,700 less in gross income, $5,792 less in total contributions and $41.91 less in weekly wages than workers in counties whose payrolls are less than 5% covered by PPP loans. We have delimited at 5%, as it is the median relative payroll coverage across counties. Regressing these responses against the share of payrolls covered by PPP loans, total quarterly wages and contributions result in significant relationships at 95%-confidence. These results imply that every 1% increase in payroll coverage results in an increase in total wages of $743 and in total contributions of $2,331. There seems to be no significant linear relationship between weekly wages and an increment in payroll coverage.

As for an intervention analysis in the trend of falling county nonfarm payrolls, our model implies that each 1% increase in payrolls covered by PPP loans produced a scalar coefficient which dampens the decay in payroll by 0.25% on a weekly basis once loans begin to be issued. That is to say, a county with 2% of its payroll covered by a loan should expect the rate at which its payroll falls to flatten out by 0.49% (the square of the coefficient) week over week. During

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3: Bartik, Alexander W and Cullen, Zoe B and Glaeser, Edward L and Luca, Michael and Stanton, Christopher T and Sunderam, Adi. 2020. *The Targeting and Impact of Paycheck Protection Program Loans to Small Businesses*. National Bureau of Economic Research, *Working Paper Series*, 27623. http://www.nber.org/papers/w27623.

the course of the loan's term (an average of 12 weeks), a county with 1% payroll coverage should expect 1.96% fewer layoffs than a county with trivial or no coverage.

Contrast this with the same comparison across industries controlled for geography. In 3Q 2020, there was no significant difference in changes to total wages, contributions or weekly wages at any percent of payrolls covered by PPP loans at the NAICS-6 level. Unsurprisingly, in regressing these variables against industry payroll coverage, no significant relationship appears. Moreover, there is no measurable relationship in the intervention analysis of industry payrolls and the issuance of loans. This seems to suggest, given the nature of the crisis, that these injections of capital serve to sustain local economies as a kind of closed system but not across geographies. These results do not necessarily suggest that PPP had no effect on industry payroll; rather, the nature of the crisis, its anachronistic effects across geographies and its unequal effect across industries and their supply chains makes the effect of PPP loans difficult to measure

Figure 3. **NAICS-2 PPP EFFECT**
(X = NAICS-2, Y = PPP EFFECT R = PAYROLL COVERED BY PPP LOAN, %)
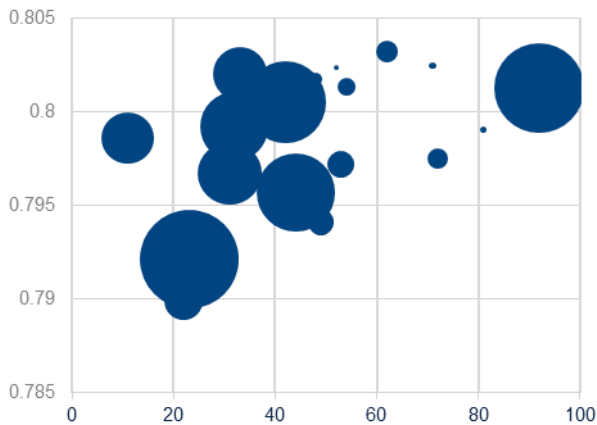
Source: BBVA Research, BLS and SBA

Figure 4. **COUNTY NFP TO NFP COVERAGE BY PPP LOANS** (%)
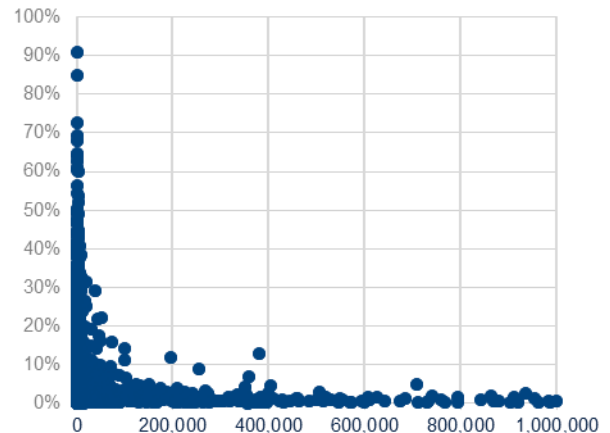
Source: BBVA Research and SBA

This may not be unexpected given the SBA's qualifications for a PPP loan. In most counties, the average borrower's company size was between two and seven employees and relatively few reported more than thirty. We might consider that analyzing the effects of PPP loans across counties biases against more metropolitan counties, which are more likely to fall below this 5% threshold. This could be true if larger corporations, who were more likely to bear the brunt of the pandemic or request other types of assistance, make up a larger share of employers and payrolls in these counties. Therefore, this significant difference in measures is better described as a greater difficulty experienced within more metropolitan counties. Moreover, this describes the lack of significance across industries, as the impact of PPP loans would be most visible in industries whose payroll is concentrated in smaller firms. Only 14% of industries had payrolls which had PPP loan coverage of more than 5%. Compare this with the 26% of counties which had more than 5% of their payroll covered by PPP loans.

Since we have accounted for the PPP's contribution to small counties, we turn our attention to metropolitan economies and their response around the issuance of these loans. Between the trough of the crisis and December 2020, MSAs saw an average recovery of 3% of its labor force, 10.2% of its nonfarm payroll, an uptick of 1.6% in their unemployed population and a 5.9% downtick in U-6 unemployment. Regression analysis finds a significant relationship between PPP loan coverage of payroll, and labor force, nonfarm payroll and the unemployed population at 90%-confidence. Each percent increase in loan coverage seems to correspond with a 0.14% increase in the labor force, a 0.71% increase in nonfarm payroll and a 0.5% decrease in unemployed persons.

Figure 5. **PERCENT OF PAYROLL COVERED BY PPP LOAN** (%)
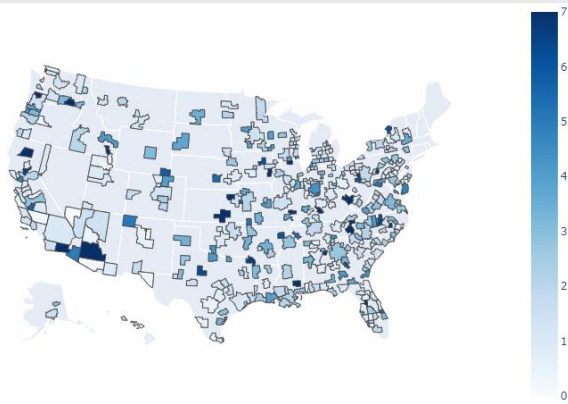
Source: BBVA Research and SBA

Figure 6. **SCALAR EFFECT OF PPP INTERVENTION ON NFP BY MSA**
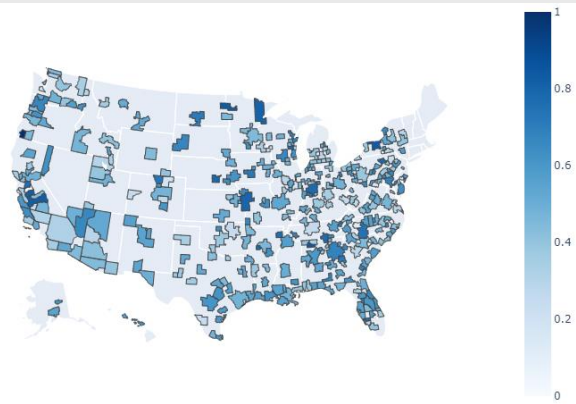
Source: BBVA Research

Tracking the trends of these variables starting in January 2019 through December 2020 and assuming an intervention sometime between April and June 2020, we also find a significant effect between the trending levels of labor force, nonfarm payrolls, unemployment and this intervention. As was the case with county nonfarm payrolls, disbursement of loans corresponds with a scalar effect which moderates the trends created by the crisis. We find that for each 1% increase in payrolls covered by PPP loans, the monthly decrease in the labor force moderates by 0.3%, decreases in nonfarm payroll moderate by 0.41% and increases in the unemployed population moderate by 0.11%. These results imply that over the course of the terms of the loan, an MSA with 1% of its payrolls covered by PPP loans might expect to have prevented a 0.65% contraction in its labor force, a 0.83% decrease in its nonfarm payroll and a 0.23% increase in the unemployed population.

Lastly, we considered the extent to which PPP loans contributed to existing trends in consumer spending. However, this is not as straightforward as tracking the trends in labor statistics through the beginning of the crisis and focusing on the timeframe during which the terms of PPP loans were active; because, the issuance of the loans also coincides with the disbursement of the first round of economic relief payments to upwards of 85% of Americans. The issuance of these payments itself should be viewed as an intervention in otherwise falling consumer spending. To solve this problem, we apply our intervention analysis to county-level consumer spending with an intervention date defined as the median date a county's population received its stimulus payment and compare the change in falling spending patterns to the proportion of that county's payroll covered by PPP loans.
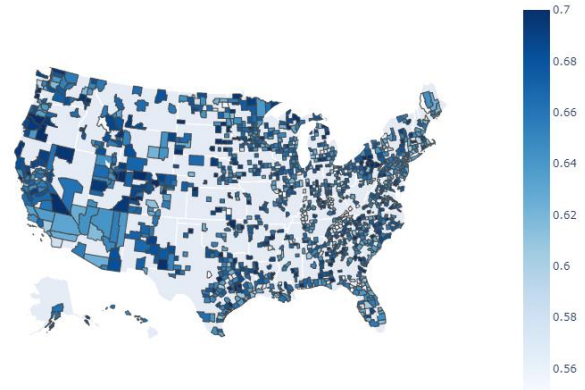
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Figure 7. **NATIONAL CONSUMER SPENDING INDEX** (JANUARY 2020 = 0)
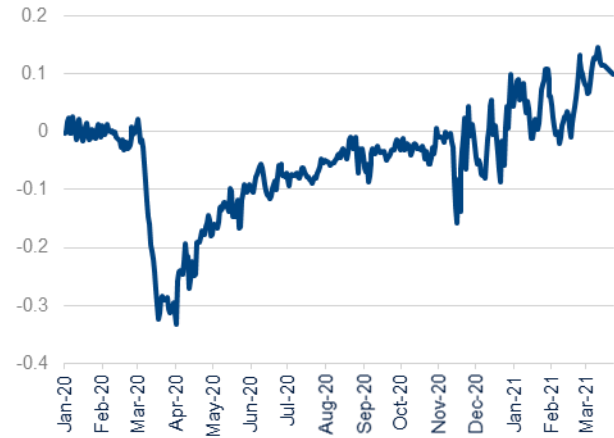
Source: BBVA Research and Opportunity Insights

Figure 8. **COUNTY LEVEL EFFECT OF INTERVENTION ON CONSUMER SPENDING**

Source: BBVA Research

As chained to average spending in January 2020 (Figure 7), the fall in 7-day moving average consumer spending bottomed out between -28% and -33% across the first two weeks of April 2020. This drop suddenly inflects during the week of April 13th which coincides with the bulk of relief check disbursements via direct deposit. Our intervention analysis calculates scalars for each county's consumer spending with an intervention around April 13th and a reversal in the trend of falling consumer spending thereafter. As compared to the distribution of PPP loans, regression analysis against these scalars describes a weekly bolstering of upward momentum in consumer spending by 0.61% for every 1% of payrolls covered by PPP loans which is significant at 90%-confidence. This is to say that counties with 1% of its payrolls covered by PPP loans might expect to experience a 2.7% boost to its rate of recovery of consumer spending per week as compared to counties with negligible payroll coverage. Given the national rate of recovery to total consumer spending which fully recovered by December 2020, these results imply that counties accelerated their recovery in consumer spending by one week for every additional percent of its payrolls covered by PPP loans.

Bottom Line

The issuance of just over half a trillion dollars across almost five million loans was estimated to have covered around 84% of all small business payrolls. While evidence of the short term boon is strong, long term measures of direct and indirect factors affected by the PPP are more middling. The PPP's effect on features of local economies such as labor force participation, unemployed persons and the unemployment rate is present; though, it varies widely given secular shifts to industry composition and local government's effectiveness in controlling the virus. Over the term of the loan, our estimates show that just over eight jobs were retained for every ten covered by a loan and 3.64 million jobs retained in the long-term which is consistent with the academic consensus.

A few relationships to highlight include the disproportionate benefit to small counties as compared to those belonging to the system of metropolitan statistical areas. Future analyses and replications of existing research should make sure to partition response metrics based on features of the underlying economy in order to describe the scalar effect of labor force size, median company size and industry composition on those metrics. These results suggest that PPP loans

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work as a means of fiscal policy to stimulate regional economic activity rather than sectoral stimulus, and its benefits have difficulty circulating around larger and more complex regional economies.

Since the passing of the CARES Act, the PPP has been sidelined as a marginal tool in recovering from the Covid-19 crisis. Legislation around its creation and its major rounds of loan disbursements under the 116th U.S. Congress has sought to expand eligibility, coverage periods and loosen terms for loan forgiveness. However, this new Congress working alongside the Biden administration has been less keen to the continued expansion of the program. The $1.9tn American Rescue Plan Act of 2021 earmarked small business loans by industry rather than funneling funds through the PPP. It only expanded the PPP by $7bn and extended eligibility to some non-profit firms. While we might expect the PPP to be shelved in favor of more targeted fiscal measures, the Covid-19 crisis has set the precedent for deferring payroll coverage to employers and local lenders for when the next threat to small business operations comes about.

Finally, a key lesson of the PPP for future downturns is that special attention needs to be placed on the nature of the crisis. The Covid-19 pandemic has been a pervasive force for more than a year, and it was initially met with a program which assumed a return to normalcy within a few months. Of course, we now see better given the gift of hindsight. Yet given the undeniable but knowingly ephemeral effects of the PPP, its subsequent expansions as late as December 2020, as the height of Covid-19 in the U.S. and with no end in sight, just seems like a knowingly inefficient use of taxpayer dollars.

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