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Public investment and labor market flexibility

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Abstract

This paper examines how labor market flexibility affects the output effect of a public investment shock by using panel data from OECD countries. We identify the public investment shock as a public investment spending forecast error and employ the local projection method to estimate its effect on output. Our empirical analysis shows that labor market flexibility affects the output effect of the public investment shock. While a positive public investment shock boosts output significantly in economies with flexible labor markets, output responses are not statistically significant in economies with rigid labor markets.

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1 Introduction

Public investment has been the subject of considerable attention, especially in light of the global economy being severely impacted by the coronavirus pandemic. Governments worldwide are implementing extraordinary measures to address the crisis, highlighting the role of public investment in economic recovery.[1] In addition, large amounts of public investment are needed to build public infrastructure to make economies more resilient to climate change and natural disasters. In this context, all countries must ensure that public investment is efficient and effective.

Recent studies have investigated the macroeconomic effects of public investment. They find that key characteristics of the economy, such as the degree of economic slack, the efficiency of public investment, and the way the investment is financed, are important determinants of macroeconomic effects of public invesment (e.g., IMF, 2014; Abiad et al., 2016; Furceri and Li, 2017; Miyamoto et al., 2020).

Public investment could create jobs, raising the growth of average living standards. However, job creation depends on the labor market structure. In a labor market with strict employment protection and regulations, firms may not find it profitable to create jobs in response to fiscal stimulus. Thus, labor market flexibility could play a critical role in determining the effects of public investment. Nevertheless, the literature on public investment has yet to thoroughly explore the role of labor markets.

This paper aims to fill this gap. Using panel data from OECD countries, we estimate the output effects of public investment shocks and how labor market flexibility affects them. The public investment shock is identified as a forecast error of public investment, following the approach of Auerbach and Gorodnichenko (2012, 2013). Its output effects are estimated using the local projection method of Jordá (2005).

Our findings reveal that labor market flexibility is significant. While public investment boosts output in economies with flexible labor markets, the output response to a positive public investment shock is not statistically significant in economies with rigid labor markets. A possible explanation for this result is that in rigid labor markets, firms may find it less profitable to increase employment in response to public investment due to constraints on the hiring and firing process. Indeed, our analysis shows that public investment shocks increase employment in countries with flexible labor markets but have

[1] IMF (2020) argues that increasing public investment could help revive economic activity from the sharpest and deepest global economic collapse in contemporary history. Low interest rates also support governments to invest in old and new projects as well as infrastructures.

no statistically significant effect on employment in countries with rigid labor markets.

The remainder of the paper is organized as follows. Section 2 presents the literature review. Section 3 presents the empirical methodology and data. Section 4 presents the main findings. Finally, Section 5 provides the conclusion.

2 Related literature

Since the global financial crisis, there has been extensive research on fiscal multipliers, mainly focusing on the effect of government consumption on output. Various factors have been identified that influence the fiscal multiplier, including (1) the state of the business cycle (Auerbach and Gorodnichenko, 2012, 2013), (2) the degree of indebtedness (Kirchner et al., 2010; Huidrom et al.,2020), (3) the degree of accommodation of monetary policy (Miyamoto et al., 2018; Bonam et al., 2022), (4) the exchange rate regimes and the degree of trade openness (Ilzetzki et al. 2013), and (5) population aging (Basso and Rachedi, 2021; Honda and Miyamoto, 2021; Miyamoto and Yoshino, 2022). Fiscal multipliers also differ between various spending categories and taxes (Kraay, 2012; Gechert et al., 2015). If various components of government expenditures exhibit different multipliers, the commonly estimated multiplier for total government purchases may have external validity problems (Boehm, 2020).

Ongoing research has also explored the effects of government investment. Abiad et al. (2016) find positive and significant short- and long-term effects of public investment on output in developed countries. Furceri and Li (2017) find short- and medium-term positive effects of public investment on output in developing countries. The fiscal multiplier of public investment also depends on various factors. Abiad et al. (2016) show that the output effect of public investment relies on the state of the business cycle and investment efficiency. Izquierdo et al. (2019) estimate public investment multipliers in developing countries and find that the initial level of public capital stock impacts public investment multipliers. Miyamoto et al. (2020) discover that the output effects of public investment vary by fiscal instrument and are contingent upon the quality of governance.

In addition to the above factors, this paper demonstrates that labor market flexibility can influence the public investment multiplier. The present study is most closely related to the work of Cacciatore et al. (2020). Theoretically and empirically, they investigated how labor market regulations affect fiscal multipliers and found that employment protection legislation significantly impacts them. While their research concentrates on gov-

ernment spending multipliers, the current paper examines how labor market flexibility affects public investment multipliers. Consequently, this paper is a complement to their study.

3 Methodology and Data

We identify public investment shocks as forecast errors of public investment, as in Auerbach and Gorodnichenko (2012, 2013) and Abiad et al. (2016).[2] Thus,

$$Shock_{i,t} = PI_{i,t} - PI^{E}_{i,t},$$

where $PI_{i,t}$ is the actual public investment spending as a share of GDP of country i in year t, and $PI^{E}_{i,t}$ is the forecast of the public investment spending. Forecasts are taken from the fall issue of the Economic Outlook issued by the OECD.[3]

The identified public investment shocks are used to examine the output effect of public investment with the local projection method of Jordà (2005). We first estimate the average impact of public investment shocks on output. We then examine how labor market flexibility affects the output effect of public investment shocks by allowing the output response to varying with a degree of labor market flexibility.

The first regression specification is:

$$Y_{i,t+h} - Y_{i,t-1} = \beta^{h} Shock_{i,t} + \theta^{h} X_{i,t} + \alpha^{h}_{i} + \gamma^{h}_{t} + \varepsilon^{h}_{i,t}, \tag{1}$$

where $Y_{i,t}$ is the log of the real GDP, α is the country-fixed effect, γ is the time-fixed effect, *Shock* is the identified public investment shock, and X is a set of control variables including two lags of the shocks, as well as two lags of GDP growth. We estimate equation (1) for each $h = 0, \ldots, 3$, where $h = 0$ is the year when the public investment shock takes place. We compute the impulse response functions of variables of interest with the estimated β^{h}. The confidence intervals associated with the impulse response functions are obtained by the estimated (clustered robust) standard errors of the coefficient β^{h}.

[2]This identification method overcomes two challenges often associated with the estimation of fiscal multipliers, namely the "fiscal foresight" problem (Leeper et al., 2012; Leeper et al., 2013) and the potential feedback from the state of the economy to fiscal policy.

[3]The mean and standard deviation of the shock are 0.55 and 0.95, respectively. Our results could be driven by a few influential observations. However, we find that our main findings remain broadly unchanged when using the trimmed shock, which excludes the bottom 5th and top 95th percentiles.

The second specification allows the output response to varying with the degree of labor market flexibility. As Auerbach and Gorodnichenko (2013) discussed, the local projection method can easily adapt to nonlinearity and thus estimate a state-dependent model. The second regression model is

$$Y_{i,t+h} - Y_{i,t-1} = \beta_R^h G(z_{i,t}) Shock_{i,t} + \beta_F^h \left(1 - G(z_{i,t})\right) Shock_{i,t} + \theta^h X_{i,t} + \alpha_i^h + \gamma_t^h + \varepsilon_{i,t}^h, \quad (2)$$

with

$$G(z_{i,t}) = \frac{\exp(-\delta z_{i,t})}{1 + \exp(-\delta z_{i,t})}, \ \delta > 0,$$

where z is an indicator of the labor market flexibility normalized to have zero mean and unit variance, and $G(\cdot)$ is the corresponding smooth transition function. As in Abiad et al. (2016) and Miyamoto et al. (2020), we set $\delta = 1$. For indicator z, we use the hiring and firing practices indicator from the World Economic Forum (WEF)'s Global Competitiveness Report. The indicator takes values between 1 and 7. More flexible the labor market, the higher the score.

We obtained the data used in the analysis from the OECD's Statistics and Projections Database. In order to construct public investment shocks, we use the forecast of public investment reported in the fall issue of the OECD's Economic Outlook for the same year. Our data set covers an unbalanced sample of 17 countries (Australia, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Japan, Korea, Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom, United States) over the period 1985–2017.[4]

4 Results

This section presents our empirical results.[5] We first examine the average effect of the public investment shock on output by estimating equation (1). Figure 1 displays the responses of output to an increase in public investment by 1 percentage point of GDP. In this and subsequent figures, the horizontal and vertical axes measure the years after the

[4]Countries in the sample are the same as in IMF (2014).

[5]Our results are robust in several directions. Instead of using the forecasts made in October of the same year, we use the forecasts from October of the previous year to compute the forecast errors of public investment. Our results remain broadly unchanged with the alternative shock. We also consider different combinations of control variables (e.g., public sector debt, fiscal variables, revenue shocks, and the interest rate) and lag length. Our main results are broadly unchanged with the regressions using these variables. To save space, the results of these robustness checks are available upon request.

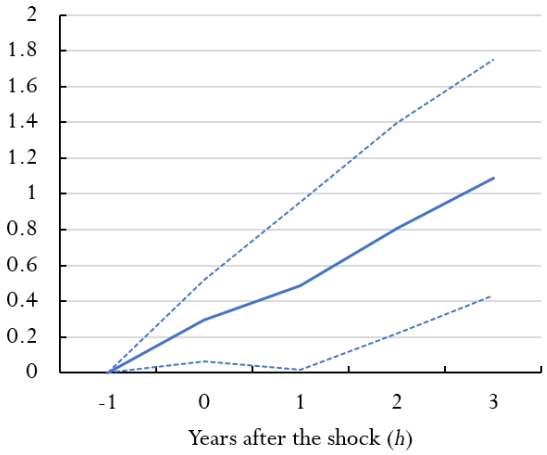

Figure 1: **The average output effect of public investment shock**
Note: The x-axis indicates the years after the shock, and h=0 represents the year of the shock. Shock represents an increase of 1 percentage point of GDP in public investment spending.

shock and the deviation from pre-shock in percent for output, respectively. Dashed lines indicate 90% confidence bands.

Positive public investment shocks raise output. A positive public investment shock of 1 percentage point of GDP is associated with an increase in output of about 0.3 percent in the same year and 1.1 percent three years after the shock. Using the sample average of government investment as a percentage of output implies that the investment spending multiplier is about 1.1 in $t = 0$. This result is in line with other estimates of the public investment multiplier (see, for example, Batini et al., 2014). Moreover, public investment shocks have long-lasting effects on output, in line with the hypothesis that an increase in public investment boosts the economy's productive capacity.

Labor market flexibility affects the output effects of public investment shocks. Figure 2 shows the estimated output responses to public investment shocks from equation (2). The analysis shows that in countries with flexible labor markets, a positive investment shock of 1 percentage point of GDP increases output by about 0.5 percent in the same year and by 2.5 percent in the medium term. In countries with rigid labor markets, output response is not statistically significant.

A possible explanation for this result is that in rigid labor markets, firms may find it less profitable to increase employment in response to public investment because of con-

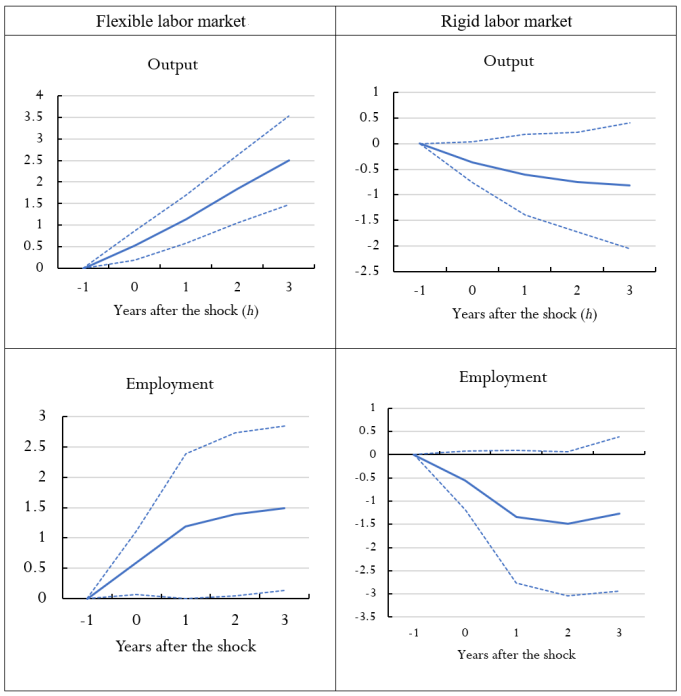

Figure 2: **Effects of public investment shocks: the role of labor market flexibility**
Note: The x-axis indicates the years after the shock, and $h = 0$ represents the year of the shock. Shock represents an increase of 1 percentage point of GDP in public investment spending. Flexible (rigid) labor market is defined based on the value of z in the transition function.

straints on the hiring and firing process. Indeed, as seen in Figure 2, public investment shocks increase employment in countries with flexible labor markets, but have no statistically significant effect on employment in countries with rigid labor markets.

We now check whether our results are sensitive to a measure of labor market flexibility. Instead of indicators on hiring and firing practices, we use the WEF's labor market efficiency indicator and OECD's employment protection legislation indicator as the measure of labor market flexibility and estimate equation (2). Table 1 reports the results. Our main result broadly remains unchanged.

The local projection method is robust to misspecification (Jordá, 2005). However, to ensure that any remaining predictable component is purged from the estimation, we add a broad set of macro variables together with other components of spending (e.g., transfers) and total revenues into control variables.[6] Our main results remain broadly unchanged with the regression using these control variables.

Table 1: Robustness check: the output effects of public investment shocks at time h

	Baseline		WEF's Labor market efficiency		OECD's employment protection legislation		More controls	
h	Flexible	Rigid	Flexible	Rigid	Flexible	Rigid	Flexible	Rigid
0	0.525	-0.362	0.715	-0.325	0.444	0.072	0.333	-0.226
	(0.207)	(0.240)	(0.180)	(0.331)	(0.176)	(0.438)	(0.198)	(0.324)
1	1.133	-0.610	1.381	-0.834	0.745	0.106	0.844	-0.481
	(0.337)	(0.477)	(0.313)	(0.592)	(0.389)	(0.918)	(0.349)	(0.673)
2	1.836	-0.751	1.731	-0.568	0.712	0.954	1.315	-0.486
	(0.477)	(0.588)	(0.383)	(0.626)	(0.534)	(1.248)	(0.446)	(0.814)
3	2.504	-0.822	2.100	-0.430	0.642	1.773	1.816	-0.572
	(0.624)	(0.743)	(0.449)	(0.673)	(0.622)	(1.460)	(0.434)	(0.817)

Note: $h = 0$ is the year of the shock. Standard errors are in parentheses.

5 Conclusions

This paper finds that the effect of public investment on boosting the economy depends on the degree of labor market flexibility. A positive public investment shock increases

[6]Kraay (2012) demonstrates that due to the varying multipliers of different components of spending, econometric models estimating multipliers for total purchases are inherently misspecified.

output significantly in economies with flexible labor markets. In contrast, in economies with rigid labor markets, the public investment shock does not significantly impact output statistically. Our finding suggests that labor market flexibility plays a crucial role in determining the effectiveness of public investment, which would interest economists and policymakers.

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