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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 a panel data of OECD countries. We identify the public investment shock as a forecast error of public investment spending 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.

Keywords: Public investment, fiscal multipliers, labor market flexibility

JEL Classification

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# 1 Introduction

The global economy has been hit hard by the coronavirus pandemic. Governments around the globe are taking extraordinary measures to respond to the current crisis. Under such circumstances, the role of public investment to recover the economies is drawing attention.<sup>1</sup> But, how effective is public investment? While the size and determinants of government consumption multipliers have been studied<sup>2</sup>, those of public investment multipliers have not been fully explored.

The purpose of this paper is to fill this gap by examining how labor market flexibility affects the effect of public investment to boost an economy. Public investment could create jobs which in turn raises 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, it may not be profitable for firms to create jobs in response to fiscal stimulus. Thus, the labor market flexibility could play an important role in determining public investment effects.

This paper estimates the output effects of public investment shocks and examines how labor market flexibility affects them by using a panel data of OECD countries. The public investment shock is identified as a forecast error of public investment, as in Auerbach and Gorodnichenko (2012, 2013), and its output effects are estimated by using the local projection method of Jordà (2005).

Labor markets flexibility matters. We find that while in economies with flexible labor markets, public investment boosts output, the output response to a positive public investment shock are not statistically significant in economies with rigid labor markets.

Our paper is related to the recent literature of public investment multipliers. Abiad et al. (2016) find a short- and long-term positive and significant effect of public investment on output for advanced economies. They also find that output effects of public investment depend on the state of business cycles and investment efficiency. For developing countries, Furceri and Li (2017) find a positive effect of public investment on output in the short and medium terms. Izquierdo et al. (2019) also estimate public investment multipliers in developing countries and find that the initial level of public capital stock affects public investment multipliers. None of them explore how labor market flexibility affects public investment multipliers.

This paper is most related to Cacciatore et al. (2020). They study both theoretically and empirically how labor market regulations affect fiscal multipliers and find that job protection legislation has a significant impact on fiscal multipliers. While their study focuses on government spending

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<sup>1</sup>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.

<sup>2</sup>IMF (2014) and Ramey (2016) provide broad surveys of the literature estimating fiscal multipliers.

multipliers, our paper examine how labor market flexibility affects public investment multipliers. Thus, our paper could be considered as their complement.

## 2 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).<sup>3</sup> Thus,

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

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

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 vary with a degree of labor market flexibility.

The first regression specification is:

$$Y_{i,t+h} - Y_{i,t-1} = \beta^h Shock_{i,t} + \theta^h X_{i,t} + \alpha_i^h + \gamma_t^h + \varepsilon_{i,t}^h, \quad (1)$$

where  $Y_{i,t}$  is log of the real GDP,  $\alpha$  is the country fixed effect,  $\gamma$  is the time fixed effect,  $Shock$  is the identified public investment shock, and  $X$  is a set of control variables. We estimate equation (1) for each  $h = 0, \dots, 3$ , where  $h = 0$  is the year when the public investment shock take place. We compute the impulse response functions of variables of interest with the estimated  $\beta^h$ . The confidence intervals associated with the impulse response functions are obtained by the estimated (clustered robust) standard errors of the coefficient  $\beta^h$ .

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

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

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<sup>3</sup>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.

with

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

where  $z$  is an indicator of the business cycle 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 the 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 obtain 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 over the period 1985–2017.

### 3 Results

This section presents our empirical results.<sup>4</sup> 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 percent of GDP. In this and subsequent figures, the horizontal and vertical axes measure the years after the 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, this implies that 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 productive capacity of the economy.

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

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<sup>4</sup>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 broadly unchanged with the regressions using these variables. To save a space, the results of these robustness checks are available upon request.

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, the response of output is not statistically significant. This result suggests that labor market flexibility plays an important role in success of public investment.

We now check 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. We find that our main result broadly remain unchanged.

## 4 Conclusions

This paper finds that the effect of public investment to boost an economy depends on the degree of labor market flexibility. In economies with flexible labor markets, a positive public investment shock increases output significantly. In contrast, in economies with rigid labor markets, the public investment shock does not have a statistically significant impact on output. Our finding suggests that labor market flexibility plays a crucial role in determining effectiveness of public investment, which would be of interest for not only economists but also policy makers.

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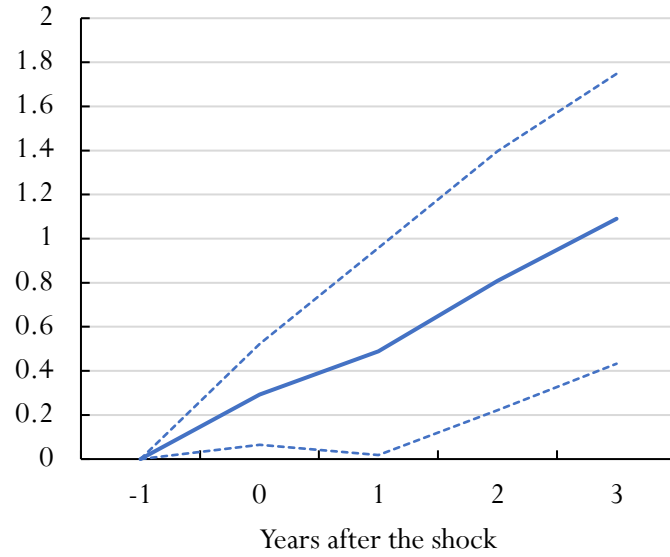
Table 1: Robustness check: the output effects of public investment shocks at time  $h$

$h$	Baseline		WEF's Labor market efficiency		OECD's employment protection legislation	
	Flexible	Rigid	Flexible	Rigid	Flexible	Rigid
0	0.525 (0.207)	-0.362 (0.240)	0.715 (0.180)	-0.325 (0.331)	0.444 (0.176)	0.072 (0.438)
1	1.133 (0.337)	-0.610 (0.477)	1.381 (0.313)	-0.834 (0.592)	0.745 (0.389)	0.106 (0.918)
2	1.836 (0.477)	-0.751 (0.588)	1.731 (0.383)	-0.568 (0.626)	0.712 (0.534)	0.954 (1.248)
3	2.504 (0.624)	-0.822 (0.743)	2.100 (0.449)	-0.430 (0.673)	0.642 (0.622)	1.773 (1.460)

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

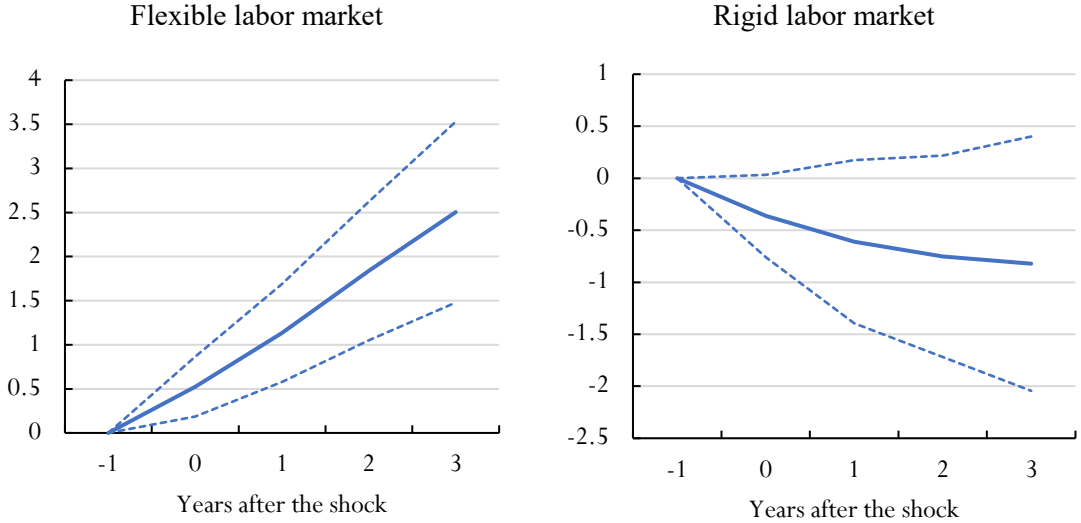


**Figure 1. The average output effect of public investment shock**



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

**Figure 2. Effects of Public Investment Shocks: The Role of Labor Market Flexibility**



*Note:* The x-axis indicates the years after the shock, and  $t = 0$  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.