

Testing the Phillips Curve: Inflation or Unemployment? Evidence from a Behavioral Experiment

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Abstract

The central thesis of the Phillips Curve is that inflation leads to less unemployment. The link between inflation and employment has been tested empirically many times using econometrics but never by behavioral science. The purpose of this paper is to use behavioral science to test the Phillips Curve thesis. A simplified company was used as a model, where labor demand was related to investments. Our experiments have shown that inflation reduces unemployment in the short term, thus confirming the Phillips hypothesis. This would mean that the central banks are able to counteract unemployment through an inflationary, expansive monetary policy and generate growth in the short term, but there are strong distributional effects.

Keywords: Phillips Curve, inflation, unemployment, expansive monetary policy, behavioral modeling, behavioral economics, quantitative easing, experimental simulation, distribution policy

JEL classification: E 24, E 31, E 53, E 58, E 70

1. Introduction

The relationship between inflation and unemployment has been discussed among economists for decades and analyzed econometrically with examples from many countries and time periods. Among other things, the relationship indicates whether a central bank can combat unemployment through an expansive, inflationary monetary policy. Proposing such a trade-off led to a discussion on whether inflation or unemployment is the greater evil. The discussion about the link between inflation and unemployment goes back to Phillips' (1958) paper. The fact that the Phillips curve has not yet been behaviorally tested led to this paper. Chapter 2 presents the related literature on the Phillips curve. The structure of the experiment is then presented in Chapter 3 and the results are explained in Chapter 4. The paper closes with conclusions in Chapter 5.

2. Related Literature

The original 1958 Phillips curve, based on UK data from 1861 to 1957, showed the relationship between average nominal wage increases and the unemployment rate. Samuelson and Solow (1960) modified the relationship between inflation and unemployment. Friedman (1968) and Phelps (1968) showed that the connection between inflation and unemployment is lost in the long term, i.e. the Phillips curve is vertical. It is now agreed that the central bank can only influence non-structural unemployment. Monetary stimuli that go beyond this only lead to inflation without a reduction in unemployment (Zanetti, 1998).

There have been many empirical studies on the Phillips curve. For example, King (1994) calculated a negative correlation between inflation and unemployment in economic cycles and a long-term trade-off for the US post-war period. Then there were many studies on the shape of the curve. The original Phillips curve of 1958 was a concave function based on an inverse relation between wage growth and unemployment. There has been some debate as to whether the curve is linear or concave, noting that although the subject of study was always the U.S. and the Phillips curve was the same, results differed due to the different econometric methods. Gordon (1998) and Staiger, Stock and Watson (2001) and Eliasson (2001) presume a linear US Phillips curve. Many others have concluded that the US Phillips curve is concave (Clark, Laxton & Rose, 1996 and Akerlof & Yellen, 2006; Stiglitz, 1997; Eisner, 1997 and Stimel, 2009). Russell and Banerjee (2006) estimated the Phillips curve from 1952 to 2004 for the USA, taking into account a non-stationary inflation rate, and came to the conclusion there is a significant positive relationship between inflation and unemployment, but they found that a rising inflation rate reduces the short-term relationship between inflation and employment, i.e. the trade off between inflation and unemployment, weakened. Furthermore, they not only confirmed that the long-run Phillips curve is vertical, but that inflation actually has a negative impact on employment. A five percent increase in the inflation rate would lead to a 1.5 percent increase in unemployment over the long term. There appears to be a weakness in the econometric research, since it comes to contradictory conclusions.

Furthermore, the Philipps curve was confirmed to exist for many countries. For example, the short term and long term curve for North Cyprus (Shahbaz et al., 2012). However we must keep in mind that the Phillips curve has not yet been behaviorally tested. Ultimately, it has never been proven that there is a causal relationship between unemployment and inflation rates because people's behavior has always been assumed but never proven. Inflation and unemployment both react to cyclical fluctuations, so it could also be a cyclical connection related to business cycles. Experimental macroeconomics has set itself the task of experimentally testing model-based macroeconomic theories. The models are to be seen as hypotheses which, according to Popper (1958), can be valid until they are falsified. The crucial question is, do people behave as in the models assumed?

3. Experimental Design

The central statements of the Phillips Curve are:

1. Increases in inflation lead to less unemployment and
2. A central bank can fight unemployment through an expansive, inflationary monetary policy.

The purpose of this paper is therefore to test the central hypothesis of the Phillips Curve:

“Increasing inflation leads to less unemployment”

The behavioral experiments were carried out online on MS Teams with the help of Excel. The experiment was conducted in summer 2021, winter semester 2021/22, summer semester 2022 and winter semester 2022/23. There were 124 participants in seven groups who were students of different business bachelor programs (macroeconomics and political economy) at the University of Applied Sciences (HTW) in Saarbrücken. The students' were asked to invest capital the way a manager of a company would. The participants' obligation was to maximize profit, which is the task of a manager as a representative of a principal (company owner or shareholder). The maximum profit in the group resulted in 10€ of real money as variable compensation.

A simplified company was used as a model, where labor demand was related to investments. Every manager of a company had to make decisions about their investment. Each company (represented by a player) started with a production capacity (PC) of 500,000 units. The games started with sales (S) of 10 million euros, at a price (P) of 20 euros and cost of 15 euros (C). Thus, the players sold 500,000 goods with their individual company, making a profit (PR) of 2.5 million euros ($PR = S - C$) with an equity (EQ) of 10 million. Each company had to decide on its investment (I). As in reality, there were delays in expanding the production capacity. The manager had to order the production equipment and to install it in the production process. Sometimes the production plant had to be developed specifically for the company. In our game, investments of 2.5 million euros (two rounds of the game) brought 50,000 increased production capacity in 2 years, or 1 million euros of additional sales at a price of 20 euros (40% or 50 euros per unit of production capacity, $PC_{t+2} = PC_t + I/50$).

Investments were made by equity, thus decreasing the company's equity, while profits increased it. Hence, the investment changes affected unemployment in the same percentage ratio, which is assumed to be 5% in the first round.

Demand and capacities were included in the price. The ratio between demand and capacity was multiplied by the price of the previous period ($P_t = D/PC P_{t-1}$). If the demand was not altered by the game master, demand and capacities increased in the same proportion. Once production facilities were installed they could no longer be dismantled, so the increase in capacity was irreversible.

Friedman (1968) pointed out that only unanticipated, i.e. rising, inflation can have an effect on real wages and thus unemployment. This is where the model comes in. The inflation was entered by the game master after each round. The inflation proportionally reduced the purchasing power of the wages (real wages). The inflation rate only affects prices, not wages. Here we assume money illusion.

4. Results

All seven groups showed similar behavior. In the first round demand equaled supply. In the second round there was a 20% drop in external demand. As a result, prices fell by 20% (Fig. 1) and unit profit fell from 5 euros to 1 euro (Fig. 2). Companies invested significantly less (Fig. 3), which reduced the demand for labor proportionally. The central bank reacted with an expansive monetary policy and the inflation rate rose by 2% per round as a result. As a result, prices rose while wages remained constant. This resulted in a continuous increase in the profit margins of the companies, which therefore invested more and more and asked for work. Unemployment fell (Fig. 4) while sales, i.e. production, rose (Fig. 5). Real wages fell by more than a third (Fig. 6).



Figure 1. Price development or Inflation



Figure 2. Unit profits

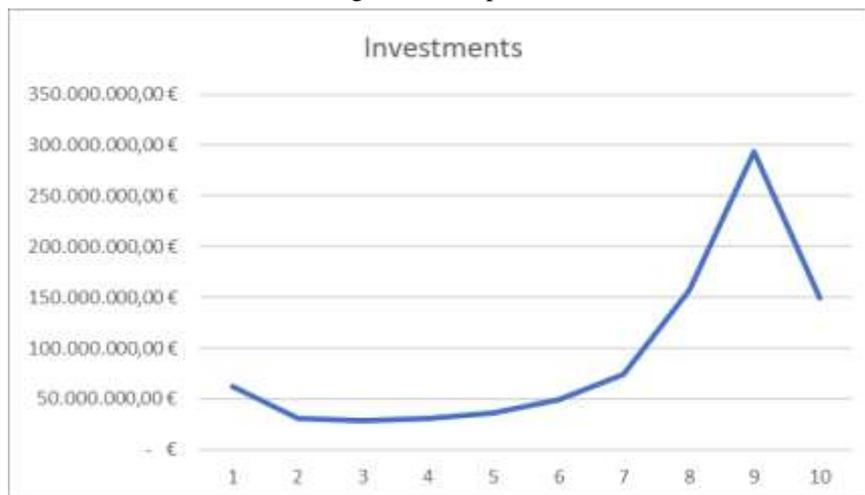


Figure 3. Investments

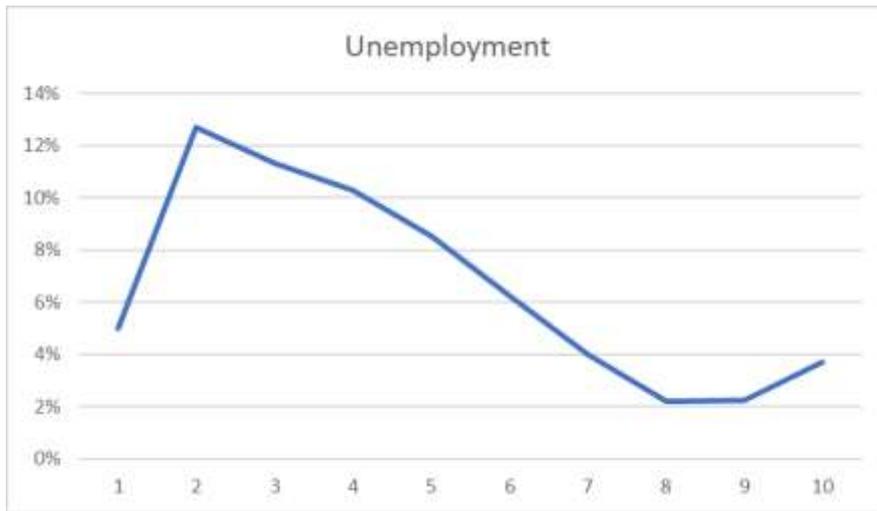


Figure 4. Unemployment

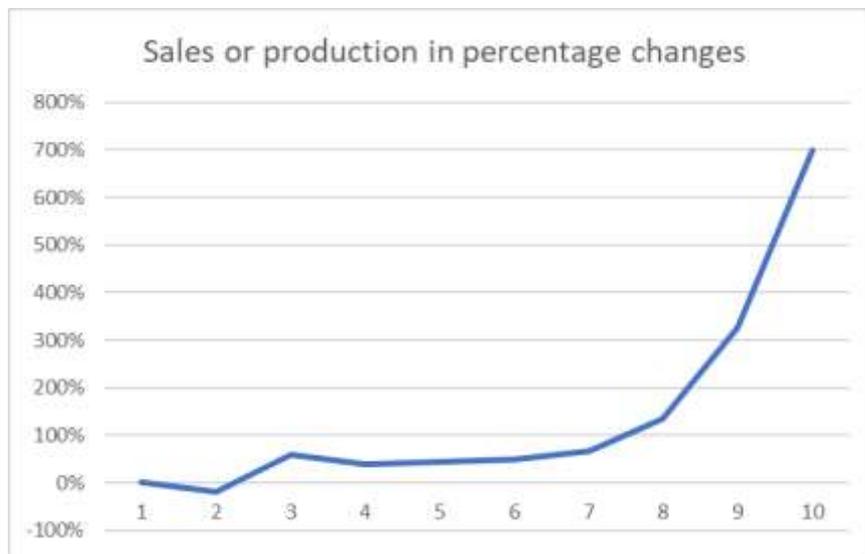


Figure 5. Production or sales



Figure 6. Real wages

5. Conclusion

The Phillips hypothesis was confirmed by behavioral science. It has been shown experimentally that inflation reduces unemployment in the short term. It was assumed that wages could not be adjusted. This is also the case in the short term.

Seen in this way, the central bank was able to fight unemployment through an inflationary, expansive monetary policy and generate growth. However, there were strong distributional effects. Real wages fell while corporate profits rose sharply. Workers got jobs but lost a share of the national income. In the long run, the effects of inflation are likely to be different if workers are able to reverse the fall in real wages through wage increases. From this point of view, even with a quantitative easing policy, negative long-term effects can be expected if inflation is triggered.

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