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Ronald Schettkat, Sonja Jovicic

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Abstract

Expansionary macroeconomic policy is ineffective because, according to the policy ineffectiveness hypothesis (PIH), which is based on the rational expectations hypothesis (REH), it does not affect the real economy. This conclusion is false for several reasons. In their critique on Keynes' theory, Lucas and Sargent (1978) argue that economic agents erroneously react with positive output and labor supply responses to expansionary macroeconomic policy. But they learn the long-run solution of the Lucas/Sargent model, which involves price reactions only, and do not repeat their mistakes when again confronted with expansionary macroeconomic policy. Thus, learning makes expansionary macroeconomic policy in the Lucas/Sargent model ineffective.

The PIH is derived from models based on neoclassical micro-foundations where economic agents optimize in a stationary environment in 'logical time.' Experiencing and learning in 'logical time'? In this paper, we take historical time seriously; that is, we investigate what economic agents actually experience regarding the effectiveness of expansionary macroeconomic policy in 'historical time.' We conclude that even if neoclassical micro-foundations are rigorously applied, if economic agents behave as assumed in the Lucas/Sargent model but that they move through time, the economy will not settle at the predicted long run equilibrium. Instead expansionary macroeconomic policy will be perceived as a virtue.

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Affiliation of both authors: Schumpeter School of Economics, University of Wuppertal. Schettkat@wiwi.uni-wuppertal.de

1. Introduction

"The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed, the world is ruled by little else."

John Maynard Keynes (1936, Ch. 24 "Concluding Notes" pp. 383-384)

The rational expectations hypothesis (REH) which led to the policy ineffectiveness hypothesis (PIH) in the new classical model is a tragic example of Keynes' statement. The REH has shaped common views on macroeconomic policies classifying unemployment as structural, which thus cannot be pushed below its 'natural' level by expansionary macroeconomic policy, fiscal or monetary. All expansionary macroeconomic policy can achieve is a higher price level. These are the major conclusions of the PIH, widely accepted among central bankers, politicians, and many economists. Unfortunately, the PIH did not remain in academics but rather guided and still guides economic policies emphasizing structural reform and austerity in Europe with tragic, long-lasting negative effects on growth prospects.

That the predictions of Keynesian theory "… were wildly incorrect, and that the doctrine on which they were based is fundamentally flawed, are now simple matters of fact, involving no novelties in economic theory," wrote Lucas and Sargent (1978: 49); they argued, "For policy, the central fact is that Keynesian policy recommendations have no sounder basis, in a scientific sense, than recommendations of non-Keynesian economists, or for that matter, noneconomists" (Lucas/Sargent 1978:57). The core of the so-called "Lucas critique" is changing coefficients in a macroeconomic model because economic agents do not simply repeat past responses to economic policies but they learn from experience, correct their expectations accordingly, and avoid systematic errors (the REH). Expansionary macroeconomic policy measures, unless unexpected, do not affect the real economy (Sargent/Wallace 1975). Certainly, no Keynesian economist denies that future-oriented decisions are based on expectations, but Lucas and Sargent assume a stochastic version of perfect foresight (Arrow 1986: 316) where the economy settles at a specific equilibrium; that is, the economy is assumed to be stationary, an ergodic system (see Davidson 1982). According to the PIH, only when confronted with an unexpected, surprising policy shock, when information is imperfect, can macroeconomic policies show real effects. However, experience will perfect the knowledge; that is, economic agents are learning, and they will

consequently not react to expansionary macroeconomic policy in the future once they experience the inflationary cycle laid out in the writings of the new macroeconomics. Rising prices is all that expansionary macroeconomic policy can achieve; it pushes the economy out of the general equilibrium but fails to stimulate production.

Lucas and Sargent (1978) claimed that the simultaneous occurrence of high inflation and high unemployment in the 1970s was evidence of the failure of Keynesian economic theory for which "a key element … is a 'trade-off' between inflation and real output: 'the higher is the inflation rate, the higher is output (or equivalently, the lower is the rate of unemployment)" (Lucas/Sargent 1978:56). However, in the 1970s, the authors argued that "the inflationary bias on average of monetary and fiscal policy in this period should, according to all these models, have produced the lowest average unemployment rates for any decade since the 1940s. In fact, as we know, they produced the highest unemployment rates since the 1930s. This was econometric failure on a grand scale" (Lucas/Sargent 1978:57). It seems that Lucas and Sargent took the modified Phillips curve (Samuelson/Solow 1960), that is, the relationship between inflation and unemployment, as the structural form of the Keynesian model, assuming that inflation causes low unemployment. However, as Robert Solow emphasized,[1] in the structural form of the Keynesian model, expanding output causes lower unemployment and probably inflation. Solow (1978) as well as Blinder (1988) argued in response to the Lucas/Sargent (1978) paper that – within the Keynesian model – supply shocks can well explain the coexistence of unemployment and inflation during the 1970s.[2]

When experiencing expansionary macroeconomic policy the first time, economic agents lack knowledge about the economic process – they are caught by surprise – but experience will lead them to discover the 'true' model – learning – and henceforth expansionary macroeconomic policy will be ineffective unless unexpected. Unexpected expansionary macroeconomic policy is treated like an exogenous shock, hitting the economy in optimum (i.e., pushing the economy out of equilibrium) because economic agents – according to the argumentation – misinterpreted nominal variables as real. They confused general price

[1] In their seminal paper, Samuelson and Solow (1960:192) wrote: "In order to achieve the nonperfectionist's goal of high enough output to give us no more than 3 percent unemployment, the price index might have to rise by as much as 4 to 5 percent per year." Thus, the relevant structural model relates output (growth) to both variables, unemployment and inflation. Inflation may be a side effect of growth in output but it does not directly affect employment or unemployment.

[2] Blinder also doubted that high public deficits in that period can be identified as expansionary policy as Lucas and Sargent did. We agree with Blinder's theoretical arguments but here we will focus on the internal consistency of the Lucas/Sargent model.

increases with relative price rises for their good, igniting adjustments to reach the mistakenly perceived new optimum. However, they will learn that they confused nominal and real and the economy returned to the initial position, the optimum, at a higher price level.

Although extremely influential in economics and economic policy, we show that the Lucas/Sargent analysis is fundamentally flawed for several reasons:

(1) The Phillips curve, the trade-off between inflation and unemployment, is taken as the structural form of the Keynesian model. Actually, rightward shifts of the demand function cause higher output, higher employment, and lower unemployment in the Keynesian model, with the probable side effect of some inflation. Thus, in the Keynesian model, the causation runs from rising demand not from inflation to quantities, which may occur if the capacity limits are reached.

(2) Furthermore, in Lucas/Sargent, only suppliers (of products or labor) are misinterpreting a general price rise, but firms experience prices in intermediate products and workers observe prices as consumers. Agents do not notice price changes for the products they buy but rather interpret a general rise in prices as specific for the goods they supply?

(3) Applying comparative statics – applying isolated equilibrium analysis for different situations in 'logical time' (Robinson 1980) – is inadequate for analyzing the adjustment process and misleading even if the underlying microeconomic assumptions are accepted.[3] As Robinson (1974, 1980) clearly explained, markets converging[4] to equilibrium requires time, a dimension missing in the quantity-price diagram[5] and only superficially used in the Lucas/Sargent analysis. Moving ahead in time, one 'short run' follows the 'next short run' (Kalecki 1968).[6] Responses to economic incentives, even if based on misperceptions, affect the next short run and may shift the economic potential in the "short runs" to come.

[3] A large body of literature in behavioral economics and psychology (e.g., Kahneman/Tversky (1979), Thaler (1994)) casts severe doubt on the optimization assumption. However, in this paper, we accept neoclassical assumptions although we have more sympathy for the counter views.

[4] Whether markets actually converge to equilibrium is not as clear-cut as often assumed; see, e.g., Ezekiel (1938), and Nerlove (1958).

[5] It is well known that in the price-quantity diagram the supply function needs to be very steep compared to the demand function to achieve a move to the equilibrium, even in 'logical time.' Otherwise, the market may circulate around an equilibrium or even move away from it.

[6] Kalecki (1971: 65) argued convincingly that "The long-run trend is a slowly changing component of a chain of short-period situations –it has no independent identity."

(4) Lucas/Sargent claims only one economics – not micro and macro – which needs to be based on 'first principles' (equilibrium and optimization), the so-called micro foundations, but their analysis treats micro units superficially. They do not investigate the consequences of actions at the micro level; they ignore output and income effects. Micro-foundations are simply the assumptions of equilibrium and maximization.[7]

(5) Using 'learning' as a metaphor for discovering an assumed stationary model and ignoring the adjustment process is insufficient and misguiding; it is, in this case, evidentially flawed. Lucas and Sargent assume that economic agents learn that the economy converges to the 'long-run' solution of their specific model. Actually, agents learn from their experience, which may well be that expansionary macroeconomic policy improves the real economy, that the potential increases, and that their incomes rise permanently. Does the economic adjustment process when the economy is 'out of equilibrium' affect the outcome? Yes, it leads to completely different conclusions.[8]

Keynes (1936) showed in chapter 19 of the *General Theory of Employment, Interest, and Money* that assuming perfect markets but a decline in real wages brought about by a reduction in nominal wages is inconsistent. Similarly, we argue that Lucas and Sargent, given their own neoclassical assumptions, are inconsistent. In this paper, we show that if economic agents behave as they argued, they will not discover their static model but rather they will learn the virtues of a dynamic economy. Expansionary macroeconomic policy will be perceived as stimulating, pushing the economy to a higher potential, and it will be perceived as a virtue rather than a mistake.

Thus, economic agents are assumed to have learned (or to know) the right model – which is supposed to be the new classical model – and they know (or have learned) the values of the

[7] Robert Solow (1978) comments on the Lucas/Sargent claim that these principles should guide economics: "When you read closely, they seem to regard the postulate of optimizing behavior as self-evident and the postulate of market-clearing as essentially meaningless. ….. the one that they think is self-evident I regard as meaningless and the one they think is meaningless, I regard as false" (Solow 1977: 204).

[8] George Akerlof (1970) argued in "The Market for Lemons" that buyers may suffer from incomplete information about the quality of used cars offered in the market (asymmetric information), which – taking the process into account – does not lead to the 'long-run equilibrium' of the neoclassical model but to an extinction of the market. Performing the sequential analysis (in historical time) leads to completely different conclusions than a static analysis. Once the buyer learns that all used cars offered are lemons, she adjusts her expectations and lowers her reservation price, which is then followed by a further decline in the quality of used cars offered. A positive feedback leads to 'equilibrium' when the market is extinguished. It is well known that the Akerlof paper was declined by several journals; one referee wrote: "If it were right, economics would be different," according to the Economist (July 23, 2016).

parameters reproducing the true relationships. According to Lucas and Sargent (1978), this reasoning is why rising prices and high unemployment (stagflation) are observed in the 1970s. Even if the analysis is based on neoclassical micro-foundations, Lucas and Sargent's conclusion is not as clear-cut as the analysis with comparative statistics suggests. Although new classical macroeconomics ostensibly provides consistent microeconomic foundations, the foundations are actually inconsistent with the neutrality of macroeconomic policy in historical time. Only rational expectations – the shortcut to the long-run neoclassical solution – solves the problem but assumes away the intermediate effects on real variables; it assumes away frictions in the adjustment process. Continuing the analysis as if the period of 'mistakes' had not occurred, as it did not have any effect on the real economy (other than price changes), however, is misleading.

If workers take jobs, even if misled by nominal wage rises as a result of expansionary policy, what do they do in the period when they are misled? If employers hire additional workers, what do they have them producing? Unless productivity drops substantially when additional workers enter the workforce, there will be additional (real) output. Although prices may rise, additional output will dampen inflation. In addition, what happens to unearned income – capital or transfers – does it rise with nominal wages?[9]

In this paper, we take the process, experience, and learning seriously,[10,11] (i.e., we investigate what economic agents actually experience and therefore learn about the effectiveness of expansionary macroeconomic policy in 'historical time'). 'Historical time' is the only deviation from the neoclassical assumptions claimed to be essential for rigorous economic analysis by Lucas and other proponents of the new classical macroeconomics.

[9] Inflation will affect earned and unearned income similarly.

[10] Learning – even about a stationary economy pushed out of equilibrium – in logical time? This approach is fundamentally flawed because learning certainly requires time, that is, an analysis in 'historical time' (Robinson 1974, 1980).

[11] This kind of learning is different from the creation of new knowledge, leading to new products and new production processes. Schumpeterian or Arrow-type learning may induce a dynamic process in the economy. Learning has also become a core issue in growth theory explaining continued productivity growth as shifts of the production function, as Arrow (1962), whose paper is often regarded as the start of "new growth theory," emphasized. Schumpeter (1911) also relates growth to change, the 'destruction' of old technologies and products by new products and production processes. These are disequilibria situations in which profits are generated but eventually disappear through imitation.

We must conclude that even if neoclassical micro-foundations are rigorously applied but learning, the process in historical time, is taken seriously, the predicted ineffectiveness of expansionary macroeconomic policies is a false conclusion. If the economy behaves as assumed in the Lucas/Sargent model and economic agents are learning, expansionary macroeconomic policy is perceived as a virtue. The Lucas/Sargent analysis is flawed because it uses learning as a metaphor but ignores the consequences of the postulated behavior. Sadly enough, the widely application of the Lucas model in economic policy has been extremely costly.

2. The Policy Ineffectiveness Hypothesis: Lucas/Sargent in a Nutshell

Expectations are a core element in Keynes' economics, but the rational expectations hypothesis put forward by Muth (1961) and popularized by Lucas and others in the new macroeconomics squeezes a non-ergodic system (see Davidson 1982) with an uncertain future into a stationary general equilibrium model, ignoring the analysis of 'out of equilibrium' behavior and historical time. "I should like to suggest that expectations, since they are informed predictions of future events, are essentially the same as the predictions of the relevant economic theory" (Muth 1961: 316).[12] In Lucas and Sargent's view, the relevant economic theory was a stationary general equilibrium model, in which all economic agents optimized. "Economics has tended to focus on situations in which the agent can be expected to 'know' or to have learned the consequences of different actions so that his observed choices reveal stable features of his underlying preferences" (Lucas 1986: 218). Neoclassical micro-foundations were claimed to be the only basis for rigorous science, discarding other approaches. However, micro-foundations are reduced to two assumptions: clearing markets and optimization.

In the Lucas/Sargent reasoning, expansionary macroeconomic policy raises the general price level, which pushes the economy out of equilibrium because when applied the first time economic agents misperceive a general rise in price as a rise in the relative price of their goods[13] and react. The reactions occur because economic agents interpret changes in nominal wages as real due to incomplete information. The Phelps' (1970) island parable of the new

[12] By this standard, however, predictions based on other than the neoclassical model (e.g., a model allowing for a response to nominal variables) could also be applied in rational expectations analysis.

[13] This seems to imply heterogeneous products.

microeconomics states that unemployed workers travel among information islands (i.e., local labor markets) to collect wage information and in this way complete their initially imperfect information while searching. Searching causes frictions and thus unemployment. Lucas applied this reasoning to the macro economy but economic agents now travel through time; that is, they experience and learn about the effects of an expansionary 'shock' to the economy (the expansionary macroeconomic policy).

"Because they do not have all of the information that would enable them to compute perfectly the relative prices they care about, agents make errors in estimating the pertinent relative prices, errors that are unavoidable given their limited information. In particular, under certain conditions, agents will tend temporarily to mistake a general increase in all absolute prices as an increase in the relative price of the good that they are selling, leading them to increase their supply of that good over what they had previously planned. Since everyone is, on average, making the same mistake, aggregate output will rise above what it would have been" (Lucas/ Sargent 1978: 60). This is a remarkable statement: General prices are rising, but agents perceive higher prices as higher demand for their specific good. Prices rise first and agents react. But who raises prices? Firms rely on price signals but these are not the only signals; surely, they will observe orders. Confusing a general rise in prices as specific for their own product reveals a very passive view firms, which certainly recognize changes in orders.[14] Furthermore, to attract workers, firms have to offer higher wages. That goes unnoticed? How and why do prices rise if employers – on average, as Lucas and Sargent mentioned several times in their paper – do not raise them? Assuming the price to be determined in atomistic, fully competitive markets, the rising price will be the result of the intersection of the market supply function (i.e., the market demand function must have shifted). However, if firms misinterpreted a general price rise as specific for their products, the supply function obviously had not yet changed. For prices to rise – even in a static setting – demand must increase.

Obviously, Lucas and Sargent analyze the economy from the supply side only. If prices rise first, who is increasing demand? Firms are usually integrated in a production chain (i.e., they buy intermediate products) and they should observe rising prices. Workers not only provide labor but also they are consumers. Here they do not realize the rise in prices? The timing

[14] Since firms are embedded in a production chain, they certainly observe rising prices for their intermediate products. If these prices rise first, firms may reduce rather than expand production (Friedman 1978).
Innovative firms not only rely on price signals but also learn from the feedback of users of their products, called learning by using (Rosenberg 1982).

required for a rise in the general price level to be interpreted as a rise in price for their own good requires ‘one-eyed’ economic agents.

The Lucas/Sargent description of the adjustment process is superficial. They use the long-run equilibrium of the general equilibrium model as reference but abstract from the adjustment process which occurs in historical time. Experiencing the effects of expansionary macroeconomic policy the first time, economic agents make mistakes (i.e., they underestimate the inflationary process). Experience teaches them that the economy will return to the initial general equilibrium once rising prices have eliminated the real effect of higher nominal wages. After learning about their misperceptions (i.e., interpreting nominal variables as real), workers correct their behavior by withdrawing labor, and unemployment is at its initial level. So, employers must reduce production to initial levels. The economy returns to its initial general equilibrium, the assumed optimum (i.e., the long run). Having experienced this cycle, once the knowledge about the ‘true’ model is completed, economic agents form their expectations about macroeconomic stimuli ‘rationally’ and do not repeat their ‘mistakes.’ From then on, erroneous behavior in response to macroeconomic impulses will be random but not systematic and, consequently, deviations of predicted from actual values are random but not systematic.

Lucas/Sargent in a nutshell: Six steps to macroeconomic policy ineffectiveness

1. **The economy is assumed to be in general equilibrium;
   that is, all markets are cleared, economic agents (both employers and employees) have optimized.**

2. **Now (being in general equilibrium) expansionary macroeconomic policy is regarded as an external shock pushing the economy out of equilibrium.**

3. **A rise in the general price level disturbs the equilibrium because economic agents have imperfect information and misinterpret a rise in the general price level as a rise in relative prices for their own goods (whether products or labor).**

   Mistakenly:

   3a. Firms hire additional employees at higher wages and expand production.

   Obviously, there are two types of workers: those who achieve their utility maximum at the going wage while employed and those who maximize utility while not working (the unemployed).

   3b. For already employed workers, the neoclassical labor supply theory is undetermined about whether they will expand or reduce the labor supply. Here, Lucas and Sargent refer to empirical work arguing that the short-run supply elasticity is high (i.e., the substitution effect dominates the income effect).

   3c. Unemployed workers leave the corner solution because at wages above their reservation wage employment rather than unemployment is optimal.

4. **Admittedly out of equilibrium, economic agents increased the labor supply and production but now they discover that they confused a general price rise with a rise in the relative price of their goods (i.e., they misinterpreted nominal for real).**

   What happened to product demand? The rise in general prices should have affected demand adversely.

5. **Economic agents adjust their behavior; initial quantitative effects diminish (i.e., workers return to their initial position, employers reduce production). The economy returns to the initial equilibrium.**

6. **Having experienced this cycle, economic agents learn from their mistakes. Being confronted with an expansionary macroeconomic policy again, economic agents will not respond but will remain in their optimum. They have "rational expectations" that macroeconomic policy will be ineffective.**

Lucas and Sargent wrote about 'agents' actually treating workers and employers similarly. In an earlier paper, Lucas (1977) seemed to assume that the labor supply elasticity in the long run is close to zero or even slightly negative, but that the short-run elasticity is quite high, as Ghez and Becker (1975) suggested.[15] "If he (the worker-producer, RS/SJ) believes the price change signals a permanent change in his selling price, we know from much evidence that he will work no harder, and probably a little less hard. That is, we know that 'long run' (very unfortunate terminology, since the 'long run' response to a permanent price change is immediate) labor supply elasticities are zero or negative. What if, at the opposite extreme, the price change is transitory (as would be the case if each period's price were an independent drawing from a fixed distribution)?" Lucas (1977: 16). Although Lucas cited the Ghez/Becker empirical work, it is not clear whether he intended to make a statement relevant for an actual economy or whether it was pure theoretical reasoning because he referred to a cycle-free world in which the general or average level of prices does not change for a representative agent who is a single worker-producer (Lucas 1977: 16).

Obviously, Lucas and Sargent assumed that the income effect dominates the substitution effect in the long run, but intertemporal substitution will cause strong labor supply reactions in the short run. First, workers consume, but rising prices for consumer goods go unnoticed? Blinded in the consumers' eyes, but interpreting wage rises as real? Also, how do workers know whether wage increases are temporary or permanent? Since initially at the same wage some workers are employed and some are unemployed, workers clearly have different preferences. The unemployed workers maximize their utility[16] while not employed (i.e., they are in a so-called corner solution, and their reservation is higher than the market wage). These workers can only increase their labor supply and take jobs in response to a wage rise. Employed workers seem to maximize utility while employed; for them, the effect of a perceived real wage increase is theoretically undetermined because income and the substitution effect work in different directions.

How important is intertemporal substitution? One may distinguish between those workers who vary the hours worked but participate in employment and those workers whose participation decision is affected. For empirical work, the best data are panel data where

[15] The Ghez/Becker (1975) analysis investigated labor supply over the life cycle based on cross-sectional data. Whether one regards utility maximization of the life span as short run may be a religious or philosophical question. Clark/Summer (1982) reported persistence in labor force participation rather than intertemporal substitution.

[16] What actually is 'utility'? In a general sense, it is empty for analytical purposes.

individual characteristics can be controlled. Important is also whether workers can actually vary hours in response to wage variations, which is surely different from variations over the life cycle. For example, New York cab drivers can vary their working hours and their wage varies with weather conditions, which affect the time they are searching for passengers. Camerer et al. (1997) found that New York taxi drivers worked shorter hours whenever their wage was high (on rainy days). This behavior contradicts intertemporal maximization (i.e., drivers should work longer hours when hourly wages are high and vice versa). However, there is a lengthy debate about whether Camerer et al.'s findings hold in different data sets and regarding the worse driving conditions on rainy days.[17]

[17] Farber (2005) and more recent analysis based on Uber data suggest learning effects (Jaffe 2014).

3. Inconsistent: Micro-foundations and Historical Time

Starting from a situation in which workers maximized their utility ('unemployed' workers choose not to work and only a wage rise can bring them into employment) and firms produce at cost minimum, Lucas and Sargent (1978) argued that economic agents initially misunderstand the effects of expansionary macro policy, which is assumed to be a general rise in prices misinterpreted as a rise in the relevant relative price of their own supplies, but that agents will learn quickly that such policies affect nominal variables (prices) only and thus lead to inflation and not to real income effects. Misperception of a general price as specific to their supplies? This is an extremely passive view on firms, which only observe prices for their supplies but not for intermediate products? Who raises prices if not firms? Similarly, workers supply labor and observe a change in wages but they are also consumers and rising prices go unnoticed? What happens to demand if prices rise first before any reaction to the general price rise occurs? Ignoring the demand side of markets is misleading and we regard a shift in the demand function as the first effect of an expansionary Keynesian macroeconomic policy which may be followed by rising prices. This does not affect the possibility that Keynesian policy is ineffective, but it makes the underlying mechanism more complete and more convincing.

If Keynesian policy is ineffective, economic agents may still learn about it, but starting with a shift in the demand function does not require the one-eyed view of agents. As in Lucas and Sargent,[18] unexpected expansionary macro policy may initially affect the real economy as derived from the Keynesian model. If agents learn that the policy results in price effects only, workers will respond to this experience. They will then form rational expectations about the effects of expansionary policy, which are assumed to be inflation only, and workers will no longer react to expansionary policies; that is, the short-run reaction under 'rational expectations' is the same as the long-run equilibrium solution in the stationary neoclassical model.

[18] In Lucas and Sargent's (1978: 65) words: "Employers and workers are fooled into too many jobs by unexpected inflation, but only until they learn it affects other prices, not just the prices of what they sell. The reverse happens temporarily when inflation falls short of expectation. This model can scarcely explain more than transient disequilibrium in labor markets."

3.1 Labor supply: Income and substitution effects

In the Lucas/Sargent model, unexpected expansionary policy pulls unemployed workers into employment because workers misperceive the rise in nominal wages as a rise in real wages. Since it is assumed that "unemployed" workers initially maximize their utility while not working, they reach a higher utility level after misperceiving the new wage as real.[19] However, they erroneously abandon their no-work optimum and increase the labor supply because they initially equate the nominal wage rise to a real wage rise. Non-employed workers were initially at a corner solution; their reservation wage was higher than their achievable wage. When workers leave the 'no work' position and accept employment, the substitution effect (substituting work against leisure) must dominate the income effect (the desire for more leisure rises with higher income; that is, leisure is assumed to be good) in the neoclassical labor supply model. If prices rise first and the generality is only discovered after quantity reactions occur, workers will withdraw labor. If the demand function shifts first, an inflationary process may start and be recognized after some time. Inflation diminishes the nominal wage rise initially perceived as a real wage rise until it disappears and real values return to the initial wage level. Workers quit employment because at the initial real wage the utility maximizing choice was 'not working'; they are back at the corner solution. However, if prices rise with a time lag to wages, a period of elevated real wages should stimulate consumption.

However, whether the income effect or the substitution effect dominates among incumbent workers is undetermined within the neoclassical labor supply model. Here, Lucas and Sargent referred to empirical findings (see above). If for the going wage some workers maximize their utility at the corner solution ('unemployment') but some choose employment at the same wage, this implies heterogeneous preferences (different indifference curves) and/or heterogeneity with respect to unearned income. Both are difficult to square with a representative agent assumption.

Neoclassical micro-foundations formulate labor supply as a choice between leisure (L) and income (consumption, C). Since more consumption (higher income) requires less leisure, the individual has to determine the hours worked (h), maximizing utility as a function of the wage (W), unearned income (V, capital income or transfers), and price level (P) because economic

[19] If the unemployed search for a job, rising wages will raise the probability of job acceptance.

agents are assumed to base their choices on real wages and real unearned income (no money-illusion; w = W/P, v = V/P).

(1) $h = h(W, V, P);\ h = h(w, v)$

(2) $u = u[C(w,v), L(t-h(w, v))]$

The effect of v on L is direct because leisure is assumed to be a normal good; in other words, consumption of L rises with income (the income effect). The effect of w, however, is ambiguous because the wage affects income but also the price of leisure. A wage rise will therefore have two effects: the income effect reducing h and the substitution effect raising h. Which effect dominates is theoretically undetermined for incumbent workers. Only a variation in unearned income (v) affects h unambiguously, negatively for rising income and positively for declining income. However, for workers at a corner solution, those workers who maximize utility while not working, a sufficient real wage rise may pull them into employment and to a higher utility level with a different work-leisure combination. If the labor supply cannot adjust smoothly to wage variations due to discontinuities in working hours/schemes, workers may not achieve their utility maximum for a given wage but their utility may nevertheless be improved compared to the former corner solution.[20]

A general wage rise will have an ambiguous labor supply effect on incumbent workers. If every worker receives the same wage, the employed worker must have a flatter indifference curve than a worker who does not work at this wage (assuming similar access to non-work income). Choosing work instead of leisure implies the same wage and the same non-work income implies a flatter indifference curve than for those "choosing" non-employment. The steepness of the indifference curve indicates how strongly leisure is weighted against income and consumption. Workers with steep indifference curves put a higher weight on leisure. Whether incumbent workers will supply more or fewer hours after a wage rise depends on the relative strength of the income and the substitution effects.

Because it is assumed that workers are pulled into employment by a wage rise initiated by expansionary macroeconomic policy (through either a misinterpreted general price rise or hiring efforts in response to a shift in the demand function), the wage must now be higher than the reservation wage of those workers who had previously chosen not to work. As

[20] The higher the standard minimum working hours, the higher the wage rise needs to be to attract unemployed workers to jobs.

illustrated in Figure 1, the misperceived wage rise let workers move away from the corner solution (A) into employment (B) in the neoclassical labor supply model. Since the economy is assumed to be in equilibrium before the policy shock (i.e., all resources – capital and labor – are assumed to be fully employed), workers' labor supply is optimal (utility maximizing) and 'not working' is chosen. Bringing workers into employment requires higher (perceived) real wages.

As prices rise (as the misperception is discovered),[21] the wage after the rise (dotted line in Figure 1) will be reduced, probably until the initial real wage is achieved again. Former corner-solution workers will quit employment and return to the initial corner solution (not working). The assumed inflationary process will compensate for the rise in nominal wages, eliminating the real wage rise. However, if prices do not rise immediately, there will be a real wage gain, at least for some time. After a while, however, prices may compensate for the initial wage rise and workers will voluntarily return to the 'not working' position.

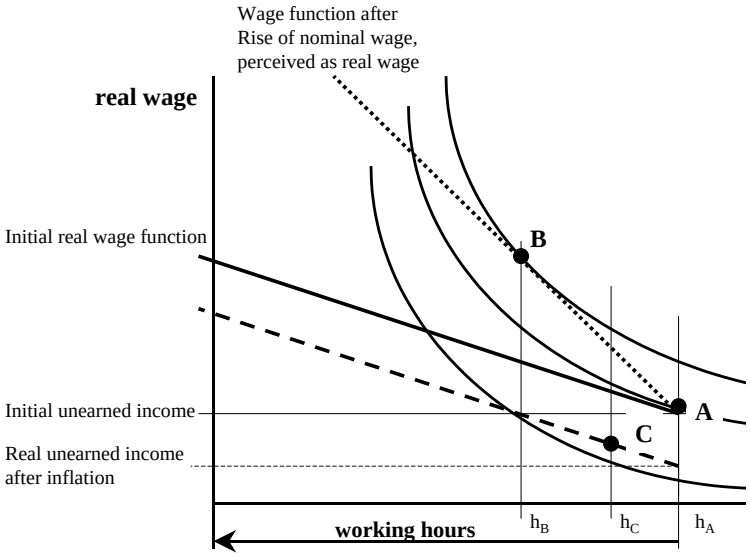
Not only are wages subject to inflation, but also unearned income will suffer from higher prices. Unless unearned income is indexed, its real value will be lower after the presumed inflation follows the expansionary macroeconomic policy shock. Lower v will unambiguously increase the labor supply of former incumbent workers and of workers pulled into employment by the expansionary macroeconomic policy shock. Thus, even if higher prices fully compensate for the initial nominal wage rise, a reduced value of v will have a positive labor supply effect (illustrated in Figure 1 by the downward shift of the wage function – dashed line).

How much will prices rise? Additional workers pulled into employment will produce additional output until they withdraw. However, the addition of workers might reduce productivity. Capital utilization is always somewhat flexible although additional workers may not work with the marginal productivity as the already employed workers. (We discuss this issue in the next section.) After returning to the initial real wage labor supply of the incumbent workers, those who had worked before the expansionary policy shock may return to their initial position, but they will face a decline in real unearned income, inducing an expansionary labor supply effect.

[21] Similarly, if general prices rise first, agents may discover slowly that all prices rose, not just their own selling price.

In summary, the labor supply effect of an unexpected expansionary macroeconomic policy 'shock' depends – within the neoclassical labor supply model – on the strength of the inflationary responses and the time lag between the macro impulse and price reactions. Furthermore, non-work income may shrink in real terms.

Figure 1: Labor supply effect of lower real unearned income



3.2 Labor demand and production

In Lucas/Sargent, agents identify (mistakenly) a general rise in prices as specific for the goods they supply. This seems to be a mystery since economic agents are also active on the demand side of the market buying intermediate products and consumption goods. It is more than puzzling that higher prices are interpreted this way. Nevertheless, expansionary macroeconomic policy will shift the demand function to the right and may lead to higher prices depending on the elasticity of the product supply function. A totally inelastic product supply function will transform the demand shift into higher prices without any quantity effect. The other extreme, a totally elastic product supply function, will transform the shift of the demand function into higher production, but this requires unused capacity[22] and constant wages.

If workers are pulled out of unemployment into employment, someone must hire them. When firms hire, they want to serve increased demand and produce higher output, even if mistakenly.[23] Since Lucas and Sargent concede the quantity reaction – workers expand labor supply and firms hire and produce – the production capacity is either flexible or expands instantly. However, assuming that the economy is in unit-cost minimizing equilibrium, firms produce at the optimal capital-labor ratio,[24] so why would firms raise production? How much would costs and prices increase? Obviously, the production technology and the flexibility of the capital stock (i.e., the shape of the supply curve) are relevant here. If firms produce with constant returns to scale technology (the minimal condition for the neoclassical production function),[25] they may expand capacity (both capital and labor) with unchanged relative factor prices. Firms would invest to accommodate higher demand. However, given the labor supply assumptions (see above), additional workers can only be hired at higher wages. Unless capital

[22] Underutilization of capacity, a slump, may be the typical situation in which to apply expansionary macroeconomic policy, but that is not compatible with the general equilibrium assumed in Lucas and Sargent's paper.

[23] "Under certain conditions, agents will tend temporarily to mistake a general increase in all absolute prices as an increase in the relative price of the good that they are selling, leading them to increase their supply of that good over what they had previously planned. Since everyone is, on average, making the same mistake, aggregate output will rise above what it would have been. This increase of output will rise above what it would have been" (Lucas/Sargent 1978: 60).

[24] Deviating from the full employment assumption, one may assume idle capital and an expansionary macroeconomic impulse can result in hiring additional workers.

[25] If firms produce with a technology of diminishing marginal returns to scale (the condition for atomistic competition), existing firms seldom increase production. Additional output would have to be provided by new firms. New, additional firms may be established, but cost/prices will be higher because of higher wages and not because the optimum production size is exceeded.

costs are indexed to wages, relative factor costs change in favor of capital, thus leading in a neoclassical model to some substitution of labor by capital, requiring additional investment. Expanding capital (i.e., investing) raises capacity and demand in the economy.

If the capital stock cannot be adjusted (probably a short-run friction), firms can expand output along the neoclassical production function moving away from the optimal capital-labor ratio and marginal productivity of labor will decline. Additional workers' productivity will be lower although wages are higher. If input factors are compensated according to their marginal productivity, wages should fall rather than rise in this case. Cost-minimizing factor combinations require some labor to be substituted by capital, which requires investment, thereby lifting demand. With a fixed capital stock, prices should rise according to the neoclassical production.

In the textbook version (e.g., Mishkin 2010) of the macroeconomic policy ineffectiveness hypothesis, the economy expands output (and employment) in the short run but not in the long run because after a while the supply function is assumed to shift upward. Why should product supply in the long run be totally price inelastic but not in the short run? The answer lies in the long-run equilibrium assumed to be unaffected by short-run reactions, by the assumption of an unchanged capacity, and by the assumption of an ergodic system. With the assumptions of the neoclassical production function – constant returns to scale, decreasing marginal productivity of input factors – it is implausible that the short-run reaction is an expansion of output but that the long-run reaction is a pure price effect.

4. Conclusion

The Lucas/Sargent REH states that in response to an unexpected expansionary macroeconomic impulse, economic agents react mistakenly but they will learn that higher prices are the only effect of such policy and will henceforth not be fooled again; thus, expansionary macroeconomic policy will be ineffective (PIH). Lucas and Sargent claimed that Keynesian economics is fundamentally flawed, wildly incorrect, a failure on a grand scale, and that there is only one economics – no micro- and macroeconomics – based on optimization and cleared markets. Expansionary macroeconomic policy is ineffective once economic agents understand that it affects only nominal variables – prices – but fails to stimulate the real economy (production and employment). There are many problems with the underlying assumptions in the Lucas/Sargent framework, but we show that even within this framework their analysis is inconsistent or, as they would probably phrase it, flawed. The inconsistencies in the Lucas/Sargent model that we show are as follows:

1. Lucas and Sargent misinterpret the Keynesian model assuming the Phillips curve to be its structural form. Actually, in the structural form, demand or growth may affect prices positively and unemployment negatively, resulting in a trade-off between the variables. Assuming the economy to be in general equilibrium allows Lucas and Sargent to predict rising prices in response to a macroeconomic stimulus, but it remains unclear how strongly prices react under this assumption. Since economic agents (firms as well as workers) mistakenly react to the macroeconomic stimulus, output will rise, which should dampen the upward pressure on prices.

2. Economic agents are treated as one-eyed, misinterpreting a rise in the general price level (assumed to be the result of macroeconomic stimulation) as specific for the goods they are selling (products or labor). Are there only sellers in the market who initially do not observe higher prices when buying intermediate goods or when shopping for consumption goods? Firms hire at higher wages but do not notice that they buy intermediate goods at higher prices? These are hardly rational agents! Only after some time do economic agents learn that not only their selling price but also their buying price rose? An amazing interpretation of rational behavior, this is surely inconsistent.

3. Neglecting the demand side of markets leads to the implicit assumption that demand in real terms remains constant. If as a result of expansionary macroeconomic policy general prices

rise first, as claimed by Lucas and Sargent, one would expect an adverse demand reaction if the price elasticity of demand is negative.

4. Mistakenly responding to higher selling prices, firms recruit workers intending to expand output and workers accept jobs. When workers take up employment and employers hire and probably invest, output increases. Why then should inflation occur or, more precisely, why should one assume that inflation exactly cancels out the initial (nominal) expansionary impulse? However, if employers assume that demand will be higher – as they expect when hiring additional workers – they may invest and raise the capital stock, probably bringing marginal productivities back to their initial levels.[26] Marginal productivity of labor may be back at its initial level but wages may still be above marginal productivity, causing a substitution of labor through capital.[27]

5. A somewhat sketchy labor supply is assumed to react positively to higher perceived real wages but only because workers expect the wage rise to be short-lived (intertemporal maximization of utility). If wages rise permanently, the labor supply reaction is assumed to be nil or slightly negative, as Lucas argues in reference to empirical work. How do workers know whether a wage rise is permanent or transitory, especially if they do not yet understand that the economy follows the Lucas/Sargent model?

6. Inflation will affect non-wage income (transfers). Unless it is indexed, the resulting negative (real) income effect will unambiguously raise the labor supply in the neoclassical model.

7. Keynesian economics works only if economic agents have not yet understood the true model – which is the Lucas/Sargent new classical model. Only surprise and incomplete information allow expansionary macroeconomic policy to work. Once information is completed (i.e., after the economy jumps back to the initial long-run equilibrium in the Lucas/Sargent model), Keynesian policies will be ineffective. That is Lucas and Sargent's view of why expansionary macroeconomic policy worked in the 1960s but not in the 1970s, when stagflation was observed. The Lucas/Sargent analysis, however, is based on comparative statistics of general equilibria and ignores the adjustment process. However, the

[26] Investment may induce technological progress as Arrow (1962) and Kaldor (1957) emphasized.

[27] Empirically, productivity growth is pro-cyclical because in recessions some capital and labor seems to be idle, allowing labor productivity to behave pro-cyclically, as Keynes – initially assuming that higher employment requires lower real wages – had to admit when confronted with the analysis of Dunlop (1938) and Tarshis (1939).

process may severely affect the equilibrium; that is, the potential may be – for several reasons – that higher macroeconomic expansion takes place.

To summarize, even within the new classical model – the model claimed to best represent the true economic relations – the experience of workers may not be what the REH claims. Rigor and micro-foundations may actually lead to workers seeing a rise in real production probably with some but most likely not fully compensating price rises in response to a macroeconomic impulse. Even if the initial nominal wage rise – whether higher demand in the economy leads to higher wages is questionable – is fully compensated by inflation, non-work income (i.e., transfers) will decline in real terms. If employers hire, they obviously expect higher demand to be real, so they may invest in capacity expansion rather than raise prices. Thus, taking learning and neoclassical micro-foundations seriously, workers and employers will find expansionary macroeconomic policy to be effective. The REH seems to be inconsistent in its own neoclassical micro-foundations in historical time.

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