

Bilo, Simon

Working Paper

Lucas and Hume on Monetary Non-Neutrality: A Tension between the Logic and the Technique of Economics

CHOPE Working Paper, No. 2015-01

Provided in Cooperation with:

Center for the History of Political Economy at Duke University

Suggested Citation: Bilo, Simon (2015) : Lucas and Hume on Monetary Non-Neutrality: A Tension between the Logic and the Technique of Economics, CHOPE Working Paper, No. 2015-01, Duke University, Center for the History of Political Economy (CHOPE), Durham, NC

This Version is available at:

<https://hdl.handle.net/10419/149728>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

LUCAS AND HUME ON MONETARY NON-NEUTRALITY: A
TENSION BETWEEN THE LOGIC AND THE TECHNIQUE OF
ECONOMICS

BY SIMON BILO

CHOPE WORKING PAPER No. 2015-01

MARCH 2015



CENTER FOR THE
HISTORY OF POLITICAL ECONOMY
AT DUKE UNIVERSITY

Lucas and Hume on Monetary Non-Neutrality: A Tension between the Logic and the Technique of Economics^{*}

Simon Bilo[†]

ABSTRACT

Translation of old economic doctrines into new technical frameworks led the profession to lose a valid theory of monetary non-neutrality. The theory relates to how additional money diffuses through the economy after entering at different points. Diffusion takes time, redistributes resources, and changes relative prices. This theory of the non-neutrality of money was introduced into economics by David Hume, among others, but it has since disappeared from the leading conversations on monetary non-neutrality. However, the disappearance was not caused by any theoretical or empirical weakness. Using Lucas's Nobel lecture as my point of departure, I argue that it disappeared because it did not fit into the popular technical frameworks.

Keywords: non-neutrality of money, Lucas, Hume

JEL classification: B11, B41, E31, E32

^{*} I would like to thank to John Berdell, Peter Boettke, Harry David, Richard Ebeling, Maria Pia Paganelli, Shruti Rajagopalan, Mario Rizzo, Dalibor Rohac, Richard Wagner, Lawrence White, Crystal Ho Po Wong, participants of the 2012 annual meeting of the History of Economics Society in 2012, and participants of the 2012 annual meeting of the Southern Economic Association for valuable comments and suggestions to the earlier drafts of the present paper. I gratefully acknowledge the financial help that I received from Bradley Foundation, Center for the History of Political Economy at Duke University, Earhart Foundation, History of Economics Society, Institute for Humane Studies, and Mercatus Center while working on this project. I am responsible for all errors.

[†] Assistant Professor, Economics Department, Allegheny College, 520 North Main Street, Meadville, PA 16335; Email: sbilo@allegheny.edu.

Lucas and Hume on Monetary Non-Neutrality: A Tension between the Logic and the Technique of Economics

Introduction

Besides being a medium of exchange, money is a medium of change. And changes in the quantity of money impose real effects on economies in a number of ways. It is perhaps for this multiplicity of different real effects, as Humphrey (1991) and Subrick (2010) argue, that the term “non-neutrality of money” is imprecise and every discussion of it therefore requires proper qualifications. I focus on a specific meaning that one can trace back to David Hume (1987abc [1752]), among others.¹ Hume considers that it takes time before monetary change works its way through changes in particular peoples’ money balances and expenditures to reach everyone. The monetary change affects relative prices and redistributes resources in the transition toward final equilibrium. In spite of the theory’s soundness and empirical relevance, academic interest in it significantly declined over the past fifty years, after its prominence during the first

¹ The same theory of non-neutrality that I discuss here can also be traced back to Richard Cantillon (2010 [1755]). Although Cantillon’s work was published in 1755, which is three years after Hume’s publication, Cantillon probably completed the manuscript around 1730 (Thornton 2007: 454). There is no direct evidence proving an intellectual influence of Cantillon on Hume (Henderson 2010: 163–166, Monroe 2001 [1923]: 211 n658, Murphy 1985: 203, Perlman 1987: 283–284 n5, Viner 1937: 74 n2, Wennerlind 2005: 227 n3). Still, a number of authors make unfounded suggestions of such influence (Blaug 1991: ix, Hayek 1967 [1935]: 9, 1985 [1931]: 238, Rothbard 2006 [1995]: 360, Spengler 1954a: 283) and Thornton (2007) provides some indirect evidence. That Hume and Cantillon share the same theory of non-neutrality of money might also be explained by an independent factor that influenced both of them. Marget (1966a [1938–1942]: 501–502, 1966b [1938–1942]: 309) proposes this explanation when he argues that the theory was the product not of an isolated individual, but of the intellectual debates of the time.

half of the twentieth century. But to be an efficient scientific discipline, economics needs to incorporate useful older ideas within new technical frameworks of analysis.

The prominence of Hume's theory before the Second World War can be confirmed by looking at important contributions of the time, such as by Hayek (1967 [1935]), Keynes (1930: 89–94), Mises (1971 [1924]), Robbins (1971 [1934]), Robertson (1961 [1922]: 74–77), and Schumpeter (1983 [1934]). A good illustration of the subsequent fading of interest in the theory is how Milton Friedman's views developed. Initially, Friedman (1961: 461–463) uses Hume's theory to explain the time lags between monetary policy actions and changes in output. While Friedman in 1969 (pp. 4–7) still accepts the theory, he already abstains from further elaborating. Finally, in his later works, such as those in 1972 (p. 15) and 1987 (p. 10), he argues that Hume's theory is not supported by evidence, a point also raised by Chari (1999: 6).

Friedman's declining interest in the theory is not an exception. After all, the important models of the 1960s and 1970s, such as Samuelson and Solow's (1960) Phillips curve, Friedman's (1968) money illusion, or Lucas's (1972) monetary misperception, are all driven by changes in the average level of prices rather than by changes in relative prices and therefore do not rely on insights from Hume's theory. Only a few outliers in the top professional journals during the 1960s and 1970s belie my observation.

Among these outliers, Cagan (1966: 229–230, 1969) and Allais (1974:

311–315) use the theory to explain the liquidity effect. Hayek (1969: 277–282) argues from the theory that changes in the money supply lead to changes in relative prices and have an effect on output. Morgenstern (1972: 1184–1185) briefly calls for attention to the theory. Wagner (1977) discusses how self-interested policy makers try to change relative prices through monetary policy, and Bordo (1983) and Perlman (1987) revisit Hume in exercises in the history of economic thought.

The empirical literature on relative-price dynamics that started in the second half of the 1970s, however, suggests the decline of interest in Hume's theory was not justifiable. The literature also contradicts Friedman's (1972) and (1987) criticisms of the theory on empirical grounds in at least three ways. First, Bordo (1980) finds that changes in the money supply change relative prices across industries; Fischer (1981) supports Bordo's findings by pointing to the positive relationship between changes in the money supply and relative-price variability, as measured by the variance of relative prices. These findings are consistent with Hume's theory because if the money supply increases through increasing the balances of some individuals, it only purchases a subset of all goods. Correspondingly, the new money affects the prices of these initially purchased goods relatively sooner, which means relative prices change across industries and overall relative-price variability increases.

The second type of supporting evidence comes because changes in the money supply also tend to change the average level of prices. If an increase in

the money supply also leads to an increase in relative-price variability, as Hume's theory predicts, the price level should be positively related to relative-price variability. This relationship has been confirmed by, among others, Debelle and Lamont (1997), Fischer (1981), Lastrapes (2006), Parks (1978), and Vining and Elwertowski (1976).

Third, Hume's theory is also consistent with the rightward skewness of the distribution of shocks to individual prices during inflationary periods documented by Vining and Elwertowski (1976) and Ball and Mankiw (1995). As I already mentioned, the theory starts with the assumption that new money is injected into the economy through cash balances of some individuals, who likely spend it on a limited number of goods. As a result, it should be only a few prices that push the inflation rate upwards, which can then explain the skewness of the distribution of shocks to individual prices.

All this evidence, however, has not had a significant effect on the leading academic discussions of monetary non-neutrality; disinterest in Hume's theory therefore, lasts until today. Notable exceptions include exercises in the history of thought by Berdell (2010: 216–217), Schabas and Wennerlind (2011: 218–220), and Wennerlind (2005). Further, Anthonisen (2010) shows how injections of new money across geographic space change relative prices and real output; and Williamson (2008, 2009) discusses the injections in the context of segmented asset markets and segmented goods markets.

Exceptions aside, in popular models, changes in the money supply do not

affect relative prices through changes in the distributions of money supply of Hume's theory. Rather, relative prices in these models are affected in two other ways. First, a monetary shock changes relative prices through a version of "time-dependent" staggered pricing decisions of Calvo (1983), as is well illustrated by the recent contributions of Christiano et al. (2005), Atkeson et al. (2010), Engel (2011), or Guimaraes and Sheedy (2011). The second currently popular way of accounting for money non-neutrality and its effects on relative prices are "state-dependent" pricing decisions of menu cost models, such as, Golosov and Lucas (2007), Gertler and Leahy (2008), Nakamura and Steinsson (2010), or Midrigan (2011).

These time-dependent and state-dependent models, considered from a Humean perspective, do not substantially differ from each other. As I explain below in more detail, money itself is the main friction in Hume's theory and the conclusions follow with only a few additional assumptions. This contrasts with time-dependent and state-dependent models, which impose special assumptions on certain aspects of the world, with otherwise frictionless money. Thus, the center stage of inquiry in Hume's theory is occupied by frictions in money itself and by the pattern through which it changes in the economy. The main actors in time-dependent and state-dependent models, however, are frictions in particular markets and individuals.

The problem with these newer models is that they implicitly restrict scientific inquiry. Although they, like Hume's theory, describe step-by-step

changes in relative prices, the changes are exogenous: the monetary authority cannot cause changes in relative prices, although it does influence the price level; rather, the given landscape of markets and given knowledge of individuals determine relative-price changes. The time-dependent and state-dependent models thus restrict analysis in at least two ways. They discourage economists from asking how and why the monetary authority chooses the point where the new money is being injected. And they deter economists from investigating how monetary expansion changes relative prices.

The way in which contemporary economics shunted aside Hume's theory raises concerns about how it incorporates valid old theories into new frameworks. Unfortunately, it seems that new frameworks are built for purposes that sometimes makes them incompatible with old ideas. Such incompatibility, as Blanchard (2003: 24) and Krugman (1984: 261–262) suggest, might tempt scholars to reject old ideas for reasons other than those of merit, such as convenience. If nothing else, we should be aware of the possibility of such rejections and understand how they happen. In the following sections, I use Lucas's discussion of Hume's theory in his Nobel Lecture (Lucas 1996) as a case study of how economists can reject valid older theory, like Hume's, when they examine it from perspective of a more recent technical framework of economic analysis.

I. Comparing Lucas and Hume: Is money an amplifier of external frictions

or is it a friction?

The misunderstanding between Lucas and Hume arises from their different views on the sources of the non-neutrality of money. The non-neutrality in Lucas (1996) arises from frictions of the world into which the monetary authority injects frictionless money. Such frictions include sticky and otherwise imperfect responses of people and markets to injections of money. In contrast, Hume emphasizes that money is itself characterized by inherent frictions that may lead to changes in the structure of the economy even without the frictions assumed by Lucas.

One can think of the economy in Lucas's model as a system of interconnected transparent tubes into which a blue liquid can be injected under pressure. In this analogy, the tubes represent the structure of the economy, the blue liquid represents money, and the observable movement of the liquid in otherwise colorless tubes represents the non-neutral effects of monetary change. Depending on their volume, injections of the liquid change the color of the tubes. However, while money matters in this model because it can change the color of the tubes, it does so in a constrained way. The consequences of a given change in the money supply is independent of the way in which this change happens—it is rather the structure of the economy embodied in the interconnections among the tubes that determines the effects of the change.

A slight modification to this model highlights the difference between Lucas and Hume. An injection of the blue liquid does not flow according to a pre-

determined structure of the transparent tubes. It can now change the structure of the economy by creating new connections between the existing tubes or by creating new tubes.

The contrast between the two models, and ultimately the contrast between Lucas and Hume, is not a mere quibble. Hume's theory describes how changes in the money supply change relative prices and in turn the structure of the economy. While a given monetary change does not predetermine the effects on prices of specific goods as these depend on how the change happens, the effects nonetheless exist as I pointed out in Introduction. A model with predetermined frictions like Lucas (1996), in contrast, does not capture the open-ended relative-price effects of Hume's theory. Professional success of theoretical frameworks describing monetary non-neutrality in the spirit of Lucas (1996) thereby drives attention away from Hume's theory and its unique insights.

II. Hume on the Dispersion of Money

Let me first consider in more detail Hume's framework, as laid out in "Of Money" (1987a [1752]), "Of Interest" (1987b [1752]), and "Of the Balance of Trade" (1987c [1752]). Hume considers differences in levels of money supply in a closed economy irrelevant;² rather, it is changes in the money supply that matter³

² Hume (1987a [1752]: 281–286, 288–290, 294; 1987b [1752]: 295–299, 301–303; 1987c [1752]: 311, 316–317).

³ Hume (1987a [1752]: 286, 286–288, 294; 1987b [1752]: 296, 305–306; 1987c [1752]: 317 n13). Also see Humphrey (1991: 5) on Hume's distinction between different levels of the money supply and changes in the money supply.

because they take time and lead to changes in relative prices. With monetary expansion, for example, the increase in the money supply diffuses throughout the economy through particular points of injection, which determine prices that increase sooner.

While Hume's theory of monetary non-neutrality applies to both increases and decreases in the money supply, I focus only on monetary expansion. I divide the theory into three parts. First, new money enters the economy through expenditures by specific individuals. Second, it takes time before new money gets into the cash balances of all individuals and the economy reaches its final equilibrium. And third, monetary expansion leads to temporary changes in relative prices.

II.1 Money enters the economy through a specific point of injection

For Hume, money enters the economy through the money balances of a specific segment of a heterogeneous population. This implies that some receive the new money first and some receive it later. If the money is imported, the importers receive it first; if it comes from debasement of coins or printing of cash, the first spenders, likely in the government, receive it first, and so on.

While Hume does not explicitly express his views in such general terms, the textual evidence suggests that this is what he has in mind. Hume is clearest in his description of how newly imported money concentrates in the hands of a few (1987a [1752]: 286–287):

When any quantity of money is imported into a nation, it is not at first dispersed into many hands; but is confined to the coffers of a few persons, who immediately seek to employ it to advantage.

(Hume 1987a [1752]: 286)

Hume does not directly address other ways the new money enters the economy; however, one can infer the same pattern from his discussions of different circumstances. For example, while Hume does not discuss injections of additional nominal quantity of money coming from debasement, he observes that it takes time before debasement affects all prices (1987a [1752]: 287). One can infer that newly debased money, in Hume's eyes, is injected through expenditures by particular people, most likely the sovereign and his close allies.

Hume also touches on paper money (1987c [1752]: 317 n13). He says the consequences of an increase in the quantity of paper money can increase output, just as when new money enters through importing specie. Since Hume's previous discussion of such a beneficial impact also assumes a point injection of the new money, one can infer that Hume thinks that when there is an increase in paper money, it disperses through the money balances of particular people.

Hume is thus consistent on the consequences of changes in the money supply from different sources, which suggests that his view on the transmission of changes in the money supply is consistent as well. Changes in the money supply, according to Hume, therefore work through changes of the money balances of specific individuals rather than through proportional changes of the

money balances of all people.

II.2 It takes time before new money reaches its equilibrium distribution

The second part of Hume's theory describes how new money diffuses throughout the economy. New money spreads across the money balances of all people only gradually. As Hume says:

[S]ome time is required before the [new] money circulates through the whole state, and makes its effect be felt on all ranks of people[.]

(Hume 1987a [1752]: 286; see also Hume 1987b [1752]: 305)

Hume describes how merchants imported gold and silver from the Spanish port of Cadiz:

Here are a set of manufacturers or merchants, we shall suppose, who have received returns of gold and silver for goods which they sent to CADIZ. They are thereby enabled to employ more workmen than formerly, who never dream of demanding higher wages, but are glad of employment from such good paymasters.... [Each workman] carries his money to market[.]... The farmer and gardener [who supply workmen] ... can afford to take better and more cloths from their tradesmen[.]... It is easy to trace the money in its progress through the whole commonwealth[.] (Hume 1987a [1752]: 286–287)⁴

⁴ The reader who is familiar with the passage might notice my omission of most of the parts

Thus, to Hume, new money spreads across the economy step by step. The initial holders of the new money in this case are manufacturers and merchants. They use the money to hire additional workmen, who, in turn, increase expenditures on the products of farmers and gardeners, who then increase their own expenditures on the products of their tradesmen, and so forth.

Hume's description of the temporal diffusion of new money rests on two assumptions. First, money can only be injected into the economy through the money balances of specific individuals. And second, the initial recipients of the new money spend it on goods in proportions that make the overall relative expenditures on goods in the economy inconsistent with those in the final equilibrium. The two assumptions mean that monetary expansion diverts the economy from its path of final equilibria for some time because individuals can spend units of money in two transactions only sequentially. This sequential nature of the adjustment guarantees that the new final equilibrium can be established only with a passage of time.

When new money enters the economy through a specific point of injection, it redirects the economy toward a new final equilibrium represented by a certain flow of expenditures and a certain distribution of money balances across people. This final equilibrium cannot be established immediately because the expenditures of the initial recipients of the new money are inconsistent with such equilibrium. The time has to pass before the establishment of new final

referring to changes in output and relative prices, which I did on purpose because changes in output are not the focus of the present paper and I discuss changes in relative prices later.

equilibrium because newly injected money has to go through a number of transactions to reach the final equilibrium distribution. However, since the same piece of money cannot be simultaneously spent and received in two different transactions and two transactions using the same piece of money can therefore happen only in sequential order, it will take more than one transaction for the final equilibrium to be established. The flows of expenditures and distribution of money balances of final equilibrium therefore does not happen at the moment of the change in the money supply; it happens only with passage of time.

II.3 The injection of new money is followed by changes in relative prices

The assumptions that new money enters the economy through particular individuals' money balances and that new money changes the relative expenditures in the economy imply that an increase in the money supply changes relative prices of goods, at least temporarily. Hume describes how relative prices change step by step and reflect the sequential diffusion of new money throughout the economy:

[T]hough the high price of commodities ... [is] a necessary consequence of the encrease of gold and silver, yet it follows not immediately upon that encrease; but some time is required before the money circulates through the whole state, and makes its effect be felt on all ranks of people. At first, no alteration is perceived; by degrees the price rises, first of one commodity, then of another; till

the whole at last reaches a just proportion with the new quantity of specie which is in the kingdom. (Hume 1987a [1752]: 286; see also Hume 1987a [1972]: 288; 1987b [1972]: 296, 305–306)

One might object that Hume's theory rests on additional, hidden assumptions. For example, just as I discuss later with respect to Lucas (1996), perhaps Hume implicitly assumes imperfect market-clearing, imperfect information, or a type of imperfect expectations. These additional assumptions might serve as a good complement to the theory. However, under plausible circumstances, they are unnecessary.

To prove this, I introduce a frictionless environment (1) with all people having perfect information about current events, (2) without transactions costs, and (3) populated by people and firms without significant market power. Such an environment has no external frictions, which means people respond optimally to any new information or event. To abstract from other shocks and to continue the earlier discussion, I also assume (4) only one unexpected monetary shock, which enters economy through particular people who change their relative expenditures in the economy. Lastly, I assume that (5) after the monetary shock, everyone perfectly foresees the consequences of the shock. I will now trace the effects of the unexpected shock under assumptions (1)–(5) to show that Hume's theory holds without assumptions of frictions beside the two I already mentioned.

To describe the effects of a monetary shock on relative prices, I adopt a simplified model of Hume's parable of importing new money through the port of

Cadiz and introduce three consecutive groups of recipients of the new money—merchants, workers, and farmers. I assume the money supply increases by \$1 and merchants receive it at time 0. Merchants spend all the new money at time 1 for the services of workers. Workers, in turn, spend all the new money at time 2 for the products of farmers. Even when endowed with perfect foresight at the moment of monetary expansion, merchants, workers, and farmers cannot neutralize the effects of the monetary shock on relative prices.

Assume the nominal interest rate between times 0 and 1 is r_1 and that the nominal interest rate between 0 and 2 is r_2 . Time preference and the inflation caused by the money growth imply that $1 < r_1 < r_2$. The difference in the nominal interest rates means merchants, workers, and farmers apply different discount rates from one another at time 0, when they calculate the present value of the increase in cash balances resulting from the increase in the monetary stock. While the present value at time 0 is \$1 for merchants, it is only $\$1/(1+r_1)$ for workers, and $\$1/(1+r_2)$ for farmers, where $1 > 1/(1+r_1) > 1/(1+r_2)$. The difference in the present values means that in spite of perfect foresight, the three groups of people experience a change in their relative permanent incomes, which means they tend to respond differentially to the monetary shock at time 0. The monetary shock increases the ability of merchants to outbid workers and farmers. For the same reason, the ability of workers to outdo farmers in bidding for goods increases as well. The change in relative willingness to pay for different goods also implies a change in relative demands for these goods and a corresponding

change in relative prices.

One can object that while the unexpected monetary expansion might lead to an immediate change in relative prices, the economy also immediately moves to its new final equilibrium. Such an immediate movement would mean that the step-by-step changes in relative prices described by Hume would not happen.

The first such objection is that people who receive new money later, like workers and farmers in the example above, can take into account their higher future nominal incomes, increase their current expenditures, and thereby increase prices of the goods that they demand already at the moment when the new money enters the economy. The economy then ends up in its final equilibrium in terms of relative expenditures and relative prices immediately after the monetary expansion. And as a second objection, sellers whose customers receive the new money only later can store goods that are initially intended for immediate sale and bring the goods to the market only when the new money also reaches their customers. Such postponement allows sellers to increase present prices and take advantage of future higher prices. This puts the economy into final equilibrium, in terms of relative prices of goods, immediately after the monetary expansion.

The first objection is valid only under implausible circumstances. Namely, time preferences of earlier recipients of the new money, such as merchants in my example, and later recipients of the new money, such as farmers, might be consistent with nominal money expenditures arriving immediately at final

equilibrium. But such an alignment would imply that earlier recipients would engage in a stream of lending and later recipients would engage in a stream of borrowing with two special properties. First, the expenditures of the initial recipients of the new money and of the later recipients combined would be identical to the expenditures of final equilibrium. While this result is possible, the subjectivity and heterogeneity of preferences and time preferences of earlier and later recipients of the new money makes this result unlikely. And second, although the stream of lending and borrowing might lead to the expenditures of final equilibrium, the relative prices would reach their final equilibrium values only if the short-run and long-run supply curves were identical. Without these special assumptions, reaching the relative prices of the new final equilibrium has to take time and is accompanied by changes in relative demands for goods across the economy and by the changes in relative prices described by Hume.

As for the second objection, wherein sellers arbitrage between lower present prices and higher future prices, this does not imply that prices of all goods have to immediately reach their final equilibrium levels either. Even if the storage costs of goods were zero and all goods and services were storable, some sellers would still have an incentive to abstain from restricting supply and increasing present prices to their final equilibrium levels. The discount factor that sellers use to compute the present value of their future revenues is higher than zero and therefore allows sellers to charge lower prices at the moment of monetary expansion when compared to prices in the final equilibrium. Moreover,

sellers whose customers receive the new money earlier and who therefore face an increase in the demand for their products above the demand at the final equilibrium might have the incentive to increase prices above those of the final equilibrium. The second objection therefore, does not imply that the relative prices of the final equilibrium immediately follow monetary expansion.

Excluding the unlikely assumptions about the consistency of preferences and time preferences of earlier and later recipients of the new money with expenditures of the final equilibrium and about the relationship between short-run and long-run supply curves of goods, I conclude that a monetary shock is accompanied by step-by-step changes in relative prices before they reach final equilibrium. Thus, individuals are unlikely to fully neutralize change in the money supply even when people perfectly predict the consequences of the shock once it happens. To be sure, perfect foresight allows people to adjust their behavior before new money physically enters their cash balances. In this sense, perfect foresight affects changes in relative prices that follow the path of the new money supply. But perfect foresight does not change the fact that monetary shocks likely affect relative prices step by step, as described by Hume. With the stated exception, non-neutrality holds as long as one assumes, as I do, that new money is injected into the economy through some particular set of people who use their higher incomes to change their relative expenditures on goods and services.

III. Lucas on Hume and Money

Hume's theory of monetary non-neutrality is powerful because its conclusions depend on only two, rather reasonable, assumptions: that money is injected into the economy through money balances of particular individuals, and that initial recipients of new money change the pattern of relative expenditures in the economy. These assumptions are sufficient for us to conclude that a change in the money supply affects relative prices, and correspondingly, production decisions and the distribution of resources. As I have already pointed out, the theory is also consistent with empirical evidence; this, however, did not prevent it from disappearing from the main discussions in economics.

I use Lucas (1996) as a case study to help unveil the cause of the disappearance. Rather than resulting from a difference in the underlying economic way of thinking between Hume and Lucas, Hume's theory might have disappeared because economists have relied on technical frameworks that have restricted economic theorizing with an overly restrictive analytical structure.

I build the argument in two steps, where I first focus on Lucas's own perception of the difference between himself and Hume and I show that Hume's theory does not have to be viewed in the light of omission of the equilibrium style of analysis. I then point out that the main cause of the disagreement is more likely a matter of technique rather than that of economics.

III.1 Hume and Lucas may be representatives of different methodologies

Lucas (1996) sees his way of thinking as fundamentally different from that of Hume—although he recognizes Hume as an intellectual predecessor of his own views on monetary non-neutrality.⁵ Reviewing Hume's (1987ab [1752]) conclusions, however, Lucas expresses disagreement, which Blaug (2001: 154–155) has discussed and Laidler (2010: 48 n13) noted.

Blaug (2001) argues that the source of Lucas's (1996) disagreement with Hume is a clash of methodologies that cannot be reconciled within a unified framework. From this perspective, Hume explains the non-neutrality of money through disequilibrium reasoning while Lucas struggles to reconstruct Hume's explanation within a general equilibrium framework. Hume's account of short-run non-neutrality, however, cannot be reconstructed in a general equilibrium model and Lucas is unsuccessful.

Lucas's (1996) own assessment of his unsuccessful struggle is similar to Blaug's (2001). According to Lucas, Hume and economists who follow him have

5 It is an interesting question why Lucas decided to discuss Hume at such length in his Nobel lecture. I have found two plausible and complementary explanations. First, as was pointed out to me by Maria Paganelli, there is a link from Hume to Lucas via Friedman. Since Friedman was interested in Hume's work (*cf.* Friedman 1987: 3), Hume might have influenced Lucas as well. The second explanation revolves around "A Sticky-Price Manifesto," by Ball and Mankiw (1994), to which Lucas responded in 1994. Ball and Mankiw (1994) make a distinction between "traditionalists" and "heretics" in macroeconomics (1994: 127–128), where traditionalists believe in the importance of price-stickiness and heretics do not. While Ball and Mankiw decide to include Friedman and Hume (1994: 127) among the "traditionalists", they put Lucas into the category of "heretics" (1994: 135). Lucas (1994: 154) in his response labels Ball and Mankiw's (1994) distinction as "ideological" and he considers the use of this type of ideology in economics to be "risky" (1994: 154–155). An ideologue, according to Lucas, has an incentive to caricature one's opponents and to abstain from acknowledging contributions from the other side of the barricade just for the sake of ideological purity. In light of this debate, Lucas might have chosen Hume as the subject of his Nobel lecture to prove that the ideological lines drawn by Ball and Mankiw (1994) are not very useful because of important overlaps between traditionalists and heretics: while Ball and Mankiw (1994) view Hume as traditionalist, Lucas shows that Hume still has some important insights as a heretic.

to “resort to disequilibrium dynamics” (Lucas 1996: 669), which is a different and inferior methodological position compared to Lucas’s. Hume and his followers use the disequilibrium style of theorizing “only because the analytical equipment available to them offers no alternative” (Lucas 1996: 669). Lucas later gives a more comprehensive statement:

The intelligence of these attempts to deal theoretically with the real effects of changes in money is still impressive to the modern reader, but serves only to underscore the futility of attempting to talk through hard dynamic problems without any of the equipment of modern mathematical economics. (Lucas 1996: 669)

Although Blaug (2001) and Lucas’s (1996) argument is plausible, there is a more fruitful way of considering the clash over the effect of change in the money supply on the income distribution and relative prices—what I call “Hume’s theory.”⁶

III.2 But Hume and Lucas are both equilibrium theorists

Before I reconsider the clash between Lucas and Hume, consider the following passage, where Lucas, using his general equilibrium perspective, evaluates Hume’s supposed disequilibrium dynamics.

If everyone understands that prices will ultimately increase in

⁶ It is true that both Hume (Hume 1987ab [1752]) and Lucas (1996) also explore the link between the theory and changes in aggregate output in some specific direction but this is a separate problem that, as noted, I do not intend to discuss.

proportion to the increase in money, what force stops this from happening right away? Are people committed, perhaps even contractually, to continue to offer goods at the old prices for a time? If so, Hume does not mention it. Are sellers ignorant of the fact that money has increased and a general inflation is inevitable? But Hume claims that the real consequences of money changes are "easy to trace" and "easily foreseen." If so, why do these consequences occur at all? (Lucas 1996: 663–664)

This shows Lucas's struggle to bring Hume's theory into a general equilibrium framework where the point of injection of new money does not matter and where the final equilibrium is a proportional increase of all prices. Given his tools and assumptions, Lucas identifies potential sources of monetary non-neutrality described by Hume, like multiperiod contracts, ignorance, and imperfect expectations. Lucas, however, realizes that such sources of non-neutrality are not consistent with Hume's essays.

This inconsistency, however, does not necessarily arise from an incompatibility of Hume's theory with general equilibrium analysis, as Lucas (1996) implies. The inconsistency might be, rather, viewed as the result of different assumptions on how the new money enters the economy and how the first recipients spend this money. Such a view would be in line with my interpretation of Hume's theory in section II above, where the injection of new money and its diffusion themselves lead to the effects described by Hume's

theory.

Unlike Lucas (1996), my interpretation puts Hume's theory into an equilibrium setting, while relying on the assumption that money unexpectedly enters the economy through money balances of particular people who spend the new money in a way that distorts the final equilibrium pattern of relative aggregate expenditures on different goods. This assumption answers Lucas's concern above and allows me to apply Hume's description of an increase in the money supply and its relative-price effects to the world of equilibrium, where people are not bound by inflexible contracts, ignorance, or imperfect expectations about the future once the monetary shock happens.

I explained in subsection II.3 how my assumptions about the injection of new money prevent buyers and sellers from immediately establishing final equilibrium prices and expenditures. For buyers, preferences of earlier and later recipients of new money might be mutually inconsistent with final equilibrium. Meanwhile, sellers, responding to demand, will not immediately set equilibrium prices either. While customers of some sellers increase their money balances relatively sooner, the balances of other sellers' customers may remain unchanged for some time. Sellers catering to the customers with higher money balances thus can increase prices above their final equilibrium levels and sellers whose primary customers are the later recipients of the new money might find that the optimal solution is not to immediately raise their prices to the final equilibrium.

The essence of Hume's theory of the non-neutrality of money is therefore not in conflict with the equilibrium style of reasoning. Hume's theory can be conveyed, as I have done above, in a framework with fully rational sellers and buyers who use money in an otherwise frictionless world. Prices do not have to reach their final equilibrium immediately after the new money enters the economy. Every step of the progression toward the final equilibrium, however, is an equilibrium itself, because people under given circumstances make the best choices they possibly can.

The distinction between Hume and Lucas therefore does not have to be seen as between equilibrium and disequilibrium, or between rigorous analysis and “patched-in” dynamics, as Lucas puts the issue at one point (Lucas 1996: 669). The underlying analytical tool in both cases is a framework of general equilibrium and the real difference between them comes with their different understandings of the non-neutrality of money. While Hume sees non-neutrality primarily in the diffusion of money across the economy, Lucas points to the non-neutral features of the world into which we inject otherwise neutral money.

My analysis does not imply that one of the two views on the sources of non-neutrality of money is necessarily wrong. Quite the contrary: each of the two views might be correct. However, the profession's interest in views of monetary non-neutrality like Lucas's (1996) has led them to build technical frameworks of analysis, such as those using models with menu costs or staggered prices, that decrease our ability to discuss Hume's theory, even though the theory is just as

compatible with equilibrium theorizing.

IV. Conclusion

Because of its excessive interest in models like Lucas's (1996), then, modern economics has overly discounted an aspect of non-neutrality of money represented here by David Hume, in which the source of monetary non-neutrality is the money itself rather than various frictions of the world into which otherwise frictionless money is injected.

The neglect of Hume's insights follows from the nature of economic science. Most of the insights in economics are not based on experiments, but are established by deductive reasoning (Hayek 1999 [1944]: 136–137). With every new generation of economists, the knowledge of previous generations is sustained only when it is successfully replicated. But the very need for this replication opens the possibility of losing valuable insights. And methodological trends sometimes make it difficult to rediscover some theorems, as Hayek (1944: 137) points out and as Krugman (1984: 261–2) illustrates regarding the role of money in international economics. The story I have just presented is therefore not only about bringing back a theory that is logically consistent and empirically relevant. It also speaks to the importance of the history of economic thought as a tool for economic research.

The value of research in the history of thought stands out when one looks at the tension between Stigler (1969) and Boulding (1971), as Boettke (2000)

points out. Stigler argues that although economics has a useful past, the costs of researching the history of economic thought surpass the benefits. The benefits of revisiting past authors are low because their useful ideas are already incorporated within modern economic thought. After claiming that researching the history of economic thought is too costly, Stigler concludes by saying “it remains the unfulfilled task of the historians of economics to show that their subject is worth its cost” (Stigler 1969: 230). In his reply, Boulding argues that the history of economic thought can systematically uncover important insights that have not been incorporated into modern economics. Older works can be understood as a part of the extended present and analyzed in light of present discussions. This, Boulding says, is particularly important now, when the resources of the profession are directed toward quantitative research and increasing the amount of such resources leads to significantly diminishing returns. This essay offers another data point in support of Boulding's argument that, as he puts it, even after Samuelson, we indeed still need Adam Smith.

References

Allais, Maurice (1974). "The Psychological rate of Interest." *Journal of Money, Credit and Banking* 6, 285–331.

Anthonisen, Niels (2010). "Monetary shocks in a spatial overlapping generations model." *Journal of Economic Dynamics and Control* 34, 2461–2484.

Atkeson, Andrew, Varadarajan V. Chari, and Patrick J. Kehoe (2010). "Sophisticated Monetary Policies." *Quarterly Journal of Economics* 125, 47–89

Ball, Laurence and N. Gregory Mankiw (1994). "A sticky-price manifesto." *Carnegie-Rochester Conference Series on Public Policy* 41, 127–151.

Ball, Laurence and N. Gregory Mankiw (1995). "Relative-Price Changes as Aggregate Supply Shocks." *Quarterly Journal of Economics* 110, 161–193.

Berdell, John (2010). "Retrospectives: An Early Supply-Side — Demand-Side Controversy: Petty, Law, Cantillon." *Journal of Economic Perspectives* 24, 207–218.

Blanchard, Olivier. (2003). "Discussion of 'The price level, relative prices and

economic stability: aspects of the interwar debate,' by David Laidler." In David Laidler. "The Price Level, Relative Prices and Economic Stability: Aspects of the Interwar Debate," pp. 24–28. BIS Working Paper No. 136.

Blaug, Mark, ed. (1991). Richard Cantillon (1680–1734) and Jacques Turgot (1727–1781). Brookfield, VT: Edward Elgar Publishing.

Blaug (2001). "No History of Ideas, Please, We're Economists." *Journal of Economic Perspectives* 15, 145–164.

Boettke, Peter J. (2000). "Why Read the Classics in Economics?" Web: <http://www.econlib.org/library/Features/feature2.html>

Bordo, Michael David (1980). "The Effects of Monetary Change on Relative Commodity Prices and the Role of Long-Term Contracts." *Journal of Political Economy* 88, 1088–1109.

Bordo, Michael David (1983). "Some Aspects of the Monetary Economics of Richard Cantillon." *Journal of Monetary Economics* 12, 235–258.

Boulding, Kenneth E. (1971). "After Samuelson, Who Needs Adam Smith?"

History of Political Economy 3, 225–237.

Cagan, Philip (1966). “Changes in the Cyclical Behavior of Interest Rates.”

Review of Economics and Statistics 48, 219–250.

Calvo, Guillermo A. (1983). “Staggered prices in a utility-maximizing framework.”

Journal of Monetary Economics 12, 383–398.

Cantillon, Richard (2010 [1755]). An Essay on Economic Theory. Auburn, AL:

Ludwig von Mises Institute.

Chari, V. V. (1999). “Nobel Laureate Robert E. Lucas, Jr.: Architect of Modern

Macroeconomics.” Federal Reserve Bank of Minneapolis Quarterly Review 23,

2–12.

Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans (2005).

“Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy.”

Journal of Political Economy 113, 1–45.

Debelle, Guy and Owen Lamont (1997). “Relative Price Variability and Inflation:

Evidence from U.S. Cities.” Journal of Political Economy 105, 132–152.

Engel, Charles (2011). "Currency Misalignments and Optimal Monetary Policy: A Reexamination." *American Economic Review* 101, 2796–2822.

Fischer, Stanley (1981). "Relative Shocks, Relative Price Variability, and Inflation." *Brookings Papers on Economic Activity* 1981, 381–441.

Friedman, Milton (1961). "The Lag in Effect of Monetary Policy." *Journal of Political Economy* 69, 447–466.

Friedman, Milton (1968). "The Role of Monetary Policy." *American Economic Review* 58, 1–17.

Friedman, Milton (1969). "The Optimum Quantity of Money." In Milton Friedman. *The Optimum Quantity of Money and Other Essays*. Chicago: Adline Publishing Company, 1–50.

Friedman, Milton (1972). "The John R. Commons Lecture: Monetary Trends in the United States and the United Kingdom." *American Economist* 16, 4–17.

Friedman, Milton (1987). "Quantity Theory of Money." *The New Palgrave: A Dictionary of Economics* 4, edited by John Eatwell, Murray Milgate, and Peter Newman. London: Macmillan, 3–20.

Gertler, Mark and John Leahy (2008). "A Phillips Curve with an Ss Foundation." *Journal of Political Economy* 116, 533–572.

Golosov, Mikhail and Robert E. Lucas Jr. (2007). "Menu Costs and Phillips Curves." *Journal of Political Economy* 115, 171–199.

Guimaraes, Bernardo, and Kevin D. Sheedy. 2011. "Sales and Monetary Policy." *American Economic Review* 101, 844–876.

Hayek, Friedrich A. von (1967 [1935]). *Prices and Production*. New York: Augustus M. Kelly.

Hayek, Friedrich A. von (1969). "Three Elucidations of the Ricardo Effect." *Journal of Political Economy* 77, 274–285.

Hayek, Friedrich A. von (1985 [1931]). "Richard Cantillon." *Journal of Libertarian Studies* 7, 217–247.

Hayek, Friedrich A. von (1999 [1944]). "On Being an Economist." in Daniel B. Klein, ed. (1999). *What do Economists Contribute?* New York: New York University Press, 133–149.

Henderson, Willie (2010). *The Origins of David Hume's Economics*. New York: Routledge.

Hume, David (1987a [1752]). "Of Money." In David Hume (1987 [1752]) *Essays Moral, Political, and Literary*, edited by Eugene F. Miller. Indianapolis: Liberty Fund, 281–294.

Hume, David (1987b [1752]). "Of Interest." In David Hume (1987 [1752]) *Essays Moral, Political, and Literary*, edited by Eugene F. Miller. Indianapolis: Liberty Fund, 295–307.

Hume, David (1987c [1752]). "Of The Balance of Trade." In David Hume (1987 [1752]) *Essays Moral, Political, and Literary*, edited by Eugene F. Miller. Indianapolis: Liberty Fund, 308–326.

Humphrey, Thomas M. (1991). "Nonneutrality of Money in Classical Monetary Thought." *Economic Review of Federal Reserve Bank of Richmond* March/April, 3–15.

Keynes, John Maynard (1930). *A Treatise on Money, Volume I: The Pure Theory of Money*. Edinburgh: R. & R. Clark.

Krugman, Paul R. (1984). "The International Role of the Dollar: Theory and Prospect." In John F. O. Bilson and Richard C. Marston, eds. (1984). *Exchange Rate Theory and Practice*. Chicago and London: University of Chicago Press, 261–278.

Laidler, David (2010). "Lucas, Keynes, and the Crisis." *Journal of the History of Economic Thought* 32, 39–62.

Lastrapes, William D. (2006). "Inflation and the Distribution of Relative Prices: The Role of Productivity and Money Supply Shocks." *Journal of Money, Credit, and Banking* 38, 2159–2198.

Lucas, Robert E., Jr. (1972). "Expectations and Neutrality of Money." *Journal of Economic Theory* 4, 103–124.

Lucas, Robert E., Jr. (1994). "Comments on Ball and Mankiw." *Carnegie-Rochester Conference Series on Public Policy* 41, 153–155.

Lucas, Robert E., Jr. (1996). "Nobel Lecture: Monetary Neutrality." *Journal of Political Economy* 104, 661–682.

Marget, Arthur W. (1966a [1938–1942]). *The Theory of Prices: A Re-Examination of the Central Problems of Monetary Theory, Volume I*. New York: Augustus M. Kelley.

Marget, Arthur W. (1966b [1938–1942]). *The Theory of Prices: A Re-Examination of the Central Problems of Monetary Theory, Volume II*. New York: Augustus M. Kelley.

Midrigan, Virgiliu (2011). “Menu Costs, Multiproduct Firms, and Aggregate Fluctuations.” *Econometrica* 79, 1139–1180.

Mises, Ludwig von. (1971 [1924]). *The Theory of Money and Credit*. Irvington-on-Hudson, New York: The Foundation for Economic Education.

Monroe, Athur Eli (2001 [1923]). *Monetary Theory Before Adam Smith*. Kitchener, ON: Batoche Books.

Morgenstern, Oskar (1972). “Thirteen Critical Points in Contemporary Economic Theory: An Interpretation.” *Journal of Economic Literature* 10, 1163–1189.

Murphy, Antoin E. (1985). “Richard Cantillon – Banker and Economist.” *Journal of Libertarian Studies* 7, 185–215.

Nakamura, Emi and Jon Steinsson (2010). “Monetary Non-Neutrality in a Multisector Menu Cost Model.” *Quarterly Journal of Economics* 125, 961–1013.

Parks, Richard W. (1978). “Inflation and Relative Price Variability.” *Journal of Political Economy* 86, 79–95.

Robbins, Lionel (1971 [1934]) *The Great Depression*. Freeport, NY: Books for Libraries Press.

Robertson, Denis (1961 [1922]). *Money*. Cambridge, UK and Welwyn, Herts, UK: James Nisbet and Company, Cambridge University Press, University of Chicago Press.

Rothbard, Murray N. (2006 [1995]). *Economic Thought before Adam Smith: An Austrian Perspective on the History of Economic Thought*. Volume I. Auburn, AL: Ludwig von Mises Institute.

Samuleson, Paul A. and Robert M. Solow (1960). “Analytical Aspects of Anti-Inflation Policy.” *American Economic Review* 50, 177–194.

Schabas, Margaret and Carl Wennerlind (2011). “Retrospectives: Hume on

Money, Commerce, and the Science of Economics.” *Journal of Economic Perspectives* 25, 217–230

Schumpeter, Joseph A. (1983 [1934]). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. New Brunswick: Transaction Publishers.

Spengler, Joseph J. (1954a). “Richard Cantillon: First of the Moderns. I.” *Journal of Political Economy* 62, 281–295.

Stigler, George J. (1969). “Does Economics Have a Useful Past?” *History of Political Economy* 1, 217–230.

Subrick, J. Robert (2010). “Money Is Non-Neutral.” In Boettke, Peter J., ed. (2010). *Handbook on Contemporary Austrian Economics*. Cheltenham, UK: Edward Elgar Publishing.

Thornton, Mark (2007). “Cantillon, Hume, and the Rise of Antimercantilism.” *History of Political Economy* 39, 453–480.

Viner, Jacob (1937). *Studies in the Theory of International Trade*. New York: Harper and Brothers.

Vining, Daniel R., Jr., and Thomas C. Elwertowski (1976). "The Relationship between Relative Prices and the General Price Level." *American Economic Review* 66, 699–708.

Wagner, Richard E. (1977). "Economic Manipulation for Political Profit: Macroeconomic Consequences and Constitutional Implications." *Kyklos* 30, 395–410.

Wennerlind, Carl (2005). "David Hume's Monetary Theory Revisited: Was He Really a Quantity Theorist and an Inflationist?" *Journal of Political Economy* 113, 223–237.

Williamson, Stephen D. (2008). "Monetary Policy and Distribution." *Journal of Monetary Economics* 55, 1038–1053.

Williamson, Stephen D. (2009). "Transactions, Credit, and Central Banking in a Model of Segmented Markets." *Review of Economic Dynamics* 12, 344–362.