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ABSTRACT

In this paper I analyze the work on exchange rates and external imbalances by University of Chicago faculty members during the university's first hundred years, 1892-1992. Many people associate Chicago's views with Milton Friedman's advocacy for flexible exchange rates. But, of course, there was much more than that, including the work of J. Laurence Laughlin on bimetallism, Jacob Viner on the balance of payments, Lloyd Metzler on transfers, Harry Johnson on trade and currencies, Lloyd Mints on exchange rate regimes, Robert Mundell on optimal currency areas, and Arnold Harberger on shadow exchange rates, among other. The analysis shows that, although different scholars emphasized different issues, there was a common thread in this research, anchored on the role of relative prices' changes during the adjustment process.

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1. Introduction

Many people associate Chicago's views on exchange rates, external adjustment, and the balance of payments with Milton Friedman's advocacy for floating exchange rates. Indeed, Friedman's 1953 essay "The case for flexible exchange rates" is one of his most highly cited works. As soon as the paper was published, it became an important reference for those who favored market-based solutions to external imbalances. However, Chicago's contributions to the exchange rate and adjustment literatures go well beyond Friedman. Indeed, since the University's founding, in 1892, many faculty members published important works on the subject. Some of the most prominent Chicago names associated with exchange rates and balance of payments research include J. Laurence Laughlin, Jacob Viner, Lloyd Mints, Henry Simons, Lloyd Metzler, Robert Mundell, Harry G. Johnson, Arnold Harberger, Jacob Frenkel, Rudi Dornbusch, and Michael Mussa.[1] Some of these scholars stayed in Chicago until retirement, while other departed for other schools or institutions where they had very productive careers.

In this paper I analyze exchange rates-related research in Chicago during the University's first one hundred years, 1892-1992. Of course, I recognize that scholars from other schools in the United States, Europe, and other regions, made important contributions to this literature -- John Maynard Keynes, Bertil Ohlin, Irving Fisher, Frank Taussig, James Meade, Gottfried Haberler, Fritz Machlup, Charles Kindleberger, and Arthur Pigou, just to mention some of the most prominent ones. In my analysis I do refer to their work, especially when it provides the right context for the discussion on research pursued in Chicago.

Although different Chicago faculty used different models and stressed different aspects of the exchange rate and balance of payments issue, they followed a consistent thread that emphasized the importance of market signals and relative prices' changes during the adjustment process. This was even the case when their policy recommendations regarding the optimal exchange rate regime were at opposite ends of the spectrum – strictly fixed rates, as preferred by Laughlin and Mundell, or clean floats as argued by Mints and Friedman. The emphasis on relative prices mechanisms set the Chicagoans apart from other authors who were highly influential during the period under consideration, including Ragnar Nurkse and Gunnar Myrdal, both of whom were skeptical of markets and of the ability of exchange rate changes to contribute to the attainment of external balance.

[1] There were other Chicago faculty who made contributions to this literature. Unfortunately, due to space considerations I cannot provide an exhaustive review of every contribution. See, however, below for some additional scholars and their work on the subject. On Chicago's contributions to the pure theory of trade see, for example, Edwards and Irwin (2023).

Instead of following a strict chronological order I have organized the analysis around several interrelated research issues. In Section 2, I discuss adjustment under the gold standard and bimetallism. In Section 3 I focus on Purchasing Power Parity, exchange rates, and the pass through from exchange rates into prices. In Section 4 I deal with the transfer problem, while in Section 5 I dissect the debate between flexible and fixed exchange rates. In Section 6 I concentrate on the role of real exchange rates and their "fundamentals." Section 7 covers the issue of public sector investment and exchange rates, with an emphasis on the "shadow exchange rate." Finally, in Section 8 I offer some concluding remarks.

2. Gold, silver, and external adjustment

During the early years of the Department of Economics, exchange rate-related discussions revolved around the question of adjustment under alternative monetary standards: gold, silver, and bimetallism.[2] J. Laurence Laughlin, the first chairman of the Department and the founding editor of the *Journal of Political Economy*, was particularly interested in the subject.[3] In 1885, while still at Harvard, Laughlin published the treatise "*History of Bimetallism in the United States*," where he strongly defended a monometallic standard. In chapter 7 of this book, Laughlin discussed the demonetization of silver in 1873, and argued that in the absence of the Coinage Act silver would have driven gold out of monetary circulation (Gresham's Law). If a bimetallic standard had been maintained, he posited, it was likely that "the resumption of specie payments in January 1879, would have been in silver, not in gold...." For Laughlin, that would have been a disaster that would have greatly reduced the United States' credibility and standing in the world financial community. For him "the act of 1873 was a piece of good fortune, which saved our financial credit and protected the honor of the state" (p. 93).

Laughlin's monetary views were not restricted to a rejection of bimetallism. He also believed that the quantity theory of money was misleading. During the 1904 and 1910 American Economic Association meetings he debated Irving Fisher, a staunch supporter of the quantity theory and a great believer in a commodity-backed dollar with a fluctuating value relative to gold (Fisher 1912, 1913; Houston et. al. 1911; Dimand 2020). In a 1987 entry in *The New Palgrave Dictionary (Volume 3)*, Milton Friedman noted that Laughlin's rejection of the quantity theory "had much in common with… cost-push or structural or supply-shock theories of inflation, in

[2] Commodity-based money was also considered, but most discussions were centered on these three options.
[3] On Laughlin contributions to economics, including international finance and exchange rates, see, for example, Nef (1967) and Friedman (1987). Laughlin had also great influence on policy makers. For example, Frank A. Vanderlip, an Assistant Secretary of the Treasury in the McKinley administration and, later, President of the National City Bank of New York, said that most of the economics that he knew he had learned from Laughlin. (Nef 1967, p. 780).

emphasizing the role of factors affecting specific goods and services rather than general monetary influences." (p. 12).[4]

The majority of Chicago scholars tended to side with Laughlin's views in the bimetallism debate, and supported gold. Henry Simons referred to silver legislation during the Roosevelt administration as representing an "awful moral decay" (1948 [1936], p. 88). Viner pointed out that the use of both gold and silver as monetary reserves by the Bank of England had not worked well (1937, p. 237). Paul Douglas and Aaron Director (1931) dealt with the issue from a more general perspective and analyzed the merits of a commodity-based dollar along the lines suggested by Irving Fisher (1913). They concluded that, although the "compensated dollar" provided a theoretically interesting way of dealing with the business cycle, it was difficult to implement (Douglas and Director 1931, Ch. XVII). Milton Friedman and Anna Schwartz (1963, Ch. 3) were skeptical about the sustainability of a bimetal regime, both for political and economic reasons (however, see below on Friedman's change of heart on this issue). Robert Mundell (1983, p. 189) concurred with the idea that bimetal systems tended to be unstable but argued that changes from a two-metal to a monometallic regime were always gradual and usually had "decades of advanced warning."[5]

Milton Friedman was interested in silver and bimetallism throughout his career. Chapter 3 of his monumental (with Anna Schwartz, F&S) "*A Monetary History of the United States"* deals with the period between the resumption of convertibility, in 1879, and the defeat of William Jennings Bryan in the 1896 presidential election. According to Friedman and Schwartz, 1896 marked the beginning of the decline of the free silver movement (1963, p. 89). In their analysis of the 1930s, Friedman and Schwartz criticize FDR's Silver Purchase Act of 1934, and contend that it had limited monetary effects in the United States; in this they coincided with Simons who, as noted, was extremely critical of that legislation. In Friedman and Schwartz's view, FDR's silver policy was little more than another commodity price support program that responded to political considerations (p. 483-491). Friedman's 1994 volume "*Monetary Mischief*" includes four chapters on silver and/or bimetallism, including a lengthy analysis on the effects of the 1934-35 United States' silver purchase program on China's economic problems. According to Friedman, FDR's policy raised "the price of the metal promptly and sharply…

[4] During the 1920s and first half of the 1930s, issues related to the monetary standard continued to attract the attention of Chicago's faculty. An important question was how to explain the recurrent divergence between the legal rate of exchange between gold and silver – in the U.S. it was 16:1, between 1837 and 1933 –, and the market relative price of the two metals. (Viner 1937).

[5] Bimetallism, of course, had some prominent supporters outside of Chicago, including Walker (1896) and Schumpeter (1954). After being critical for many years, in 1990 Milton Friedman reassessed bimetallism. See below.

[and] thereby assured the final and all but complete demonetization of silver [around the world]" (1994, p. 158). In his view, the sharp decline of monetary silver in China created a deep recession and contributed to the eventual success of Mao Zedong and his Communist revolution.

In a 1990 article in the *Journal of Economic Perspectives*, Friedman revisited bimetallism, and pointed out that after carefully weighing the evidence, he had changed his mind. In the Introduction he writes (p. 87):

> "Until recently, I shared what I take to be the conventional view of monetary economists about the relative merits of bimetallism and gold monometallism: namely, that bimetallism is an unstable and unsatisfactory monetary standard..."

He then explains that after reviewing several historical episodes from around the world and considering practical and theoretical issues (including the weight of high denomination coins under a silver standard), he had concluded that bimetallism had not generated instability, and that the shift from one metal to the other had usually been smooth. He writes (p. 102): "Far from being a thoroughly discredited fallacy, bimetallism has much to recommend it on theoretical, practical, and historical grounds as superior to monometallism, though not to symmetallism, or to a tabular standard."

3. Purchasing Power Parity, money, and exchange rates

One of Laughlin's last actions as chairman of the Department, in 1916, was hiring the young Canadian economist Jacob Viner as an Assistant Professor. Viner was a member of the Chicago faculty for three decades, and during this period he became one of the most prominent and respected international economists in the world. Between 1933 and 1939 he was an adviser to the Treasury, and in that capacity he contributed to the writing of the Gold Reserve Act of 1934. This legislation opened the door for the official devaluation of the dollar, from $ 20.67 to $ 35 per ounce of gold, and created the Exchange Stabilization Fund at the Treasury. Viner also played an important role in the drafting of the 1936 Tripartite Agreement on exchange rates, between the U.S., the U.K. and France. Besides teaching Chicago's famous price theory courses (301 and 302) and writing a very large number of influential articles -- including the piece that became the bases of the Ricardo-Viner specific factors model of international trade --, Viner was the editor of the *Journal of Political Economy* for twenty years (1925-1945).[6] In 1946 he left for Princeton, where he stayed until his retirement in 1960.

[6] The term "Ricardo-Viner specific factors model" was coined by Samuelson (1971). However, as Maneschi (1992) has pointed out, the specific factor model doesn't appear in Viner's 1937 book. For a selection of Viner's work on

In 1937 Viner published his monumental "*Studies in the Theory of International Trade*." This volume, which summarized much of his research in international economics until that time, was used as a graduate textbook around the world for almost 30 years. The book includes several chapters on monetary policy, adjustment, relative prices, and exchange rates. In Chapter 6, Viner presents a thorough exposition of Hume's simple specie-flow adjustment mechanism in a stylized economy without banks. In Chapter 7 the analysis is extended to the case where there is a modern banking system, and gold provides the base of the monetary edifice. Parts of this Chapter draws on his January 1932, Harris Lecture on "International Aspects of the Gold Standard," an important piece from a historical perspective. At the time (1932), and because of the devaluation of Sterling in September 1931, there was talk about the possibility of the U.S. getting off gold, something that eventually happened in April 1933.[7] A growing number of economists outside Chicago, including Irving Fisher, James Harvey Rogers, and George Warren, believed that a devaluation of the dollar would contribute significantly to ending deflation. Early on, Viner took a guarded and somewhat ambiguous position on the issue. He argued that although the gold-exchange standard was not working properly, it was too risky to try something different. According to him, the automatic adjustment mechanism was not functioning because over 70% of the metal was in the hands of two countries – the United States and France. He noted that an additional cause for malfunctioning was the reluctance by U.S. banks to use the rediscount window at the Federal Reserve. Towards the end of the 1932 Harris Lecture, Viner summarized his views as follows: "the gold standard is a wretched standard, but it may conceivably be the best available to us." (p. 37).[8]

Viner's guarded defense of the gold standard clashed with Keynes' very critical view of the system, a view that had become associated with a quote from *A Tract for Monetary Reform*, (1924, p. 172): "In truth, the gold standard is already a barbarous relic." Interestingly, Keynes had delivered the Harris Lectures at Chicago in 1931, one year before Viner. Although Keynes's topic was not international adjustment or exchange rates -- the paper was titled "An Economic Analysis of Unemployment" -- he made some critical remarks about the gold standard that were in line with the views expressed at length in the Tract and that he would expand in his 1933 pamphlet "The Means to Prosperity."

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the history of economics see Irwin and Viner (1991). On Viner's evolving views on the international adjustment system see Nerozzi (2007).

[7] Some of the alternatives considered included Irving Fisher's "compensated dollar." On details of the process leading to the U.S. getting off gold, see Edwards (2018).

[8] Although Jacob Viner was not directly involved in the design of the U.S. negotiating position at the Bretton Woods conference, he provided inputs to those in charge of it, including Harry Dexter White, with whom he had worked in the Treasury in 1934. The main issue in constructing a new international architecture what was the best mechanism to deal with (large) external imbalances.

At the end of the 1932 Harris Foundation conference, a group of economists in attendance sent a telegram to President Herbert Hoover urging him to take several measures to fight the Great Depression. The document was dated January 31, 1932, and was signed by twelve Chicago faculty – in addition to Viner the letter was also signed by Henry Simons, Aaron Director, Henry Schultz, Lloyd Mints, Frank Knight, Theodore Yntema and Paul Douglas --, and twelve scholars from other departments, including Irving Fisher, Alvin Hansen and James W. Angell. The twenty-four economists made several specific recommendations:[9]

- Allowing the Federal Reserve to use "federal government securities on equal terms with commercial paper as cover for Federal Reserve notes."
- The Federal Reserve should "pursue open-market operations with the double aim of facilitating government financing and increasing liquidity…"
- The Reconstruction Finance Corporation was to "give aid to banks by making loans on assets not eligible for rediscount" at the Fed.
- The federal government was to maintain and deepen "its program of public works and public services…"
- The cooperation between federal government and state and local governments had to be strengthened to assure "the maintenance of adequate unemployment relief."
- The U.S. should provide debt relief to European countries. This was "an essential step towards recovery of world industry and trade."
- The U.S. should enter negotiations with other countries, "leading toward a reciprocal and substantial lowering of [import] tariffs."

Although the program was highly innovative and even controversial, it fell short of suggesting the abandonment of the gold standard and the devaluation of the dollar (Wright 1932, p. 161-163). A few months later, in April 1932, a slightly different group of twelve Chicago economists, including Viner, delivered a memorandum to Congressman Samuel B. Pettengill, in response to a questionnaire he had sent on the issue of "reflation." This time, the option of getting off gold was openly stated. Viner, however, did not sign a second memorandum, where the issue of devaluation was addressed with renewed force. (Nerozzi 2011; Tavlas 2019, 2023). It took several months – until January 30, 1934 --, for the dollar to be officially devalued from $20.67 to $35 per ounce of gold.

One of the key questions in the "gold standard debates" of the early 1930s was how a devaluation of the dollar – or an increase in the dollar price of gold – would affect the price level. This issue was related to the Purchasing Power Parity (PPP) doctrine, or proposition that

[9] See Tavlas (2023) for an in-depth analysis of the Chicago faculty policy recommendations in 1932.

postulates that aggregate price levels are linked across countries through the exchange rate. What is called the "absolute version", the PPP proposition is captured by the following simple equation:

$$P = E\, P^*,$$

where P and P^* are the respective prices levels in the home and foreign countries, and E is the exchange rate. A variant of PPP was behind the idea, popular in 1933, that purchases of gold at discretionary high prices by the U.S. government would result in a general rise in the price level. This "Gold Purchase Program" was the brainchild of Cornell agricultural economist George Warren and was put in place by the Roosevelt administration between August and December 1933. Viner criticized the plan in correspondence with Henry Morgenthau, the future Secretary of the Treasury.[10]

In "*Studies in the Theory of International Trade*" Viner (1937, p. 380-386) develops a severe criticism of Purchasing Power Parity. His darts were (mostly) aimed at Gustav Cassel and his use of "simple quantitative relationships between average price levels [in PPP exercises]." Viner argued that recurrent, significant (larger than the gold points), and persistent deviations of PPP-based exchange rates from market values was a clear indication of the flaws of Cassel's approach. He postulated that to be useful, PPP analyses needed to make an explicit distinction between international and domestic goods, a distinction that went all the way back to David Ricardo and had been emphasized by Viner's teacher Frank Taussig. Viner also criticized the implicit causality in Cassel's analysis -- "prices determine exchange rates, and not the other way around." (p. 385) --, and the use of a period "arbitrarily chosen as the base year [for the analysis]" (p. 380 and 381). As will be shown below, these two issues – the selection of the price indexes and of the base year – would occupy scholars in the years to come. (To be fair, however, in his study of exchange rates and prices after the Great War, Cassel focused on the "relative version" of PPP, which established a relation between *changes* in the equilibrium exchange rate and the inflation differential across countries. In his 1922 treatise Cassel wrote (p. 140, emphasis added): "When two countries have undergone *inflation*, the normal rate of exchange will be equal to the old rate multiplied by the quotient of the degree of inflation in one country and in the other.")

PPP survived Viner's attacks and continued to be a tool used frequently by Chicago (and other) economists. In 1947, Lloyd Metzler, who had just joined the Department, relied on the PPP methodology to evaluate whether the (fixed) exchange rates announced by the members of

[10] See Fiorito and Nerozzi (2009), for a transcript of Viner's reminiscences of this period; see Edwards (2018) for a comparison between the Warren plan and a "reflation plan" supported by Irving Fisher.

the recently created International Monetary Fund were close to equilibrium. The importance of the topic stemmed from the fact that the IMF's Articles of Agreement stated that countries could only alter their currency pegs when facing a "fundamental disequilibrium." In his analysis, Metzler used a version of Cassel's purchasing power parity doctrine that is not too different from the one criticized by Viner in 1937. In undertaking his computations, Metzler defined the average PPP exchange rate between October 1936 and June 1937 as the benchmark or "base period" with respect to which equilibrium (or lack thereof) was measured. Metzler justified this as follows (p 117): "This period was selected because it was relatively close to the war years but at the same time reasonably free of war influences." He further wrote (p 129): "The virtue of the parity rate is that it preserves the earlier real exchange ratio between the goods and services of one country in the goods and services of another."

Of course, Metzler was aware that there were several limitations associated with this method (p 132):

> "[S]ince several types of price index number are usually available, the calculation of parity rate is not a simple procedure, but involves a considerable element of judgment as to what prices and costs are important for a country's balance of payments."

At the end of his analysis, Metzler concluded that several nations had declared "overvalued" exchange rates to the IMF. This was not an auspicious beginning for a new institution with the mandate to provide financial assistance to countries facing severe disequilibria. This weakness of the new system was confirmed two years later, with the 1949 crisis of the Sterling Area.

In "*A Monetary History of the United States"* Milton Friedman and Anna J. Schwartz use of PPP computations to analyze the evolution of market exchange rates relative to their equilibrium or par values, as implied by the gold standard. Their analysis focuses on three periods: The Greenback years, the two World Wars, and the 1933-1939 period. Early on, they explain the relation between price and exchange rates according to the PPP doctrine (p. 62, emphasis added):

> "*Other things being the same*, the exchange rate would tend to vary with relative internal prices… *Of course, other things were not the same* during the greenback. And, as we shall see, they produced significant deviations from the changes in exchange rates that would have been strictly in accord with changes in purchasing power parity."

In a very long footnote – over a page! –, F&S discuss the main methodological challenges involved in their PPP computations, including the unavailability of long series on production prices, and the fact that most available indexes included many "international goods" (fn 66, p. 62-63). In their view, the ideal price indexes would track the evaluation of production costs in each country, expressed in domestic currency. F&S addressed the "arbitrary base year" problem that concerned Viner by selecting the average PPP index for over a decade (1861-1879) as a benchmark. In Appendix A-4 (p. 769-775) Friedman and Schwartz present their PPP exchange rate calculations for the dollar relative to the British pound (1871-1960), the Swedish krone (1920-1960), and the Swiss franc (1920-1960). F&S noted that some of the most important exchange rate-related episodes in international economic history, including the abandonment of the gold-exchange standard by the U.K. in 1931, by the U.S. in 1933-34, and by Switzerland in 1936, were clearly captured by these data.

I return to discussing some PPP-related issues in Section 6 on the monetary approach to exchange rates and the balance of payments, an issue where some Chicago Faculty such as Harry G. Johnson, Jacob Frenkel and Michael Mussa played an important role.

4. The case for flexible exchange rates: Lloyd Mints, Henry Simons, and Milton Friedman,

Milton Friedman first addressed the exchange rate regime issue in 1948, two years after he joined the faculty in Chicago. In his *American Economic Review* article "*A monetary and fiscal framework for economic stability*" Friedman points out that if there is a monetary rule, it is not possible to use monetary policy to attain external balance. He writes (1948a, p. 252; emphasis added):

> "Under the [monetary] proposal, the aggregate quantity of money is automatically determined by the requirements of domestic stability. It follows that changes in the quantity of money cannot be used – as they are in the fully operative gold standard – to achieve equilibrium in international trade… The international arrangement that seems the logical counterpart of the proposed [monetary] framework is *flexible exchange rates, freely determined in the foreign exchange markets, preferably entirely by private dealings*."

In a footnote, Friedman notes his argument may be presented in a completely different way, starting with the exchange rate regime: "[F]lexible exchange rates can be defended directly. Indeed, it would be equally appropriate to present the proposed domestic [monetary and fiscal] framework as a means of implementing flexible exchange rates." He would make this point many times during the years to come. There was a strict connection between monetary policy

and the exchange rate regime; it was not possible for a country to simultaneously have free capital mobility, active monetary policy (including a monetary rule), and rigid exchange rates. This proposition would come to be known as "the impossibility of the Holy Trinity."

In April 1948, Friedman participated in a roundtable on Canada's inflation and balance of payments problems. During the discussion, which was transmitted on NBC radio, he argued that Canada would benefit from adopting a market-determined exchange rate regime. In his memoirs, Friedman points out that until that time Canadian officials had never thought of implementing floating exchange rates, as they eventually did – partially prompted by Friedman's suggestions -- in September 1950 (Friedman and Friedman, F&F, 1998, p. 189). In the same memoirs, Friedman recalls that in 1950, when he was working on the Schuman Plan, he presented a memorandum to the German authorities, suggesting that, as part of the reconstruction effort, they should adopt flexible exchange rates. He argued in favor of "the simple step …letting the exchange rate go free…"[11]

"*The case for flexible exchange rates,*" was originally written in 1950 as a memorandum for the U.S. Economic Cooperation Administration, and subsequently published, in 1953, in *Essays in Positive Economics*.[12] Friedman begins with a simple argument: countries are frequently affected by shocks that alter their balance of payments positions. There are four methods for solving the imbalances created by these shocks: (a) changes in exchange rates (b) changes in internal prices or income; (c) direct controls; and (d) use of monetary reserves. When discussing the first alternative – changes in the exchange rate – Friedman compares flexible exchange rates with infrequent and discrete (large) changes in the official exchange rate, as considered by the Bretton Woods system. He argues that infrequent large devaluations would be destabilizing. He writes:

> "The system of occasional changes in temporarily rigid exchange rates seems to me the worst of two worlds: it provides neither the stability of expectations that the genuinely rigid and stable exchange rate could provide in a world of unrestricted trade… nor the continuous sensitivity of a flexible exchange rate. (1953, p. 164)"

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[11] In the 1950s, and after Canada had moved to floating, the United Kingdom considered, twice, adopting a flexible exchange rate. The arguments used by supporters of flexibility mirrored closely those made by Friedman in his 1950 memorandum. The first time was the ROBOT plan of 1951-52. Flexible rates were again considered in 1952, during the negotiations for the Collective Approach. See Schenk (1991) for details.

[12] The memo version was never released to the public. Its introduction is very different from that of the published version. Friedman refers to Keynes ***Monetary Tract*** and argues that policy makers face a trilemma: it is not possible to simultaneously have fixed exchange rates, stable internal prices and unrestricted multilateral trade. See *Milton Friedman Archives, Hoover Institution*, MFAHI, Folder 43-13.

Friedman, then discusses changes in internal prices and aggregate income as an adjustment mechanism. A serious problem with that option is that wages and prices are, generally, rigid downward. He writes that "in consequence, an incipient deficit that is countered by a policy of permitting or forcing prices to decline is likely to produce unemployment rather than, or in additional to wage decreases." (p. 165). Regarding the last two options, he points out that direct controls in the form of import tariffs, licenses, and quotas have significant efficiency costs, and that the use of monetary reserves would be ineffective if the shocks are large and persistent. In the rest of the essay Friedman addresses several objections commonly raised against flexible exchange rates and delineates practical ways of implementing a new international financial system characterized by market-based exchange-rates, including what role (if any) the IMF would play in this alternative international monetary arrangement.[13]

Many of the arguments made by Friedman had been made a few years earlier by his Chicago teacher, and later colleague, Lloyd Mints. For example, in a review of a 1944 League of Nations report, which was mostly written by Ragnar Nurske, a strong supporter of pegged exchange rates, Lloyd Mints wrote (1945, p. 193-194):

> "It is doubtful that fluctuating exchanges, under conditions of internal monetary stability… would be disequilibrating... And it is beside the point to contend that exchange fluctuations 'involve constant shifts of labor and other resources between production for the home market and production for export'… [Under fixed rates] the adjustment must come by ways of a change in domestic prices, including wage rates, whereas with free exchanges the necessary adjustments can be obtained largely by means of changes in the prices of international goods. The important consideration is that the latter prices are more flexible than wage rates."

In his book Ragnar Nurske argued that a flexible exchange rate regime would result in highly volatile currency values. He wrote (1944, p. 118):

> "The dangers of such cumulative and self-aggravating movements under a regime of freely fluctuating exchanges are clearly demonstrated by the French experience of 1022-1926, Exchange rates in such circumstances are bound to become highly unstable, and the influence of psychological factors may at times be overwhelming. French economists… developed a special "psychological theory"

[13] The paper is almost silent regarding the less developed countries. However, Friedman does point out that the Sterling Area could be characterized by a floating rate with respect to the rest of the world and a rigidly fixed rate within the area.

> of exchange fluctuations, stressing the undetermined character of exchange rates [under free markets]."

The role of "speculators" in the foreign exchange market played an important role in Friedman's plug for flexible exchange rates. In his 1953 article – and in the 1950 memo version, for that matter – Friedman makes a distinction between transitory and permanent forces affecting the foreign currency market and argues that in both cases speculators play a positive, stabilizing, role. Regarding changes in currency values prompted by changes perceived "as produced by fundamental factors that are likely to be permanent, … speculative transactions will speed up the rise or decline in the exchange rate and thus hasten its approach to its final position." (Friedman, 1953, p. 162). In the years that followed Friedman would insist, from different perspectives, that speculation was not destabilizing as critics of flexible rates argue – see, for example, Chapter 13 of his The Optimum Quantity of Money, for a discussion on destabilizing speculation.

In 1950 Lloyd Mints published a book titled *Monetary Policy for a Competitive Society* (1950), where he argued that flexible rates could provide a solution to the international adjustment problem. In chapter 5 he criticizes Purchasing Power Parity -- he calls the doctrine "a fallacy," p. 97 --, and the nascent Bretton Woods system. In the preface to the book Mints writes: "I am greatly indebted to Professor Milton Friedman, who read the penultimate draft of the manuscript. In consequence of his many suggestions several chapters have been rewritten." (p. vii).

It is well known that Henry Simons influenced Friedman on monetary policy in general, and on monetary rules in particular (see Friedman 1967). What is less known, however, is that Simons also had an impact on Friedman's views on exchange rates. Simons was more guarded than his colleague Lloyd Mints in supporting flexible rates, but in several of his writings he criticized the gold standard and argued in favor of what he called "independent national currencies." In a little-known 1934 essay titled "Currency Systems and Commercial Policy," Simons wrote that the gold standard was "conductive in depressions to policies of extreme protectionism and economic isolation" (Simons 1934, p. 346). In his view, this problem would not exist if there was "a system of independent currencies… [that] would involve… change[s] in the exchange rates." He pointed out that if monetary policy was geared at stabilizing the price level, flexible exchange rates would not be volatile and that "adequate future markets for foreign exchange would surely develop." (Simons 1934, p. 347).

In a 1943 paper on the future of the global economy after World War II, Simons argued that free trade was the most important requirement for a durable peace. He then pointed out that

the adoption of flexible rates by the main countries would facilitate a world based on free trade. He wrote (Simons 1943, p. 149, emphasis added):

> "My own predilection is for essentially independent currencies (or currency blocks), each stabilized in terms of an inclusive domestic price index, *and all traded freely (i.e., without intervention by central bank treasuries, or stabilization funds) on well-organized exchange markets (forward and spot).* It is hard however, to point an easy or promising course toward such a monetary world."

Neither of the papers referenced above were included in the volume on Simons' works edited posthumously by Aaron Director. However, in several of the essays included in the book Simons addresses exchange rates, and in all of them he points out that his preferred regime is independent national currencies that float with respect to each other (Simons, 1951, p. 63, 81, 83 and 85).

In the years that followed the publication of "*The case for flexible exchange rates,*" Friedman reiterated and refined his arguments on the superiority of flexible exchange rates. He was relentless and expressed his view in papers, at conferences and roundtables. Here is a small selection of instances, in different parts of the world, where Friedman promoted flexible exchange rates and/or criticized the Bretton Woods system:[14]:

- In a 1963 conference in Mumbai, he said that given India's recurrent balance of payments crises, "the appropriate solution is to stop pegging the price of foreign exchange. Let anybody buy and sell foreign exchange at any price mutually agreeable to buyer and seller." (1968, p. 59). He added that if, for political reasons, it was not possible to have a completely free market, the second-best option was to auction foreign exchange. In the next few years, he emphasized that for him flexible rates didn't necessarily have to be market determined; poorer countries could resort to auctions or crawling pegs as second-best alternatives. (Friedman 1973a; Edwards 2023).

- In a 1965 American Enterprise Institute symposium, he discussed a paper by James Meade, and said that new empirical and historical research showed that flexible rates worked efficiently and in a stable way. He emphasized the experiences of Canada and Peru in the post-World War II, the U.S. during the Greenback period, and several European countries after the Great War. He pointed out that the fears of destabilizing speculation had been greatly exaggerated.

[14] I deal with his debates with Robert Mundell in Section 6. For greater details on Friedman's policy views on exchange rates, see Edwards (2023).

- In a 1967 debate with former Under Secretary of the Treasury Robert Roosa, Friedman pointed out that contrary to Roosa's assertion, flexible rates were (very) likely to boost international commerce, while fixed rates hindered it. The reason was that under fixed rates countries usually dealt with payments imbalances by putting in place trade barriers and other forms of direct controls. He also challenged Roosa to produce empirical evidence on cases of destabilizing speculation. Friedman said: "If countries separately follow stable internal policies, exchange rates, while free to move, will be highly stable. Stability is not rigidity." (Friedman 1967, p. 48).

- In a 1969 debate with MIT's Charles Kindelberger, Friedman made two important points: flexible exchange rates did not require money illusion, and the amount of exchange rate risk under fixed and flexible rates was similar. He said that "[t]he difference between the two systems is the form that the uncertainty takes. Under a fixed rate system, the uncertainty takes the form of whether there will be major exchange rate changes every 5 or 10 years." (Friedman 1969, p. 115).

- In a June1973 testimony in front of the Joint Economic Committee in Congress, almost two years after the "gold window" had been closed by President Nixon, Friedman stated that recent events had vindicated his long-held views on exchange rates. He said: "The exchange rate of the dollar has… declined in an orderly fashion... There has been no crisis, no closing of exchange markets, no changes of rates by 10 percent overnight."[15]

- In 1994, in a policy piece on the 50th Anniversary of the IMF, Friedman wrote that the Bretton Woods institutions had "been major failures; they have done far more harm than good and have imposed heavy costs on their members." His assessment was heavily influenced by his views on the pegged exchange rate regime. (Friedman 1994, p. x).

In the 1950s and 1960s one of the strongest opponents to the notion of devaluations and exchange rate changes as an adjustment mechanism was Swedish economist Gunnar Myrdal, who would win the Nobel Prize in 1975 and would be extremely critical of Milton Friedman when he was awarded the prize two years later. For example, in his three-volume oeuvre *Asian Drama: An Inquiry into the Poverty of Nations* he gives scant importance to the exchange rate. Most of the discussion on currencies is relegated to Appendix 8, "A Note on Positive Operational Controls." The first section of this appendix is titled "The Foreign Exchange Front," and opens with a discussion on "reasons for or against devaluation" (Myrdal 1968, p. 2078). Throughout his analysis – which is less technical than other appendixes and doesn't include any equations --,

[15] Friedman (1973b).

Myrdal is very skeptical with respect to the role of exchange rate adjustments in developing nations. He wrote (Myrdal 1968, p. 2081; emphasis in the original):

> "Since devaluation cannot – either in the short or the long run – be expected to stimulate a very considerable increase in export volume, it cannot free countries like India and Pakistan from the necessity of preventing or severely limiting imports other than those of essential consumption goods and development goods. *Devaluation is not an alternative to import controls*… [I]t should be frankly recognized that that the concept [devaluation] is not applicable to these countries."

This was exactly the opposite to the message Milton Friedman had given to Indian policymakers in his 1955 and 1963 trips to India. However, Myrdal's position in 1968 was not new; he had already presented it in his 1956 treatise *An International Economy: Problems and Prospects*, where he wrote that the historical evidence demonstrated that "a large and sudden devaluation of the currency… is neither a wholesome nor an efficient means of curing a structural disequilibrium in trade and payments (Myrdal 1956, P. 94).

In the early 1970s Friedman changed his mind regarding the desirability of flexible rates for developing countries. In the Horowitz Lectures, delivered in Israel in April 1972, he argued that given poor nations' proclivity to rely on the inflation tax, a more appropriate regime was one characterized by irrevocable fixed exchange rate and no central bank. He called that system a "unified currency," and forcefully made the point that it was a very different regime from the Bretton Woods pegged-but-adjustable system. In the years that followed Friedman continued to emphasize the importance of relative price changes during the adjustment process and argued that under a "unified currency" regime it was particularly important that free markets prevailed and that both wages and prices maintained some degree of flexibility. If prices (and wages) were rigid, adjustments to external shocks would result in heightened unemployment.

Friedman's conclusions in the Horowitz Lectures were simple and controversial: (Friedman 1973a, p. 47, emphasis added).

> "I conclude that the *only way* to refrain from using inflation as a method of taxation is to *avoid having a central bank*… [A] unified currency assures a maximum degree of integration of the country in question with the greater world."

During the questions and answers session, the moderator of the second Horowitz Lecture asked whether there was an optimal sequencing in the adoption of an appropriate monetary/exchange rate regime in a developing country such as Israel. He said that he

understood that Friedman thought that "a unified currency… was a *first step* and a flexible rate a *second step*." (Friedman 1973a, p. 64, emphasis added).

Friedman's response was long, pragmatic, and all-encompassing. He argued that the answer had to consider the overall reality of each developing country, including political pressures and the institutional structure. When the big picture was considered, he affirmed, the unified currency regime was his preferred monetary arrangement for most poorer countries; it was the regime to adopt as soon as possible and to maintain over time. He said: "*The reason why I regard a floating rate as a second best for such a [developing] country* is because it leaves a much larger scope for government intervention." (Friedman 1973a, p. 64-66, emphasis added).

A year after delivering the Horowitz Lectures, Friedman confirmed, in Congressional testimony, that in his view the best strategy for LDCs was to adopt one of two monetary and exchange rate regimes. (Friedman 1973b; emphasis added):

> "[W]hile I have long been in favor of a system of floating exchange rates for the major countries, *I have never argued that that is necessarily also the best system for the developing countries*. Indeed, in April of last year I gave a series of lectures in Israel [where]… I recommended as probably *the optimum policy under current conditions for a developing country that it [irrevocably] peg[s] its exchange rate to its major trading partner rather than have a floating system*."

5. <u>The transfer problem, relative prices, and exchange rates</u>

Between the 1930s and 1970s, there was significant interest in analyzing the "transfer problem," or how a monetary transfer across countries affects the terms of trade, the trade balance, the exchange rate, employment, and real incomes, among other variables. The interest on this issue stemmed, largely, from the debate on the effects of German reparations after World War I, a debate that pitched Bertil Ohlin vs John Maynard Keynes in 1929.

Jacob Viner devoted long passages of his 1937 book to analyzing the transfer problem from different perspectives and under alternative assumptions. Viner criticized Keynes (1929), Ohlin (1929a, b), and Pigou (1932) for not considering all variables in play and praised Wilson (1931) and Yntema (1932) for analyzing second round effects, including the way in which transfers impacted on the composition of demand. Viner argued that because of the complexity of the problem, it was not possible to reach a firm and unequivocal conclusion about the effects of a transfer on the key macroeconomic aggregates and prices. He could only offer a conjecture with respect to its effects on relative prices: "a transfer… may shift the commodity terms of trade

in either direction, but is much more likely to shift them against than in favor of the paying country." (Viner 1937, p. 360).

A few years later, Lloyd Metzler (1942) developed a two-country Keynesian model to analyze the effects of a transfer on real incomes. Although he used a more sophisticated apparatus than Viner, his conclusions were similar, in the sense that it was not possible to reach an unambiguous result. The final effect of the transfer depended on several variables, including whether the two countries exhibited stability in isolation. In 1951, Metzler extended his analysis to the case on an n-country world. He showed that, once again, the conditions of stability affected the results. In the most plausible case, when marginal propensities to spend in all countries are less than one (a stability condition in a closed economy or isolation), a simple result is obtained: real income will fall in the paying country and will increase in the receiving country. It is not possible, however, to determine what happens in the rest of the world. Once instability in one of the countries is allowed, almost any result can be obtained, including that all incomes fall or that all incomes rise. (Metzler 1951, p. 27). The wide range of possible results may be seen in Figure 1, which is taken from Table 2 of Metzler's paper (1951).

SUMMARY OF POSSIBLE INCOME MOVEMENTS IN THE *n*-COUNTRY SYSTEM

	Normal Case: All Marginal Propensities To Spend Less than Unity	First Special Case: System Unstable when Paying Country Is Withdrawn in Favor of Receiving Country	Second Special Case: System Unstable when Receiving Country Is Withdrawn in Favor of Paying Country
Income of paying country	Falls	Rises	Falls
Income of receiving country	Rises	Rises	Falls
Income of other countries	?	Rises	Falls

Figure 1: Possible results in Metzler's n-country transfer problem analysis (Metzler 1951)

Harry G. Johnson (1956) argued that almost any problem in international macroeconomics could be analyzed using the conceptual framework of the "transfer problem." In his analysis he considered two alternative models (Classical vs Keynesian), and two exchange rate regimes, fixed vs flexible. Johnson, as Metzler, concluded that, at the end of the road, the results depended on the stability of the system: (1956, p. 221; emphasis added).

> "In either case [fixed or flexible exchange rates] the central theoretical problem concerns the conditions under which a relative reduction in export prices would tend to improve a country's trade balance. This problem, which may be described generically as '*the exchange stability problem,*' also arises as a phase of the transfer problem…"

In a Keynesian world, the conditions for the exchange market to be stable depend on the size of the import elasticities in the two countries, and on the magnitude of the propensities to import in each of them. Harberger (1950) and Laursen and Metzler (1950) showed that the foreign exchange market will be stable if the sum of the elasticities of import demands in the two countries is greater than one plus the sum of the marginal propensities to import. Obstfeld (1982, p. 251) summarized the results in Laursen and Metzler (1950) as follows: "[A]n adverse movement in the terms of trade between domestic and foreign goods will cause a rise the home-goods value of expenditure, and… a current account deficit." The key assumption behind this result was that a negative terms of trade shock resulted in a decline in both consumption and savings (marginal propensity to consume lower than one). Svensson and Razin (1983) expanded the analysis and considered an intertemporal optimization model. They showed that the traditional results by Harberger and Laursen-Metzler depended on whether the terms of trade shock was permanent or temporary and on the size of the rate of time preference.

The effect of transfers on exchange rates, terms of trade, and incomes continued to play an important role in research undertaken in Chicago in the 1960s through 1980s. Robert Mundell (1968, Ch. 2) investigated the effects of commercial and fiscal policies within the context of transfers, and emphasized, as other authors before him, the role of stability associated with the Marshall-Lerner condition and marginal propensities to consume and import. Dornbusch (1980, p. 106-107) showed that under most parameter configurations the receiving country will experience a real appreciation and a deterioration in the trade balance. Mussa (1986) and Frenkel and Razin (1987) show that a transfer will result in an equilibrium real exchange rate appreciation in the receiving country, if the marginal propensity to spend on nontradable goods is positive and the marginal propensity to spend in the paying country is greater or equal to zero.

Harberger (1986) used a transfer problem framework to analyze how the liberalization of the capital account is likely to affect macroeconomic conditions. Once capital controls are lifted, as part of a comprehensive and coherent reform program, large amounts of capital will flow into the reforming country. Harberger argues that this creates a situation similar to that of "an exogenously driven transfer": the real exchange rate will appreciate, and a large current account deficit will develop (this is required for the transfer to be effected). Once portfolio equilibrium is achieved, and foreign investors hold the desired amount of the reforming country's securities,

capital flows will decline towards a new steady state, requiring a reversal of the original real appreciation. The experience of the Latin American countries in the early 1980s shows that this is very difficult under fixed exchange rates, and wage rate downward rigidity. In country after country a predictable cycle that ended in major crises developed.

6. The monetary approach to exchange rates

In the 1960s and 1970s, purchasing power parity played an important role in the development of the "monetary approach" to exchange rates, a view advanced by Harry G. Johnson and Jacob A. Frenkel. In its simplest representation, the monetary approach posited that the equilibrium bilateral nominal exchange rate was consistent with simultaneous monetary equilibrium in the two countries in question. The importance of goods' arbitrage along the lines of the PPP doctrine, was emphasized by Harry G. Johnson (1976, 1977) in several of his papers on the subject. He argued that discussions on what type of indexes to use – traded goods vs general prices – had stalled research progress during the early 1970s (Johnson 1977, p. 252).

Although the term "Purchasing Power Parity" does not appear in the index of Robert Mundell's 1968 or 1971 books, the connection of domestic and foreign prices, through the exchange rate, plays an important role in his models of devaluation (Mundell 1971, Ch. 8 and 9). According to Harry Johnson (1977, p. 261):

> "The development of the 'monetary approach' at Chicago followed the evolution of the work of Mundell… [Mundell developed a] monetary-theoretic approach on Patinkinian lines… an analysis that, in conformity with the international monetary problems of the late 1960s concentrated on the general equilibrium in a system of markets for national currencies and gold."

The reference to Don Patinkin in the above quote is intriguing, as in his monumental "Money, Interest and Prices" there is no discussion on the open economy. The terms "exchange rate," "currency," "devaluation," and "balance of payments" are not in the index. There are only three references to the "gold standard." In Chapter X, on the workings of his model under full employment, Patinkin mentions an influx of gold as the possible source of an exogenous increase in the supply of money (P. 241, fn. 10). A second reference to the gold standard occurs when Patinkin discusses the relation between "outside" and "inside" monies. He argues that under "the gold-standard in which the neoclassical economists were writing… an equiproportional change in outside and inside money [could happen] … (p.299). Finally, in Chapter XII Patinkin points out that under a "pure gold-standard economy… the central bank creates reserves by buying gold instead of bonds." (P. 309).

In 1978, Frenkel and Johnson collected eleven papers written, in the previous years, by Chicago faculty and former students on different applications of the monetary approach to exchange rates.[16] In all these papers, PPP – either in "absolute" or "relative" terms – plays an important role. Dornbusch (1978 [1976], p. 28-29) provides the clearest exposition of the basic monetary model: PPP holds for tradable goods, $P_T = EP_T^*$, and the money market is in equilibrium in both countries, $\left(M/P\right) = L(\ )$ and $\left(M^*/P^*\right) = L^*(\ )$, usual notation applies. The model is closed with equations for the equilibrium relative price of tradables with respect to the price level at home and abroad: $P_T = \theta P;\ P_T^* = \theta^* P^*$; these equilibrium relative prices are consistent with the simultaneous attainment of external and domestic balance. In equilibrium, then, the logarithmic differentials of the nominal exchange rate ($\hat{E}$) will be given by the following expression (Dornbusch's equation 6):[17]

$$\hat{E} = \left(\hat{M} - \hat{M}^*\right) + \left(\hat{L} - \hat{L}^*\right) + \left(\hat{\theta} - \hat{\theta}^*\right).$$

The first term in parenthesis is the difference in money supply growth across the two countries; the second term represents changes in demands for monies. The last term captures the effect of real variables, including different productivity gains across sectors and countries and changes in the terms of trade, on the dynamics of nominal exchange rates.

Whether models along these lines appropriately captured the behavior of exchange rates hinged largely on the assumptions made about PPP. Frenkel's research (1978) suggested that PPP had held during periods of rapid inflation, including the 1920s in Germany. However, in more tranquil periods, such as the 1980s, there were large and persistent deviations from PPP (Frenkel, 1980). This was confirmed by Mussa (1986) in an extensive, detailed, and influential analysis comparing the behavior of prices and exchange rates during the first decade of floating rates. Other writers associated with Chicago (and, of course, in other schools) confirmed these results for many countries and periods. The problem came to be known as the "PPP puzzle." (Rogoff 1996; Itskhoki 2021).

In a 1985 review article prepared for the New Palgrave Dictionary, Dornbusch argued that there could be no objections to PPP as a theoretical construct. Problems arose, however, with it as an empirical proposition used to guide and/or evaluate policy, and to analyze exchange rate behavior. He pointed out that it was necessary to distinguish between structural and monetary-induced deviations from PPP. The most important among the former was the Ricardo-Balassa effect that stated that in growing economies there is a secular tendency for the relative price of

[16] The volume came out a few months after Harry Johnson had passed away.
[17] Dornbusch, of course, acknowledges that many of the right-hand side variables are, of course, endogenous.

nontradables relative to tradables to rise. Other structural deviations are related to commercial policies and terms of trade changes. Monetary deviations, on the other hand, have to do with price sluggishness, wage stickiness, capital controls, and expectations. (Dornbusch and Helmers 1988).

The empirical rejection of PPP in the short run led researchers, both in Chicago and in other departments, to develop richer models that emphasized more complex portfolio choices and allowed for price sluggishness in the short and medium run. One of the most successful efforts is Dornbusch's (1976) celebrated overshooting model, a paper written while Dornbusch was a member of the Business School faculty at Chicago, and published in the *Journal of Political Economy* after he joined MIT. In this work prices are sticky in the short run and adjust slowly; PPP holds only in the long run. A key assumption is that there is free capital mobility and risk neutrality. Thus, the uncovered interest parity condition always holds. The country is assumed to be small. An increase in the quantity of money will drive domestic interest rates down, and future prices and exchange rates up. Long run equilibrium, then, will be characterized by higher price levels and a depreciated currency. For the interest parity condition to hold at every moment in time, it is necessary that there is an *expected appreciation* in the immediate run. Since the long-term exchange rate will depreciate due to PPP, the only way for an expected appreciation to take place immediately is if in the short term the currency depreciates by more than in the long run: that is, in the short run there is an exchange rate overshooting relative to its new long-term steady-state equilibrium.

7. Exchange rates and fundamentals

The question of how fast domestic inflation converges to international inflation under a fixed exchange rate regime – a proposition that follows directly from the relative version of PPP –, became particularly important during a number of stabilization programs in emerging and former communist countries, in the 1980s and 1990s. Many of these programs, especially in Latin America, were put in place by teams led by Chicago graduates. These reformers came to be known as the "Chicago Boys."[18] Some scholars at Chicago, including Harry Johnson and Larry Sjastaad, believed that under fixed rates the convergence of domestic inflation to international

[18] In an interview for the University of California, Berkeley, Oral History Program, George Shultz, the former Secretary of State, and former Dean of the Chicago Business School, pointed out that Arnold Harberger was the "godfather" of these "technopols." The term "technopol" to refer to politically powerful professional economists was coined by political scientist Jorge Dominguez. Shultz interview (p. 35): https://digitalassets.lib.berkeley.edu/roho/ucb/text/shultz_george_2016.pdf

inflation would be rather fast; others, including Arnold Harberger, were more skeptical about the process.[19]

If convergence is slow, prices would continue to rise once the nominal exchange rate was fixed, and a situation of real exchange rate overvaluation would develop. If the extent of misalignment grew up to be (very) large, the country could -- as many, in fact, did – end up facing a major and very costly crisis. Milton Friedman addressed this issue in Chapter 9 of his 1994 book "*Monetary Mischief*," where he compared the experiences of Chile and Israel with stabilization programs that used a fixed nominal exchange rate as an anchor. While in Chile the experiment ended up with a major crisis in 1982, in Israel it was a largely successful episode. Friedman pointed out that although the two experiments looked, on the surface, very similar, there were a number of important differences. In particular, Israel pegged the exchange rate to the USD as a temporary measure aimed at guiding expectations in the short run. After a few months the shekel was devalued "at irregular intervals to offset the difference between the roughly 20% inflation in Israel and the lower inflation in its trading partners." (Friedman 1994, p. 241). Chile, in contrast, announced that the fixed rate would remain indefinitely, even in light of obvious overvaluation and increasingly large current account deficits financed with short term capital.[20]

7.1 Robert A. Mundell, fixed exchange rates, and optimal currency areas

Robert Mundell joined the faculty in 1966, and remained in Chicago until 1971, when he moved to Canada. During his Chicago years he published two important books where he collected his work on international economics since the early 1960s (Mundell 1968, 1971). Much of Mundell's research, including his work on exchange rates and adjustment, has been at the center of policy debates in the last 60 years or so. His extension of the Keynes-Hicks IS-LM model to the open economy – the so-called Mundell–Fleming model – became the workhorse of international finance for decades. Some of the most important insights from this work were: (a) the connection between capital mobility and the effectiveness of different macroeconomic policies; (b) the assignment of policy tools to different goals under alternative exchange rate regimes; and (c) the definition of criteria for determining the extent of optimal currency areas. (Mundell 1968). As noted in the preceding Sections, Mundell also made important contributions to theoretical discussions on bimetallism, the gold standard, stability, the transfer problem, adjustment, exchange rates and portfolio models in open economies, among other.

[19] Edwards and Montes (2021).
[20] See Edwards and Montes (2020).

Although Mundell had done his seminal work on optimal currency areas before joining Chicago, he continued to push the idea of the optimality of fixed exchange rates and a unified money once he joined the Department (and after he left for Canada and, eventually, for Columbia). His views on the subject were very influential in Europe and helped build the conceptual base for the creation of the Euro. These ideas were also debated in several developing countries that had suffered from macroeconomic instability and recurrent currency crises. For instance, during the late 1990s there was an intense debate on whether Argentina and other Latin American countries should give up their currencies and adopt the US dollar as legal tender. Those who supported this view often referred to Mundell's work as an intellectual justification for their position. Often this debate pitched the experiences of Panama, a country without a currency of its own, and Argentina and Brazil, countries with chronic inflation and instability.

Rudi Dornbusch, one of Mundell's most prominent students, argued in 2001 that there were too many currencies in the world, and that in many countries monetary independence was abused by politicians and resulted in rapid inflation. In his view, the world would greatly improve if a Mundellian view was adopted and many emerging countries joined currency unions managed by stable central banks, or, simply, gave up their currencies and adopted an advanced nation's money as legal tender. He wrote (2001, p. 240):

> "The gains from a currency board or dollarization come in the financial area and derive from a far enhanced credibility in exchange-rate and hence inflation performance… The gains come in two forms. First and most obviously, there is a dramatic decline in interest rates… A further benefit is the transformation of the financial sector and the lengthening of agents' horizons."

Arnold Harberger, an old Latin American hand, and the putative father of the famed "Chicago Boys," has argued that an important consideration in the fixed versus flexible exchange rates debate has to do with the nature and magnitude of external terms of trade shocks. He has pointed out that Panama, in contrast to Argentina, has a very steady source of foreign exchange, stemming from the Panama Canal. Countries with volatile terms of trade need large real exchange rate adjustments to accommodate shocks, and in the absence of very flexible labor markets and nominal wages, a flexible exchange rate – including some variation of the crawling peg -- would operate better. (Harberger 1986).

In 1991, Argentina implemented a currency board as a way of stabilizing the economy. Mundell's views were extremely influential in the design of the policy. As early as 1995, Mundell pointed out that Argentina "had fallen victim to overvaluation paid for by capital imports." (1995, p.26). Mundell (1997) argued that it was important to distinguish between

"true" and "pseudo" currency areas and suggested that it was not yet clear where Argentina fell within that classification. In 2000, one year before the Argentine experiment with fixed exchange rates and a pseudo currency board collapsed, Mundell (2000, p. 225) wrote that "Argentina sill has credibility problems… reflected in high interest rates in dollars." Most analysts, including Mussa (2002), attributed the failure of Argentina's experiment with a fixed exchange rate and a currency board to an inconsistency between fiscal and monetary policy, and labor market rigidity.

In 2001, Mundell and Milton Friedman had a friendly debate on the merits of flexible versus fixed exchange rates. Friedman opened the conversation by arguing that the traditional dichotomy should be replaced by a trichotomy: hard pegs, soft pegs, and flexible. His criticism of soft pegs was the traditional one, including the fact that they often build up significant pressure that ends up in major crises. He then argued that hard pegs provided a credible option, and a preferred one for a number of small ones such as Hong Kong and some developing nations.[21] Mundell agreed on the need to be more precise, and pointed out that it was useful to distinguish between a number of credible fixed exchange rate arrangements: A common currency area, a "dollarized" area, a monetary union, and a currency board system. He also said (2001, p. 12).

> "I have never nor ever would advocate a general system of 'pegged' rates. Pegged rate systems always break down. Monetary authorities may, as a temporary expedient, find pegged rates useful as a tactical weapon over some phase of the business cycle, but it cannot and should not be elevated into a general system."

7.2 The real exchange rate

In the mid-1970s, a group of young researchers, many of them associated with the University of Chicago, began to emphasize the role of nontradable goods in the adjustment process. While this was not completely new –after all, the distinction between domestic and international goods dates back, at least, to David Ricardo and was emphasized by Frank Taussig, Jacob Viner and others --, it was a highly influential development. Rudi Dornbusch, Michael Mussa, and Jacob Frenkel are the better known names associated with this development. As noted, the three of them were students of Robert Mundell and Harry G. Johnson, and through the years the three of them had many students that contributed to transforming the "real exchange rate," or relative price of tradables to nontradables, into one of the most important variables in global macroeconomic analyses. Real exchange rate analyses also became central to discussions

[21] Friedman had explicitly developed this idea in the Horowitz Lectures in Israel. Friedman (1973a).

about stabilization and external sustainability in less developed nations. Here, the contributions of Arnold Harberger, another Chicago figure, were particularly influential.

The functioning of the tradable-nontradable (or dependent economy) model is nicely captured in Figure 2, which is taken from Dornbusch (1975). The horizontal axis depicts the production and consumption of nontradables (N), while the vertical axis does the same thing for tradable or international (I) goods; VV is the production possibilities frontier under full employment; U_0 and U_1 are indifference curves.[22] Initial equilibrium is at E, where both the internal and external markets clear. At that point the trade balance is equal to zero. The (not drawn) tangent to both the PPF and the indifference curve at point E is the equilibrium real exchange rate, or equilibrium relative price of tradable to nontradable goods. Assume now a real depreciation or increase in the price of tradables. Production moves to point A, with a higher output of international goods and a lower output of domestic goods; consumption equilibrium moves to point C. Now, there is an excess supply for tradables (a trade surplus) equal to AB, and an excess demand for nontradables equal to BC. However, this situation of excess demand for domestic goods cannot be sustained and needs to be resolved. The natural mechanism would be an increase in the nominal price of nontradables until the real exchange rate goes back to its original equilibrium, consistent with E. An alternative, proposed by Dornbusch (1975, p. 862-863), is to put in place an income tax that reduces absorption, to point B, where the trade balance continues to have a surplus equal to AB, and the domestic goods' market clears.

In line with Chicago's tradition of applied work, during the 1980s several researchers and PhD students examined the behavior of real exchange rates in a number of countries and under different circumstances. Michael Mussa's 1986 paper "Nominal exchange rate regimes and the behavior of real exchange rates: Evidence and implications," was, possibly, the most influential early contribution on the subject. Mussa found that real exchange rates behaved very differently under these two types of regimes. Volatility was significantly higher under flexible exchanges, and the main source of volatility was changes in the nominal exchange rate. Mussa concluded that "the observed empirical regularities provide strong evidence against theoretical models that embody the property of 'nominal exchange rate neutrality' (Mussa 1986, p. 118)." These findings were considered, by Mussa and others, to support models with sluggish price adjustments, including Dornbusch's is overshooting model discussed above, and to cast doubt on models that relied extensively on PPP.[23]

[22] The indifference curves are drawn under the assumption that the marginal propensity to consume on N is equal to one.

[23] Mussa is careful in not providing a "blanket condemnation" to all PPP based models. However, he points out that "caution should be used in applying [those] models." (1986, p. 121)

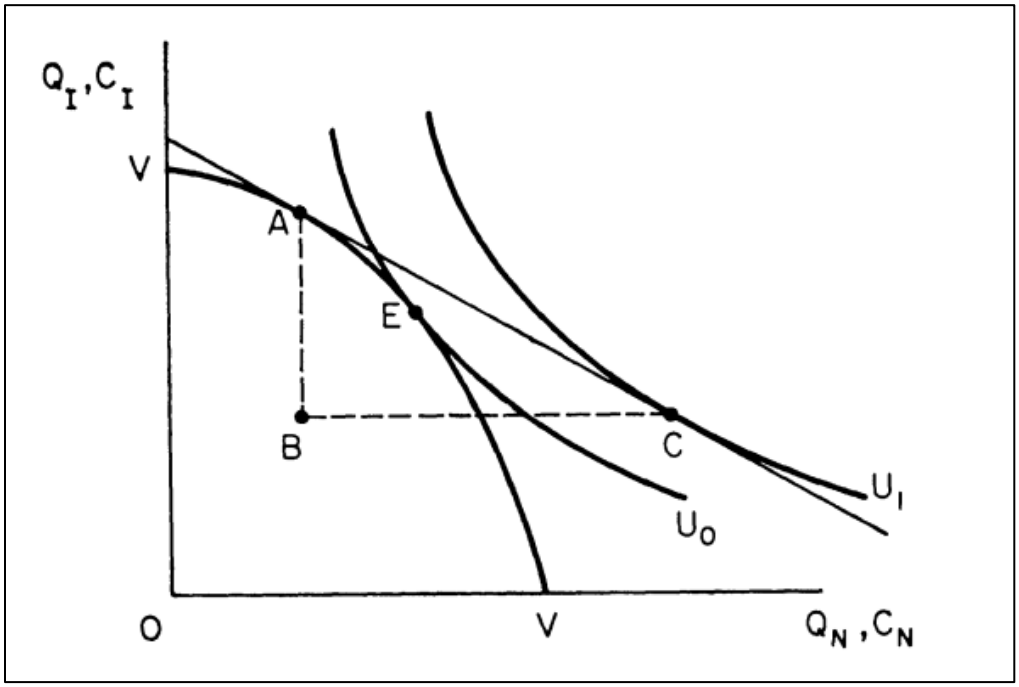

Figure 2: Dornbusch's Tradable and Nontradable goods model

The theoretical development of models that emphasized the role of domestic of nontradable goods, starting with Mundell and Dornbusch, resulted in an important change in the way economist, including those at the international financial institutions (IMF and World Bank) evaluated whether the exchange rate in a particular country, and at a specific point in time, was close to equilibrium, or whether it was misaligned. This, of course, was the same issue addressed by Viner, Metzler, and Friedman, which were discussed in some detail in the preceding sections of this paper. Newer empirical models identify the way in which long-term "fundamentals," such as terms of trade, commercial policy, differential productivity trends across countries, and other, affected the equilibrium long-term relative price of tradables to nontradables. Large and persistent deviations from this long-term equilibrium were considered to represent situations of misalignment (under or overvaluation), and the policies aimed at correcting them were discussed (Dornbusch and Helmers 1988).

8. Arnold Harberger and "shadow" exchange rates

In 1987, the World Bank named Arnold Harberger one of fifteen "pioneers of development." In his lecture to celebrate the occasion, Harberger chose to address the issue of "social project evaluation," or the methodology he had developed to determine whether public

sector investments made a net "social" contribution to society. This methodology was adopted by many countries, from India to Colombia, and from Indonesia to Argentina. A fundamental element of Harberger's approach was calculating "shadow" or "social" prices for key variables such as capital (the social discount rate or hurdle rate for public sector investment), labor, and foreign exchange. The mere idea that these social prices must be calculated implies that, in the presence of distortions, market prices do not provide an adequate measure of the "opportunity cost" of using certain resources in public sector investment projects. The case of foreign exchange is particularly interesting, since in addition to distortions such as import tariffs, license and quotas, and export subsidies/taxes, many countries chose to have a fixed (nominal) exchange rate that often is out of line with fundamentals.

Harberger's method recognizes that, at the margin and with other things given, a public sector project that uses foreign exchange will result in a more depreciated domestic currency in real terms. The method is based on the "sourcing" principle. Each unit of foreign exchange used in a public investment project comes from two possible sources. A fraction of it comes from imports that have been crowded-out because of the project, and another fraction comes from additional exports that would not have taken place in the absence of the project and the more depreciated real exchange rate. The "shadow" exchange rate – or, as Harberger prefers to call it, the "opportunity cost of foreign exchange" – is a weighted average of the import- and export-related sources. The weights of the two components are given by the elasticities of demand for imports with respect to the foreign exchange and the elasticity of exports relative to the real exchange rate.

In an early paper where he discussed Kenneth Arrow's to discount rates, Harberger offered a specific equation for the social opportunity cost of the foreign exchange rate (this assumes several categories of imports, subject to ad valorem import tariffs):

$$E_{s=} \frac{\varepsilon E - \sum \eta_i \left(M_i/X\right) E\,(1+t_i)}{\varepsilon - \sum \eta_i \left(M_i/X\right)},$$

Where E is the market exchange rate X and M are private sector exports and imports, and t_i is the ad valorem import duty affecting private sector imports of type i. Variables ε and η refer to the elasticities of the private sector's supply of exports and of its demand for imports, respectively.

Starting in the 1960s numerous planning offices in emerging markets relied on Harberger's approach to evaluate public sector investment projects. A good example is the early 2000s estimation for South Africa. This study concluded "the additional cost of the use of, or the benefit from generating, foreign exchange in South Africa would be approximately 6.2 per cent of the market value of tradable goods." (Harberger et. al. 2003, p. 322).

9. Concluding remarks

In this essay I have reviewed the contributions made to the external adjustment and exchange rates literature by scholars associated to the University of Chicago during the university's first hundred years. I have shown that research was both deep and varied and went well beyond the advocacy for market determined exchange rates, a position taken by Milton Friedman as early as 1950, and usually associated with Chicago.

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