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# ONE HUNDRED YEARS OF EXCHANGE RATE ECONOMICS AT THE UNIVERSITY OF CHICAGO: 1892–1992

BY

SEBASTIAN EDWARDS

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*In this paper I analyze the work on exchange rates and external imbalances by University of Chicago faculty members during the university's first 100 years, 1892 to 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 others. 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.*

## I. 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. Friedman's 1953 essay "The Case for Flexible Exchange Rates" is one of his most frequently 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

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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.<sup>1</sup> Some of these scholars stayed in Chicago until retirement, while others departed for other schools or institutions where they had very productive careers.

In this paper I analyze the evolution of exchange rates-related research in Chicago during the university's first 100 years, 1892 to 1992. Of course, I recognize that scholars from other schools made important contributions—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 when it provides context for the discussion.

Although different Chicago faculty 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 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, including Ragnar Nurkse and Gunnar Myrdal, who were skeptical of markets and of the ability of exchange rate changes to contribute to the attainment of external balance.

## II. GOLD, SILVER, AND EXTERNAL ADJUSTMENT

During the early years, exchange rate-related discussions revolved around the question of adjustment under alternative monetary standards: gold, silver, and bimetallism.<sup>2</sup> J. Laurence Laughlin, the first chairman of the economics department and the founding editor of the *Journal of Political Economy*, was particularly interested in the subject.<sup>3</sup> In 1896, Laughlin published the treatise *History of Bimetallism in the United States*, where he 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" (1896, p. 93). For Laughlin, that would have greatly reduced the United States' 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" (1896 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 (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

<sup>1</sup> Other Chicago faculty made contributions to this literature. Unfortunately, due to space considerations I cannot provide an exhaustive review of every scholar.

<sup>2</sup> Commodity-based money was also considered, but most discussions were centered on these three options.

<sup>3</sup> On Laughlin, see Nef (1967) and Friedman (1987).

theory “had much in common with ... cost-push or structural or supply-shock theories of inflation ... rather than general monetary influences” (Friedman 1987, p. 12).

Most Chicago scholars tended to side with Laughlin, and supported gold. Henry Simons referred to silver legislation during the Roosevelt administration as representing an “awful moral decay” ([1936] 1948, p. 88). Jacob 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) analyzed the merits of a commodity-based dollar along the lines suggested by Irving Fisher (1913). They concluded that the “compensated dollar” was difficult to implement (Douglas and Director 1931, ch. 17). 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 bimetallic 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.”<sup>4</sup>

Milton Friedman was interested in silver and bimetallism throughout his career. Chapter 3 of his (with Anna Schwartz) *A Monetary History of the United States 1867–1960* 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 Franklin D. Roosevelt’s Silver Purchase Act of 1934 and contend that it had limited monetary effects in the United States. In their view, Roosevelt’s silver policy was little more than another commodity price support program (pp. 483–491). Friedman’s 1994 volume, *Monetary Mischief*, incorporates 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, the policy raised “the price of the metal promptly and sharply ... [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. He writes (1990, 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 episodes 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 (1990, 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.”

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<sup>4</sup> Bimetallism, of course, had some prominent supporters outside of Chicago, including Walker (1896) and Schumpeter (1954). In 1990 Milton Friedman reassessed bimetallism. See below.

### III. JACOB VINER, PURCHASING POWER PARITY, MONEY, AND EXCHANGE RATES

One of Laughlin's last actions as chairman of the department, in 1916, was hiring 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 international economists in the world. Between 1933 and 1939 he was an adviser to the Treasury and 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 US, the UK, 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 basis of the Ricardo–Viner model of international trade—Viner was the editor of the *Journal of Political Economy* for twenty years (1925 to 1945).<sup>5</sup> In 1946 he left for Princeton, where he stayed until his retirement in 1960.

In 1937 Viner published his monumental *Studies in the Theories 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 thirty years. The book includes several chapters on monetary policy, adjustment, relative prices, and exchange rates. In Chapter 6, Viner presents David Hume's 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 draw on his January 1932 Harris Lecture on "International Aspects of the Gold Standard." At the time (1932), and because of the devaluation of sterling in September 1931, there was talk about the possibility of the US getting off gold, something that eventually happened in April 1933.<sup>6</sup> 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 somewhat ambiguous position. 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 failing because over 70% of the metal was in the hands of two countries: the United States and France. Towards the end of the 1932 Harris Lecture, Viner summarized his views: "the gold standard is a wretched standard, but it may conceivably be the best available to us" (Viner 1933, p. 37).

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Viner's guarded defense of the gold standard clashed with Keynes's very critical view of the system, a view that has become associated with a quote from *A Tract on Monetary Reform*, (Keynes 1924, p. 172): "In truth, the gold standard is already a barbarous relic." Interestingly, Keynes had delivered the Harris Lecture at Chicago in 1931, one year before Viner. Although Keynes's topic was not international adjustment—the paper was titled "An Economic Analysis of Unemployment"—he made some critical remarks

<sup>5</sup> The term "Ricardo-Viner specific factors model" was coined by Samuelson (1971). See Maneschi (1992), Irwin and Viner (1991), and Nerozzi (2007).

<sup>6</sup> See Edwards (2018).

about the gold standard that were in line with the views expressed in the *Tract* and that he would expand in his 1933 pamphlet, “The Means to Prosperity.”

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 and other faculty, 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 recommendations:<sup>7</sup>

- The Federal Reserve should be allowed 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 US should provide debt relief to European countries. This was “an essential step towards recovery of world industry and trade.”
- The US should enter negotiations with other countries, “leading toward a reciprocal and substantial lowering of [import] tariffs.”

Although the program was innovative, it fell short of suggesting the abandonment of the gold standard (Wright 1932, pp. 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 some questions on “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 would affect the price level. This issue was related to the Purchasing Power Parity (PPP) doctrine, or proposition that postulates that aggregate price levels are linked across countries through the exchange rate. In its “absolute version,” the PPP proposition is captured by the following equation:

$$P = EP^*,$$

where  $P$  and  $P^*$  are the price 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 US government would result in a general rise in the price level. This “Gold Purchase Program” was the brainchild of Cornell agricultural

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<sup>7</sup> See Tavlas (2023).



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.<sup>8</sup>

In *Studies in the Theories of International Trade* Viner (1937, pp. 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, 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]” (pp. 380, 381). (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.)

The PPP doctrine 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 the recently created International Monetary Fund (IMF) were close to equilibrium. The IMF’s Articles of Agreement stated that countries could alter their currency pegs only when facing a “fundamental disequilibrium.” Metzler used a version of Cassel’s purchasing power parity doctrine that was not very different from the one criticized by Viner in 1937. Metzler defined the average PPP exchange rate between October 1936 and June 1937 as the benchmark or “base period” with respect to which equilibrium was measured. He justified this as follows (Metzler 1947, p. 5): “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. 17): “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 (Metzler 1947, p. 20): “[S]ince several types of price index numbers 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 an institution with the mandate to provide financial assistance to countries facing severe disequilibria. This weakness 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 PPP computations to analyze the evolution of market exchange rates relative to their equilibrium or par values. Their analysis focuses on three periods: the greenback years,

<sup>8</sup> See Fiorito and Nerozzi (2009), and Edwards (2018).



the two World Wars, and the period from 1933 to 1939. Early on, they explain the relation between price and exchange rates according to the PPP doctrine (1963, 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 one page!—Friedman and Schwartz 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” (1963, pp. 62–63n66). For them, the ideal price indexes would track the evaluation of production costs in each country, expressed in domestic currency. Friedman and Schwartz addressed the “arbitrary base year” problem that concerned Viner by selecting the average PPP index for over a decade (1861 to 1879) as a benchmark. In Appendix A-4 (pp. 769–775) they present their PPP exchange rate calculations for the dollar relative to the British pound (1871 to 1960), the Swedish krone (1920 to 1960), and the Swiss franc (1920 to 1960). They 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 UK in 1931, by the US in 1933–34, and by Switzerland in 1936, were clearly captured by these data.

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 several 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 known as the “Chicago Boys.” Some scholars at Chicago, including Harry Johnson and Larry Sjustaad, believed that under fixed rates the convergence of domestic inflation to international inflation would be rather fast; others, including Arnold Harberger, were more skeptical about the process.<sup>9</sup>

If convergence is slow, prices would continue to rise once the nominal exchange rate is fixed in a high inflation country. A situation of real exchange rate overvaluation would develop, and an eventual devaluation crisis would ensue. Milton Friedman addressed this issue in Chapter 9 of *Monetary Mischief* (1994), where he compared the experiences of Chile and Israel with stabilization programs that used a pegged nominal exchange rate as an anchor. Although in Chile the experiment ended up with a major crisis in 1982, in Israel it was largely successful. Friedman pointed out that Israel pegged the exchange rate 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 growing overvaluation and an increasingly large current account deficits financed with (very) short-term capital.<sup>10</sup>

<sup>9</sup> Edwards (2023a).

<sup>10</sup> See Edwards and Montes (2020).

#### IV. 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 wrote (1948, p. 252; emphasis added): “The international arrangement that seems the logical counterpart of the proposed [rule-based monetary] framework is *flexible exchange rates, freely determined in the foreign exchange markets, preferably entirely by private dealings.*”

In a footnote, Friedman points out that his argument may be presented in a completely different way, starting with the exchange rate regime: “[I]t would be equally appropriate to present the proposed domestic [monetary and fiscal] framework as a means of implementing flexible exchange rates” (p. 248n11a). He would make this point many times during the years to come; it was not possible to simultaneously have free capital mobility, active monetary policy (including a monetary rule), and rigid exchange rates.

In April 1948, Friedman participated in a radio debate on monetary policy in Canada. In his memoirs (with his wife Rose), Friedman notes that until that time, Canadian officials had never thought of implementing a floating rate, as they eventually did in September 1950 (Friedman and Friedman 1998, p. 189). In the same memoirs, Friedman recalls that in 1950 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.”<sup>11</sup>

“The Case for Flexible Exchange Rates” (Friedman 1953) was originally written in 1950 as a memorandum for the US Economic Cooperation Administration, and subsequently published, in 1953, in *Essays in Positive Economics*. 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 these imbalances: (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 writes (1953, p. 164): “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.”

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 addition to wage decreases” (1953, p. 165). Regarding the last two options, direct controls have significant efficiency costs, and the use of monetary reserves would be ineffective if the shocks were persistent. In the rest of the

<sup>11</sup> In the 1950s the United Kingdom considered, twice, adopting a flexible exchange rate; the ROBOT plan of 1951–52. Flexible rates were again considered in 1952, during the negotiations for the Collective Approach. See Schenk (1991).

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 the IMF would play in this alternative international monetary arrangement.<sup>12</sup>

Many of the arguments made by Friedman had been made a few years earlier by his Chicago teacher, and later colleague, Lloyd Mints. 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, pp. 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 way 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 had 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 1922–1926. 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” of exchange fluctuations, stressing the undetermined character of exchange rates [under free markets].

This view clashed with Friedman’s, who in his 1953 article argues that speculators play a positive and stabilizing role: “[S]peculative 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 argued by critics of flexible rates—see, for example, “The Optimum Quantity of Money,” Chapter 13 of his book *Essays in Positive Economics*.

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 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 (see Friedman 1967). What is less known, however, is that Simons also had an impact on Friedman’s views on exchange rates. In several of his writings Simons criticized the gold standard and argued in favor of what he called “independent national currencies.” In a

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<sup>12</sup> See Edwards (2023b).

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 global economy after World War II, Simons contended that free trade was the most important requirement for a durable peace. He then pointed out that the adoption of flexible rates would facilitate free trade (Simons 1943, p. 435; emphasis added): “One may look forward to an eventually more flexible and less administered system in which the separate currencies of nations or groups of nations are stabilized fiscally in terms of internal price levels and freely traded, without fixed parities, in organized, unmanipulated foreign-exchange markets.”

In the years that followed the publication of “The Case for Flexible Exchange Rates” (1953), Friedman reiterated and refined his arguments on the superiority of flexible exchange rates. He expressed his view in papers and at conferences and roundtables. Here is a small selection of instances where Friedman promoted flexible exchange rates and/or criticized the Bretton Woods system:<sup>13</sup>

- 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. 269). A second-best option was to auction foreign exchange. In the next few years, he pointed out that flexible rates didn’t necessarily have to be market determined; poorer countries could resort to auctions or crawling pegs (Friedman 1973a; Edwards 2023b).
- In a 1965 American Enterprise Institute symposium, he discussed a paper by James Meade, and said that new 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 period, the US 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.
- In a 1967 debate with former Under Secretary of the Treasury Robert Roosa, Friedman pointed out that flexible rates were (very) likely to boost international commerce, while fixed rates hindered it. He said: “If countries separately follow stable internal policies, exchange rates, while free to move, will be highly stable. Stability is not rigidity” (Friedman and Roosa 1967, p. 77).
- In a 1969 debate with MIT’s Charles Kindleberger, 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

<sup>13</sup> I deal with his debates with Robert Mundell in section VI.

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 June 1973 testimony in front of the Joint Economic Committee in Congress, almost two years after the “gold window” had been closed by President Nixon, Friedman 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.”<sup>14</sup>
- In 1994, in a policy piece on the fiftieth 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” (Friedman 1994, p. x).

In the 1950s and 1960s one of the strongest opponents to flexible exchange rates changes was Swedish economist Gunnar Myrdal, who would win the Nobel Prize in 1975. In his three-volume oeuvre, *Asian Drama: An Inquiry into the Poverty of Nations* (1968), 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, Myrdal is very skeptical with respect to the role of exchange rate adjustments in developing nations (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 the concept [devaluation] is not applicable to these countries.

Myrdal’s position was not new; he had already presented it in his 1956 treatise *International Economy: Problems and Prospects*, where he wrote 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 an irrevocable fixed exchange rate and no central bank. He called that system a “unified currency.” In the years that followed Friedman continued to emphasize the importance of relative price changes during the adjustment process. He pointed out that under a “unified currency,” it was key that both wages and prices remained flexible. If prices (and wages) were rigid, adjustments to external shocks would result in heightened unemployment (see Edwards 2023b for details).

Friedman’s conclusions regarding poorer nations were 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

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<sup>14</sup> Friedman (1973b).



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). In his answer Friedman noted that a unified currency regime was a long-run solution for poorer countries. 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, pp. 65–66; emphasis added).

## V. THE TRANSFER PROBLEM, RELATIVE PRICES, AND EXCHANGE RATES

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. 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 versus John Maynard Keynes in 1929.

Jacob Viner devoted long passages of his 1937 book to the transfer problem. Viner criticized Keynes (1929), Ohlin (1929a, 1929b), and Pigou (1932) for not considering all variables in play, and praised Roland Wilson (1931) and Theodore Yntema (1932) for analyzing second-round effects, including the way in which transfers impacted on the composition of demand. Viner argued that it was not possible to reach a firm and unequivocal conclusion about the effects of a transfer on the key macroeconomic variables. He could offer only a conjecture: “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 model to analyze the effects of a transfer on real incomes. Although he used a more sophisticated apparatus than Viner, his conclusions were similar: it was not possible to reach an unambiguous result. The final effect depended on several variables, including whether the two countries exhibited stability in isolation. In 1951, Metzler extended his analysis to the case of 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 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).

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 versus Keynesian), and two

exchange rate regimes, fixed versus 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. Arnold C. Harberger (1950) and Svend 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. Maurice Obstfeld (1982, p. 251) summarized these results as follows: "[A]n adverse movement in the terms of trade between domestic and foreign goods will cause a rise in 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. Lars Svensson and Assaf Razin (1983) expanded the analysis and considered an intertemporal optimization model. They showed that the traditional results by Harberger, and Laursen and 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 the 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. Rüdiger Dornbusch (1980, pp. 106–107) showed that under most parameter configurations, the receiving country will experience a real appreciation and a deterioration in the trade balance. Michael Mussa (1986) and Jacob Frenkel and Assaf 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 than 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 like that of "an exogenously driven transfer": the real exchange rate will appreciate, and a large current account deficit will develop. 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.



## VI. 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 the balance of payments and exchange rates, a view advanced by Jacob A. Frenkel and Harry G. Johnson (1978). In its simplest representation, the monetary approach posited that the equilibrium 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). He argued that discussions on what type of indexes to use—traded goods versus general prices—had stalled research progress on PPP 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, chs. 8 and 9). According to 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 *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 (1963, p. 241n10). 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). As well, 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.<sup>15</sup> In all these papers, PPP—either in “absolute” or “relative” terms—plays an important role. Dornbusch ([1976] 1978, pp. 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,  $(M/p) = L(\dots)$  and  $(M^*/p^*) = L^*(\dots)$ , where 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

<sup>15</sup> The volume came out a few months after Harry Johnson had passed away.

logarithmic differentials of the nominal exchange rate ( $\hat{E}$ ) will be given by the following expression (Dornbusch's equation 6):<sup>16</sup>

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

The first term in parentheses 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.

Whether models along these lines appropriately captured the behavior of exchange rates hinged on the assumptions made about PPP. Frenkel's research (1978) suggested that PPP had held during periods of rapid inflation, including in Germany during the 1920s. 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 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 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 there is a secular tendency for the relative price of nontradables 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 elsewhere, to develop richer models that emphasized more complex portfolio choices and allowed for price sluggishness in the short and medium runs. 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 equilibrium.

<sup>16</sup> Dornbusch, of course, acknowledges that many of the right-hand-side variables are endogenous.

## VII. 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 sixty 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). 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.

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 once he joined the department. His views on the subject were very influential in Europe and helped build the conceptual base for the euro. These ideas were also debated in several developing countries that had suffered from 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. In his view, the world would greatly improve if a Mundellian perspective 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, 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. Mundell, however, was skeptical about the sustainability of the policy. In 1995 he wrote that Argentina "had fallen victim to overvaluation paid for by capital imports" (1995, p. 26). Two years later 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 collapsed, Mundell (2000, p. 225) wrote that "Argentina still 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 to labor market rigidity.

In 2001, Mundell and Milton Friedman had a debate on the merits of alternative regimes. Friedman argued that there was a trichotomy: hard pegs, soft pegs, and flexible rates. 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 for most developing nations. Mundell agreed on the need to be more precise, and pointed out that it was useful to distinguish between alternative fixed exchange rate arrangements: a common currency area, a "dollarized" area, a monetary union, and a currency board system. He said (Friedman and Mundell 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."

## VIII. EXCHANGE RATES AND FUNDAMENTALS

In the early 1970s, a group of young researchers 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—it was a highly influential development. Rudi Dornbusch, Michael Mussa, and Jacob Frenkel are the better-known Chicago names associated with this emphasis. The three were students of Robert Mundell and Harry G. Johnson, and, in turn, had many students who contributed to transforming the "real exchange rate" into one of the most important variables in global macroeconomics. Real exchange rate analyses also became central to discussions about stabilization and external sustainability in less developed nations.

During the 1980s several researchers and PhD students examined the behavior of real exchange rates in several 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 overshooting model discussed above, and to cast doubt on models that relied extensively on PPP.<sup>17</sup>

The theoretical development of models that emphasized the role of domestic non-tradable goods, starting with Mundell and Dornbusch, resulted in an important change in the way economists, 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 “misaligned.” This, of course, was the issue addressed by Viner, Metzler, and Friedman, discussed in some detail in the preceding sections. Newer empirical models identify the way in which long-term “fundamentals,” such as terms of trade, commercial policy, differential productivity trends, and others, 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 under- or overvaluation, and the policies aimed at correcting them were discussed (Dornbusch and Helmers 1988).

### VIII. 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. 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), 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 “social opportunity cost” of using certain resources in public investment projects. The case of foreign exchange is particularly interesting, since in addition to distortions such as import tariffs, licenses, and quotas, and export subsidies/taxes, many countries chose to have a fixed (nominal) exchange rate that often was 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 project comes from two possible sources. A fraction comes from imports 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. The “shadow” exchange rate—or, as Harberger prefers to call it, the “social opportunity cost of foreign exchange”—is a weighted average of the import- and export-related sources,

<sup>17</sup> 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).



the weights 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 contributions 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):

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

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  $\varepsilon$  and  $\eta$  refer to the elasticities of the private sector's supply of exports and of its demand for imports.

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 that "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. 162).

## IX. CONCLUDING REMARKS

The international financial architecture has changed dramatically since 1892, the year the University of Chicago was founded. In the late nineteenth and early twentieth centuries, most countries were on the gold standard, currencies were rigidly pegged to gold—in the US, until January 1934, an ounce of gold was \$20.67—the Federal Reserve did not exist, there was no understanding of the consequences of different macro policy mixes, and there were no efforts to coordinate policies across borders.

The evolution of the international financial system was neither easy nor smooth. In many cases changes were the response to dramatic events, including major wars, the Great Depression, rapid inflation, and rampant protectionism. Research undertaken by members of the economics faculty at the University of Chicago helped the world transition to newer (and better) institutional arrangements and contributed to an improved understanding of the global economy. In this essay I analyzed the most important contributions made by the Chicagoans in the field of exchange rates and external adjustment during the university's first 100 years (1892 to 1992). I showed that Chicago's contributions covered a myriad of issues and went beyond the fixed versus flexible exchange rates debate dominated by Robert Mundell and Milton Friedman. Indeed, pioneering work by many Chicago scholars is behind many of today's global financial arrangements, including the euro, the implementation of countercyclical macro policies, and the prevalence of flexible exchange rates in countries of all degrees of development.

Of course, Chicago was not the only place where cutting-edge research on these issues was undertaken during the period under study. The frontier of knowledge was also pushed out by scholars at MIT, Yale, Harvard, Berkeley, Michigan, Cornell, Oxford,

Cambridge, Kiel, and other schools. However, what made Chicago unique was the emphasis on the role of markets and relative price changes during the adjustment process.

## COMPETING INTERESTS

The author declares no competing interests exist.

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